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수치예보시스템의 검증
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1. 각 모델들의 주요특성

2002년 수치예보과에서 현업 운영중인 모델들은 전지구 예보시스템(Global Data Assimilation and Prediction System, GDAPS) 2종, 지역 예보시스템(Regional Data Assimilation and Prediction System, RDAPS) 3종, 태풍모델(Barotropic Adaptive-grid Typhoon System, BATS), 통계예보모델, 파랑모델(WAve Model, WAM), 앙상블 예보시스템(Ensemble Prediction System, EPS)이다. 통계예보모델에는 KFM(Kalman Filter Method), GDLM(GDAPS Dynamic Linear Model), RDLM(RDAPS Dynamic Linear Model), KF3H(KF 3 Hours), PPM(Perfect Prog Method)으로 나뉘며 파랑모델은 전구파랑모델(Global Wave Model, GoWAM)과 지역파랑모델(Regional Wave Model, ReWAM)로 나누어져 있다.

표 1는 전지구 예보시스템, 표 2는 지역 예보시스템, 표 3는 파랑모델, 표 4는 태풍모델(BATS), 표 5는 통계모델, 표 6는 앙상블모델에 관련된 주요 특성을 간략히 나타낸 것이다.

표 1. 전지구 예보시스템 및 앙상블 예보시스템의 모델 특성

모델	고분해능(T213L30)	저분해능(T106L21)	Ensemble
기본방정식	하이브리드 좌표계를 이용한 원시방정식		
수평분해능	55km	110km	
영역	Global		
연직층수	30층 (~ 10hPa)	21층 (~10hPa)	
분석	3차원 최적내삽		
예보시간	3.5일 (2회/일, 00, 12UTC) 10일 (1회/일, 12UTC)		10일 (1회/일, 12UTC)
시간적분	반암시적 시간적분		
수평확산	라플라시안의 2차 수평확산		
습윤과정	Kuo scheme, 대규모 응결, 천해대류방안		
복사	장파복사는 매3시간마다 계산, 단파복사는 매 1시간마다 계산		
중력파저항	장파(파장 > 100km), 단파(파장 10km)		
PBL 과정	비국지 방안		
지표면	Simple biosphere model		
지표상태	NOAA 일별 SST, 토양수분, 적설량, 지중온도는 기후값 사용		

표 2. 지역 예보시스템의 모델 특성

	지역모델	고분해능 모델	
역학과정	비정역학계		
분해능	30km	10km	5km
격자개수	171 x 191	160 x 178	141 x 141
시간적분간격	75초	30초	15초
연직층수	33층(지상 ~ 50hPa)		
예보시간	2일	1일	
초기화방법	FDDA(12시간)	1-way Interaction	
미세물리과정	혼합상 미세물리과정(수증기, 구름, 비, 얼음, 눈)		
적운모수화	Kain-Fritsch		None
PBL 방안	Nonlocal 행성경계층		
지상온도	5층 토양모델		
복사과정	구름복사과정		
해수면	NOAA 일별 SST		

표 3. 파랑모델들의 주요 특성

	GoWAM	ReWAM
모델	3세대 파랑모델	
스펙트럼 분해능	12 방향 25 주파수	
격자체계	구좌표계에서의 위, 경도	
수평분해능	1.25 × 1.25deg(288×113)	0.25 × 0.25deg(141×121)
모델영역	70°S-70°N, 0°E-360°E	20°N-50°N, 115°E-150°E
적분시간	720 초	360 초
예보시간	240 시간(12UTC)	48 시간(00, 12UTC)
초기조건	전 작업에서 24시간 예보된 스펙트럼장	전 작업에서 12시간 예보된 스펙트럼장
바람장	10m 바람장(GDAPS)	10m 바람장(RDAPS)

표 4. 태풍모델들의 주요 특성

초기 및 경계 자료	전지구 분석장 및 예보장
모조태풍 및 초기화	전지구 분석장의 850 ~ 200hPa의 연직 평균 고도장에 태풍분석자료에 근거한 모조태풍 삽입
지배방정식	천수방정식
수평분해능	위, 경도 : 0.6°(태풍중심 : 0.3°)
모델영역	60° × 60°(101 × 101)

표 5. 통계모델들의 주요 특성

방법	모델명	예보인자	예보요소	예보시간 및 예보기간	예보식
PPM	PPM	RDAPS 예보 변수를 이용하여 재 산출된 45개 잠재예보인자	최고/최저 기온	00UTC : +1일 12UTC : +2일	중회귀식
KFM	KFM	RDAPS 시그마 최하층 기온 예보값	최고/최저 기온	00UTC : +2일 12UTC : +3일	상태방정식 출력방정식
	KF3H	RDAPS 시그마 최하층 기온 예보값	3시간 간격 기온	00UTC : +2일 12UTC : +2일	
DLM	GDLM	GDAPS 최고/최저 기온예보값	최고/최저 기온	12UTC : +10일	상태방정식 출력방정식
	RDLM	RDAPS 시그마 최하층 기온 예보값	3시간 간격 기온	00UTC : +2일 12UTC : +2일	

표 6. 앙상블모델들의 주요 특성

초기자료	전지구 분석장
모델영역	전지구(지상 ~ 10hPa)
수평분해능	1.125° Gaussian grid
연직층수	21 층
적운모수화	Kuo Scheme
지표면	Simple Biosphere Model
섭동생성방법	Breeding of Growing Modes(BGM) method
섭동생성영역	Global
시간적분	10 일(12UTC)
Ensemble 멤버수	17 개

2. 2002년 모델 변경 사항

o 2002년 4월 1일 : KF3H 지점추가(백령도, 충주), 총 38개 지점
KFM 지점추가(충주), 총 38개 지점

o 2002년 6월 1일 : KF3H 지점추가(문산, 상주, 진도), 총 41개 지점
KFM 지점추가(문산, 상주, 진도), 총 41개 지점

o 2002년 6월부터 기상청 태풍감시구역(20N 북쪽, 140E 서쪽)내 태풍이 존재할 때만 태풍모델이 수행되던 것을 북서태평양 전지역에 TD(Tropical Depression) 이상 강도를 가지는 열대저기압이 존재할 때 태풍모델이 수행되도록 변경

o 2002년 11월 13일 저분해능 전지구예보시스템 (T106L21) 분석기법 변경
- 2DOI(21층 sigma)에서 3DOI(21층 sigma)로 변경
- 대칭 보거싱 기법에서 비대칭 보거싱 기법으로 변경

o 2002년 11월 26일 : 전지구모델, 지역모델, 태풍모델 해수면 자료 변경
- 주간 해수면 자료를 일 해수면 자료로 변경

o 2002년 12월 1일 : 앙상블해수면자료변경
- 주간해수면자료를 매일해수면자료로 변경
- 초기장사용시 T213(3DOI)를 T106(3DOI)로 변경

3. 검증

3. 1. 검증 개요

예보를 미래상태에 대한 예측이라 할 때, 예보 검증이란 예측의 질을 평가하기 위한 하나의 과정이다. 따라서 실제 발생한 관측자료를 가지고 예보를 비교 평가한다. 검증은 질적인 (예를 들어, 맞은 것인가?) 혹은 양적인 (얼마나 정확한가?) 것

으로 정의할 수 있다. 두 경우 모두 예보 오차에 대한 상태 정보를 제공해 준다.

예보를 검증하는 3가지 주된 이유는 예보의 질을 - 예보가 얼마나 정확하며 시간에 따라 향상되는 지 - 감시하고, 예보의 질을 향상시키기 위하여 무엇이 잘못된 것인 지를 알아내어 해결하고, 마지막으로 서로 다른 예보시스템의 예보 질을 상호 비교함으로써 장, 단점을 파악하여 어떤 예보 시스템을 사용할 것인지를 판단하게 해 준다. 다시 말하면, 검증은 예보관에게 각 예보시스템의 장점과 단점을 판단할 수 있는 객관적 정보를 제공해 준다. 또한 예보를 향상시키기 위해 개선해야 할 부분을 모델들에게 제시해 주기도 한다. 검증 평가 없이 발표된 예보는 예보의 질과 예보 값이 하찮은 것임을 간접적으로 나타낸 것이다.

검증은 예보의 형태가 다양하기 때문에 각기 적용하는 방법 역시 약간씩 다르다. 아래의 표는 예보를 구분하는 방법과 예보의 실제 예를 보여주고 있다.

표 7. 예보의 형태 분류

예보 상태:	**예**
단일예보 (deterministic)	정량적 강수 예보
확률예보 (probabilistic)	강수 확률, 앙상블 예보
질적예보 (qualitative, worded)	5일 전망
시공간 영역:	
시계열 (time series)	지점의 일 최고기온
공간분포 (spatial distribution)	지위고도, 강수 분포도
합동 공간과 시간 (pooled space and time)	월평균 전지구 이상기온
예보의 특수성:	
양분예보 (dichotomous, yes/no)	안개 발생 여부
다중범주 (multi-category)	추움, 정상 (normal), 더움 조건들
연속적 (continuous)	최고기온
객체 혹은 사건 지향 (object- or event-oriented)	열대저기압 이동 및 강도

예보의 질은 예보 값과 일치하지 않는다. 만일 객관적 혹은 주관적 기준에 따라 예보한 것이 관측 값에 가까웠다면 예보의 질이 높아질 것이다. 그러나 예보 값 자체는 사용자가 잘 이용하도록 도움을 주는 참고자료일 뿐이다. 예를 들어, 고분해능 수치예보 모델이 특정지점에서 독립적인 뇌우의 발달을 예보하였다고 할 때, 뇌우

자체는 그 지역 (넓은 지역)에서 실제로 관측되었지만 모델에서 추정한 특정 지점에서는 관측되지 않을 수 있다. 이러한 경우, 대부분의 표준 검증에 따르면 예보가 낮은 품질로 평가될 것이지만, 예보관의 입장에서는 매우 가치 있는 예보임에 틀림없을 것이다. 예를 들어 고품질의 예보이지만 낮은 가치를 갖는 것들 중 하나는 건조기 동안 사하라 사막에서 예보하는 "맑음" 예보일 것이다.

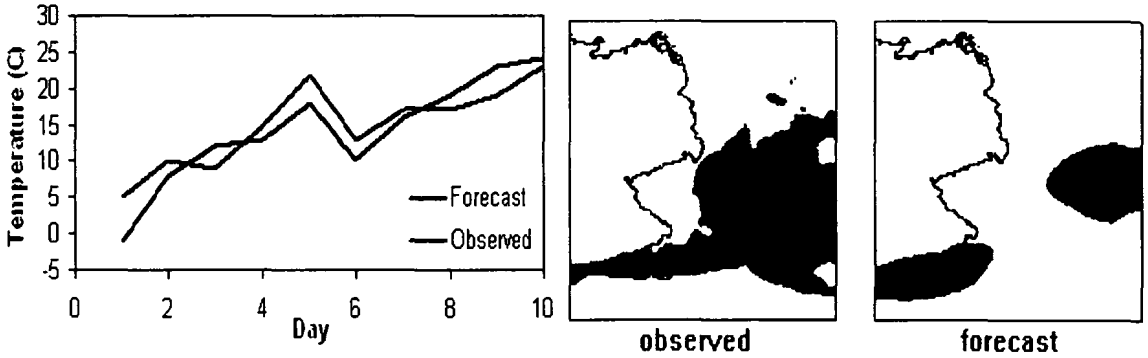
그러면 검증할 때 무엇을 진짜 혹은 참 (truth)으로 둘 것인가? 예보를 검증하기 위해 일반적으로 사용하는 참값은 관측자료이다. 일반적으로 우량계 관측, 기온 관측, 위성자료로부터 유도된 운량, 지위고도 분석 등이 관측자료로 이용된다. 그러나 관측 자체에도 오차가 있기 때문에 정확한 참값이라 하기에는 어려운 점이 있다. 관측 자체에 내재된 무작위 오차 (random error)와 편차 (bias error), 표본 오차와 대표값 자체의 오차, 그리고 관측자료를 분석할 때 혹은 예보 규모에 일치시키기 위해 관측자료를 변환할 때 발생하는 분석 오차 등이 불확실 (uncertainty)의 원인이 된다. 대부분의 시간 우리는 운 좋게 참값 속에 내재된 오차를 무시하여 왔다. 만일, 참값 속에 있는 오차가 예보에 내재된 예상 오차보다 훨씬 작다면 (즉, 높은 신호대 잡음 비) 검증결과는 의미가 있을 것이다. 왜곡된 혹은 표본보다 못한 검증자료일지라도 내부의 상이한 예보 방법을 상호 비교할 때는 어떠한 예보 결과가 나은 지를 알려주는 기준점을 제공해 주기도 한다.

검증결과는 검증자료의 양과 질이 높을 때 자연적으로 믿음이 더 간다. 만일 그렇지 못하다면 검증결과 자체에 어떤 오차 한계를 넣어주는 것이 좋다. 특히 어느 예보가 확연히 뛰어난 것인지를 알고 싶을 때 특히 중요하다. 검증 스코어에서 신뢰구간을 주는 여러 가지 방법들이 있다.

신뢰할만한 검증 통계를 얻기 위하여 상당한 양의 예보와 관측 표본들이 시공간에 대해서 채워지게 된다. 표본이 많을수록 검증결과의 신뢰도 또한 높아진다. 그러나 표본을 채워 넣을 때 감수해야 할 점은 자료가 균질하지 않을 때 예보 성능에 많은 차이가 날 수 있다는 점이다. 더구나 이것은 검증결과를 가장 일반적인 표본구간(예를 들어, 고밀도 관측지역 혹은 악기상이 없는 날들)으로 편향시킬 수 있다는 점이다. 표본들을 비슷한 균질 집합으로 나누는 것은 (계절별로, 지역별로, 관측의 강도 별로 등) 특정 기간동안 예보의 양상을 추출하는 데 도움을 준다. 신뢰도 높은 검증결과를 제공하기 위해서는 충분한 양의 표본들을 포함하도록 해야만 한다는 것이다.

3. 2. 표준 검증 방법

가장 오래되고 가장 뛰어난 검증 방법의 하나가 눈으로 직접 비교하는 방법(eyeball)이다; 예보와 관측을 나란히 놓고 비교하여 사람의 판단력으로 예보 오차를 가려내는 방법이다. 눈으로 직접 비교하는 방법은 예보의 수가 적고, 시간은 많고, 정량적인 검증 통계를 기대하지 않을 때 사용한다. 통계가 필요하다 할지라도 차례대로 자료를 차근차근 살펴보는 것이 좋은 방법이다.



예보의 형태에 따라 검증 방법이 다르기 때문에 여기에서는 양분 예보(dichotomous), 다중 범주예보, 연속 예보와 확률예보에 대한 표준 검증방법과 점수(score) 에 대해 간략히 설명을 한다.

3.2.1. 양분 예보 (예/아니오)에 대한 방법

양분 (dichotomous) 예보는 "사건이 일어날 것인가?"에 대해 "예 혹은 아니오"라 말하는 것과 같은 예보를 말한다. 강우와 안개가 일반적인 양분 예보의 예이다. 이런 형태의 예보를 검증하기 위해서는 예보와 발생 각각에 대한 "예" 와 "아니오"의 빈도수를 보여주는 분할표 (contingency table)를 먼저 작성해야 한다. 분할표는 조건 분포라 부르기도 하며, 예보와 관측에 대한 "예"와 "아니오" 로 구성된 4개의 조합으로 구성된다.

맞힘 (hit); 사건이 발생할 것으로 예측, 실제로 발생

놓침 (miss); 사건이 발생하지 않을 것으로 예측, 실제로 발생

거짓 알림 (false alarm); 사건이 발생할 것으로 예측, 실제로 발생하지 않음

부의 정확 (correct negative); 사건이 발생하지 않을 것으로 예측, 실제로 발생하지 않음

		Forecast		
		yes	no	Total
Observed	yes	***H (hits)***	***M (misses)***	***observed yes***
	no	***F (false alarms)***	***C (correct negatives)***	***observed no***
Total		***forecast yes***	***forecast no***	***total***

분할표는 오차의 분류가 어떻게 만들어지는 지를 볼 수 있는 가장 효과적인 방법이다. 완벽한 예보 체계는 단지 맞힘 (hits, 이하 H)과 부의 정확 (correct negatives, 이하 C)만이 존재하고 놓침 (misses, 이하 M)과 거짓 알림 (false alarms, 이하 F)이 없는 결과를 산출한다. 예보 성능의 특정 상태를 설명하기 위해 분할표에 있는 요소들을 가지고 다양한 형태의 범주형 통계를 계산한다. 범주형 통계는 다음과 같다.

(1) 정확도 (accuracy): 개개의 예보와 관측간의 평균적인 일치 정도를 나타내는 것으로 정확히 예보한 것에 대한 백분율로 나타낸다. 값의 범위는 0에서 1이며 완벽한 예보는 1의 값을 갖는다. 문제는 가장 일상적인 범주, 즉 거의 발생하지 않는 현상에 대해 발생하지 않는다고 예보한 것에 의해 심각히 영향을 받을 수 있다는 점이다.

$$accuracy = \frac{H + C}{H + M + F + C}$$

(2) 치우침 (bias score): 평균적인 예보와 평균적인 관측간의 일치 정도를 나타내는 것으로 전체적인 치우침(overall bias), 체계적 치우침 (systematic bias), 혹은 무조건적 치우침 (unconditional bias)으로도 알려져 있다. 범주형 예보에 대한 bias의 척도는 사건 예보 총 수를 관측된 사건의 총 수로 나눈 것이다. 값의 범위는 0에서 무한대까지이며 완벽한 예보는 1의 값을 갖는다. 1 보다 작은 값은 예보 시스템이 과소예보 경향을, 1 보다 큰 경우에는 예보 시스템이 과대 예보 경향을 갖는다고 말한다. 따라서 예보가 얼마나 정확히 관측에 대응하는 지를 측정하는 것이 아니라 단지 상대적 빈도를 측정한다.

$$Bias\ score = \frac{H + F}{H + M}$$

(3) 탐지 확률(POD, Probability of Detection): 발생한다고 예보한 사건에 대해 실제로 발생했는가를 나타내는 척도로서 정확히 사건을 예측하였던 수를 실제 발생하였던 사건의 수로 나눈다. 적중률 (hit rate)로도 불리며 0에서 1 사이의 값을 가지며 완벽한 예보는 1의 값을 갖는다. POD는 맞힘 (hits) 경우에 아주 민감하며

거의 드문 현상에도 좋은 숙련도를 보인다. 거짓 경보는 무시하며, 맞히는 수를 증가시키기 위해 "yes" 형 예보를 대량 생산하여 임의적으로 숙련도를 높일 수 있다는 단점을 가지고 있다.

$$POD = \frac{H}{H+M}$$

(4) 거짓 알림 비 (FAR, False Alarm Ratio): 발생하지 않은 사건에 대해 발생한다고 예보한 것의 비로서 정의되며, 거짓 알림 수를 사건 발생 예보 총 수로 나눈다. 예보보다는 관측에 중점을 둔 false alarm rate (= $\frac{F}{F+C}$)와 혼동하지 말아야 한다. 값의 범위는 0에서 1 사이이며 완벽한 예보는 0의 값을 갖는다. FAR은 거짓 알림에 민감하며 misses를 무시한다. 거짓 경보의 수를 줄이기 위해 임의적으로 "no" 예보를 산출할 수 있다.

$$FAR = \frac{F}{H+F}$$

(5) 성공 임계 지수 (CSI, Critical Success Index): Treat Score 혹은 Gilbert Score로도 불리며 정확히 예측하였던 사건 수를 예보이든 관측이던 간에 사건 발생과 관련된 총수를 합하여 나눈 것이다. 값은 0에서 1의 값을 가지며, 0은 숙련이 안 되었음을 1은 완벽한 예보를 의미한다. CSI는 사건이 발생하지 않는다고 예보하였고 실제 발생하지 않은 경우의 수(correct negatives)에 의해 영향을 받지 않는다. 따라서 사건의 빈도수에 따라 좌우되는 경향이 있다. 또한, CSI는 무강수에 대한 정확한 예측(H)값을 고려하지 않기 때문에 강수일수가 적은 경우 ACC를 의미하게 된다. 예를 들면 CSI가 0인 경우(POD=0 그리고 FAR=1), 무강수가 많았던 경우이다. 특히,. 집중성 강수가 많아 상대적으로 강수 일수가 적은 지역에 대해서는 잘못된 통계치를 유발할 가능성이 크다. 단점은 예보오차의 원인을 구별할 수 없다는 것이다. 어떤 경우에 맞힌 것(hits) 자체가 우연한 기회에 의한 것일 수 있기 때문에 사건의 기후학적 발생빈도에 의존하는 경향을 가지고 있다.

$$TS = CSI = \frac{H}{H+M+F}$$

(6) Equitable Threat Score (ETS): 보통은 드문 사건들 (예를 들어 커다란 임계값을 넘는 강수량)에 대한 결정론적 예보의 검증에 주로 사용된다. Gilbert가 Treat Score에서 우연히 맞힐 수 있는 경우를 고려하여 수정한 것으로 Gilbert Skill Score라고도 불린다. 우연히 맞출 수 있는 것을 배제한 상태로 예측한 사건에 대한

관측과 예측의 비이다. ETS는 자체의 등방성이 다른 예측 구간을 가로질러 비교될 수 있기 때문에 수치예보모델의 강수 검증에 주로 사용된다. 값의 범위는 $-\frac{1}{3}$에서 1의 값을 가지며, 0는 미숙련을 1은 완벽한 예보를 나타낸다. 맞힘(hits) 수에 민감하며 misses와 false alarm 수에 따라 불리해지는 특성을 가지고 있다. 또한 기후학적 사건 빈도수를 고려하고 있다. 그러나 예보오차의 원인을 구별하지 못하는 단점을 가지고 있다.

$$ETS = \frac{H - H_{random}}{H + M + F - H_{random}} \quad \text{여기서} \quad H_{random} = \frac{(H+F)(H+M)}{H+F+M+C} \text{ 이다.}$$

(7) Hanssen and Kuipers discriminant (HK or true skill statistic): "no" 경우에서 "yes"의 경우를 추출하여 예보의 능력을 측정한다. 또한 사건 발생에 대한 정확도 (accuracy)와 사건이 발생하지 않은 것에 대한 정확도를 합하여 1을 뺀 값으로서 해석할 수 있다. 값의 범위는 -1에서 1의 값을 가지며 만점은 1이다. 분할표에 있는 모든 요소를 사용하며 기후학적 사건 발생 빈도와는 무관하다. 드물게 발생하는 사건에 대해서도 POD에 과도한 가중치를 둔다. hits_random 항이 unbiased 된 것을 제외하면 ETS와 유사한 형태로 표현된다.

$$HK = \frac{H}{H+M} - \frac{F}{F+C}$$

(8) Heidke Skill Score (HSS): 순전히 우연한 기회에 의한 correct 예보를 제거한 후의 성공률이다. 우연한 기회에 의한 맞힘은 사건 발생 빈도수에 사건 예보의 수를 곱한 것으로 주어진다. HSS는 정확한 사건 예보 수에서 우연한 기회로 인한 맞힘을 뺀 것을 사건 예보 수에서 우연한 기회로 인한 맞힘을 뺀 것으로 나눈 것이다. 이것은 가장 일반화된 숙련도의 형태로 음의 무한대에서부터 1의 값을 가지며 0는 숙련이 없음을 1은 완벽한 예보를 의미한다. 우연한 기회에 대한 향상정도를 측정한다. 우연한 기회는 보통 비교 대상에 대한 최적 예보가 아니다-기후(장기간 평균) 혹은 지속성 (예보=가장 최근 관측, 즉 변화 없음) 혹은 다른 어떤 표준값을 사용하는 것이 낫다.

$$HSS = \frac{2(H \times C - M \times F)}{(H+M)(M+C) + (H+F)(F+C)}$$

(9) Odd Ratio (OR): 거짓 경보할 확률에 대한 hits할 확률의 비를 측정한다. odds ratio의 logarithms은 종종 원래 값 대신에 사용된다. 값은 0에서 무한대까지이며 1은 숙련이 없음을, 만점은 무한대이다. 드문 사건에 대해 좋은 점수를 제공한

다. 연계된 (hedging)에 덜 민감하며 넓게 사용되지는 않는다.

$$OR = \frac{H \times C}{M \times F}$$

3.2.2. 다중-범주형 예보에 대한 검증방법

다중의 범주에 속하는 예보에 대한 검증 방법은 다양한 구간에 대한 예측과 관측의 빈도수를 보여주는 분할표 (contingency table)를 가지고 시작한다.

표 9. 예측과 관측의 빈도수를 보여주는 분할표

		Forecast Category				Total
	i,j	1	2	...	*K*	
Observed Category	1	*n(F1,O1)*	*n(F2,O1)*	...	*n(FK,O1)*	*N(O1)*
	2	*n(F1,O2)*	*n(F2,O2)*	...	*n(FK,O2)*	*N(O2)*
	...	...	...	...	...	...
	K	*n(F1,OK)*	*n(F2,OK)*	...	*n(FK,OK)*	*N(OK)*
Total		*N(F1)*	*N(F2)*	...	*N(FK)*	*N*

이 표에서 $n(F_i, O_j)$는 범주 j 내의 관측값을 갖는 범주 i 내에 있는 예보의 수를 의미한다. $N(O_j)$는 범주 j 내의 총 관측 수를, $N(F_i)$는 범주 i 내의 모든 예보 수를 의미하며, N은 예보의 총 수를 의미한다.

예보 검증에 접근하는 분포법 (distribution approach)은 다중의 분할표에 있는 모든 요소간의 관계를 조사하는 것이다. 완벽한 예보체계는 대각선을 따라 $n(F_i, O_j) \geq 0$ 값을 가지며 대각선이 아닌 곳에서는 0의 값을 갖는다. 비-대각선 요소들은 예보 오차의 특수한 성질에 관한 정보를 제공한다. 표의 우단과 하단에 있는 수는 예보가 관측과 비교할 때 범주형 값들의 분포를 보여준다.

분포법의 장점은 예보오차의 성질을 쉽게 진단할 수 있다는 것이다. 단점은 결과를 단일 값으로 응축하기가 어렵다는 것이다. 다중 범주 예보의 성능을 요약하는 통계 값들이 거의 없지만, 다중 범주형 예보 검증은 일련의 K-1에 대한 양분형 검증, 즉 범주 i에 있는 "yes"와 "no"로 정의하는 양분형 검증으로 전환될 수 있다.

(1) Accuracy: 범주 내에서 예보와 관측이 정확히 일치하는 모든 예보수를 총수로 나눈 것이다. 0에서 1 사이의 값을 가지며 만점은 1이다. 간단하며 직관적이

다. 가장 흔한 범주에 의해 매우 심각하게 영향을 받기 때문에 현혹될 수 있다.

$$Accuracy = \frac{1}{N}\sum_{i=1}^{K} n(F_i, O_i)$$

(2) Heidke Skill Score (HSS): 순전히 우연히 정확해 질 수 있는 예보를 제외한 후에 정확한 예보의 비를 측정한다. 일반화된 숙련도의 한 형태이다. 계산에서 나온 점수는 정확한 예보의 수이며 이 경우에 기준 예보는 우연한 기회이다. 값은 음의 무한대에서부터 1의 값을 가지며 0는 숙련이 없음을, 만점은 1이다. 우연한 기회에 대한 향상정도를 측정한다. 우연한 기회는 보통 비교 대상에 대한 최적 예보가 아니다-기후 (장기간 평균) 혹은 지속성 (예보=가장 최근 관측, 즉 변화 없음) 혹은 다른 어떤 표준값을 사용하는 것이 낫다.

$$HSS = \frac{\frac{1}{N}\sum_{i=1}^{K} n(F_i, O_i) - \frac{1}{N^2}\sum_{i=1}^{K} N(F_i)N(O_i)}{1 - \frac{1}{N^2}\sum_{i=1}^{K} N(F_i)N(O_i)}$$

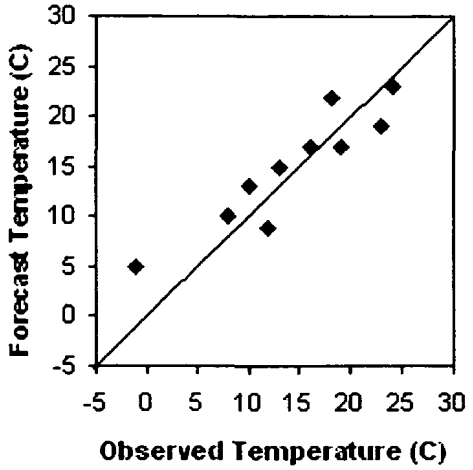
3.2.3. 연속 변수형 예보에 대한 검증방법

연속 변수들의 예보 검증은 예보가 얼마나 관측으로부터 떨어져 있는 지를 측정한다. 연속 검증 방법과 통계는 다음과 같은 표본 자료를 가지고 설명할 수 있다.

표 10. 연속 범주형 예보의 예. 예는 어느 지점의 일 최고기온이다.

Day	1	2	3	4	5	6	7	8	9	10
Forecast, *Fi*(C)	5	10	9	15	22	13	17	17	19	23
Observation, *Oi* (C)	-1	8	12	13	18	10	16	19	23	24

(1) 산포도 (Scatter Plot): 관측값에 대한 예보값을 평면도에 기입한 것으로 예보와 관측간의 일치성을 보기에 가장 좋은 방법이다. 정확한 예보는 대각선에 있거나 대각선 근처에 있어야 한다.



(2) 편차 또는 평균오차 (BIAS or Mean Error): 예보의 중심 위치와 관측의 중심 위치간의 차이를 나타낸다. overall bias, systematic bias, 혹은 uncoditional bias라고도 불린다. 예보와 관측간의 차이를 평균하는 평균 오차 (Mean Error)를 사용하여 쉽게 정량화할 수 있다. 음의 무한대에서 양의 무한대까지의 값을 갖는다. 만점은 0이다. 간단하고 친숙한 척도로 오차의 크기를 측정하지 않는다. 예보와 오차 사이의 일치성을 측정하지 않는다. 즉, 오차를 보상해주는 것이 있다면 bad 예보에 대해서도 만점을 받을 수 있다.

$$Mean\ Error = \frac{1}{N}\sum_{i=1}^{N}(F_i - O_i)$$

(3) Mean Absolute Error (MAE): 예보와 관측간의 차이를 절대값을 취한 평균으로 나타낸다. 커다란 외부 오차의 존재에 잘 견디는 평균 평방근 오차 (Mean Squared Error) 보다도 더 강하게 예보 정확도를 측정할 수 있는 도구이다. 0에서 무한대 값을 가지며 만점은 0이다. 간단하고 친숙한 것으로 편차 (deviation)의 방향을 지시하지는 않는다.

$$MAE = \frac{1}{N}\sum_{i=1}^{N}|F_i - O_i|$$

(4) Mean Square Error (MSE): 예보와 관측의 차이의 평균 제곱근으로 0에서 무한대의 값을 가지며 만점은 0이다. Murphy 법칙에 따르면 오차원을 성분별로 나눌 수 있다. MSE의 단위는 기본 단위의 제곱으로 나타낸다.

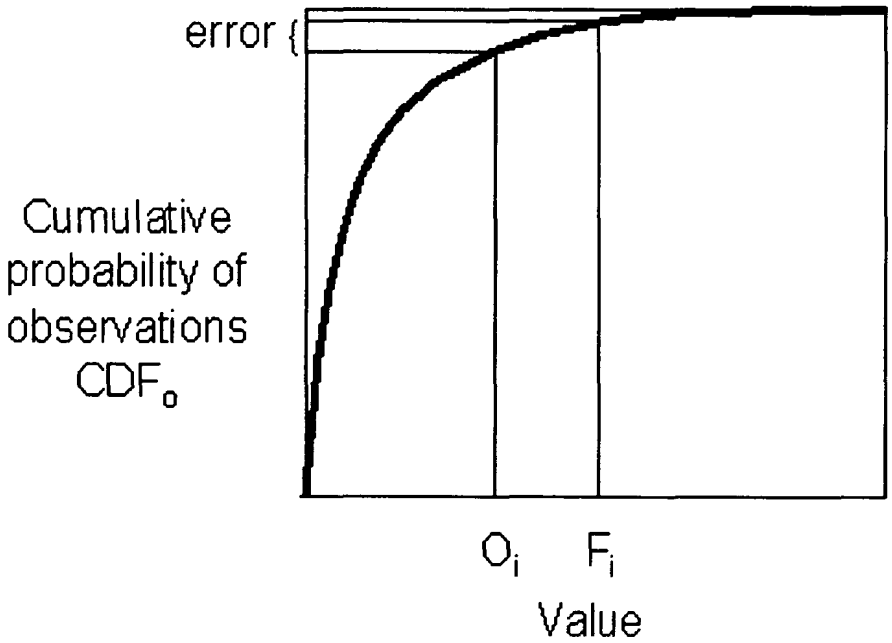
$$MSE = \frac{1}{N}\sum_{i=1}^{N}(F_i - O_i)^2$$

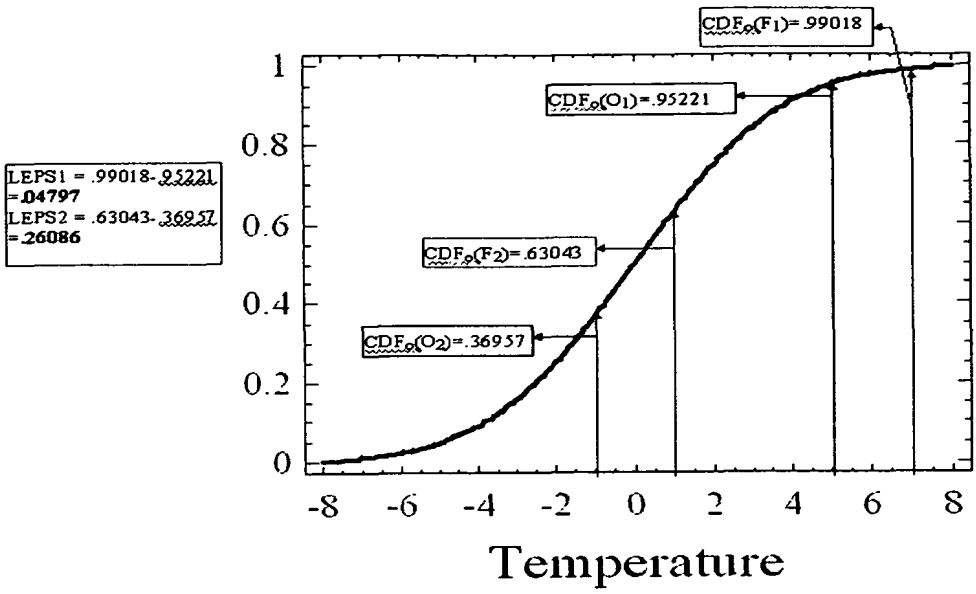
(5) Root Mean Square Error (RMSE): 예보와 관측간의 차이를 제곱근하여

평균을 취한 것으로 bias, resolution, 그리고 uncertainty에 따라 좌우되는 예보 정확도 척도로 가장 많이 사용되는 요소이다. RMSE는 작은 오차보다는 커다란 오차에 더 큰 영향을 끼친다. 만일 큰 오차를 원하지 않는다면 좋은 방법이 될 것이다. 0에서 무한대까지 값을 가지며 만점은 0이다. RMSE는 편차 (deviation)에 대한 방향성을 지시하지 않는다. 커다란 오차에 미치는 영향을 강조하는 것이 보수적인 예보를 장려한다.

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(F_i - O_i)^2}$$

(6) Linear Error in Probability Space (LEPS): 측정 공간에 대립하는 것으로서 확률 공간에서의 오차를 측정한다. 여기에서 $CDF_0(\ )$ 는 관측의 누적 확률 분포이며 적절한 기후값을 가지고 결정한다. 확률공간으로 전환하는 숨은 이유는 다음 예에서 볼 수 있다. 예보에서 기온이 평균보다 7℃ 높다고 예보하였고, 검증한 관측값은 평균보다 5℃ 높았다. 다른 경우에는 예보가 1℃ 높았고 검증한 관측은 1℃ 낮았다. 측정 공간에서 두 예보 모두 동등하게 좋았지만 극단적인 값을 성공적으로 예보한 첫 번째 예보가 더 가치 있다고 주장할 수 있다. 확률공간으로의 전환은 아래 그림에서처럼 이러한 주장을 잘 반영해 준다. 편하게 기호를 다음과 같이 놓으면; $P_f = CDF_o(F_i)$, $P_v = CDF_o(O_i)$ LEPS는 $LEPS = |P_f - P_v|$과 같이 된다.





LEPS의 기본식은 몇 가지 단점을 가지고 있다. 이를 극복하기 위하여 개선된 LEPS score를 사용하며 다음과 같이 주어진다.

$$LEPS\ score = 3(1-|P_f - P_v| + P_f^2 - P_f + P_v^2 - P_v) - 1$$

이 값은 0에서 1의 값을 가지면 0는 no skill을 1은 만점을 의미한다. 또한 범주형 자료에 대해서도 "bending back (곱추)"이 없다. 이러한 고유 성질은 간단한 형태의 LEPS에서 ordered 범주형 자료의 경우 최대로 부정확한 예보가 약간의 오차를 갖는 것보다 적게 penalised될 수 있다는 것이다. LEPS score는 일련의 예보가 LEPS score를 토대로 이루어지는 경우에 대해서는 -100에서 100까지 (혹은 -1에서 1까지) 값을 취하면서 연속적 및 범주형 자료 모두에 적용될 수 있다.

따라서 LEPS는 예보가 보장된다면 극값예보를 할 수 있다. 다만 기후학적 누적확률분포를 알아야만 한다. 그러나 아직은 널리 사용되지 못하고 있다.

(7) 상관계수 (Correlation Coefficient): 예보와 관측간의 차이의 일치와 위상을 측정하며 -1에서 1 상이의 값을 갖는다. 만점은 1이다. 일치성을 측정하는 좋은 도구이며 예보의 편차 (bias)에 민감하지 않다.

$$r = \frac{\sum(F-\overline{F})(O-\overline{O})}{\sqrt{\sum(F-\overline{F})^2}\sqrt{\sum(O-\overline{O})^2}}$$

(8) 이상 상관 (AC, Anomaly Correlation): 표본 평균 값 대신에 기후 평균 값, C를 사용하여 예보와 오차의 일치성과 위상 차이를 측정한다. 이상상관은 수치

예보모델의 결과를 검증하는 데 자주 사용된다. 값은 -1에서 +1 상이이며 만점은 1이다. 상관 계수와 같이 예보 bias에 덜 민감하며 일치성의 척도로서 좋은 도구의 하나이다.

$$AC = \frac{\sum (F - C)(O - \overline{C})}{\sqrt{\sum (F - C)^2}\sqrt{\sum (O - C)^2}}$$

(9) S1 score: 예보 공간 기울기의 정확도를 측정한다. 보통은 지위고도 혹은 해면기압장에 적용한다. 0에서 무한대의 값을 가지며 완벽한 예보는 0이다. 수치예보 기록에서 긴 역사를 가지고 있으며 다년간의 모델 성능이 향상되는 것을 보여주기에 좋은 도구이다. S1이 기울기에 따라 좌우되기 때문에 예보 값이 biased 되었을 때조차 좋은 점수를 보여준다. 또한 예보의 공간 분해능에도 좌우된다.

$$S1 = \frac{\sum_{adjacent\,pairs} |\triangle F - \triangle O|}{\sum_{adjacent\,pairs} \max(|\triangle F|, |\triangle O|)} \times 100$$

(10) 숙련도 (skill score): 기준 예보에 대한 향상 정도를 측정한다. MSE가 다음 식에 사용된 점수라면 결과론적인 통계는 분산의 감소 (reduction of variance)라 할 수 있다. 값은 음의 무한대에서 1의 값을 가지며, 0는 기준 예보에 비해 향상이 없음을 가리키며 1은 완벽한 예보를 의미한다. 기준 예보에 비해 예보가 가치가 있음을 의미하며, 적은 표본수는 불안정해질 수 있다.

$$Skill\ score = \frac{Score_{\text{for}\,ecast} - Score_{reference}}{Score_{perfect\,\text{for}\,ecast} - Score_{reference}}$$

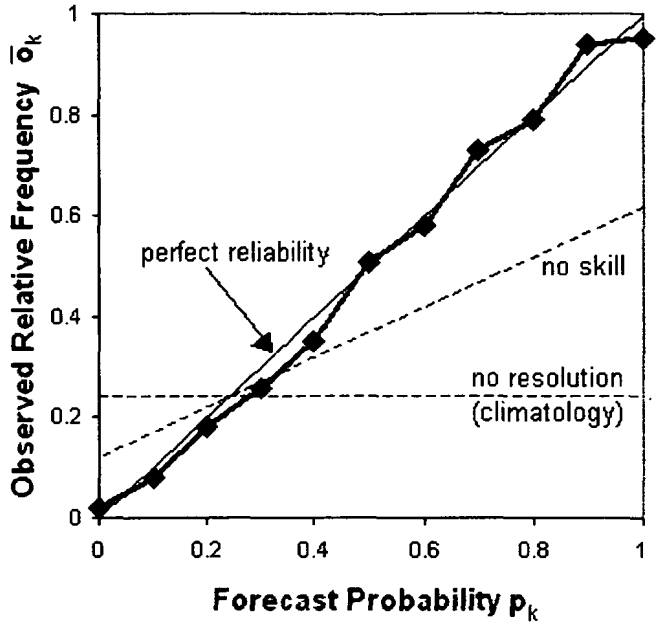
3.2.4. 확률 예보에 대한 검증방법

확률예보서는 어떤 사건이 발생할 확률을 0과 1 사이의 값 (혹은 0에서 100%)으로 주어진다. 일련의 확률예보, p_i, 를 관측, 즉 사건이 발생 (o_i=1) 혹은 발생하지 않음 (o_i=0)을 이용하여 검증한다. 좋은 확률예보시스템은 몇 가지 특성으로 나타낼 수 있다;

- 신뢰도 (reliability): categorical bias처럼 예보 확률과 평균 관측 빈도 사이의 일치
- 예리함 (sharpness): 극값을 예보하는 경향

· 분해능 (resolution): 표본 사건들 특징적으로 상이한 빈도수를 가지는 부분집합으로 분해할 수 있는 능력.

(1) 신뢰도 그림 (Reliability diagram, also called "attributes diagram"): 예보 확률에 대해 관측 빈도수를 찍은 것으로 예보 확률의 범위는 K 개의 구간으로 나뉜다(예를 들어, 0-5%, 5-15%, 15-25%, 등). 대각선으로부터의 편차 (deviation)가 조건부 편차 (conditional bias)를 제공한다.



확률예보의 신뢰성을 평가하는 검증방법으로 특정 현상(예 : 일강수량이 10㎜이상일 경우)에 대한 확률 예보값과 실제 발생 빈도의 관계를 나타내는 Reliability Diagram (Atger, 1999)이 있다. 이 때 사용되는 확률예보와 실황에 따른 Reliability table은 다음과 같이 두 가지 방법으로 나타낼 수 있다. 첫째는 실제로 어떠한 현상이 나타난 경우를 O라 하고 나타나지 않은 경우는 NO라 하자. 그 현상을 예상했을 때를 F로, 예상하지 못했을 때를 NF로 표시할 때, 표 8에 N개의 앙상블 멤버를 구간으로 나누어 그 해당구간의 빈도(H_N 또는 F_N 등등)를 표시하는 방법이다.

표 11. 앙상블 멤버 N개로 구간을 나누어 만든 Reliability Table

	F = N , NF=0	F≥N-1, NF≤1	F≥N-2, NF≤2	.....	F≥1, NF≤N-1	F≥0, NF≤N
O	H_N	H_{N-1}	H_{N-2}	.....	H_1	H_0
NO	F_N	F_{N-1}	F_{N-2}	.....	F_1	F_0

다른 한 가지 방법은 표 9처럼 어떤 현상의 예상 확률을 100%에서 0%까지로 구분하고 실황에서 그 현상을 보인 경우와 보이지 않은 경우를 나누어서 그 해당 확률 구간의 빈도(H_{100} 또는 F_0 등등)를 표시하는 방법이다.

표 12. 10% 간격의 확률 구간으로 나누어 만든 Reliability Table

	P=100%	P≥90%	P≥80%	.....	P≥10%	P≥0%
O	H_{100}	H_{90}	H_{80}	.....	H_{10}	H_0
NO	F_{100}	F_{90}	F_{80}	.....	F_{10}	F_0

(2) Brier Score (BS): 확률 오차를 제곱하여 평균한 수치로 다음과 같은 3가지 항; (1) 신뢰도, (2) 분해능, (3) 불확정성으로 나눈다. 값의 범위는 0에서 1이며 완벽한 예보는 0의 값을 갖는다. 일반적으로 사건의 기후학적 빈도에 민감하다: 빈도가 뜸할수록 실제의 skill 없이 더 좋은 BS값을 갖기가 쉽다. 부의 방향성 (작을수록 score는 좋음)은 1에서 BS 값을 빼서 고정시킬 수 있다.

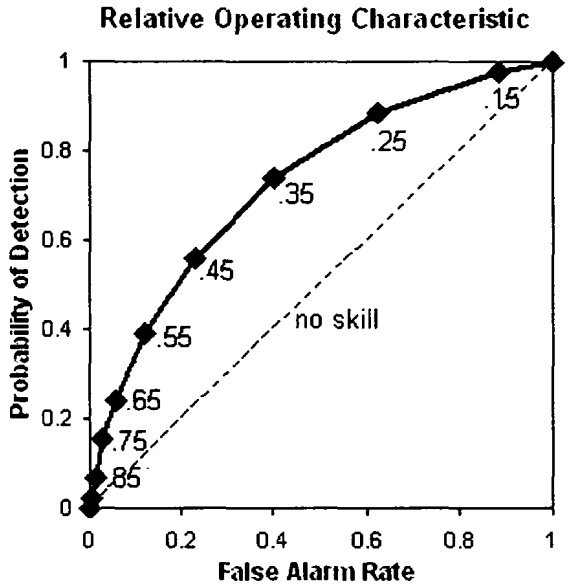
$$BS = \frac{1}{N}\sum_{i=1}^{N}(p_i - o_i)$$
$$= \frac{1}{N}\sum_{k=1}^{K} n_k(p_k - o_k)^2 - \frac{1}{N}\sum_{k=1}^{K} n_k(\overline{o_k} - \overline{o})^2 + \overline{o}(1-\overline{o})$$

(3) Brier skill score (BSS): 기준 예보에 대한 확률예보의 향상 정도를 측정하는 요소로 기준 예보로는 보통 장기간 혹은 기후 표본을 사용한다. 값의 범위는 음의 무한대로부터 1까지이며 0는 기준 예보에 비해 skill 이 없음을 완벽한 예보는 1의 값을 갖는다. 기후학적 발생 빈도수를 고려한다. 소량의 자료에 적용할 때는 불안정해진다; 사건이 적을수록 더 많은 표본 수를 필요로 한다.

$$BSS = \frac{BS - BS_{reference}}{0 - BS_{reference}} = 1 - \frac{BS}{BS_{reference}}$$

(4) Relative Operating Characteristic (ROC): 양분 예보를 하기 위해 일련의 누적 확률 문턱 (threshold) 값들을 (예를 들어, 0.05, 0.15, 0.25 등) 사용하여 POD 대 false alarm rate ((false alarm) over observation #, 거짓 탐지 확률로 알려져 있음)를 기입한 것이다. 두개의 선택적 결과를 구분하기 위해 예보의 능력을 측정한다. 0에서 1 사이의 값을 가지며 0.5는 skill 이 없음을 1은 완벽한 예보를 의미한다. 평가되는 false alarm의 비용을 인정한다. 놓친 사건을 다루지는 않는다. 신

뢰도에 대해서는 아무것도 말할 수 없다.



Relative Operating Characteristics(이하, ROC) 곡선은 어떤 현상을 확률예보에서 얼마나 잘 감지할 수 있는지를 판단하는 "signal detection theory"를 기초로 하고 있다(Swets, 1973). 이 ROC 곡선은 앙상블 확률예보의 성능을 평가하는 방법으로 ECMWF를 비롯하여 미국 기상청(NCEP)과 일본 기상청(JMA)에서도 채택하여 사용하고 있다.

ROC 곡선은 적중률을 표현하는 Hit Rate(HR)와 비적중률을 나타내는 False Alarm Rate(FAR) 사이의 분포도를 각 확률 구간별로 구해서 한 그래프에 곡선으로 나타낸 것이다. 적중률과 비적중률 계산은 표 10으로부터 다음과 같이 구해진다.

표 13. 실황에 따른 예보 분할표(Contingency Table)

		실황	
		Yes	No
예보	Yes	Hit(H)	False(F)
	No	Missing(M)	correct Rejection(R)

o 적중률 = Hit Rate (HR) = H / (H+M)

o 비적중률 = False Alarm Rate (FAR) = F / (F+R)

그리고 ROC 곡선에서 HR=1이고 FAR=0일 때가 완벽한 예보이므로 좌측상단으로 가까이 갈수록 확률예보의 감지 성능이 뛰어나다고 볼 수 있다. 일반적으로 예보시간이 길어질수록 좌측하단으로 치우치는 경향을 보인다.

여기서 y=x의 직선은 " HR = FAR " 이므로 이 대각선 하단으로 곡선이 존재할 경우 예보의 가치가 없음을 의미한다. 이에 따라 스코어 중의 하나로 ROC 곡선과 y=x의 대각선이 이루는 ROC 면적(ROC Area)을 구해서 예보기술의 척도로 사용하고 있다. 예보가 완전하다면 ROC A =1이고, A =0.5일 때 예보의 기술이 없다(no-skill)고 판단하게 된다.

(5) Ranked Probability Score (RPS): 다중 범주형 확률예보에 대한 누적 확률공간에서의 차이 자승의 합으로 0에서 1의 값을 가진다. 완벽한 예보는 1의 값을 갖는다. 예보 확률이 실제 결과보다 더 멀어졌을 때 아주 심각하게 예보를 궁지에 몰아넣는다. 음의 RPS는 1에서 RPS 값을 빼서 고정시킨다.

$$RPS = \frac{1}{K-1} \sum_{m=1}^{K} \left[\left(\sum_{k=1}^{m} p_k \right) - \left(\sum_{k=1}^{m} o_k \right) \right]^2$$

(6) Ranked Probability Skill Score (RPSS): 기준 예보에 대한 다중 확률예보의 향상도를 측정하는 것으로서 기준예보는 보통 장기간 혹은 표본 기후값을 사용한다. 음의 무한대에서 1까지 값을 가지며 기준 예보와 비교할 때 0은 skill이 없음을 1은 완벽한 예보를 가리킨다. 기후학적 빈도수를 고려한다. 작은 양의 자료에 적용할 때는 불안정하다.

$$RPSS = \frac{\overline{RPS} - \overline{RPS}_{reference}}{0 - \overline{RPS}_{reference}} = 1 - \frac{\overline{RPS}}{\overline{RPS}_{reference}}$$

(7) Economic Value : 사용자 측면에서의 평가 방법

예보의 경제 가치에 대한 자세한 논의는 "Economic Value of Weather and Climate Forecasts" (Kats & Murphy, 1997)를 참고하면 된다. 여기서 설명하는 경제 가치(EV)는 1998년 이후부터 앙상블 예보의 성능 평가 기준으로 사용되고 있다 (Richardson 2000, Zhu et al. 2001).

예보의 경제 가치는 예보의 정확도(질)에도 의존하지만 어떤 기상 현상이 발생했을 경우 대책을 세우는 데 필요한 비용(cost)과 대책이 없었을 때 생기는 손실(loss)에도 관계가 있는데 이 값들은 사용자에 따라 각기 다르다.

표 14. 실황에 따른 예보의 분할표와 비용 매트릭스 (Expense matrix)

		실황	
		Yes	No
예보와 대책	Yes	Hit(H) Cost(C)	False(F) Cost(C)
	No	Missing(M) Loss(L)	Rejection(R) No cost(=0)

위의 표 11는 실황에 따른 예보의 분할표와 비용(C)과 손실(L)의 비용 매트릭스(Expense matrix)를 함께 나타낸 것이다. 이들 관계로부터 해당 예보를 이용했을 때의 지출 비용이 기후정보를 이용했을 때에 비해 절감되는 경제적인 비용에 대한 값으로 EV를 정의하면 다음과 같이 구할 수 있다.

먼저 해당 예보를 항상 이용하여 대책을 세울 때의 지출 비용(E_F)은 표 11에서 얻어지는 모든 경우에 대한 지출비용의 합계로 구할 수 있다. 여기서 지출이 발생되는 경우는 모두 세 경우이다. 첫째, 실제로 그 현상이 발생했을 때 예보가 이를 맞추었고 대책을 세웠으므로 이 때 지출은 맞춘 예보 빈도(H)×대책비용(C)이다. 둘째, 그 현상이 발생했는데 예보가 빗나간 경우 대책을 세우지 않았으므로 이 때 지출은 놓친 예보빈도(M)×손실비용(L)이 된다. 셋째, 실제로 어떤 현상이 발생하지 않았고 예보가 틀린 경우에도 대책을 세워야 하므로 지출은 틀린 예보 빈도 (F)×대책비용(C)가 된다. 또한, 현상이 발생하지 않았고 예보가 이를 맞추었을 때의 빈도를 R이라고 할 경우 대책 비용이나 손실 비용이 없으므로 0이다. 따라서 E_F는 세 경우에 발생하는 지출의 합이 되므로 식 (3.7.1)과 같이 나타낼 수 있다.

$$E_F = HC + FC + ML$$

다음으로 예보가 완벽하게 적중할 경우 지출비용(E_P)을 구하면 F(예보가 빗나간 경우)나 M(현상을 놓친 경우)이 없으므로 위 식 3.7.1에서 FC=0, ML=0이다. 그러므로 지출 비용 E=HC인데, 예보가 적중한 빈도가 그 현상이 일어난 빈도($\overline{o}$)와 같으므로 식 (3.7.2)와 같은 비용이 지출된다.

$$E_P = \overline{o}C$$

또한, 기후 정보를 이용할 때의 지출 비용(E_C)은 대책을 마련할 때 드는 비용(C)이 예상되는 손실액($\bar{o}L$)보다 적을 때만 대비를 할 것이므로 식 (3.7.3)으로 나타낼 수 있다.

$$E_C = Min(C, \bar{o}L)$$

경제 가치(EV)는 특정 예보를 이용했을 때의 경제적인 비용 절감으로 정의되며 식 (3.7.4)으로 구할 수 있다.

$$EV = \frac{E_C - E_F}{E_C - E_P} = \frac{saving\ from\ using\ forecast}{saving\ from\ perfect\ forecast}$$

식 (3.7.4)에 식 (3.7.1), 식 (3.7.2), 식 (3.7.3)을 대입하면 식 (3.7.5)이 얻어진다.

$$EV = \frac{\min[\bar{o}L, C] - (H+F)C - ML}{\min[\bar{o}L, C] - \bar{o}C}$$

여기서 모든 항을 L로 나누고 비용/손실의 비를 C/L=r로 정의하면 식 (3.7.6)이 유도된다.

$$EV = \frac{\min[\bar{o}, r] - (H+F)r - M}{\min[\bar{o}, r] - \bar{o}r}$$

이 식은 비용/손실의 비가 현상 발생 빈도($\bar{o}$)보다 클 때와 작을 때로 나누어 구해야 되므로 식 (3.7.7)이 최종적으로 EV값이 된다.

$$EV = (1 - FAR) - \left(\frac{1 - C/L}{C/L}\right)\left(\frac{\bar{o}}{1-\bar{o}}\right)(1 - HR) \quad if \quad C/L < \bar{o}$$

$$EV = HR - \left(\frac{C/L}{1 - C/L}\right)\left(\frac{1-\bar{o}}{\bar{o}}\right)FAR \quad if \quad C/L > \bar{o}$$

4. 검증 결과

3장에서 설명하였던 WMO 권고사항의 표준 방법을 따르며, 강수를 제외한 요소는 연속 변수형 검증방법을 강수에 대해서는 범주형 검증방법을 따라 수행하였다.

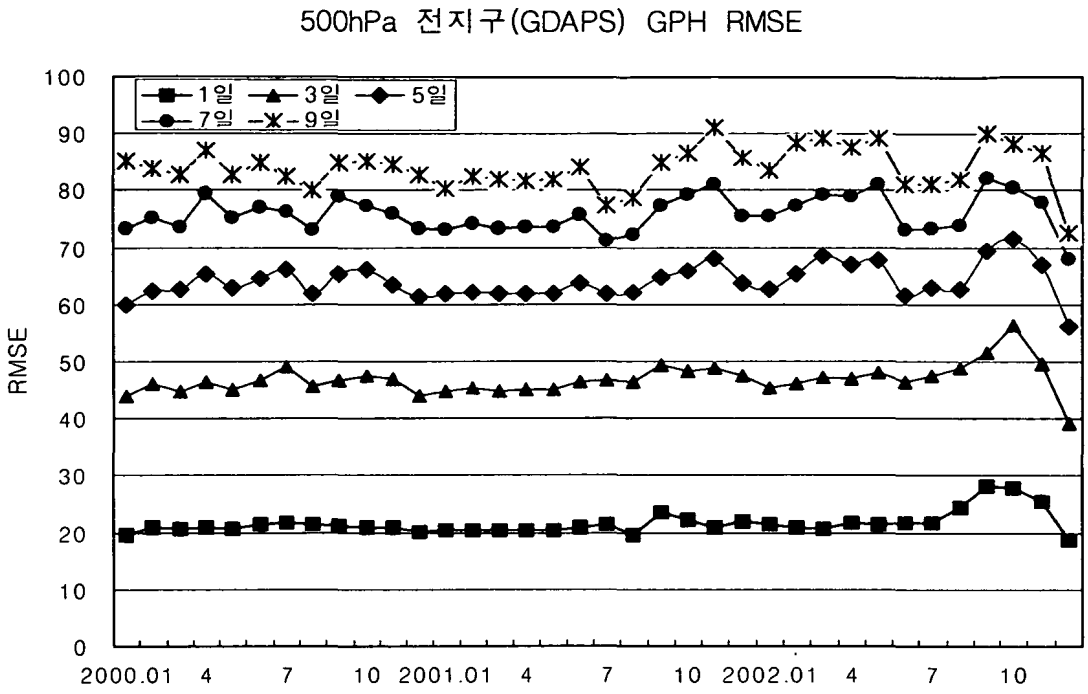
4. 1. 전지구예보 모델

4.1.1 성능 변화 추세

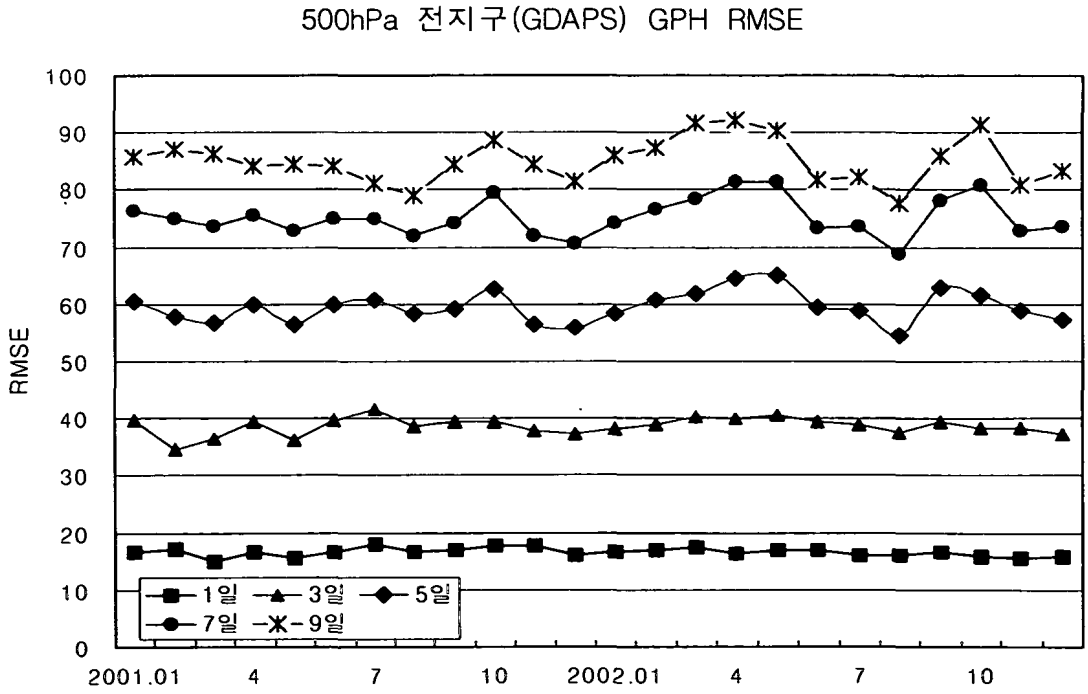
가. 500 hPa 고도장의 RMSE

(1) 전지구

① 저분해능(T106L21)

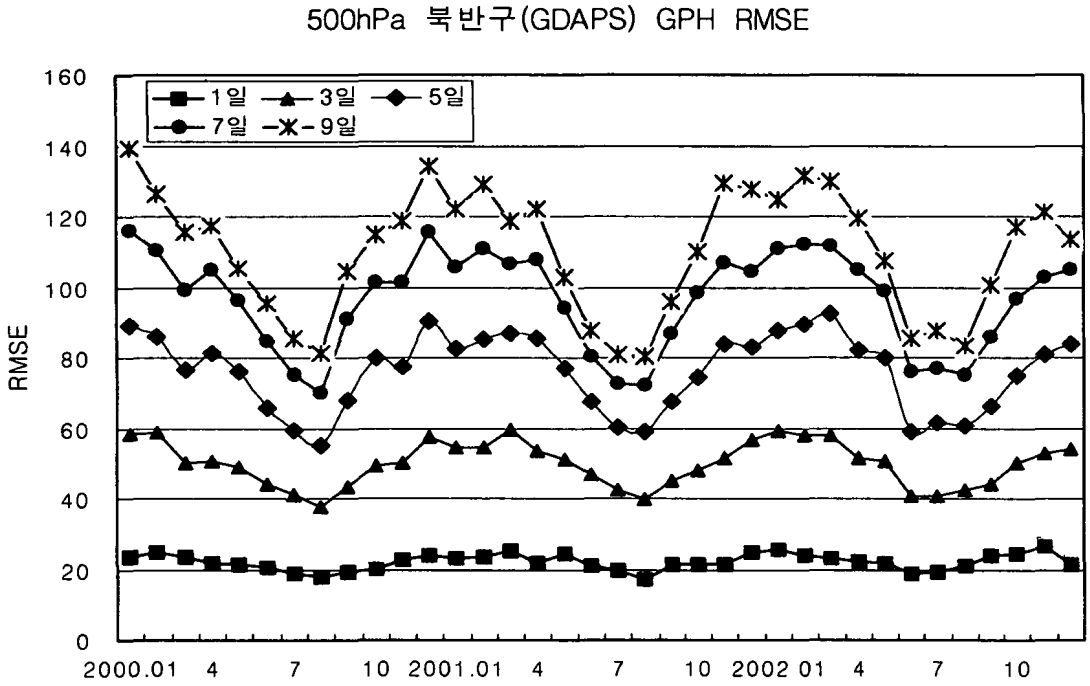


② 고분해능(T213L30)

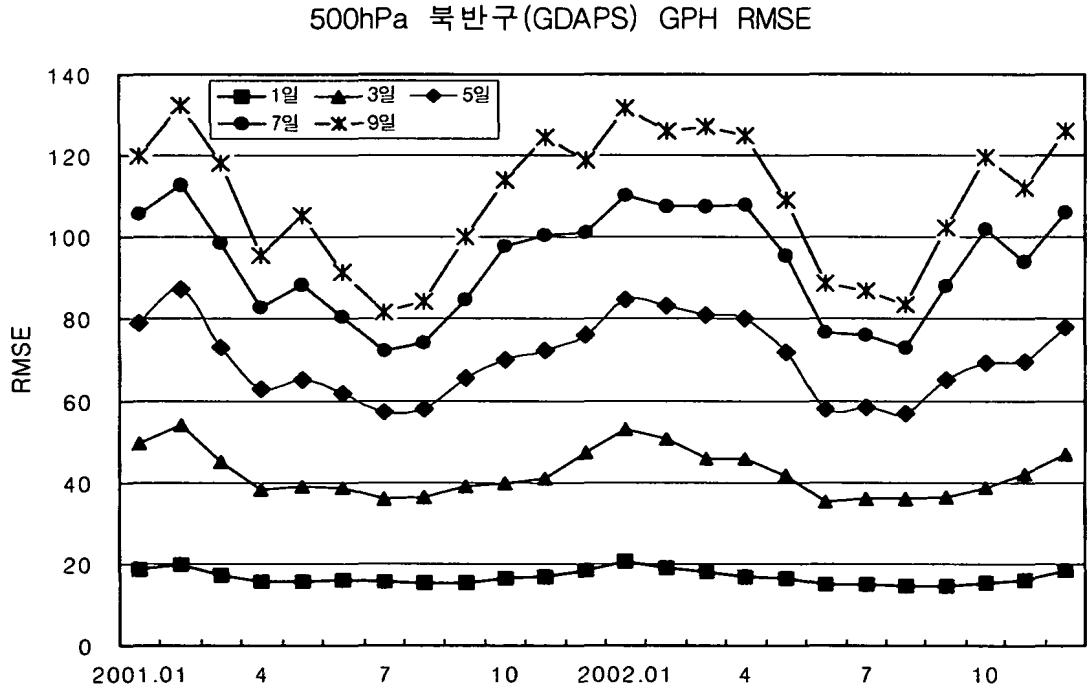


(2) 북반구

① 저분해능(T106L21)

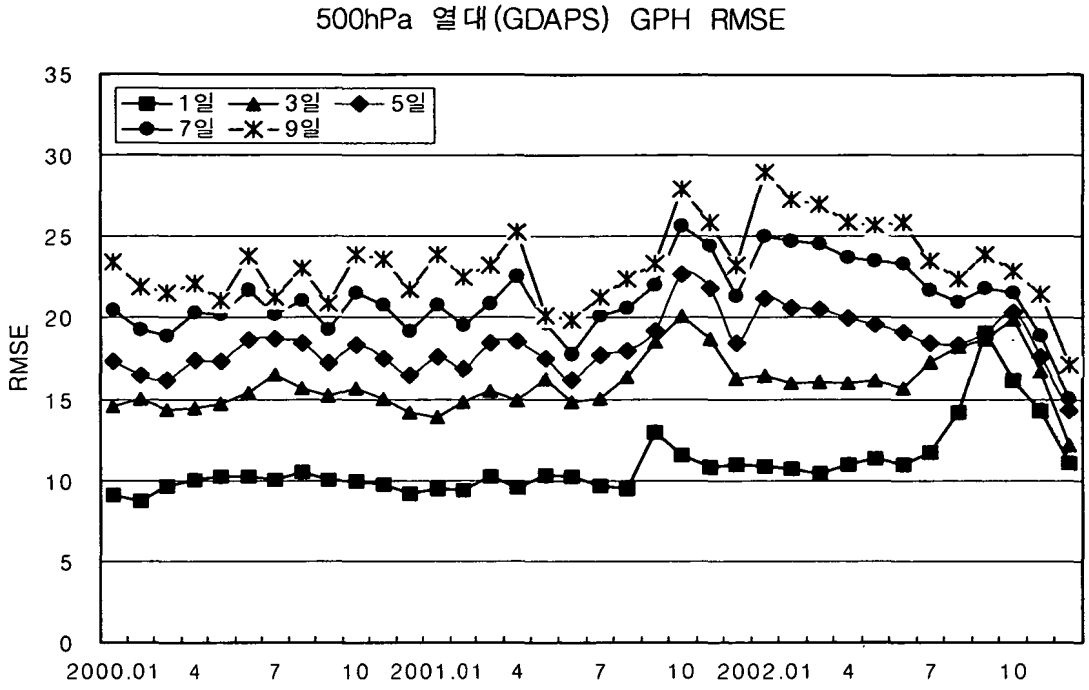


② 고분해능(T213L30)



(3) 열대

① 저분해능(T106L21)



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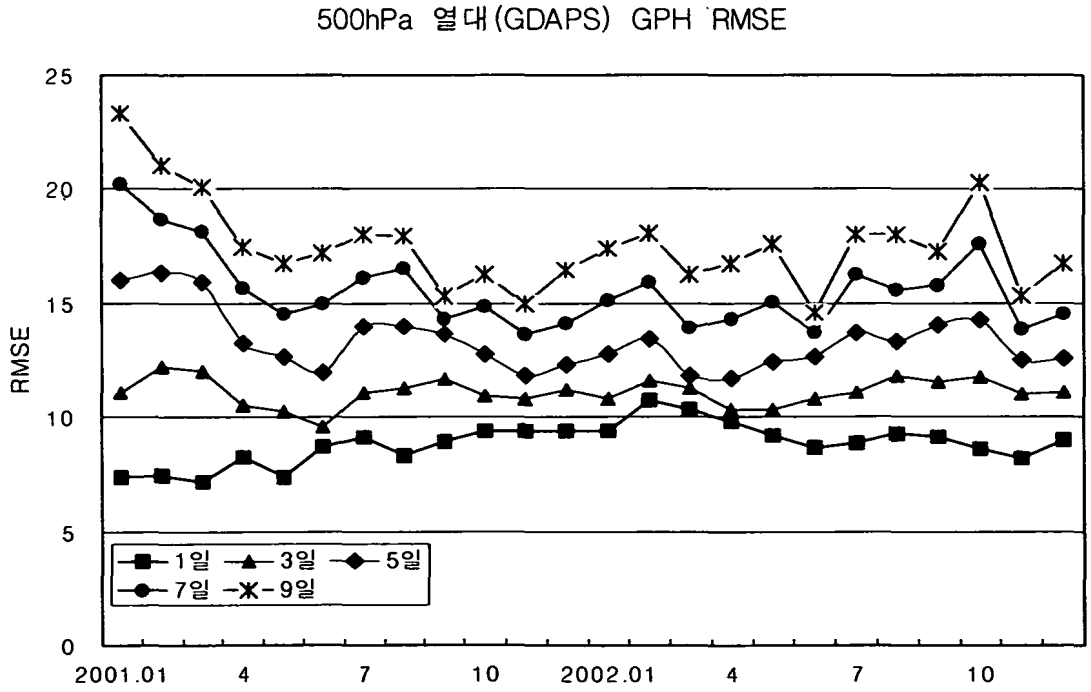
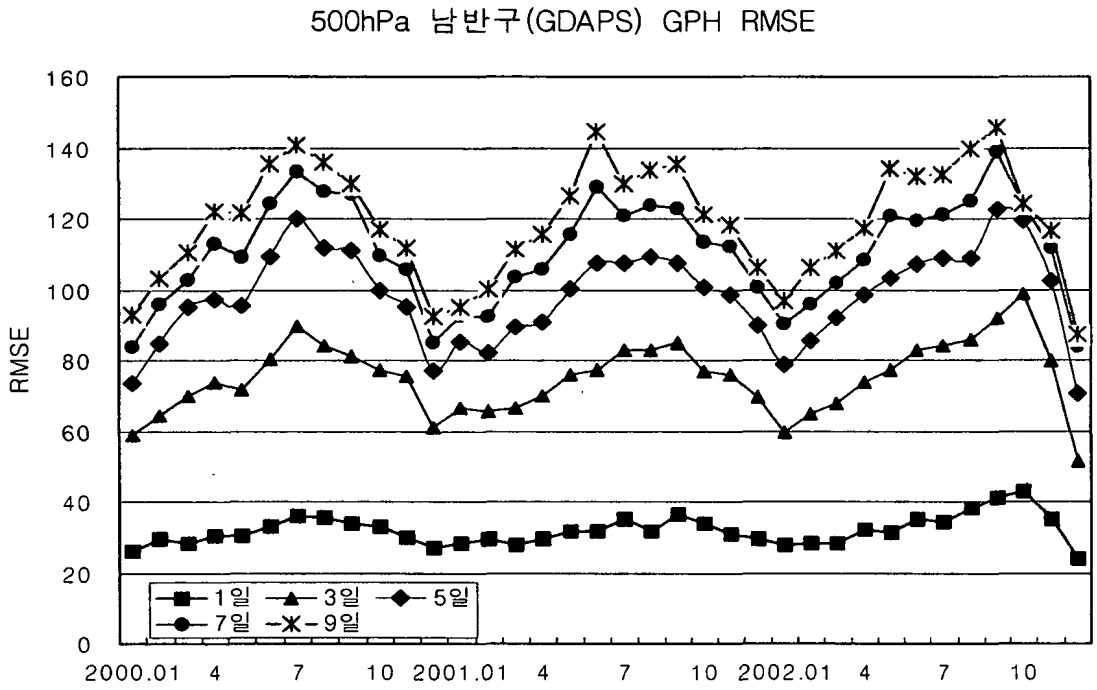


(4) 남반구

① 저분해능(T106L21)



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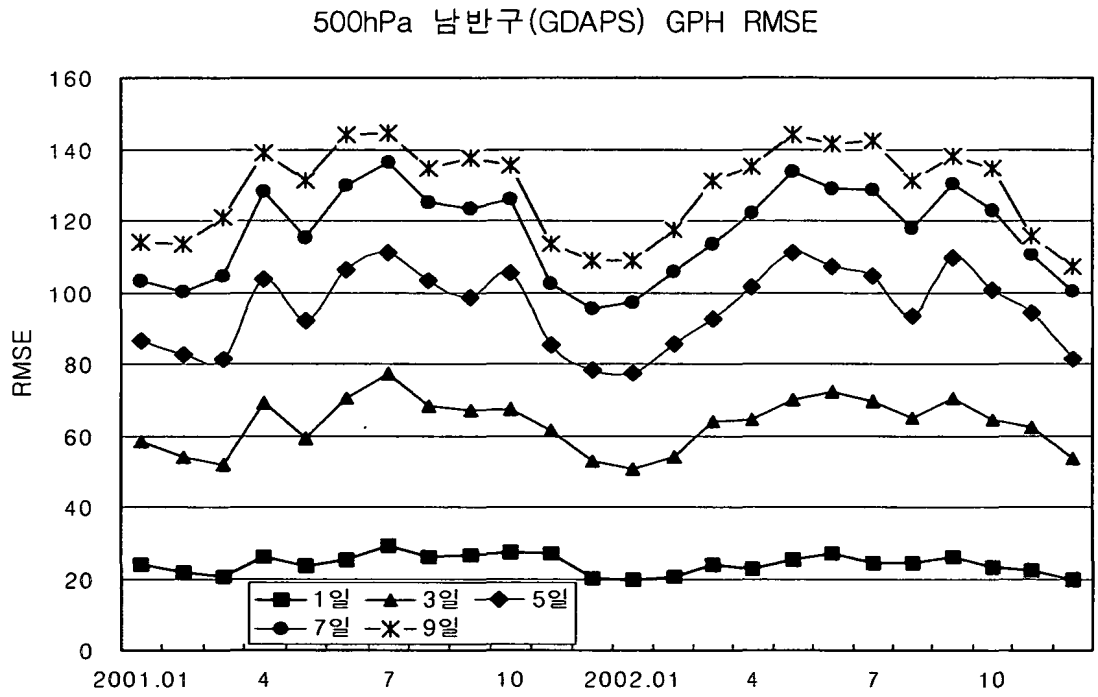
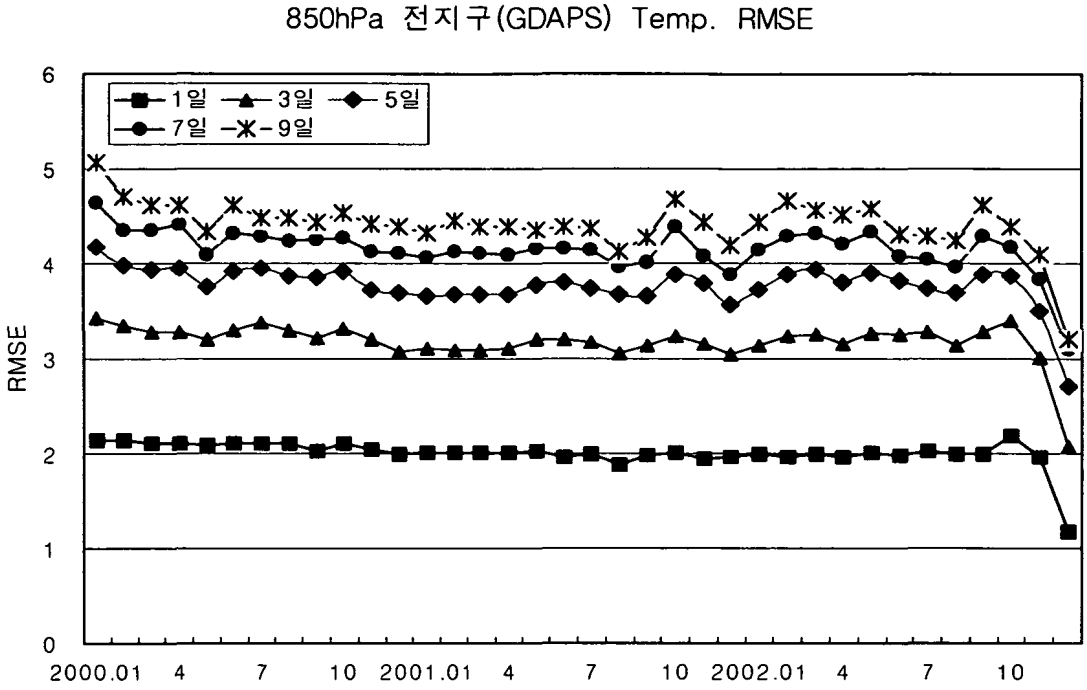


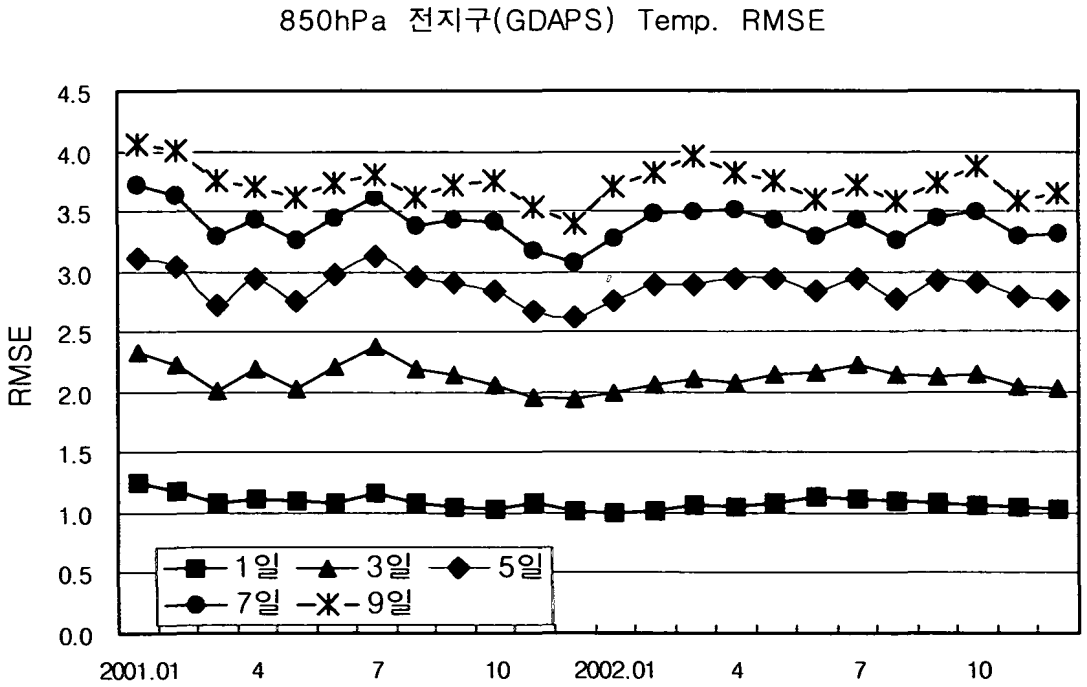
나. 850 hPa 기온의 RMSE

(1) 전지구

① 저분해능(T106L21)

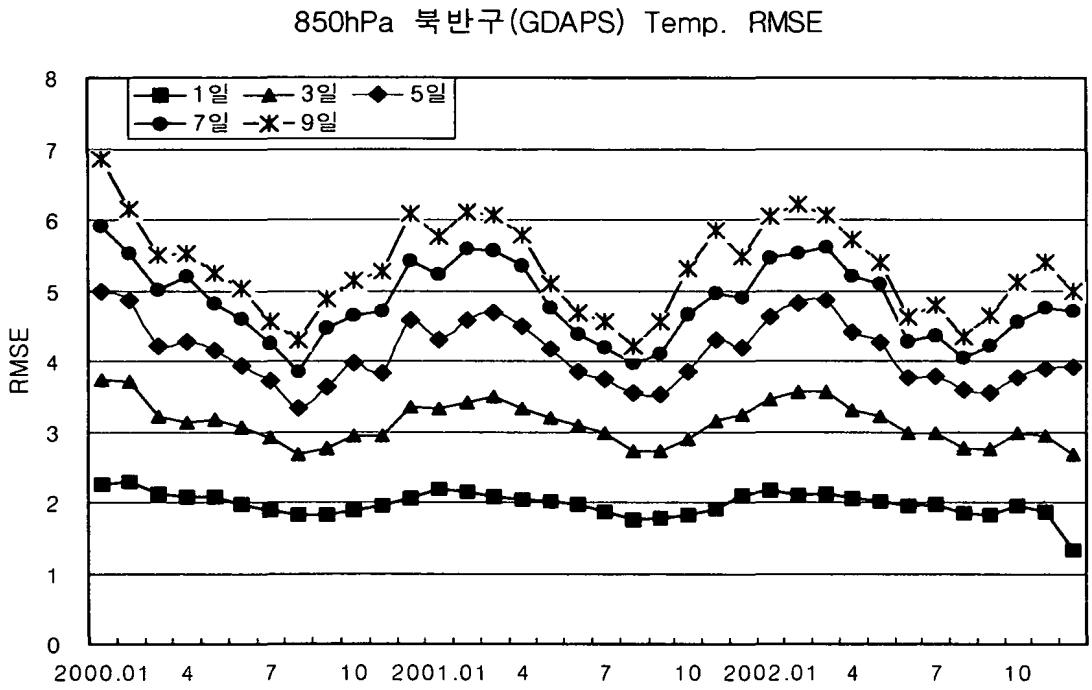


② 고분해능(T213L30)

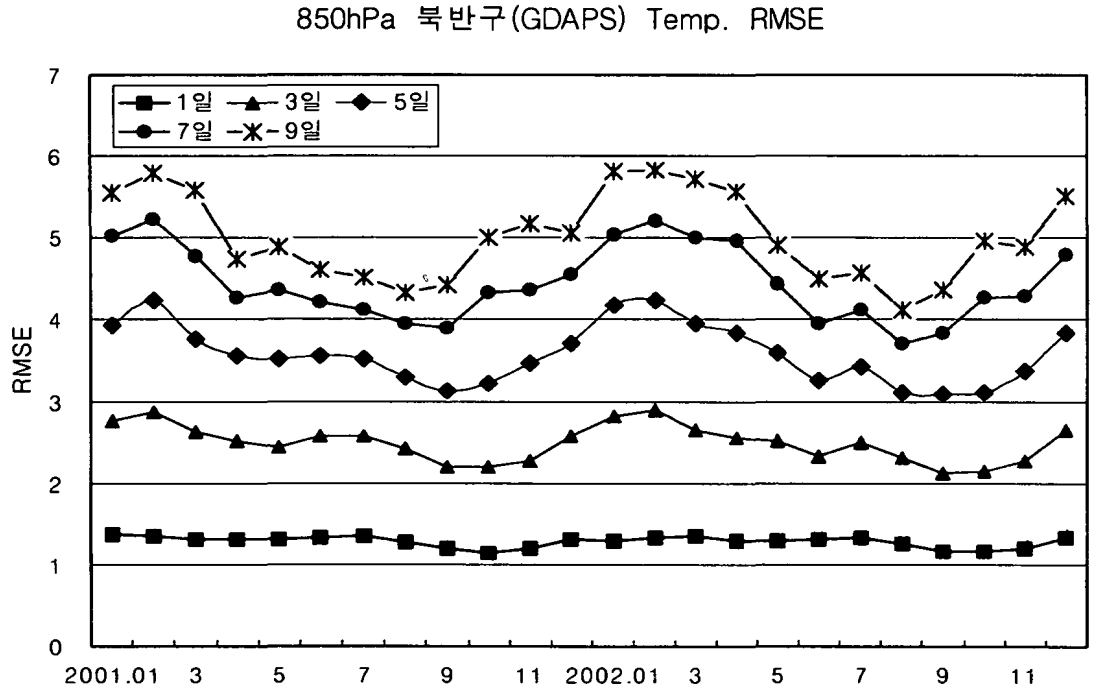


(2) 북반구

① 저분해능(T106L21)

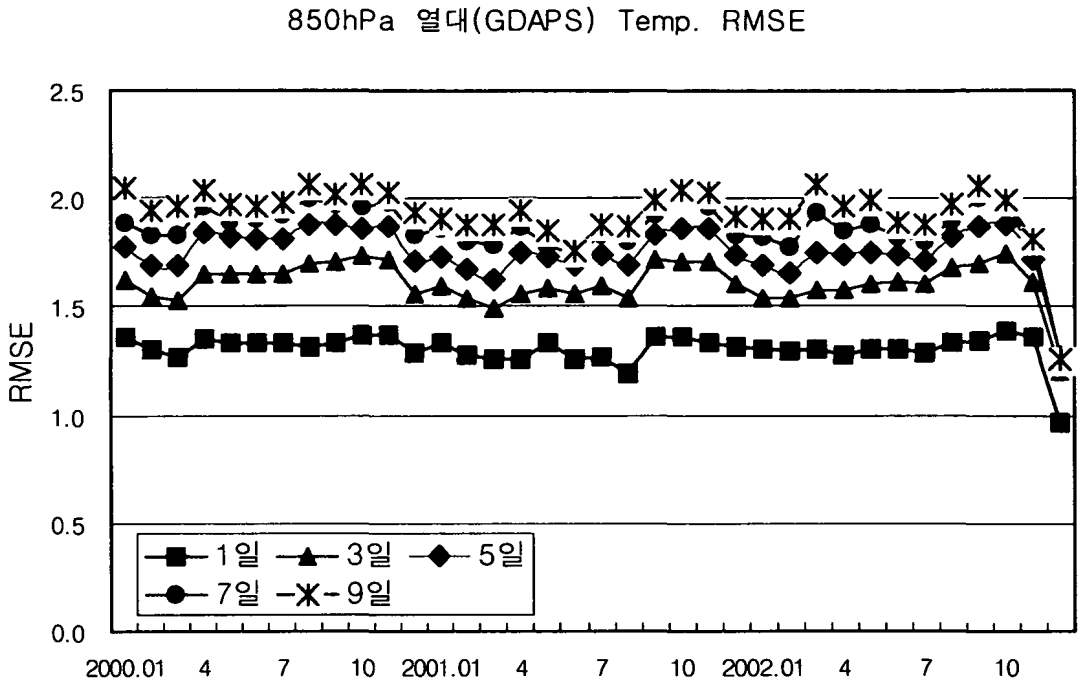


② 고분해능(T213L30)

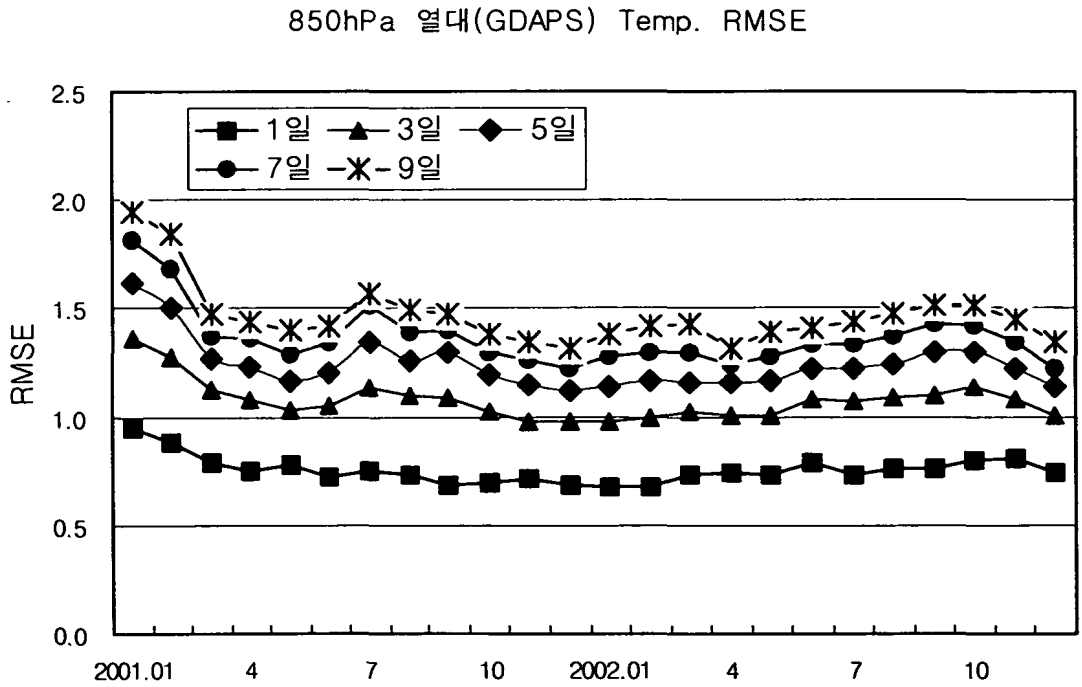


(3) 열대

① 저분해능(T106L21)

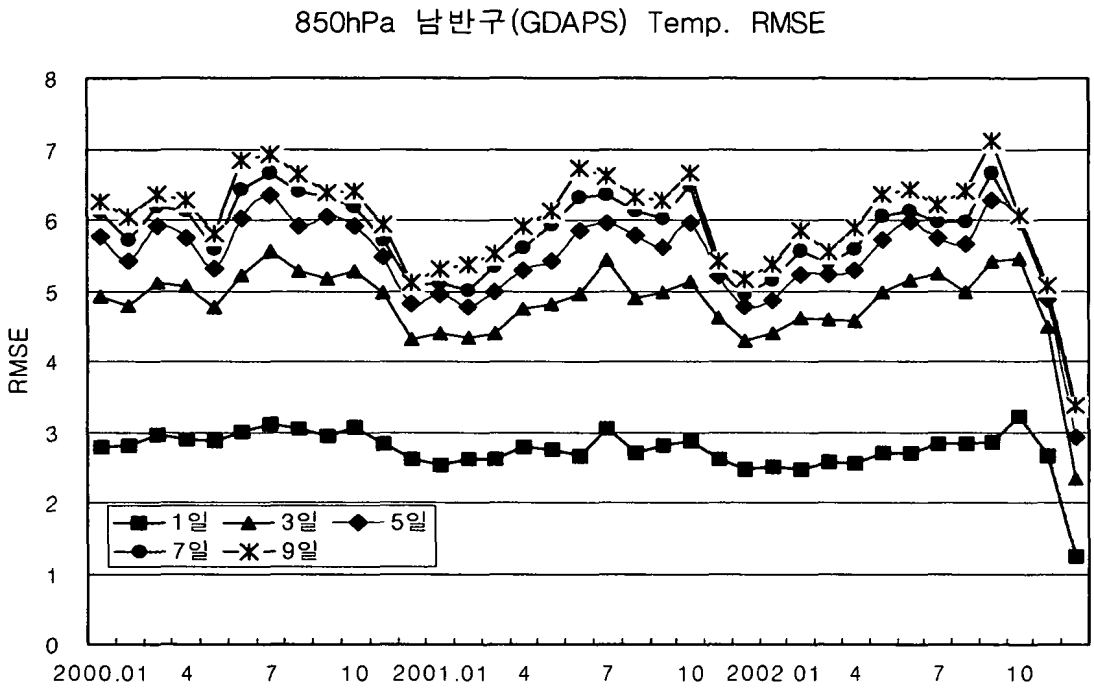


② 고분해능(T213L30)

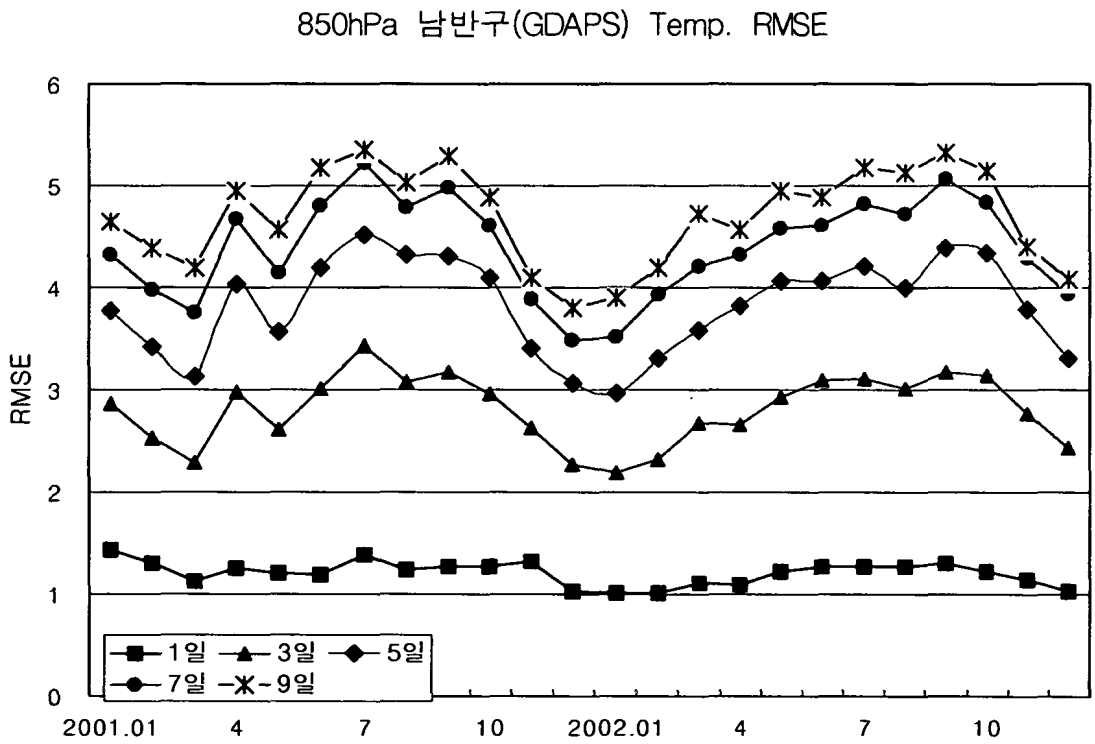


(4) 남반구

① 저분해능(T106L21)



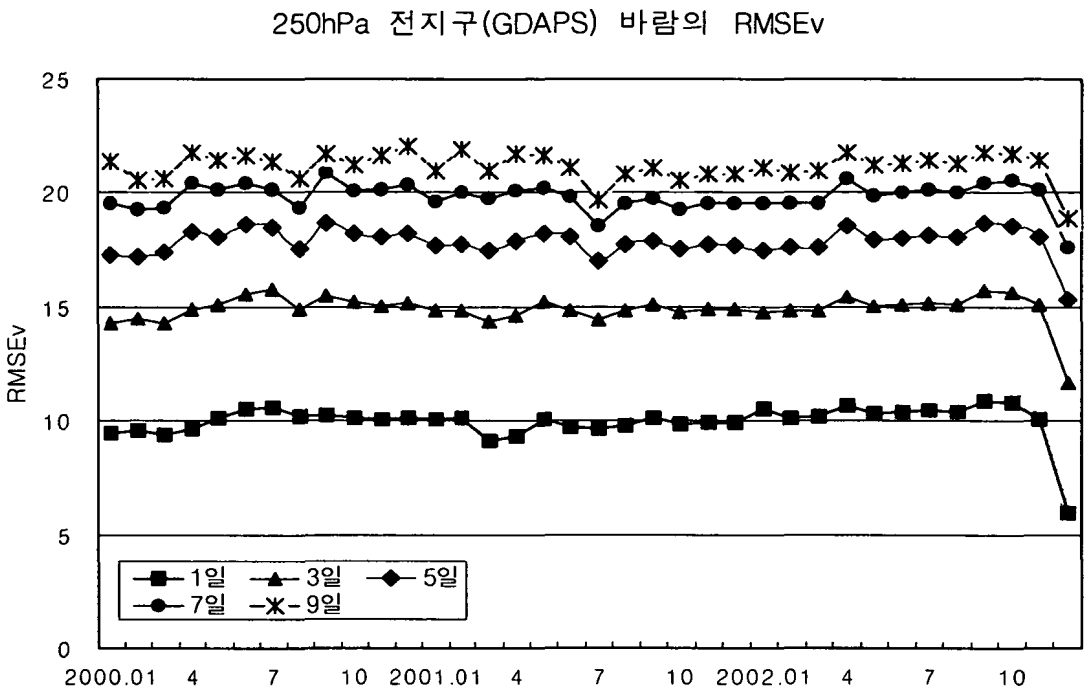
② 고분해능(T213L30)



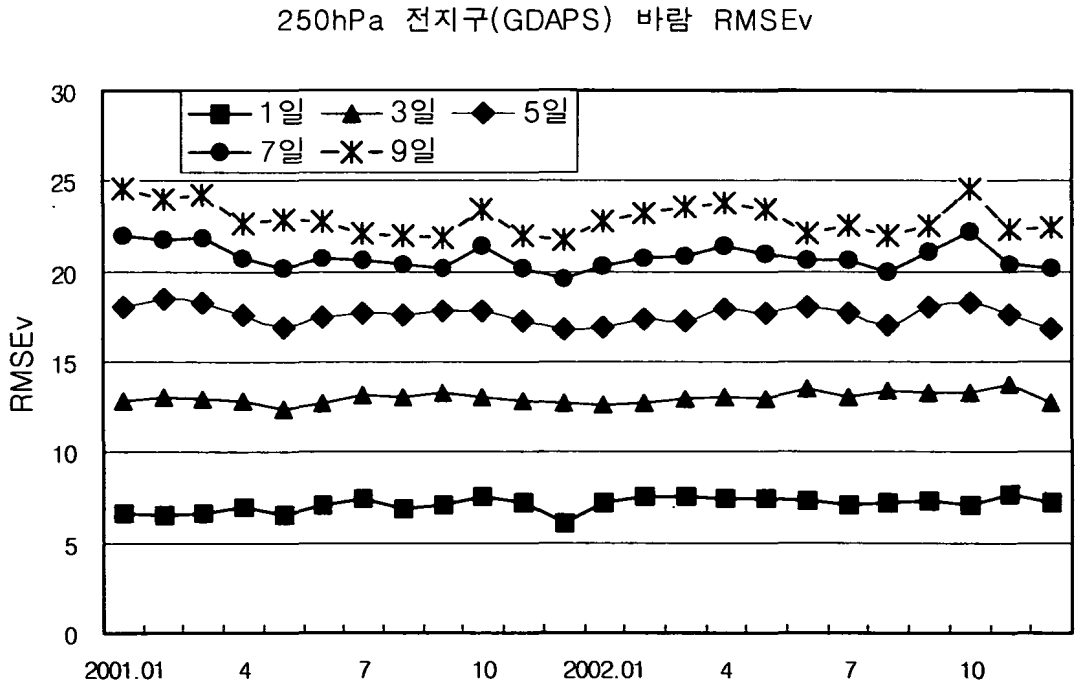
다. 250 hPa 바람의 RMSEv

(1) 전지구

① 저분해능(T106L21)

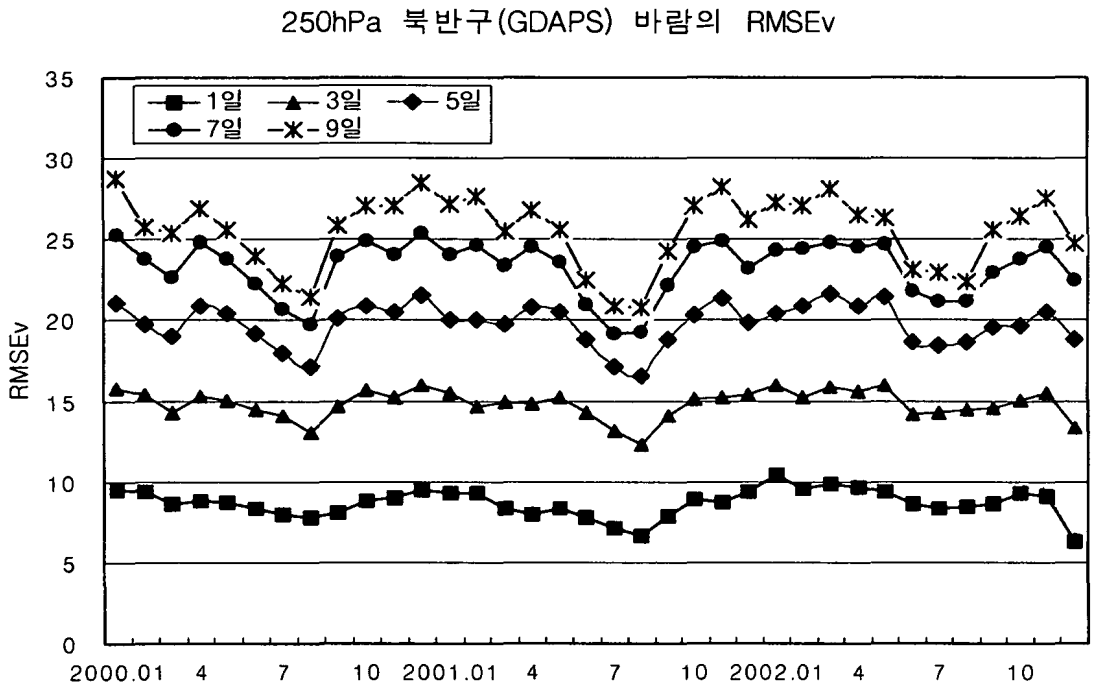


② 고분해능(T213L30)

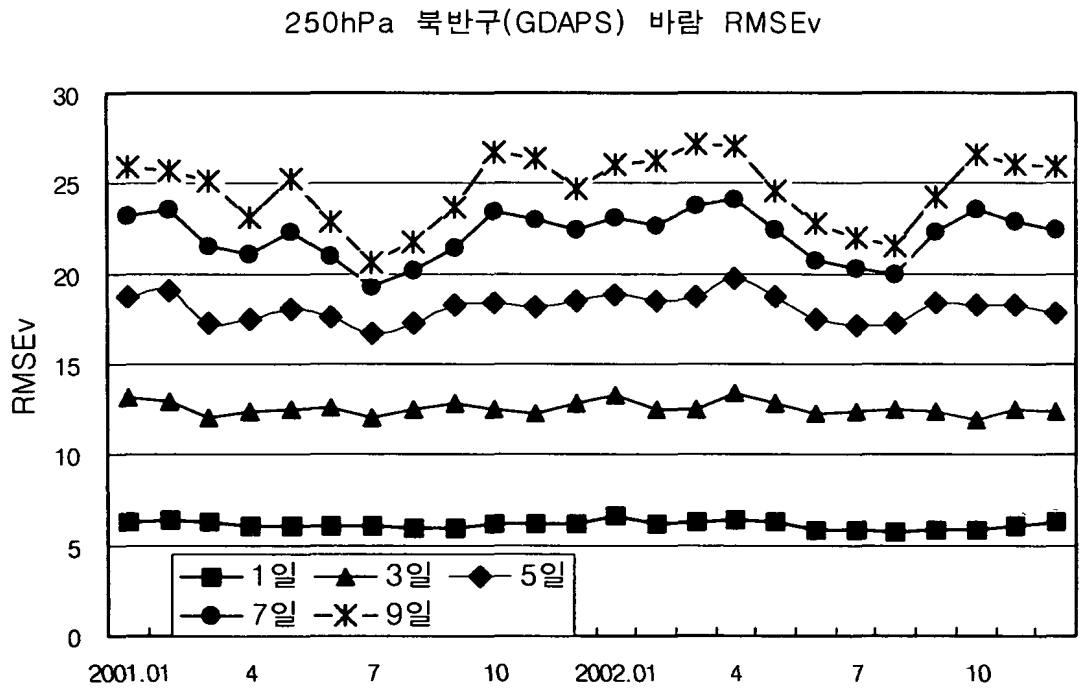


(2) 북반구

① 저분해능(T106L21)

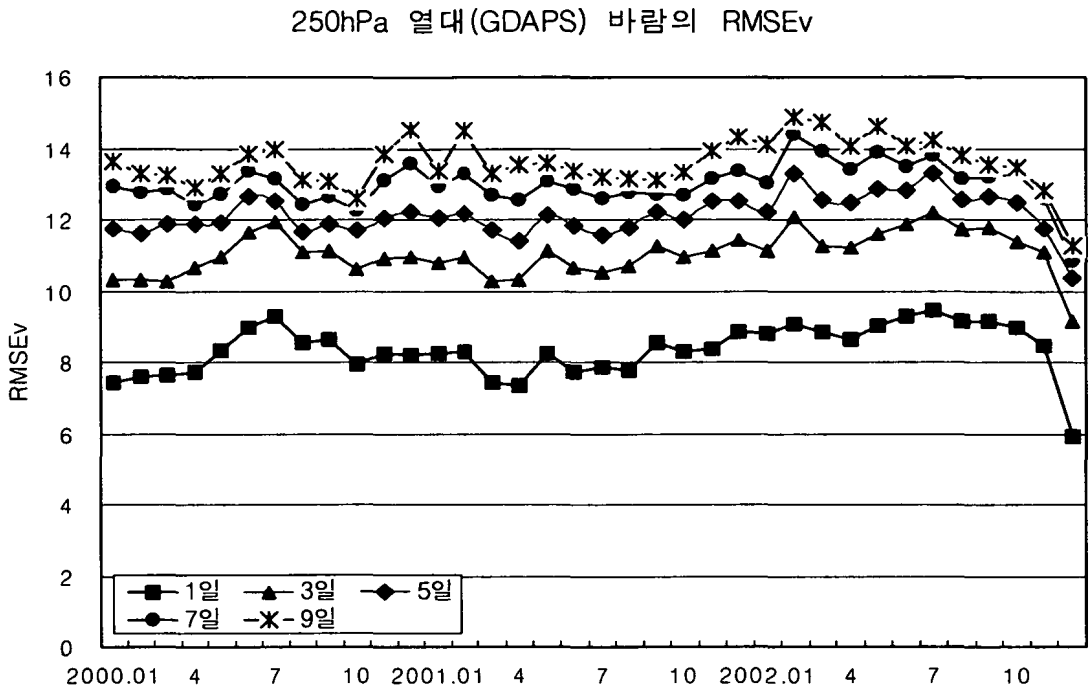


② 고분해능(T213L30)

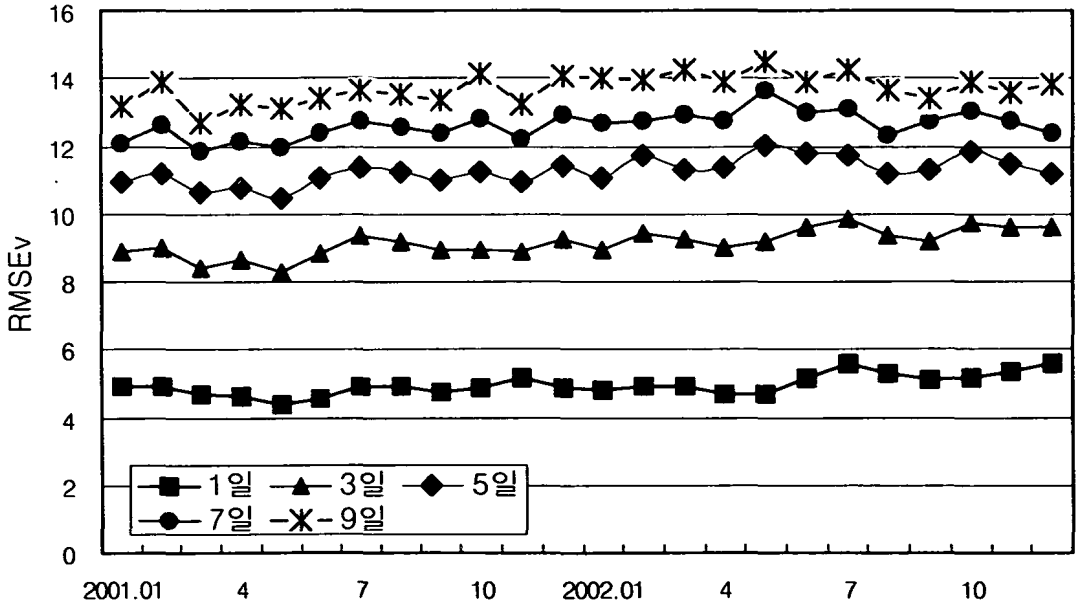


(3) 열대

① 저분해능(T106L21)

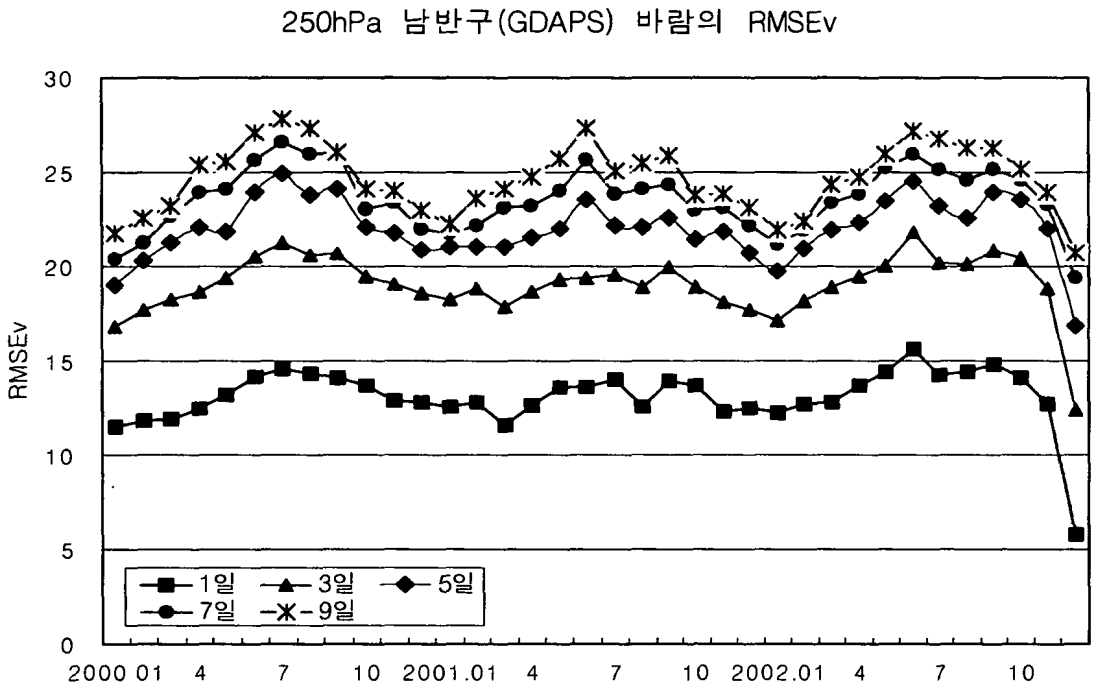


② 고분해능(T213L30)

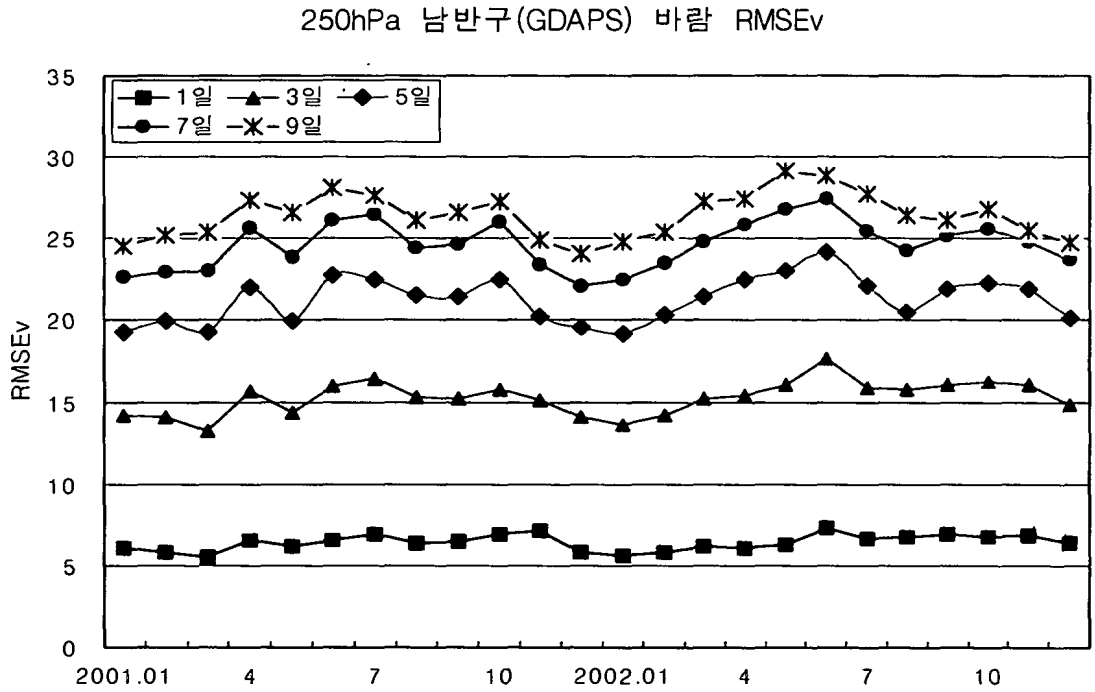


(4) 남반구

① 저분해능(T106L21)



② 고분해능(T213L30)



4.1.2. 분석 검증

o 검증 변수: MSLP, 고도, 기온, 바람

o 검증 요소: 평균 오차, RMSE, AC, Skill Score

o 검증 영역: 북반구 (20N-90N), 열대 (20S-20N), 남반구 (90S-20S)

가. 북반구

가) MSLP

1) Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.42	0.17	0.15	0.13	0.04	-0.09	-0.14	-0.11	-0.12	-0.08	-0.09	-0.11	0.01
48H	0.54	0.33	0.30	0.21	0.08	-0.18	-0.29	-0.21	-0.12	-0.04	0.02	-0.01	0.05
72H	0.64	0.45	0.40	0.30	0.12	-0.24	-0.37	-0.32	-0.09	0.04	0.12	0.08	0.09
96H	0.70	0.50	0.51	0.39	0.18	-0.19	-0.39	-0.41	0	0.14	0.18	0.11	0.14
120H	0.76	0.60	0.55	0.45	0.23	-0.16	-0.43	-0.5	0.11	0.27	0.24	0.16	0.19
144H	0.91	0.74	0.63	0.47	0.30	-0.2	-0.5	0.67	0.13	0.26	0.25	0.25	0.21
168H	1.07	0.91	0.68	0.51	0.39	-0.25	-0.56	-0.78	0.12	0.18	0.33	0.35	0.25
192H	1.28	0.96	0.70	0.57	0.49	0.25	0.59	-0.8	0.1	0.15	0.39	0.59	0.30
216H	1.57	1.02	0.78	0.61	0.51	-0.16	0.64	-0.78	0.09	0.19	0.44	0.8	0.37
240H	1.78	1.13	0.86	0.63	0.55	-0.08	-0.67	-0.75	0.04	0.2	0.46	0.83	0.42

2) RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.77	2.46	2.25	2.02	2	1.8	1.81	1.79	1.77	1.82	1.9	2.32	2.06
48H	4.13	3.83	3.43	3.22	3.1	2.72	2.79	2.73	2.75	2.94	3.08	3.67	3.20
72H	5.56	5.39	4.8	4.54	4.18	3.57	3.74	3.56	3.72	4.06	4.21	5.02	4.36
96H	6.99	6.89	6.27	5.97	5.36	4.51	4.71	4.47	4.86	5.34	5.44	6.43	5.60
120H	8.26	8.29	7.76	7.28	6.53	5.31	5.54	5.33	6.05	6.68	6.75	7.77	6.80
144H	9.29	9.42	9.13	8.55	7.4	6.12	6.3	6.11	6.92	8.11	7.81	8.89	7.84
168H	10.19	10.34	10.15	9.48	8.19	6.82	7.01	6.75	7.57	9.25	8.79	9.95	8.71
192H	11.16	10.98	10.95	10.22	8.67	7.34	7.38	7.18	8.2	10.03	9.57	10.94	9.39
216H	11.85	11.54	11.72	10.76	8.98	7.83	7.58	7.59	8.7	10.44	10.29	11.68	9.91
240H	12.04	12.25	12.23	11.06	9.19	8.27	7.77	7.78	9.15	10.93	10.93	12.17	10.31

3) S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	39.45	38.99	37.75	37.82	39.83	41.96	42	41.98	40.38	37.78	37.06	38.14	39.43
48H	49.90	49.31	47.35	48.39	50.67	52.6	52.9	52.89	50.99	48.28	47.15	48.12	49.88
72H	58.49	58.21	56.17	57.48	58.78	59.98	60.86	61.02	59.31	56.39	54.77	56.02	58.12
96H	65.69	66.19	64.01	65.81	66.18	66.15	67.11	67.56	66.98	63.53	61.66	62.99	65.32
120H	71.22	72.58	70.88	71.94	73.22	71.3	72.05	72.57	73.61	69.94	67.66	68.91	71.32
144H	75.40	77.37	76.29	77.84	78.39	75.81	75.54	76.89	78.03	76.02	71.92	73.85	76.11
168H	78.13	80.4	80.14	81.99	81.83	78.98	78.46	80.24	80.84	81.23	75.91	78.43	79.72
192H	80.87	82.77	83.16	85.19	84.59	81.39	80.81	82.24	83.39	84.25	78.65	81.52	82.40
216H	83.44	84.72	85.49	86.75	85.38	82.73	81.49	84.16	85.45	86.29	80.83	83.61	84.20
240H	83.43	86.67	87.12	88.45	86.12	84.13	82.47	84.77	86.72	87.67	83.15	84.44	85.43

나) 850 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.32	2.22	2.53	2.46	1.55	0.15	0.16	0.39	-0.18	0.35	0.94	1.96	1.24
48H	3.91	3.89	4.06	3.7	2.56	-0.01	-0.22	0.26	0.15	1.2	2.47	3.7	2.14
72H	4.98	5.08	5.03	4.83	3.31	-0.03	-0.19	-0.12	0.72	2.21	3.77	5.09	2.89
96H	5.57	5.56	5.9	5.81	4.06	0.78	0.22	-0.41	1.57	3.32	4.61	5.71	3.56
120H	6.09	6.33	6.14	6.48	4.92	1.21	0.47	-0.72	2.47	4.5	5.39	6.41	4.14
144H	7.37	7.28	6.75	6.79	5.8	1.09	0.21	-1.89	2.67	4.61	5.62	7.51	4.48
168H	8.64	8.33	7.15	7.14	6.88	1.06	-0.06	-2.59	2.73	4.38	6.3	8.51	4.87
192H	10.24	8.59	7.34	7.48	7.96	1.25	-0.12	-2.52	2.71	4.53	6.91	10.5	5.41
216H	12.29	8.85	7.87	7.61	8.2	2.21	-0.32	-2.15	2.82	5.18	7.59	12.24	6.03
240H	13.87	9.64	8.32	7.94	8.43	3.11	-0.46	-1.77	2.65	5.55	8.07	12.39	6.48

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	17.98	17.06	16.42	14.77	14.79	13.38	13.6	13.62	13.56	13.83	14.18	16.57	14.98
48H	29.03	26.86	24.71	23.5	22.86	20.22	20.9	20.96	20.76	22.12	22.87	26.26	23.42
72H	39.66	38.09	34.54	33.21	31.03	27.14	28.81	27.76	28.41	30.72	31.36	36.05	32.23
96H	50.25	49.13	45.73	44.03	40.62	34.97	36.69	35.06	37.47	40.87	40.69	46.28	41.82
120H	60.00	59.7	57.23	54.9	50.66	41.94	43.7	41.96	47.39	51.56	50.47	56.38	51.32
144H	68.22	68.4	67.72	64.74	58.29	48.95	50.19	48.14	54.82	62.92	58.67	65.3	59.70
168H	75.82	75.17	75.14	71.73	65.04	55.18	56.24	53.69	60.59	71.91	66.35	74.37	66.77
192H	83.94	80.36	81.26	77.89	69.84	59.55	60.08	57.56	65.98	78.21	72.84	82.38	72.49
216H	90.07	84.83	87.78	82.42	72.99	63.69	62.19	61.13	69.94	81.42	78.69	88.42	76.96
240H	92.07	90.55	92.87	85.1	74.49	67.6	63.65	63.06	73.52	85.1	84.18	92.33	80.38

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	34.83	35.49	35.27	36.02	38.02	39.8	40.55	40.84	38.91	36.18	35.15	35.9	37.25
48H	44.55	44.81	43.91	45.59	47.63	49.55	50.62	50.97	48.2	45.55	44.03	44.62	46.67
72H	52.82	53.32	52.25	54.44	55.67	57.05	58.83	59.17	56.37	53.29	51.09	52.05	54.70
96H	59.71	61.22	60	62.73	63.44	63.61	65.4	66.06	64.19	60.64	57.97	58.97	62.00
120H	65.46	67.63	66.95	69.61	71.21	69.27	70.59	71.63	71.24	67.56	63.99	64.69	68.32
144H	69.54	72.79	72.53	75.94	76.84	74.32	74.62	76.25	75.99	74.17	68.41	69.69	73.42
168H	72.92	76.09	76.57	80.58	81	78.51	77.95	80.19	79.38	79.53	72.66	74.51	77.49
192H	76.01	78.76	79.47	84.5	84.1	81.38	80.87	82.6	82.31	82.99	75.73	77.97	80.56
216H	78.59	81.05	82.32	86.28	85.35	83.22	82.04	84.58	84.44	85.06	77.63	80.61	82.60
240H	78.85	83.11	84.66	88.06	86.2	84.67	83.22	85.6	85.73	86.46	80.05	81.74	84.03

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.97	0.97	0.98	0.98	0.97	0.96	0.96	0.96	0.97	0.98	0.98	0.98	0.97
48H	0.93	0.93	0.95	0.94	0.93	0.92	0.9	0.91	0.92	0.94	0.94	0.94	0.93
72H	0.87	0.86	0.9	0.89	0.87	0.85	0.82	0.84	0.86	0.89	0.89	0.89	0.87
96H	0.79	0.76	0.81	0.8	0.77	0.75	0.71	0.75	0.76	0.8	0.82	0.82	0.78
120H	0.71	0.64	0.71	0.69	0.64	0.64	0.59	0.64	0.63	0.69	0.74	0.73	0.67
144H	0.62	0.53	0.59	0.57	0.52	0.51	0.48	0.52	0.52	0.55	0.65	0.64	0.56
168H	0.53	0.44	0.5	0.47	0.41	0.38	0.36	0.41	0.43	0.43	0.57	0.53	0.46
192H	0.43	0.38	0.42	0.36	0.33	0.28	0.28	0.31	0.33	0.33	0.5	0.44	0.37
216H	0.35	0.3	0.33	0.27	0.26	0.21	0.24	0.23	0.26	0.27	0.44	0.37	0.29
240H	0.31	0.22	0.25	0.19	0.22	0.15	0.21	0.18	0.21	0.21	0.35	0.32	0.24

2) 온도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.05	-0.06	-0.12	-0.08	-0.05	-0.1	0.03	0.03	-0.06	-0.04	-0.03	0.03	0.03
48H	0.12	-0.02	-0.1	0.01	0.08	0.02	0.23	0.18	0.02	0.06	0.06	0.17	0.07
72H	0.18	-0.01	-0.09	0.07	0.16	0.12	0.39	0.31	0.11	0.14	0.15	0.27	0.15
96H	0.22	-0.01	-0.1	0.12	0.23	0.22	0.55	0.43	0.19	0.23	0.23	0.34	0.22
120H	0.24	0	-0.11	0.17	0.28	0.32	0.68	0.52	0.25	0.29	0.29	0.4	0.28
144H	0.26	-0.04	-0.08	0.18	0.35	0.39	0.78	0.6	0.28	0.35	0.34	0.46	0.32
168H	0.27	-0.08	-0.08	0.18	0.41	0.45	0.85	0.67	0.31	0.42	0.38	0.53	0.36
192H	0.27	-0.11	-0.06	0.16	0.44	0.51	0.89	0.72	0.35	0.47	0.43	0.55	0.39
216H	0.27	-0.13	-0.07	0.15	0.46	0.58	0.92	0.78	0.41	0.51	0.49	0.56	0.41
240H	0.27	-0.12	-0.08	0.16	0.46	0.64	0.95	0.81	0.48	0.58	0.52	0.56	0.44

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.30	1.34	1.35	1.3	1.3	1.31	1.34	1.26	1.17	1.17	1.2	1.33	1.28
48H	2.06	2.1	1.97	1.9	1.93	1.86	1.96	1.83	1.67	1.68	1.77	2.03	1.90
72H	2.82	2.89	2.66	2.56	2.52	2.34	2.5	2.32	2.12	2.15	2.28	2.65	2.48
96H	3.54	3.6	3.34	3.24	3.08	2.8	2.99	2.74	2.61	2.6	2.82	3.26	3.05
120H	4.18	4.23	3.96	3.83	3.59	3.25	3.42	3.1	3.08	3.1	3.37	3.84	3.58
144H	4.66	4.75	4.5	4.44	4.04	3.66	3.81	3.45	3.52	3.72	3.86	4.33	4.06
168H	5.04	5.21	5	4.97	4.45	3.96	4.12	3.71	3.84	4.27	4.29	4.8	4.47
192H	5.41	5.57	5.4	5.34	4.71	4.26	4.38	3.92	4.12	4.65	4.65	5.2	4.80
216H	5.82	5.84	5.72	5.57	4.91	4.5	4.57	4.13	4.36	4.97	4.9	5.52	5.07
240H	5.93	6.02	5.91	5.82	5.04	4.63	4.68	4.23	4.52	5.17	5.15	5.75	5.24

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.30	1.34	1.35	1.3	1.3	1.31	1.34	1.26	1.17	1.17	1.2	1.33	1.28
48H	2.06	2.1	1.97	1.9	1.93	1.86	1.96	1.83	1.67	1.68	1.77	2.03	1.90
72H	2.82	2.89	2.66	2.56	2.52	2.34	2.5	2.32	2.12	2.15	2.28	2.65	2.48
96H	3.54	3.6	3.34	3.24	3.08	2.8	2.99	2.74	2.61	2.6	2.82	3.26	3.05
120H	4.18	4.23	3.96	3.83	3.59	3.25	3.42	3.1	3.08	3.1	3.37	3.84	3.58
144H	4.66	4.75	4.5	4.44	4.04	3.66	3.81	3.45	3.52	3.72	3.86	4.33	4.06
168H	5.04	5.21	5	4.97	4.45	3.96	4.12	3.71	3.84	4.27	4.29	4.8	4.47
192H	5.41	5.57	5.4	5.34	4.71	4.26	4.38	3.92	4.12	4.65	4.65	5.2	4.80
216H	5.82	5.84	5.72	5.57	4.91	4.5	4.57	4.13	4.36	4.97	4.9	5.52	5.07
240H	5.93	6.02	5.91	5.82	5.04	4.63	4.68	4.23	4.52	5.17	5.15	5.75	5.24

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.97	0.96	0.97	0.96	0.95	0.94	0.93	0.93	0.94	0.96	0.96	0.96	0.95
48H	0.91	0.91	0.93	0.91	0.9	0.87	0.85	0.86	0.88	0.92	0.92	0.91	0.90
72H	0.84	0.83	0.87	0.85	0.83	0.8	0.76	0.78	0.82	0.87	0.86	0.86	0.83
96H	0.75	0.73	0.78	0.76	0.75	0.72	0.66	0.71	0.75	0.81	0.78	0.78	0.75
120H	0.65	0.63	0.69	0.66	0.65	0.62	0.56	0.63	0.66	0.73	0.7	0.7	0.66
144H	0.56	0.53	0.59	0.55	0.55	0.52	0.48	0.55	0.56	0.61	0.61	0.62	0.56
168H	0.48	0.44	0.49	0.44	0.45	0.43	0.4	0.48	0.48	0.49	0.52	0.53	0.47
192H	0.40	0.36	0.42	0.35	0.38	0.35	0.34	0.41	0.41	0.41	0.45	0.45	0.39
216H	0.31	0.3	0.35	0.29	0.32	0.28	0.29	0.34	0.34	0.34	0.39	0.38	0.33
240H	0.27	0.25	0.31	0.21	0.27	0.25	0.25	0.3	0.29	0.29	0.33	0.33	0.28

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.20	-0.19	-0.16	-0.07	-0.05	-0.05	-0.08	-0.11	-0.12	-0.15	-0.14	-0.27	-0.13
48H	-0.24	-0.17	-0.13	-0.04	-0.07	-0.04	-0.11	-0.14	-0.18	-0.2	-0.12	-0.28	-0.14
72H	-0.28	-0.21	-0.12	-0.01	-0.08	-0.01	-0.11	-0.13	-0.2	-0.11	-0.09	-0.3	-0.14
96H	-0.33	-0.24	-0.08	0	-0.08	0	-0.04	-0.08	-0.14	-0.01	-0.08	-0.23	-0.11
120H	-0.32	-0.22	-0.05	-0.06	-0.14	0.02	0.04	-0.01	-0.05	0.11	-0.1	-0.24	-0.09
144H	-0.33	-0.21	-0.03	-0.11	-0.17	0.07	0.12	0.05	0.06	0.25	-0.11	-0.26	-0.06
168H	-0.27	-0.19	-0.01	-0.1	-0.16	0.09	0.22	0.14	0.16	0.3	-0.02	-0.3	-0.01
192H	-0.33	-0.17	-0.01	-0.07	-0.12	0.16	0.24	0.17	0.19	0.28	0.05	-0.28	0.01
216H	-0.38	-0.14	-0.04	0.02	-0.05	0.26	0.27	0.13	0.21	0.27	0.08	-0.18	0.04
240H	-0.44	-0.03	-0.13	0.02	0.04	0.3	0.26	0.09	0.26	0.28	0.02	-0.16	0.04

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	4.35	4.44	4.27	3.93	3.89	3.81	3.73	3.66	3.7	3.79	4	4.39	4.00
48H	6.13	6.11	5.77	5.42	5.28	5.13	5.1	4.93	4.99	5.23	5.52	5.92	5.46
72H	7.71	7.73	7.3	6.87	6.51	6.19	6.28	6	6.19	6.51	6.74	7.23	6.77
96H	9.04	9.18	8.72	8.23	7.72	7.15	7.24	6.94	7.39	7.7	7.98	8.49	7.98
120H	10.12	10.34	10.01	9.37	8.82	8.03	8	7.72	8.55	8.86	9.06	9.55	9.04
144H	10.93	11.26	11.05	10.36	9.64	8.73	8.61	8.37	9.32	10.04	9.85	10.49	9.89
168H	11.64	11.86	11.77	11.09	10.21	9.32	9.14	8.95	9.9	10.95	10.7	11.36	10.57
192H	12.21	12.36	12.26	11.68	10.64	9.73	9.59	9.27	10.37	11.46	11.26	11.97	11.07
216H	12.64	12.75	12.77	12.01	10.85	10.05	9.79	9.57	10.69	11.75	11.75	12.5	11.43
240H	12.58	13.16	13.11	12.31	11.01	10.28	9.9	9.74	10.92	11.94	12.26	12.77	11.67

다) 500 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	4.11	3.12	2.68	3.32	2.86	2.06	3.1	3.44	2.42	2.54	2.58	3.05	2.94
48H	5.35	4.27	2.99	4.35	3.97	2.05	3.25	3.93	3.25	3.91	4.58	4.82	3.89
72H	6.26	4.94	3.15	5.25	4.96	2.33	4	4.4	4.4	5.61	6.53	6.3	4.84
96H	6.74	5.1	3.54	6.05	6.03	3.7	5.48	5.2	6.16	7.65	8.36	7.05	5.92
120H	7.28	5.27	3.8	6.51	6.89	4.89	6.81	5.8	8	9.82	9.97	8.22	6.94
144H	8.31	5.68	4.59	6.48	7.77	5.77	7.56	5.65	9	11.2	10.84	9.81	7.72
168H	9.18	6.21	5.01	6.58	9.11	6.68	8.52	6.16	10.18	12.33	12.35	11.26	8.63
192H	10.39	6.34	4.84	6.48	10.48	7.68	9.61	7.31	11.27	13.37	13.96	13.48	9.60
216H	12.19	6.46	5.03	6.51	11.13	9.6	10.35	8.66	12.4	15.01	15.46	15.39	10.68
240H	12.84	6.94	4.97	6.9	11.81	11.54	11.04	9.85	13.27	16.42	16.53	15.84	11.50

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	20.61	19.17	18.06	16.87	16.66	14.95	14.87	14.77	14.66	15.38	16.31	18.4	16.73
48H	36.30	33.33	30.5	30.4	28.43	24.09	24.44	24.94	24.64	26.06	28.89	32.34	28.70
72H	53.24	50.84	45.8	45.9	41.67	35.23	36.31	36.02	36.33	38.59	42.16	47.19	42.44
96H	69.86	67.43	63.17	62.78	56.53	46.69	47.36	46.81	49.91	52.94	56.45	62.88	56.90
120H	84.79	83.03	80.75	80.32	72.01	58.06	58.18	56.81	65.23	69.29	69.68	78.09	71.35
144H	97.73	96.32	96.18	95.81	84.88	68.43	67.6	65	78.26	86.87	82.61	91.96	84.30
168H	110.28	107.71	107.71	107.84	95.47	76.96	75.98	72.92	88.25	101.98	94.17	106.12	95.45
192H	121.53	118.18	118.08	117.82	104.1	83.15	82.68	78.57	96	112.35	104.11	117.8	104.53
216H	131.73	126.26	127.24	124.89	109.07	88.76	86.77	83.62	102.37	119.5	112.29	125.92	111.54
240H	136.11	133.86	136.21	130.6	111.17	93.65	89.16	87.2	106.44	125.56	121.46	132.16	116.97

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	23.03	22.47	21.98	22.52	24.3	26.68	28.97	29.71	26.96	24.15	23.09	22.93	24.73
48H	33.74	32.97	32.22	34.03	35.7	37.7	40.7	41.58	37.7	33.84	33.15	32.72	35.50
72H	42.52	42.72	41.28	43.97	45.14	47.18	50.66	51.35	46.74	42.38	41.31	40.65	44.66
96H	49.71	50.51	49.41	52.54	53.99	55.3	58.22	59.44	55.48	50.25	48.58	47.84	52.61
120H	55.40	56.52	56.52	60.18	61.66	62.36	64.76	66.34	63.16	57.85	54.2	53.64	59.38
144H	59.79	61.4	62.39	66.39	67.98	68.37	70.04	71.48	68.59	65.17	59.16	58.8	64.96
168H	63.77	65.28	66.32	71.16	72.84	72.6	74.57	75.72	72.77	70.79	63.82	63.54	69.43
192H	66.84	68.6	69.62	74.91	76.62	75.89	78.12	78.15	75.49	74.6	66.96	67.01	72.73
216H	69.36	70.65	72.26	77.09	78.61	78.67	80.19	80.43	77.6	77.03	68.97	69.73	75.05
240H	70.19	72.41	74.73	79.34	79.77	80.31	81.31	81.69	78.68	78.71	71.41	71.84	76.70

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.98	0.98	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.99	0.99	0.99	0.99
48H	0.95	0.95	0.96	0.96	0.95	0.95	0.93	0.94	0.95	0.97	0.96	0.96	0.95
72H	0.89	0.89	0.91	0.9	0.9	0.89	0.85	0.87	0.9	0.93	0.92	0.91	0.90
96H	0.82	0.8	0.83	0.81	0.82	0.79	0.75	0.78	0.81	0.86	0.86	0.85	0.82
120H	0.73	0.7	0.72	0.7	0.7	0.67	0.63	0.67	0.69	0.75	0.78	0.76	0.71
144H	0.64	0.59	0.6	0.57	0.58	0.54	0.51	0.56	0.57	0.62	0.7	0.67	0.60
168H	0.55	0.48	0.51	0.46	0.46	0.41	0.39	0.44	0.46	0.49	0.61	0.56	0.49
192H	0.45	0.38	0.42	0.35	0.35	0.31	0.3	0.35	0.36	0.39	0.54	0.47	0.39
216H	0.35	0.3	0.33	0.27	0.28	0.23	0.24	0.27	0.28	0.33	0.47	0.4	0.31
240H	0.31	0.22	0.24	0.19	0.23	0.16	0.2	0.21	0.24	0.26	0.38	0.34	0.25

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.07	-0.12	-0.18	-0.16	-0.18	-0.17	-0.08	-0.03	-0.06	-0.13	-0.14	-0.16	-0.12
48H	-0.10	-0.13	-0.25	-0.2	-0.23	-0.24	-0.13	-0.05	-0.07	-0.13	-0.12	-0.19	-0.15
72H	-0.14	-0.17	-0.31	-0.24	-0.24	-0.25	-0.14	-0.03	-0.06	-0.08	-0.08	-0.22	-0.16
96H	-0.19	-0.21	-0.34	-0.28	-0.24	-0.23	-0.11	0.02	-0.02	-0.02	-0.02	-0.23	-0.16
120H	-0.23	-0.25	-0.35	-0.32	-0.26	-0.18	-0.06	0.07	0.04	0.06	0.05	-0.23	-0.14
144H	-0.27	-0.28	-0.35	-0.38	-0.27	-0.1	-0.01	0.13	0.1	0.15	0.09	-0.23	-0.12
168H	-0.32	-0.31	-0.36	-0.42	-0.28	-0.02	0.06	0.22	0.2	0.26	0.17	-0.23	-0.09
192H	-0.37	-0.33	-0.39	-0.45	-0.27	0.05	0.15	0.3	0.3	0.34	0.24	-0.23	-0.06
216H	-0.42	-0.36	-0.41	-0.45	-0.23	0.13	0.23	0.37	0.39	0.41	0.3	-0.2	-0.02
240H	-0.52	-0.4	-0.45	-0.45	-0.16	0.21	0.32	0.42	0.46	0.48	0.34	-0.17	0.01

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.10	1.09	1.1	1.01	0.99	0.95	0.9	0.89	0.89	0.93	1.02	1.06	0.99
48H	1.83	1.8	1.77	1.67	1.61	1.44	1.38	1.37	1.39	1.49	1.63	1.71	1.59
72H	2.56	2.55	2.42	2.31	2.17	1.88	1.84	1.81	1.89	2.04	2.21	2.32	2.17
96H	3.24	3.2	3.05	2.95	2.74	2.3	2.24	2.21	2.41	2.61	2.76	2.93	2.72
120H	3.78	3.75	3.69	3.63	3.25	2.68	2.6	2.58	2.94	3.2	3.29	3.48	3.24
144H	4.22	4.2	4.24	4.21	3.63	3	2.88	2.89	3.39	3.8	3.81	3.97	3.69
168H	4.65	4.56	4.67	4.63	3.98	3.27	3.14	3.1	3.72	4.35	4.26	4.44	4.06
192H	4.97	4.98	5.05	4.92	4.21	3.47	3.34	3.27	3.97	4.7	4.64	4.84	4.36
216H	5.29	5.29	5.34	5.18	4.36	3.65	3.46	3.43	4.21	5	4.9	5.08	4.60
240H	5.48	5.52	5.57	5.39	4.5	3.8	3.57	3.55	4.33	5.23	5.07	5.34	4.78

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	40.66	39.85	40.23	40.13	41.37	44.96	46.69	46.6	44.22	40.75	40.81	41	42.27
48H	56.35	54.83	54.74	56.01	57.92	61.15	63.21	63.16	60.22	55.79	55.76	55.11	57.85
72H	64.86	63.13	62.87	64.79	66.31	69.35	71.69	71.75	68.36	64.05	63.17	62.25	66.05
96H	70.37	68.48	68.91	70.39	72.78	75.09	76.74	77.23	74.81	70.33	68.53	67.67	71.78
120H	73.74	72.28	73.6	75.08	77.26	79.38	80.74	80.94	79.03	75.38	72.72	71.69	75.99
144H	76.46	75.18	77.47	78.61	80.75	82.54	83.44	84.1	82.25	79.46	75.91	74.95	79.26
168H	78.65	77.58	79.6	80.86	83.25	84.87	85.68	85.89	84.48	82.5	78.74	77.67	81.65
192H	80.22	79.71	81.76	82.68	85.27	86.38	87.54	86.92	85.53	84.29	80.82	79.58	83.39
216H	81.61	81.2	83.04	84.15	85.91	87.5	88.27	87.82	86.24	85.65	82.13	80.63	84.51
240H	82.33	82.11	84.12	85.42	86.99	88.15	88.92	88.15	87.29	86.53	82.62	82.05	85.39

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.97	0.97	0.97	0.97	0.97	0.95	0.95	0.95	0.96	0.97	0.97	0.97	0.96
48H	0.91	0.91	0.92	0.91	0.91	0.89	0.87	0.88	0.9	0.93	0.92	0.93	0.91
72H	0.83	0.83	0.85	0.84	0.83	0.8	0.78	0.78	0.82	0.87	0.86	0.86	0.83
96H	0.73	0.72	0.76	0.74	0.73	0.7	0.67	0.67	0.72	0.78	0.77	0.78	0.73
120H	0.64	0.62	0.65	0.61	0.62	0.59	0.55	0.55	0.61	0.67	0.68	0.7	0.62
144H	0.55	0.53	0.53	0.49	0.51	0.48	0.45	0.44	0.5	0.54	0.58	0.61	0.52
168H	0.46	0.44	0.43	0.39	0.4	0.39	0.34	0.36	0.4	0.41	0.48	0.51	0.42
192H	0.39	0.34	0.34	0.31	0.32	0.31	0.27	0.29	0.32	0.33	0.39	0.42	0.34
216H	0.30	0.26	0.26	0.23	0.28	0.24	0.22	0.23	0.26	0.27	0.32	0.35	0.27
240H	0.25	0.19	0.2	0.17	0.23	0.2	0.17	0.19	0.21	0.21	0.28	0.29	0.22

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.00	0.03	-0.03	0.04	-0.02	-0.01	-0.08	-0.12	-0.1	-0.1	-0.04	-0.07	-0.04
48H	-0.11	-0.03	-0.11	-0.06	-0.2	-0.21	-0.29	-0.29	-0.32	-0.24	-0.1	-0.15	-0.18
72H	-0.17	-0.08	-0.1	-0.18	-0.32	-0.33	-0.41	-0.4	-0.46	-0.3	-0.16	-0.19	-0.26
96H	-0.21	-0.14	-0.11	-0.23	-0.38	-0.41	-0.46	-0.44	-0.52	-0.32	-0.15	-0.17	-0.30
120H	-0.18	-0.17	-0.08	-0.27	-0.46	-0.45	-0.47	-0.45	-0.5	-0.32	-0.19	-0.16	-0.31
144H	-0.16	-0.2	-0.04	-0.29	-0.57	-0.5	-0.5	-0.44	-0.41	-0.27	-0.16	-0.19	-0.31
168H	-0.12	-0.2	-0.02	-0.35	-0.68	-0.46	-0.46	-0.38	-0.36	-0.22	-0.12	-0.24	-0.30
192H	-0.13	-0.22	-0.06	-0.36	-0.69	-0.43	-0.43	-0.35	-0.32	-0.22	-0.16	-0.23	-0.30
216H	-0.17	-0.17	-0.07	-0.34	-0.64	-0.44	-0.43	-0.37	-0.25	-0.19	-0.24	-0.16	-0.29
240H	-0.23	-0.08	-0.17	-0.35	-0.57	-0.49	-0.41	-0.39	-0.12	-0.24	-0.32	-0.16	-0.29

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	4.11	3.12	2.68	3.32	2.86	2.06	3.1	3.44	2.42	2.54	2.58	3.05	2.94
48H	5.35	4.27	2.99	4.35	3.97	2.05	3.25	3.93	3.25	3.91	4.58	4.82	3.89
72H	6.26	4.94	3.15	5.25	4.96	2.33	4	4.4	4.4	5.61	6.53	6.3	4.84
96H	6.74	5.1	3.54	6.05	6.03	3.7	5.48	5.2	6.16	7.65	8.36	7.05	5.92
120H	7.28	5.27	3.8	6.51	6.89	4.89	6.81	5.8	8	9.82	9.97	8.22	6.94
144H	8.31	5.68	4.59	6.48	7.77	5.77	7.56	5.65	9	11.2	10.84	9.81	7.72
168H	9.18	6.21	5.01	6.58	9.11	6.68	8.52	6.16	10.18	12.33	12.35	11.26	8.63
192H	10.39	6.34	4.84	6.48	10.48	7.68	9.61	7.31	11.27	13.37	13.96	13.48	9.60
216H	12.19	6.46	5.03	6.51	11.13	9.6	10.35	8.66	12.4	15.01	15.46	15.39	10.68
240H	12.84	6.94	4.97	6.9	11.81	11.54	11.04	9.85	13.27	16.42	16.53	15.84	11.50

라) 250 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	5.64	4.95	3.57	4.17	3.51	2.73	4.32	5.33	4.63	4.7	4.31	4.2	4.34
48H	5.1	4.78	2.07	3.97	3.46	2.2	3.88	5.68	5.69	6.22	6.4	5.2	4.55
72H	4.14	3.96	0.41	3.66	3.87	2.86	4.73	6.75	7.51	8.61	8.64	5.74	5.07
96H	2.1	2.4	-0.79	3.03	4.72	4.94	6.73	8.45	10.12	11.87	11.16	6.28	5.92
120H	0.52	1.02	-1.69	2.05	5.12	6.99	8.71	10.01	13.34	15.67	13.89	6.85	6.87
144H	-0.57	0.01	-1.63	0.77	5.4	9.01	10.27	11.1	16.04	19.11	15.78	7.62	7.74
168H	-1.52	-0.51	-2.14	0.05	6.48	11.23	12.68	13.23	19.22	22.57	18.28	8.71	9.02
192H	-2.04	-1.31	-3.31	-0.36	8.57	13.75	15.44	16.08	22.41	25.7	20.87	11.18	10.58
216H	-1.82	-2.34	-4.15	-0.26	10.63	17.2	17.65	18.74	24.94	28.92	23.43	13.87	12.23
240H	-2.69	-2.53	-5.26	-0.21	13.11	20.56	19.89	20.92	27.24	31.58	24.83	14.72	13.51

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	25.12	22.99	22.27	22.57	21.67	19.35	19.74	19.5	19.57	20	21.02	22.51	21.36
48H	43.45	39.17	37.49	39.72	37.31	33.15	34.17	34.9	34.29	35.33	38.32	40.01	37.28
72H	64.21	60.35	56.51	59.34	54.77	48.95	51.02	52.34	51.78	53.33	56	59.18	55.65
96H	85.09	81.09	78.17	81.23	75.22	65.7	67.93	69.36	70.99	73.36	75.24	78.72	75.18
120H	104.04	102.21	99.72	105.81	96.04	82.12	84.16	85.01	93.05	96.61	94.04	98.76	95.13
144H	120.72	119.96	120.13	127.91	113.94	96.3	97.95	97.77	113.31	122.13	112.1	117.47	113.31
168H	137.45	134.69	137.93	145.45	128.08	107.87	110.64	108.9	128.36	144.46	129.5	136.92	129.19
192H	151.87	150.79	153.61	159.71	140.23	117.52	119.91	117.1	138.86	160.21	144.5	153.24	142.30
216H	166.27	164.28	166.81	170	148.33	125.27	125.51	124.23	149.52	172.69	157	163.37	152.77
240H	173.82	175.34	179.63	178.43	153.55	132.66	130.09	129.97	155.04	181.13	169.27	171.09	160.84

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	18.54	17.2	17.48	18.86	20.18	22.72	24.91	24.88	22.56	19.47	18.49	17.64	20.24
48H	26.7	24.81	25.12	27.98	30.11	33.57	37.05	37.61	33.22	28.41	27.09	25.4	29.76
72H	33.96	32.72	32.59	36.64	38.71	42.97	47.5	48.39	42.45	36.57	34.3	32.45	38.27
96H	40.63	39.58	39.86	44.26	47.47	51.33	56.06	57.12	51.07	44.56	41.18	39.11	46.02
120H	46.15	45.36	46.84	51.9	54.81	58.37	62.71	63.9	58.74	52.08	47.01	44.76	52.72
144H	50.61	50.18	52.75	58.02	60.98	64.09	67.71	68.99	64.52	59.32	52.02	49.9	58.26
168H	54.58	54.05	57.39	62.62	65.68	68.13	72.35	72.53	68.72	65.15	56.85	54.61	62.72
192H	57.56	57.8	61.24	66.46	69.45	71.45	75.37	74.8	70.79	68.76	60.28	58.26	66.02
216H	60.44	60.72	64.21	69.3	71.7	74.16	77.1	76.74	72.79	71.26	62.91	61.08	68.53
240H	61.77	63.12	67.02	71.58	73.38	75.76	78.4	77.74	74.44	73.11	65.05	63.1	70.37

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99
48H	0.96	0.96	0.97	0.96	0.96	0.95	0.94	0.95	0.96	0.97	0.97	0.97	0.96
72H	0.91	0.91	0.92	0.9	0.91	0.89	0.87	0.88	0.9	0.93	0.93	0.92	0.91
96H	0.84	0.84	0.85	0.82	0.83	0.8	0.76	0.78	0.82	0.86	0.87	0.86	0.83
120H	0.76	0.74	0.75	0.71	0.72	0.69	0.64	0.67	0.71	0.76	0.8	0.78	0.73
144H	0.68	0.64	0.64	0.58	0.6	0.57	0.52	0.56	0.59	0.63	0.72	0.7	0.62
168H	0.59	0.55	0.54	0.47	0.49	0.46	0.4	0.45	0.49	0.49	0.62	0.59	0.51
192H	0.49	0.44	0.43	0.36	0.39	0.36	0.31	0.37	0.4	0.4	0.53	0.49	0.41
216H	0.39	0.34	0.34	0.28	0.31	0.29	0.26	0.3	0.31	0.33	0.45	0.42	0.34
240H	0.33	0.24	0.24	0.21	0.26	0.22	0.21	0.24	0.26	0.27	0.36	0.36	0.27

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.09	0.04	0.13	0.15	0.17	0.2	0.14	0.15	0.22	0.13	0.08	0.04	0.13
48H	-0.08	-0.1	-0.03	0.02	0.06	0.18	0.08	0.11	0.21	0.14	0.04	-0.02	0.05
72H	-0.22	-0.19	-0.16	-0.1	-0.01	0.18	0.07	0.11	0.23	0.16	0.05	-0.05	0.01
96H	-0.37	-0.28	-0.3	-0.22	-0.05	0.19	0.08	0.14	0.25	0.2	0.05	-0.06	-0.03
120H	-0.51	-0.4	-0.41	-0.32	-0.1	0.2	0.09	0.18	0.32	0.27	0.06	-0.09	-0.06
144H	-0.64	-0.51	-0.52	-0.42	-0.16	0.21	0.11	0.25	0.43	0.35	0.08	-0.12	-0.08
168H	-0.74	-0.62	-0.63	-0.48	-0.2	0.22	0.16	0.33	0.52	0.44	0.1	-0.11	-0.08
192H	-0.84	-0.75	-0.72	-0.54	-0.2	0.25	0.21	0.41	0.6	0.53	0.11	-0.09	-0.09
216H	-0.95	-0.84	-0.81	-0.59	-0.18	0.3	0.28	0.47	0.66	0.63	0.12	-0.11	-0.09
240H	-1.04	-0.87	-0.9	-0.63	-0.13	0.33	0.32	0.52	0.7	0.71	0.11	-0.13	-0.08

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.42	1.44	1.36	1.25	1.21	1.19	1.1	1.11	1.13	1.16	1.21	1.28	1.24
48H	2.18	2.12	1.99	1.92	1.83	1.78	1.72	1.72	1.71	1.77	1.85	1.96	1.88
72H	2.86	2.77	2.61	2.51	2.4	2.32	2.3	2.23	2.22	2.31	2.4	2.53	2.46
96H	3.42	3.32	3.18	3.06	2.96	2.76	2.72	2.61	2.69	2.82	2.84	3.04	2.95
120H	3.84	3.81	3.7	3.51	3.42	3.13	3.04	2.95	3.09	3.27	3.24	3.5	3.38
144H	4.2	4.21	4.15	3.87	3.73	3.44	3.32	3.23	3.33	3.7	3.59	3.83	3.72
168H	4.44	4.51	4.44	4.1	4.05	3.7	3.57	3.42	3.55	4.03	3.9	4.11	3.99
192H	4.61	4.81	4.61	4.27	4.28	3.89	3.72	3.56	3.77	4.25	4.09	4.33	4.18
216H	4.82	5.01	4.74	4.42	4.4	4.02	3.82	3.66	3.98	4.45	4.21	4.56	4.34
240H	4.97	5.17	4.87	4.55	4.54	4.11	3.9	3.71	4.08	4.56	4.34	4.74	4.46

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	49.24	47.06	47.95	47.49	47.1	48.49	50.61	51.04	50.45	48.75	48.76	48.9	48.82
48H	66.22	62.44	62.79	63.75	64.24	66.01	69.25	69.99	68.01	64.85	65.11	64.23	65.57
72H	75.13	71.86	72.03	73.34	73.44	75.8	79.24	79.81	77.35	73.57	73.88	72.25	74.81
96H	80.91	78.42	78.29	79.87	80.7	81.88	84.35	85.04	84.12	80.13	79.55	78.1	80.95
120H	84.04	82.66	83.2	84.71	85.26	85.93	87.42	88.43	88.15	84.85	83.67	82.11	85.04
144H	86.79	85.63	87	87.64	88.07	88.64	89.37	90.8	89.6	88.37	86.53	84.65	87.76
168H	88.21	87.82	88.66	89.83	90.41	90.7	90.74	91.78	90.92	90.72	89.06	87.24	89.67
192H	88.79	89.24	90.12	90.93	91.35	92.06	92.29	92.16	91.64	92.12	89.79	88.45	90.75
216H	89.78	90.37	90.64	91.22	91.77	92.77	92.85	93.01	92.19	93.05	90.23	89.37	91.44
240H	90.47	90.83	91.04	91.91	92.98	93.24	93.48	93.29	92.58	93.62	90.41	90.52	92.03

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.93	0.94	0.94	0.94	0.94	0.93	0.93	0.92	0.91	0.94	0.93	0.94	0.93
48H	0.83	0.87	0.88	0.85	0.85	0.84	0.82	0.8	0.8	0.85	0.83	0.86	0.84
72H	0.7	0.78	0.79	0.74	0.74	0.72	0.68	0.67	0.67	0.75	0.73	0.77	0.73
96H	0.58	0.69	0.69	0.62	0.62	0.61	0.57	0.55	0.53	0.63	0.63	0.67	0.62
120H	0.49	0.59	0.58	0.5	0.49	0.49	0.47	0.43	0.4	0.51	0.53	0.57	0.50
144H	0.41	0.5	0.48	0.39	0.4	0.39	0.38	0.33	0.34	0.38	0.44	0.49	0.41
168H	0.36	0.43	0.4	0.32	0.31	0.29	0.28	0.25	0.28	0.28	0.36	0.42	0.33
192H	0.32	0.36	0.35	0.26	0.24	0.23	0.22	0.2	0.22	0.21	0.32	0.36	0.27
216H	0.28	0.31	0.31	0.22	0.21	0.19	0.17	0.16	0.16	0.14	0.29	0.3	0.23
240H	0.24	0.27	0.26	0.17	0.17	0.16	0.13	0.14	0.13	0.09	0.26	0.25	0.19

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.09	-0.02	0	0.03	0.02	0.06	0.07	0.03	-0.03	-0.08	-0.15	-0.17	0.01
48H	0.1	-0.12	0.11	0.12	-0.01	0.19	0.08	-0.02	-0.07	-0.07	-0.01	-0.06	0.02
72H	0.24	-0.01	0.3	0.2	0.04	0.35	0.19	0.04	0	0	0.16	0.01	0.13
96H	0.3	0.11	0.39	0.24	0.15	0.5	0.26	0.13	0.08	0.12	0.24	0.12	0.22
120H	0.39	0.15	0.55	0.31	0.23	0.59	0.35	0.25	0.23	0.21	0.33	0.15	0.31
144H	0.42	0.29	0.64	0.29	0.15	0.63	0.46	0.31	0.37	0.28	0.53	0.14	0.38
168H	0.55	0.46	0.8	0.23	0.16	0.72	0.61	0.33	0.53	0.37	0.58	0.2	0.46
192H	0.64	0.39	0.84	0.21	0.21	0.79	0.76	0.46	0.67	0.45	0.53	0.3	0.52
216H	0.48	0.44	0.85	0.27	0.38	0.81	0.84	0.53	0.75	0.54	0.37	0.34	0.55
240H	0.46	0.54	0.94	0.29	0.57	0.75	0.93	0.53	0.87	0.52	0.39	0.2	0.58

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	6.63	6.17	6.27	6.46	6.35	5.92	5.84	5.76	5.87	5.83	6.1	6.31	6.13
48H	10.13	9.34	9.47	10.06	9.76	9.28	9.25	9.33	9.23	9.05	9.55	9.51	9.50
72H	13.32	12.55	12.55	13.43	12.84	12.26	12.43	12.55	12.39	12	12.55	12.4	12.61
96H	16.29	15.62	15.61	16.55	16	15	15.1	15.16	15.45	15.22	15.52	15.24	15.56
120H	18.8	18.45	18.67	19.73	18.77	17.48	17.18	17.23	18.33	18.22	18.26	17.84	18.25
144H	20.98	20.83	21.55	22.31	21.03	19.31	18.79	18.85	20.57	21.24	20.73	20.29	20.54
168H	23.16	22.62	23.78	24.16	22.45	20.77	20.32	19.99	22.34	23.62	22.93	22.5	22.39
192H	24.54	24.42	25.67	25.64	23.7	21.9	21.42	20.88	23.41	25.39	24.56	24.42	23.83
216H	26.05	26.25	27.21	27.1	24.6	22.74	21.97	21.55	24.22	26.6	26.09	25.95	25.03
240H	26.94	27.77	28.68	28.07	25.37	23.42	22.33	22.18	24.99	27.34	27.7	26.82	25.97

나. 열대

가) 850 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.24	0.01	-0.6	-0.68	-0.69	-0.4	-0.43	0.22	0.14	-0.25	-0.35	-0.75	0.30
48H	-1.06	-0.77	-1.24	-1.4	-1.45	-1	-0.8	0.66	0.1	-0.99	-1.19	-1.75	-0.91
72H	-1.84	-1.37	-1.65	-1.86	-2.1	-1.53	-0.96	0.99	-0.06	-1.9	-1.88	-2.56	-1.39
96H	-2.3	-1.98	-2.19	-2.55	-2.74	-2.38	-1.43	1.15	-0.07	-3.01	-2.28	-3.13	-1.91
120H	-2.81	-3.11	-2.49	-3.24	-3.35	-3.3	-2.14	1.06	-0.02	-3.56	-2.75	-3.71	-2.45
144H	-3.79	-4.53	-3.19	-4.08	-3.95	-3.95	-2.55	1.17	-0.05	-3.39	-3.45	-4.29	-3.00
168H	-4.55	-5.99	-3.78	-4.34	-4.04	-4.13	-2.66	1.7	-0.1	-2.49	-3.73	4.59	-3.23
192H	-5.57	-6.83	-4.1	-4.6	-3.99	-4.81	-2.75	1.96	-0.27	-1.65	-3.96	-5.55	-3.51
216H	-7.06	-7.29	-4.59	-4.47	-3.73	-5.45	-2.6	2.15	-0.61	-0.68	-4.21	6.4	-3.75

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	8.94	9.78	10.52	9.76	9.44	8.64	9.24	9.36	9.35	9.15	8.33	9.88	9.37
48H	9.62	10.07	10.24	9.79	10.04	9.54	10.69	11.09	10.03	10.53	9.78	10.95	10.20
72H	10.81	11.02	10.77	10.41	10.95	10.4	11.46	11.96	11.06	12.09	10.97	11.92	11.15
96H	12.17	11.82	11.16	10.93	11.99	11.8	13	12.72	11.9	12.87	12.14	12.98	12.12
120H	12.91	13.37	11.95	11.7	12.91	12.89	14.15	13.96	13.26	13.68	12.67	13.65	13.09
144H	14.18	14.59	13.1	13.13	14.41	14.03	15.03	15.05	13.85	14.66	13.46	14.79	14.19
168H	14.5	15.28	13.67	13.77	15.18	14.12	15.63	14.88	14.33	15.16	13.91	16.05	14.71
192H	15.6	16.47	14.1	14.78	16.55	14.36	16.57	15.56	14.84	15.61	14.46	16.87	15.48
216H	17	17.18	14.78	15.23	17.37	14.8	16.79	16.46	14.51	16.57	15.37	17.51	16.13
240H	17.91	17.8	15.87	15.26	17.49	15.99	17.06	17.49	14.8	17.03	16.08	18.55	16.78

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	62.02	60.82	62	62.34	60.69	60.22	58.76	56.91	61.21	61.56	60.29	61.52	60.70
48H	69.41	67.89	69.14	69.25	67.56	66.27	65.55	63.96	68.01	68.99	66.91	68.56	67.63
72H	72.78	71.16	71.78	71.95	70.84	68.71	68.54	67.16	71.29	72.35	70.1	71.34	70.67
96H	74.34	72.67	73.33	73.4	72.55	69.65	69.98	68.92	73.12	74.2	71.86	73.1	72.26
120H	75.49	73.96	74.56	74.64	73.64	70.25	71.08	69.94	74.83	75.61	73.18	74.27	73.45
144H	76.4	74.95	75.52	75.29	74.42	70.89	71.56	70.74	75.67	76.98	73.75	75.24	74.28
168H	77.04	76.09	76.05	76.01	74.83	71.16	72.27	71.43	76.41	77.86	74.53	75.93	74.97
192H	77.66	76.95	76.5	76.36	75.61	71.14	72.88	72.14	76.95	78.38	75.18	76.64	75.53
216H	77.95	77.51	76.92	77.05	76.26	71.13	73.52	72.18	77.49	78.75	75.84	77.35	76.00
240H	78.22	78.09	77.42	77.35	76.51	71.42	73.46	72.64	77.58	79.01	76.01	77.72	76.29

④) AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.78	0.75	0.69	0.73	0.77	0.76	0.75	0.74	0.73	0.76	0.81	0.77	0.75
48H	0.75	0.73	0.69	0.71	0.76	0.71	0.67	0.65	0.67	0.67	0.73	0.71	0.70
72H	0.68	0.67	0.65	0.67	0.71	0.65	0.63	0.59	0.61	0.59	0.67	0.67	0.65
96H	0.61	0.64	0.66	0.66	0.68	0.6	0.6	0.59	0.6	0.59	0.65	0.62	0.63
120H	0.57	0.55	0.64	0.64	0.66	0.59	0.57	0.55	0.53	0.55	0.67	0.6	0.59
144H	0.53	0.5	0.6	0.58	0.62	0.59	0.53	0.51	0.54	0.51	0.67	0.56	0.56
168H	0.52	0.47	0.56	0.52	0.56	0.59	0.5	0.5	0.52	0.48	0.64	0.48	0.53
192H	0.48	0.42	0.56	0.49	0.5	0.58	0.47	0.48	0.49	0.48	0.63	0.47	0.50
216H	0.41	0.37	0.54	0.46	0.43	0.54	0.42	0.41	0.47	0.4	0.57	0.43	0.45
240H	0.39	0.35	0.5	0.46	0.45	0.49	0.41	0.36	0.45	0.36	0.52	0.37	0.43

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.17	-0.16	-0.28	-0.35	-0.29	-0.33	-0.21	-0.2	-0.23	-0.35	-0.39	-0.32	-0.27
48H	-0.13	-0.1	-0.28	-0.35	-0.27	-0.3	-0.14	-0.12	-0.17	-0.29	-0.33	-0.27	-0.23
72H	-0.11	-0.08	-0.29	0.33	-0.23	-0.26	0.11	-0.05	-0.13	0.22	-0.24	-0.21	0.19
96H	-0.1	-0.07	-0.3	-0.31	-0.18	-0.22	-0.08	-0.01	-0.09	-0.17	-0.14	-0.17	-0.15
120H	-0.09	-0.05	-0.31	-0.29	-0.13	-0.17	-0.03	0.04	-0.04	-0.11	-0.07	-0.12	-0.11
144H	-0.07	-0.05	-0.32	-0.27	-0.09	-0.11	0.03	0.09	0.02	-0.04	-0.02	-0.08	0.08
168H	-0.05	-0.06	-0.33	-0.25	-0.04	-0.06	0.06	0.12	0.08	0.02	0.03	-0.05	-0.04
192H	0.04	-0.07	-0.35	-0.22	-0.01	-0.01	0.08	0.15	0.15	0.07	0.06	0.03	-0.02
216H	-0.01	-0.08	-0.37	-0.19	0.03	0.05	0.08	0.18	0.21	0.1	0.09	-0.03	0.01
240H	0.03	-0.07	-0.38	-0.17	0.07	0.08	0.09	0.21	0.24	0.1	0.09	-0.03	0.02

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.68	0.68	0.73	0.74	0.73	0.79	0.73	0.76	0.76	0.8	0.81	0.74	0.75
48H	0.86	0.86	0.9	0.91	0.91	0.97	0.94	0.96	0.96	1	0.97	0.91	0.93
72H	0.98	1	1.02	1.01	1.01	1.08	1.07	1.09	1.1	1.14	1.08	1.01	1.05
96H	1.07	1.1	1.1	1.08	1.1	1.17	1.15	1.17	1.21	1.23	1.16	1.09	1.14
120H	1.14	1.17	1.16	1.16	1.17	1.22	1.22	1.24	1.3	1.3	1.22	1.14	1.20
144H	1.21	1.24	1.22	1.21	1.23	1.27	1.28	1.31	1.37	1.37	1.27	1.17	1.26
168H	1.28	1.3	1.3	1.24	1.28	1.33	1.33	1.37	1.43	1.42	1.34	1.22	1.32
192H	1.34	1.37	1.37	1.27	1.33	1.38	1.39	1.43	1.48	1.46	1.4	1.28	1.38
216H	1.38	1.42	1.43	1.32	1.39	1.41	1.44	1.48	1.51	1.51	1.45	1.34	1.42
240H	1.4	1.47	1.47	1.35	1.42	1.44	1.47	1.53	1.53	1.56	1.48	1.4	1.46

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	52.92	53.13	52.18	51.78	51.32	54	54.29	54.8	54.15	54.11	55.4	55.71	53.65
48H	69.35	69.25	68.63	68.41	67.79	71.08	70.96	70.69	70.38	70.82	72.05	72.12	70.13
72H	75.74	75.32	75.2	74.87	74.11	77.01	76.21	76.03	75.84	76.83	78.01	77.6	76.06
96H	78.71	77.96	77.62	77.38	76.83	79.28	78.15	77.67	78.24	79.25	80.31	79.69	78.42
120H	79.92	79.31	78.96	78.71	77.85	79.96	79.05	78.81	79.55	80.43	81.62	80.89	79.59
144H	81.03	80.39	79.98	79.55	78.92	80.69	79.82	79.38	80.65	81.29	82.52	81.6	80.49
168H	81.6	81.23	80.66	80.22	79.5	81.47	80.24	79.89	81.56	82	83.05	82.32	81.15
192H	82.1	81.87	81.59	80.31	79.88	82.05	80.54	80.43	81.81	82.44	83.52	83.01	81.63
216H	82.57	82.5	82	80.88	80.3	82.41	80.77	80.71	82.15	82.89	83.89	83.53	82.05
240H	82.88	83.09	82.64	81.06	80.59	82.42	81.03	81.15	82.57	83.37	84.12	84.03	82.41

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.9	0.9	0.88	0.89	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.89	0.88
48H	0.85	0.84	0.81	0.81	0.82	0.8	0.79	0.79	0.78	0.79	0.79	0.82	0.81
72H	0.8	0.77	0.76	0.76	0.78	0.74	0.72	0.73	0.72	0.72	0.73	0.77	0.75
96H	0.77	0.72	0.72	0.72	0.73	0.69	0.68	0.68	0.67	0.67	0.68	0.73	0.71
120H	0.74	0.69	0.69	0.68	0.69	0.66	0.63	0.64	0.62	0.63	0.64	0.71	0.67
144H	0.71	0.66	0.65	0.64	0.65	0.64	0.6	0.61	0.58	0.59	0.61	0.69	0.64
168H	0.68	0.62	0.62	0.62	0.62	0.6	0.57	0.58	0.55	0.56	0.57	0.66	0.60
192H	0.65	0.57	0.58	0.59	0.59	0.58	0.54	0.55	0.52	0.54	0.53	0.63	0.57
216H	0.63	0.54	0.55	0.57	0.56	0.57	0.52	0.52	0.5	0.51	0.5	0.6	0.55
240H	0.62	0.5	0.52	0.56	0.54	0.56	0.51	0.5	0.49	0.48	0.48	0.57	0.53

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.06	0.11	0.03	0	0.05	0.08	0.15	0.11	0.04	0.01	0.05	0.08	0.06
48H	0.07	0.08	0.02	-0.04	0.03	0.09	0.15	0.06	0.03	0.06	0.14	0.18	0.07
72H	0.09	0.07	0.05	-0.03	0.15	0.25	0.33	0.18	0.23	0.24	0.28	0.3	0.18
96H	0.09	0.03	0.01	0	0.23	0.35	0.41	0.2	0.34	0.32	0.34	0.37	0.22
120H	0.06	0.03	-0.05	0.03	0.33	0.48	0.51	0.28	0.41	0.4	0.37	0.4	0.27
144H	0.02	0.04	-0.12	0.04	0.37	0.52	0.63	0.37	0.44	0.4	0.33	0.34	0.28
168H	0.03	0.08	-0.21	0.03	0.41	0.53	0.68	0.42	0.47	0.39	0.31	0.29	0.29
192H	-0.02	0.04	-0.23	0.05	0.44	0.57	0.68	0.46	0.47	0.39	0.31	0.2	0.28
216H	-0.05	0.02	-0.19	0.11	0.5	0.56	0.72	0.48	0.44	0.38	0.24	0.07	0.27
240H	-0.05	0.04	-0.23	0.16	0.55	0.48	0.8	0.51	0.42	0.37	0.14	-0.04	0.26

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.38	2.53	2.34	2.25	2.32	2.52	2.98	2.94	2.77	2.65	2.49	2.57	2.56
48H	3.45	3.61	3.32	3.19	3.37	3.6	4.05	4.1	3.85	3.77	3.51	3.52	3.61
72H	4.15	4.27	3.92	3.8	4.13	4.32	4.69	4.82	4.55	4.51	4.22	4.15	4.29
96H	4.64	4.73	4.35	4.24	4.66	4.75	5.15	5.33	5.05	5.06	4.71	4.67	4.78
120H	5.05	5.07	4.72	4.6	5.01	5.1	5.57	5.67	5.44	5.49	5.12	5.09	5.16
144H	5.36	5.4	5	4.82	5.29	5.34	5.88	5.96	5.74	5.78	5.37	5.39	5.44
168H	5.58	5.69	5.21	5.04	5.5	5.52	6.09	6.15	5.93	5.96	5.58	5.6	5.65
192H	5.8	5.89	5.38	5.25	5.72	5.65	6.24	6.31	6.04	6.13	5.76	5.79	5.83
216H	6.01	6.03	5.53	5.44	5.92	5.72	6.38	6.42	6.1	6.31	5.89	5.91	5.97
240H	6.17	6.12	5.69	5.55	6.09	5.82	6.49	6.51	6.18	6.44	6.01	6.01	6.09

나) 500 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.64	2.7	1.11	0.92	1.21	1.61	2.71	3.29	2.55	1.94	1.75	1.72	2.01
48H	0.81	1.34	-0.35	-0.14	0.32	0.56	2.13	3.44	2.17	1.26	1.06	0.73	1.11
72H	-0.31	0.05	-1.3	-0.51	-0.01	0.37	2.12	4.03	2.27	1.13	1.32	0.48	0.80
96H	-1.11	-1.1	-2.06	-0.94	-0.21	-0.06	2.24	4.54	2.78	1.01	1.95	0.53	0.63
120H	-1.7	-2.36	-2.5	-1.49	-0.34	-0.37	2.5	4.74	3.54	1.5	2.47	0.63	0.55
144H	-2.73	-3.89	-3.39	-2.12	-0.47	-0.29	3.19	5.4	4.18	2.69	2.6	0.75	0.49
168H	-3.52	-5.11	-4.04	-2.09	-0.05	0.07	4	6.41	4.97	4.4	2.9	0.95	0.74
192H	-4.52	-5.69	-4.47	-2.06	0.6	-0.04	4.57	7.18	5.91	6.07	3.06	0.38	0.92
216H	-5.59	-5.88	-4.99	-1.63	1.57	-0.08	5.07	7.89	6.59	7.56	3.04	-0.38	1.10
240H	-6.32	-6.04	-5.13	-0.88	2.66	-0.04	6.06	8.37	7.48	9.21	3.15	-0.47	1.50

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	9.39	10.73	10.36	9.79	9.2	8.66	8.89	9.25	9.12	8.6	8.2	9.01	9.27
48H	9.55	10.59	10.25	9.29	9.07	9.13	9.62	10.15	9.64	9.75	9.41	10.15	9.72
72H	10.8	11.62	11.32	10.32	10.34	10.79	11.06	11.83	11.53	11.75	11.01	11.07	11.12
96H	11.83	11.91	11.15	10.71	11.46	11.77	12.41	12.56	12.8	13.24	12.28	12.11	12.02
120H	12.77	13.46	11.82	11.7	12.45	12.64	13.72	13.29	14.04	14.23	12.5	12.54	12.93
144H	14.17	14.8	12.87	12.98	13.79	13.32	15.21	14.62	14.64	15.68	12.88	13.38	14.03
168H	15.14	15.94	13.93	14.31	15.03	13.71	16.24	15.57	15.76	17.63	13.83	14.5	15.13
192H	16.01	17.01	14.98	15.64	16.46	14.05	17.22	16.67	16.92	19.19	14.6	15.55	16.19
216H	17.4	18.08	16.29	16.71	17.62	14.6	18.01	18	17.3	20.27	15.32	16.73	17.19
240H	18.31	18.44	17.4	16.85	18.06	15.43	18.78	19.1	18.06	20.94	15.92	17.96	17.94

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	58.2	58.88	56.03	56.12	55.74	57.4	57.33	57.62	56.33	59.93	60.3	60.55	57.87
48H	66.93	69.52	66.88	66.46	66.81	68.26	67.94	68.17	66.59	70.56	70.51	71.02	68.30
72H	71.37	73.78	71.49	71.47	72.26	73.53	72.52	73.3	71.67	75.81	75.21	75.47	73.16
96H	73.93	76.79	73.86	74.09	75.32	76.37	74.97	75.57	74.91	78.97	77.69	77.7	75.85
120H	76.03	79.15	75.72	76.45	77.7	78.51	77	76.98	77.63	81.39	79.6	79.56	77.98
144H	77.77	80.73	76.98	78.14	79.67	79.9	78.62	78.23	79.1	83.44	80.87	80.95	79.53
168H	79.18	81.7	78.79	80.05	81.6	80.91	80.05	79.44	80.83	85.02	82.13	82.11	80.98
192H	80.21	82.93	80.14	81.61	82.88	81.57	81.31	80.23	82.22	85.98	83.29	83.39	82.15
216H	81.56	84.29	81.57	83.14	83.92	82.21	82.13	81.32	83.41	86.82	84.36	84.94	83.31
240H	82.55	85.33	82.9	84.54	84.67	82.68	82.49	82.1	84.72	87.14	85.14	86.04	84.19

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.86	0.74	0.78	0.79	0.82	0.82	0.8	0.8	0.82	0.8	0.82	0.81	0.81
48H	0.84	0.73	0.78	0.82	0.82	0.79	0.75	0.75	0.77	0.71	0.75	0.74	0.77
72H	0.8	0.67	0.72	0.77	0.76	0.71	0.67	0.66	0.68	0.6	0.65	0.69	0.70
96H	0.76	0.67	0.74	0.77	0.72	0.67	0.62	0.65	0.62	0.53	0.59	0.63	0.66
120H	0.72	0.59	0.71	0.73	0.67	0.63	0.54	0.6	0.54	0.46	0.59	0.6	0.62
144H	0.67	0.56	0.66	0.68	0.62	0.62	0.48	0.55	0.54	0.4	0.61	0.56	0.58
168H	0.61	0.53	0.6	0.6	0.54	0.59	0.4	0.49	0.48	0.31	0.54	0.48	0.51
192H	0.57	0.49	0.58	0.54	0.47	0.57	0.35	0.46	0.44	0.26	0.52	0.43	0.47
216H	0.49	0.4	0.5	0.45	0.38	0.5	0.28	0.36	0.38	0.18	0.46	0.34	0.39
240H	0.44	0.39	0.43	0.42	0.39	0.44	0.25	0.29	0.34	0.16	0.43	0.29	0.36

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.03	-0.04	-0.04	-0.04	-0.02	-0.05	-0.04	-0.05	-0.07	-0.09	-0.04	-0.08	-0.05
48H	-0.05	-0.09	-0.09	-0.02	-0.01	-0.08	-0.09	-0.1	-0.11	-0.09	-0.01	-0.08	-0.07
72H	-0.06	-0.14	-0.09	0.01	0.01	-0.05	-0.07	-0.09	-0.08	-0.02	0.07	-0.02	-0.04
96H	-0.08	-0.17	-0.09	0.05	0.04	-0.01	-0.02	-0.06	-0.04	0.06	0.16	0.05	-0.01
120H	-0.07	-0.17	-0.09	0.07	0.08	0.05	0.08	-0.02	0.02	0.14	0.24	0.13	0.04
144H	-0.07	-0.16	-0.09	0.1	0.12	0.12	0.19	0.04	0.08	0.23	0.3	0.2	0.09
168H	-0.07	-0.13	-0.08	0.13	0.17	0.18	0.28	0.09	0.16	0.31	0.35	0.25	0.14
192H	-0.05	-0.09	-0.08	0.16	0.22	0.22	0.35	0.15	0.25	0.37	0.37	0.3	0.18
216H	-0.02	-0.03	-0.07	0.18	0.27	0.26	0.4	0.2	0.32	0.41	0.39	0.32	0.22
240H	0.02	0.02	-0.02	0.21	0.32	0.26	0.46	0.25	0.38	0.42	0.39	0.32	0.25

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.52	0.56	0.52	0.49	0.49	0.51	0.55	0.54	0.51	0.51	0.46	0.5	0.51
48H	0.71	0.78	0.72	0.67	0.7	0.76	0.78	0.77	0.74	0.73	0.67	0.71	0.73
72H	0.85	0.94	0.86	0.8	0.85	0.91	0.93	0.92	0.88	0.86	0.82	0.84	0.87
96H	0.96	1.05	0.95	0.92	0.99	1.01	1.04	1.04	0.99	0.97	0.96	0.96	0.99
120H	1.04	1.14	1.02	1.01	1.09	1.1	1.15	1.13	1.05	1.07	1.06	1.07	1.08
144H	1.11	1.2	1.09	1.08	1.17	1.18	1.25	1.21	1.15	1.15	1.15	1.15	1.16
168H	1.18	1.26	1.15	1.15	1.27	1.25	1.33	1.27	1.23	1.23	1.23	1.22	1.23
192H	1.25	1.32	1.2	1.2	1.32	1.3	1.38	1.34	1.28	1.29	1.28	1.29	1.29
216H	1.33	1.37	1.26	1.26	1.36	1.32	1.43	1.39	1.3	1.33	1.3	1.33	1.33
240H	1.38	1.42	1.31	1.32	1.41	1.35	1.48	1.43	1.34	1.35	1.32	1.34	1.37

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	52.82	53.8	52.73	51.37	50.58	55.16	57.92	58.46	57.4	57.86	56.43	56.75	55.11
48H	74.2	75.54	74.68	73.69	72.75	77.42	79.04	79.52	79.1	80.01	77.95	77.56	76.79
72H	81.76	83.19	81.83	81.54	81.33	84.93	85.41	86.15	85.98	86.91	85.1	84.15	84.02
96H	85.01	86.77	84.87	85.06	85.2	87.98	87.81	88.88	88.76	89.45	87.99	86.88	87.06
120H	87.1	88.7	86.6	87.19	87.14	89.45	89.46	90.29	90.06	90.76	89.63	88.19	88.71
144H	88.09	89.89	87.67	88.93	88.45	90.92	90.74	91.32	91.54	91.66	90.52	89.04	89.90
168H	88.97	90.53	88.3	90.01	89.53	91.81	91.51	91.7	92.19	92.61	91.41	89.99	90.71
192H	89.75	91.27	88.85	90.32	90.2	92.53	92.04	91.95	92.52	93.09	92.09	90.8	91.28
216H	90.43	91.72	89.67	91.18	91.03	92.92	92.74	92.49	92.77	93.37	92.58	91.63	91.88
240H	90.66	92.01	90.06	91.68	91.11	93.14	93.18	92.65	93.41	93.48	92.76	91.84	92.17

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.91	0.9	0.9	0.89	0.9	0.88	0.88	0.86	0.87	0.85	0.87	0.88	0.88
48H	0.83	0.81	0.8	0.79	0.8	0.74	0.76	0.72	0.73	0.7	0.73	0.76	0.76
72H	0.76	0.72	0.71	0.71	0.71	0.63	0.65	0.61	0.62	0.59	0.61	0.66	0.67
96H	0.7	0.65	0.64	0.63	0.6	0.55	0.56	0.51	0.52	0.49	0.49	0.56	0.58
120H	0.64	0.58	0.58	0.55	0.51	0.5	0.47	0.42	0.46	0.41	0.41	0.47	0.50
144H	0.59	0.53	0.53	0.5	0.45	0.45	0.39	0.36	0.38	0.34	0.33	0.41	0.44
168H	0.54	0.49	0.47	0.43	0.38	0.4	0.34	0.32	0.3	0.27	0.27	0.35	0.38
192H	0.48	0.44	0.41	0.4	0.34	0.37	0.3	0.27	0.26	0.23	0.23	0.29	0.34
216H	0.41	0.39	0.34	0.34	0.32	0.36	0.27	0.24	0.23	0.21	0.2	0.25	0.30
240H	0.37	0.34	0.29	0.3	0.29	0.35	0.25	0.22	0.2	0.2	0.18	0.24	0.27

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.05	0.11	0.08	0.06	0.07	0.16	0.13	0.14	0.14	0.08	0.05	0.11	0.10
48H	0	0.14	0.07	0	0.03	0.12	0.04	0.13	0.05	0.03	-0.01	0.12	0.06
72H	0.01	0.14	0.07	-0.08	0.05	0.16	0.03	0.17	0.11	0.04	0.02	0.2	0.08
96H	-0.02	0.14	0.04	-0.11	0.11	0.14	0	0.16	0.1	0.12	0.07	0.24	0.08
120H	-0.05	0.09	0	-0.12	0.18	0.24	0.03	0.13	0.05	0.2	0.1	0.27	0.09
144H	-0.13	0.05	-0.01	-0.11	0.29	0.36	0.13	0.14	0	0.23	0.17	0.32	0.12
168H	-0.2	-0.03	-0.09	-0.08	0.31	0.45	0.15	0.19	-0.04	0.24	0.24	0.35	0.12
192H	-0.21	-0.1	-0.19	-0.04	0.23	0.47	0.13	0.19	-0.07	0.31	0.3	0.39	0.12
216H	-0.21	-0.23	-0.24	-0.01	0.19	0.48	0.11	0.16	-0.08	0.35	0.37	0.39	0.11
240H	-0.27	-0.31	-0.31	-0.02	0.21	0.52	0.14	0.2	-0.08	0.34	0.38	0.38	0.10

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.7	2.86	2.66	2.49	2.53	2.88	3.27	3.29	3.09	3	2.86	3.05	2.89
48H	4.13	4.42	4.12	3.82	3.9	4.43	4.86	4.94	4.59	4.46	4.22	4.43	4.36
72H	5.15	5.46	5.04	4.67	4.91	5.42	5.86	5.93	5.55	5.44	5.13	5.34	5.33
96H	5.94	6.29	5.69	5.33	5.76	6.07	6.54	6.55	6.33	6.17	5.83	6.02	6.04
120H	6.54	6.98	6.23	5.89	6.42	6.57	7.16	6.94	6.85	6.8	6.3	6.53	6.60
144H	7	7.42	6.69	6.37	6.98	7	7.73	7.27	7.25	7.28	6.67	6.93	7.05
168H	7.42	7.74	7.06	6.82	7.38	7.32	8.11	7.59	7.59	7.55	7.01	7.25	7.40
192H	7.78	8.1	7.34	7.21	7.62	7.51	8.41	7.91	7.88	7.85	7.32	7.59	7.71
216H	8.15	8.38	7.72	7.55	7.91	7.63	8.57	8.14	8.08	8.14	7.59	7.94	7.98
240H	8.43	8.58	8	7.83	8.2	7.79	8.71	8.39	8.24	8.33	7.76	8.21	8.21

다) 250 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	5.42	4.88	3.21	3.56	3.43	4.51	5.94	6.42	4.86	4.24	4.71	4.03	4.60
48H	5	4.29	2.45	4.12	4.09	5.2	7.09	7.9	5.76	5.01	6.34	4.83	5.17
72H	4.84	4.03	2.35	4.91	5.3	7.06	9.33	10.67	8.03	7.27	9.1	6.86	6.65
96H	4.55	4.01	2.35	5.57	6.49	8.45	11.45	12.9	9.98	9.32	11.95	9.08	8.01
120H	3.89	4	2.07	5.76	7.65	9.59	13.82	14.56	12.14	11.73	14.27	10.71	9.18
144H	2.84	3.4	1.03	5.91	8.41	10.95	16.49	16.61	14.01	14.69	15.49	11.73	10.13
168H	2.13	2.66	0.16	6.5	9.75	12.26	18.96	18.98	16.39	17.96	16.58	12.46	11.23
192H	1.22	2.54	-0.52	7.06	11.41	13.07	20.87	20.72	18.93	20.74	17.34	12.08	12.12
216H	0.5	3.05	-1.17	7.91	13.29	13.6	22.49	22.16	21.02	23.01	17.7	11.23	12.90
240H	0.07	3.42	-1.1	8.96	14.89	13.53	24.36	23.36	23.21	25.11	17.83	10.8	13.70

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	12.09	13.23	12.64	11.71	11.07	11.57	12.29	12.27	12.01	11.31	11.28	11.16	11.89
48H	14.47	15.73	14.86	13.88	13.94	14.77	15.36	15.15	14.88	14.8	15.24	14.76	14.82
72H	17.22	18.89	17.87	17.2	17.88	19.55	19.84	19.93	18.86	19.1	19.62	17.7	18.64
96H	19.08	20.68	18.85	19.14	20.43	21.52	22.77	22.83	21.11	22.29	22.52	20.55	20.98
120H	20.61	23.08	20.19	21.27	22.32	22.76	25.28	24.64	23.29	25.11	24.56	23.01	23.01
144H	22.94	25.34	21.89	23.39	24.9	24.41	28.02	27.21	25.96	28.14	26.49	25.12	25.32
168H	25.43	27.28	24.12	25.9	27.58	26.91	30.91	30.39	28.87	31.65	28.63	26.65	27.86
192H	26.8	29.21	26.36	27.72	29.33	28.48	33.49	32.96	31.4	34.38	30.16	28.15	29.87
216H	28.67	31.45	28.7	29.7	30.83	29.41	36.11	35.12	33.09	36.21	31.23	30.18	31.73
240H	29.74	32.6	30.57	31.47	32.9	30.02	37.91	36.68	35.22	38.08	32.02	31.8	33.25

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	45.14	47.12	43.9	43.18	42.87	50.72	49.9	51.9	51.4	53.81	51.95	48.44	48.36
48H	55.42	58.63	55.39	54.82	54.63	63.35	61.15	63.51	63.28	66.06	63.89	59.18	59.94
72H	59.89	63.29	60.11	60.24	60.4	69.4	65.68	68.4	68.29	71.56	69.21	63.9	65.03
96H	62.64	66.52	62.87	63.87	64.21	72.61	68.09	70.88	71.24	75	72.5	66.73	68.10
120H	65.19	69.12	65.03	66.92	66.95	74.77	70.33	72.51	73.5	77.74	74.71	68.65	70.45
144H	67.49	70.37	66.97	69.41	69.42	76.37	72.14	73.56	75.21	79.72	76.22	70.3	72.27
168H	69.98	71.22	68.58	71.31	71.54	77.76	73.56	74.57	76.62	81.4	77.85	72.13	73.88
192H	71.5	72.79	70.62	72.68	72.89	78.61	75.01	75.83	77.75	82.19	79.37	74.07	75.28
216H	73.23	74.52	72.64	74.3	73.91	79.16	76.06	77.21	78.48	82.85	80.45	75.74	76.55
240H	74.26	75.3	74.07	75.83	75.26	79.53	76.64	78.08	79.38	83.38	81.25	76.81	77.48

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.94	0.91	0.92	0.92	0.93	0.91	0.88	0.87	0.86	0.88	0.89	0.91	0.90
48H	0.91	0.87	0.89	0.89	0.88	0.84	0.81	0.79	0.77	0.78	0.79	0.83	0.84
72H	0.87	0.82	0.83	0.84	0.8	0.74	0.72	0.67	0.65	0.67	0.69	0.76	0.76
96H	0.84	0.8	0.81	0.81	0.75	0.71	0.66	0.62	0.6	0.59	0.63	0.69	0.71
120H	0.8	0.75	0.77	0.75	0.69	0.69	0.59	0.57	0.54	0.51	0.58	0.63	0.66
144H	0.74	0.72	0.71	0.71	0.62	0.66	0.53	0.53	0.5	0.45	0.54	0.57	0.61
168H	0.67	0.69	0.65	0.66	0.55	0.6	0.46	0.45	0.43	0.35	0.46	0.5	0.54
192H	0.62	0.67	0.6	0.61	0.51	0.57	0.41	0.38	0.38	0.31	0.43	0.42	0.49
216H	0.57	0.61	0.52	0.54	0.47	0.53	0.34	0.29	0.32	0.29	0.39	0.33	0.43
240H	0.53	0.57	0.44	0.48	0.43	0.5	0.3	0.25	0.28	0.29	0.38	0.27	0.39

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.04	0.03	-0.05	-0.06	-0.1	-0.01	-0.01	0	-0.03	-0.08	-0.09	-0.1	-0.04
48H	0.19	0.17	0.05	0.05	0.02	0.13	0.19	0.18	0.13	0.04	0.07	0.02	0.10
72H	0.26	0.24	0.1	0.09	0.07	0.23	0.31	0.31	0.23	0.14	0.17	0.1	0.19
96H	0.25	0.28	0.1	0.12	0.1	0.29	0.37	0.36	0.26	0.2	0.24	0.16	0.23
120H	0.21	0.32	0.07	0.14	0.13	0.33	0.43	0.38	0.28	0.24	0.29	0.2	0.25
144H	0.17	0.34	0.02	0.15	0.16	0.37	0.5	0.42	0.3	0.29	0.32	0.2	0.27
168H	0.14	0.33	-0.01	0.15	0.17	0.41	0.58	0.46	0.35	0.36	0.35	0.21	0.29
192H	0.13	0.32	-0.04	0.16	0.19	0.44	0.64	0.53	0.41	0.41	0.37	0.23	0.32
216H	0.12	0.33	-0.08	0.17	0.22	0.44	0.69	0.59	0.49	0.45	0.38	0.25	0.34
240H	0.12	0.35	-0.09	0.19	0.24	0.43	0.73	0.63	0.57	0.48	0.37	0.25	0.36

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.66	0.65	0.65	0.58	0.6	0.56	0.62	0.57	0.54	0.57	0.56	0.62	0.60
48H	0.9	0.91	0.88	0.8	0.81	0.81	0.89	0.83	0.77	0.77	0.77	0.85	0.83
72H	1.07	1.11	1.04	0.95	0.99	0.98	1.09	1.03	0.94	0.93	0.94	1	1.01
96H	1.19	1.24	1.15	1.07	1.13	1.1	1.22	1.16	1.05	1.05	1.05	1.1	1.13
120H	1.28	1.35	1.24	1.16	1.24	1.22	1.32	1.26	1.14	1.16	1.14	1.18	1.22
144H	1.36	1.44	1.31	1.25	1.34	1.31	1.4	1.33	1.24	1.25	1.22	1.25	1.31
168H	1.44	1.51	1.35	1.34	1.42	1.38	1.5	1.41	1.31	1.32	1.28	1.32	1.38
192H	1.51	1.58	1.4	1.39	1.46	1.44	1.59	1.5	1.36	1.36	1.34	1.38	1.44
216H	1.57	1.63	1.45	1.43	1.51	1.5	1.66	1.56	1.41	1.39	1.37	1.45	1.49
240H	1.62	1.69	1.53	1.45	1.58	1.54	1.71	1.63	1.46	1.43	1.4	1.49	1.54

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	61.72	62.07	61.93	61.62	60.55	66.51	67.34	67.38	67.85	67.55	68.85	67.58	65.08
48H	82.18	81.84	82.15	82.61	81.62	86.17	85.62	86.27	87.13	86.95	87.4	85.57	84.63
72H	87.61	87.55	87.76	88.38	88.48	90.93	89.79	90.36	91.73	91.7	91.83	89.7	89.65
96H	90.03	89.52	89.99	90.53	90.95	92.52	91.29	91.9	93.46	93.65	93.37	91.14	91.53
120H	91.43	90.89	91	91.87	92.28	93.11	92.3	93.13	94.2	94.53	94.11	92.22	92.59
144H	92.51	91.99	92.3	92.97	93.12	93.59	92.79	93.41	94.96	95.43	94.81	92.72	93.38
168H	93.19	92.42	92.84	93.8	93.5	93.45	93.16	93.9	95.37	96.01	94.94	93.43	93.83
192H	93.83	93.11	93.67	94.03	93.91	93.72	93.33	93.96	95.47	95.98	95.36	93.95	94.19
216H	94.42	93.22	94.21	94.09	94.22	93.71	93.35	93.93	95.81	96.15	95.43	94.31	94.40
240H	94.68	93.65	94.66	94.4	94.47	93.7	93.26	94.28	95.95	96.28	95.81	94.3	94.62

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.87	0.9	0.88	0.89	0.89	0.86	0.85	0.81	0.81	0.83	0.81	0.85	0.85
48H	0.78	0.82	0.79	0.8	0.79	0.73	0.72	0.66	0.66	0.7	0.66	0.72	0.74
72H	0.69	0.75	0.7	0.72	0.7	0.65	0.63	0.53	0.55	0.59	0.55	0.62	0.64
96H	0.61	0.69	0.63	0.65	0.62	0.59	0.56	0.45	0.47	0.5	0.49	0.54	0.57
120H	0.55	0.64	0.55	0.59	0.56	0.54	0.5	0.4	0.41	0.41	0.44	0.48	0.51
144H	0.5	0.59	0.48	0.53	0.49	0.51	0.46	0.37	0.35	0.34	0.38	0.44	0.45
168H	0.44	0.54	0.43	0.46	0.45	0.48	0.43	0.33	0.32	0.3	0.35	0.4	0.41
192H	0.4	0.49	0.38	0.43	0.44	0.46	0.4	0.3	0.29	0.27	0.31	0.35	0.38
216H	0.37	0.46	0.33	0.42	0.42	0.44	0.37	0.27	0.27	0.27	0.31	0.29	0.35
240H	0.33	0.41	0.26	0.41	0.38	0.43	0.35	0.23	0.25	0.25	0.28	0.25	0.32

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.1	0.13	0.13	0.04	0.11	0.21	0.12	0.09	0.27	0.33	0.36	0.15	0.17
48H	0.04	0.08	0.03	-0.05	0.02	0.13	0.23	0.15	0.41	0.5	0.46	0.17	0.18
72H	0.11	0.13	0.07	-0.04	-0.05	0.04	0.46	0.34	0.64	0.65	0.47	0.13	0.25
96H	0.24	0.27	0.17	0.02	-0.11	0.1	0.68	0.53	0.87	0.75	0.55	0.08	0.35
120H	0.2	0.29	0.25	0.06	-0.19	0.17	0.81	0.68	1.09	0.83	0.65	0.09	0.41
144H	0.28	0.23	0.31	0.07	-0.16	0.38	0.91	0.86	1.35	0.83	0.78	0.14	0.50
168H	0.35	0.29	0.33	0.07	-0.23	0.59	0.97	0.96	1.53	0.71	0.84	0.18	0.55
192H	0.52	0.34	0.34	0.13	-0.38	0.84	1.15	1.21	1.63	0.65	0.83	0.26	0.63
216H	0.5	0.38	0.32	0.08	-0.41	0.94	1.44	1.43	1.71	0.63	0.91	0.31	0.69
240H	0.49	0.45	0.17	0.12	-0.41	1.08	1.57	1.67	1.62	0.67	0.85	0.33	0.72

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	4.84	4.96	4.93	4.69	4.71	5.2	5.59	5.27	5.11	5.19	5.38	5.59	5.12
48H	7.38	7.67	7.58	7.35	7.36	7.9	8.3	7.83	7.65	7.98	8.09	8.17	7.77
72H	8.94	9.44	9.24	9.01	9.18	9.63	9.84	9.36	9.23	9.72	9.61	9.6	9.40
96H	10.1	10.69	10.38	10.29	10.63	10.87	10.92	10.44	10.36	10.94	10.75	10.46	10.57
120H	11.06	11.74	11.29	11.34	12.04	11.78	11.75	11.2	11.29	11.85	11.49	11.16	11.50
144H	11.91	12.28	12.09	12.16	12.95	12.46	12.45	11.74	12.14	12.55	12.06	11.78	12.21
168H	12.7	12.78	12.91	12.77	13.66	13	13.13	12.31	12.74	13.08	12.73	12.41	12.85
192H	13.35	13.41	13.61	13.32	14.14	13.54	13.72	13.01	13.13	13.56	13.15	13.08	13.42
216H	14	13.98	14.25	13.9	14.5	13.87	14.23	13.65	13.42	13.91	13.62	13.84	13.93
240H	14.32	14.37	14.7	14.48	14.94	14.25	14.54	14.2	13.54	14.19	14	14.12	14.30

다. 남반구

가) MSLP

1) Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.17	-0.01	-0.1	-0.09	0.02	0.11	0.16	0.15	0.09	0.17	-0.01	0.06	0.06
48H	0.18	-0.07	-0.18	-0.14	0.03	0.23	0.27	0.2	0.08	0.23	-0.08	0.05	0.07
72H	0.15	-0.12	-0.27	-0.21	0.05	0.33	0.3	0.27	0.06	0.25	-0.11	0.05	0.06
96H	0.14	-0.12	-0.34	-0.27	0.01	0.38	0.27	0.37	-0.06	0.26	-0.12	0.09	0.05
120H	0.15	-0.11	-0.37	-0.27	-0.02	0.46	0.31	0.49	-0.21	0.23	-0.12	0.11	0.05
144H	0.1	-0.08	-0.4	-0.19	-0.07	0.55	0.42	0.64	-0.23	0.24	-0.03	0.09	0.09
168H	0.06	-0.05	-0.42	-0.18	-0.21	0.63	0.46	0.66	-0.16	0.22	-0.04	0.04	0.08
192H	0	-0.03	-0.46	-0.22	-0.34	0.77	0.45	0.62	-0.06	0.18	-0.05	-0.08	0.07
216H	-0.08	-0.04	-0.51	-0.26	-0.43	0.75	0.43	0.55	0.02	0.06	-0.05	-0.19	0.02
240H	-0.12	-0.09	-0.54	-0.37	-0.56	0.68	0.41	0.53	0	-0.11	-0.11	-0.2	-0.04

2) RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	2.46	2.69	3.24	2.95	3.5	3.45	3.2	3.09	3.36	3	2.74	2.54	3.02
48H	3.85	4.31	5.17	4.85	5.54	5.71	5.45	5.21	5.65	5.08	4.62	4.22	4.97
72H	5.14	5.76	6.58	6.49	7.43	7.54	7.43	6.97	7.68	6.96	6.45	5.62	6.67
96H	6.25	7.13	7.59	7.97	9.23	9.06	8.95	8.44	9.57	8.66	8.06	6.8	8.14
120H	7.14	8.16	8.54	9.17	10.67	10.34	10.24	9.72	11.13	10.1	9.37	7.82	9.37
144H	8.02	8.95	9.5	10.11	11.83	11.49	11.32	10.95	11.99	11.22	10.29	8.62	10.36
168H	8.84	9.4	10.45	10.69	12.71	12.2	12.22	11.7	12.43	11.97	10.6	9.03	11.02
192H	9.21	9.73	11.07	11.27	12.86	12.78	12.77	12.2	12.66	12.68	10.67	9.27	11.43
216H	9.61	10.08	11.67	11.76	13	13.27	13.08	12.79	12.83	12.86	10.81	9.6	11.78
240H	9.96	10.51	11.93	12.04	13.27	13.37	13.49	13.39	13.03	12.95	10.78	9.98	12.06

3) S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	33.26	32.43	35.88	33.01	34.85	35.48	34.27	33	34.37	31.19	31.66	31.06	33.37
48H	45.81	45.78	51.11	47.91	49.66	51.53	50.71	49.02	50.11	47.1	47.41	45.38	48.46
72H	54.74	54.98	60.63	57.67	60.13	61.68	61.56	59.59	60.56	58.85	59.18	54.93	58.71
96H	61.45	62.3	66.74	64.79	67.57	68.21	68.72	66.47	68.22	67.37	66.73	61.82	65.87
120H	66.28	67.6	70.57	69.6	72.43	72.24	73.74	70.56	73.87	73.09	71.77	67.52	70.77
144H	69.84	70.65	73.95	71.88	75.78	75.48	76.69	74.14	76.9	76.77	74.71	71.43	74.02
168H	73.26	72.67	76.98	73.3	77.8	77.49	78.55	76.59	79.49	79.04	75.89	72.66	76.14
192H	75.21	74.03	78.68	75.35	78.74	79.09	80.64	78.14	80.26	80.55	76.49	73.84	77.59
216H	76.88	74.92	80.15	76.35	80.01	80.45	80.83	79.46	80.35	80.93	76.75	75.05	78.51
240H	78.07	76.48	80	77.43	80.44	81.02	80.87	80.93	80.59	80.92	76.71	75.55	79.08

나) 850 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.12	0.76	0.28	0.5	1.26	1.8	2.26	1.9	1.6	2.14	0.88	1.57	1.34
48H	1.25	0.34	-0.37	0.21	1.35	2.69	3.09	2.13	1.54	2.56	0.35	1.61	1.40
72H	1.12	-0.03	-0.99	-0.19	1.42	3.63	3.21	2.63	1.54	2.82	0.09	1.66	1.41
96H	1.09	-0.04	-1.45	-0.48	1.17	4.13	3.1	3.35	0.78	3.17	0.07	1.97	1.41
120H	1.07	0.23	-1.65	-0.54	1.19	4.81	3.44	4.32	-0.16	3.19	0.09	2.19	1.52
144H	0.67	0.54	-2.00	-0.05	1	5.45	4.3	5.54	0.14	3.52	0.94	2.07	1.84
168H	0.41	0.85	-2.37	-0.1	-0.03	5.97	4.74	5.77	0.96	3.62	1.09	1.67	1.88
192H	0.11	1.00	-2.63	-0.26	-1.1	7.06	4.81	5.49	1.94	3.45	1.37	0.65	1.82
216H	-0.44	0.91	-2.99	-0.46	-1.84	7.03	4.89	5.01	2.59	2.59	1.43	-0.27	1.54
240H	-0.66	0.48	-3.13	-1.31	-2.74	6.5	4.85	4.97	2.7	1.27	1.01	-0.34	1.13

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	18.82	20.77	24.88	22.54	26.68	25.92	23.97	23.11	25.51	22.66	20.88	19.53	22.94
48H	29.75	33.11	39.68	37.05	42.16	42.92	40.68	38.83	42.64	37.86	35.07	32.27	37.67
72H	40.01	44.53	50.98	50.33	57	57.06	55.71	52.2	58.22	52.15	49.13	43.21	50.88
96H	49.15	55.51	59.33	62.47	71.49	69.57	67.93	63.38	73.15	65.45	61.82	52.57	62.65
120H	56.53	64.12	67.44	72.31	83.41	80.11	78.36	73.76	85.72	77.21	72.06	60.98	72.67
144H	63.47	71.06	75.22	80.2	93.11	89.74	87.22	84.04	92.97	86.61	79.78	67.71	80.93
168H	70.34	75.15	83.16	85.46	100.68	95.79	95.13	90.06	96.9	92.84	82.59	71.15	86.60
192H	73.73	78.25	88.03	90.63	102.59	100.94	99.83	94.22	99.13	98.7	83.55	73.32	90.24
216H	77.07	81.47	93.26	94.79	103.85	104.74	102.47	99.34	100.78	100.41	84.87	76.11	93.26
240H	79.87	85.07	95.95	97	106.01	105.5	106.15	104.91	102.82	101.16	85.16	79.44	95.75

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	30.96	30.38	33.22	30.36	32.06	32.58	31.04	29.65	31.24	28.91	29.83	29.09	30.78
48H	42.56	42.53	47.06	43.52	45.51	46.98	45.59	43.81	45.33	43.07	44.11	41.94	44.33
72H	51.08	51.24	56.21	52.98	55.61	56.5	55.81	53.4	55.14	54.09	55.32	50.96	54.03
96H	57.79	58.29	62.23	60.22	63.07	63.27	62.78	59.71	62.51	62.47	62.86	57.7	61.08
120H	62.64	63.56	66.48	65.31	68.02	67.59	68.02	64.07	68.31	68.34	68.14	63.44	66.16
144H	66.07	66.79	70.04	67.99	71.59	70.98	71.22	68.04	71.63	72.46	71.45	67.34	69.63
168H	69.60	69.02	73.62	69.72	74.1	73.31	73.57	70.55	74.3	74.9	72.87	68.83	72.03
192H	71.69	70.56	75.46	71.96	75.38	75.11	75.8	72.11	75.29	76.77	73.35	70.04	73.63
216H	73.55	71.62	77.10	73.22	76.68	76.5	76.09	73.59	75.72	77.32	73.53	71.47	74.70
240H	74.77	73.26	77.10	74.35	77.11	77.17	76.33	75.66	75.97	77.43	73.73	72.19	75.42

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.95	0.95	0.93	0.95	0.94	0.95	0.95	0.96	0.95	0.96	0.94	0.95	0.95
48H	0.89	0.89	0.83	0.87	0.85	0.86	0.86	0.87	0.85	0.88	0.84	0.88	0.86
72H	0.80	0.79	0.72	0.76	0.74	0.74	0.74	0.78	0.71	0.77	0.7	0.78	0.75
96H	0.70	0.68	0.62	0.64	0.6	0.62	0.63	0.68	0.56	0.64	0.53	0.67	0.63
120H	0.62	0.57	0.52	0.52	0.48	0.5	0.52	0.58	0.41	0.49	0.37	0.56	0.51
144H	0.52	0.47	0.41	0.42	0.36	0.41	0.41	0.47	0.31	0.35	0.25	0.45	0.40
168H	0.42	0.42	0.28	0.36	0.28	0.35	0.3	0.39	0.25	0.24	0.22	0.4	0.33
192H	0.36	0.38	0.20	0.3	0.25	0.29	0.23	0.33	0.21	0.12	0.2	0.37	0.27
216H	0.29	0.33	0.11	0.24	0.21	0.24	0.2	0.26	0.18	0.07	0.16	0.32	0.22
240H	0.23	0.27	0.07	0.21	0.18	0.22	0.16	0.18	0.15	0.07	0.16	0.28	0.18

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.04	0.00	0.01	0.03	0.01	-0.04	-0.04	-0.07	-0.07	-0.1	-0.07	-0.05	-0.04
48H	-0.01	0.05	0.06	0.1	0.05	-0.03	-0.03	-0.06	-0.07	-0.08	-0.03	0	0.00
72H	0.01	0.09	0.10	0.18	0.05	0	-0.02	-0.04	-0.06	-0.05	0	0.03	0.02
96H	0.03	0.10	0.14	0.22	0.07	0.04	-0.03	-0.04	-0.01	-0.03	0.01	0.05	0.05
120H	0.02	0.12	0.17	0.21	0.1	0.08	-0.04	-0.05	0.04	0.01	0.03	0.06	0.06
144H	0.03	0.12	0.14	0.19	0.12	0.1	-0.03	-0.01	0.13	0.05	0.06	0.08	0.08
168H	0.05	0.12	0.10	0.16	0.13	0.11	-0.01	0.03	0.22	0.08	0.09	0.09	0.10
192H	0.08	0.12	0.07	0.17	0.13	0.09	0.03	0.03	0.27	0.11	0.15	0.09	0.11
216H	0.11	0.13	0.09	0.19	0.14	0.08	0.06	0.05	0.3	0.14	0.19	0.08	0.13
240H	0.14	0.14	0.09	0.21	0.12	0.08	0.08	0.08	0.35	0.17	0.21	0.1	0.15

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.01	1.02	1.12	1.1	1.23	1.28	1.27	1.27	1.3	1.23	1.14	1.03	1.17
48H	1.67	1.74	1.99	1.96	2.18	2.32	2.28	2.25	2.33	2.27	2.03	1.79	2.07
72H	2.19	2.32	2.68	2.66	2.93	3.1	3.12	3.02	3.18	3.14	2.78	2.43	2.80
96H	2.61	2.86	3.20	3.27	3.6	3.69	3.7	3.59	3.83	3.83	3.34	2.91	3.37
120H	2.97	3.30	3.58	3.83	4.07	4.06	4.21	4	4.38	4.34	3.79	3.3	3.82
144H	3.26	3.67	3.92	4.13	4.34	4.39	4.58	4.45	4.78	4.66	4.12	3.67	4.16
168H	3.51	3.94	4.21	4.33	4.58	4.62	4.83	4.72	5.07	4.84	4.29	3.93	4.41
192H	3.77	4.07	4.47	4.47	4.77	4.78	5.07	4.92	5.29	5	4.34	4.07	4.59
216H	3.91	4.19	4.72	4.56	4.95	4.88	5.18	5.13	5.33	5.14	4.4	4.08	4.71
240H	4.00	4.33	4.83	4.71	5.04	4.94	5.19	5.29	5.34	5.19	4.39	4.12	4.78

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	38.74	38.34	40.32	39.48	41.47	43.65	43.02	41.95	41.68	38.31	38.76	38.93	40.39
48H	54.79	55.22	58.03	57.22	59.1	60.85	59.44	58.39	58.18	54.3	55.62	54.67	57.15
72H	62.50	63.56	65.90	65.54	66.84	68.82	67.79	66.79	66.4	63.61	64.74	63.06	65.46
96H	67.38	68.87	70.41	70.7	72.07	73.32	72.49	71.6	71.71	69.59	69.71	67.72	70.46
120H	70.73	72.17	73.04	74.25	74.96	75.38	75.96	74.31	75.18	73.4	72.49	70.78	73.55
144H	73.15	74.65	75.46	75.82	76.61	77.36	77.95	76.54	76.93	75.42	74.42	73.41	75.64
168H	74.97	75.97	77.04	76.83	77.85	78.44	78.72	77.7	78.25	76.58	75.44	74.95	76.90
192H	76.47	76.91	77.98	77.47	78.57	79.33	79.83	78.54	78.98	77.21	76.15	76.12	77.80
216H	77.48	77.82	79.42	77.78	79.56	79.96	80.09	79.52	79.01	77.75	76.56	76.41	78.45
240H	78.23	78.36	79.87	78.17	80.36	79.94	80.1	79.92	79.33	78.03	76.58	76.83	78.81

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.96	0.96	0.96	0.97	0.96	0.96	0.96	0.96	0.97	0.95	0.95	0.96	0.96
48H	0.90	0.88	0.87	0.9	0.88	0.88	0.87	0.89	0.88	0.84	0.85	0.9	0.88
72H	0.83	0.78	0.76	0.81	0.78	0.79	0.76	0.8	0.78	0.7	0.72	0.81	0.78
96H	0.75	0.66	0.66	0.71	0.67	0.7	0.67	0.73	0.68	0.55	0.59	0.72	0.67
120H	0.67	0.54	0.57	0.61	0.59	0.63	0.57	0.67	0.58	0.42	0.48	0.65	0.58
144H	0.60	0.43	0.49	0.55	0.54	0.56	0.49	0.6	0.5	0.32	0.39	0.56	0.50
168H	0.53	0.35	0.42	0.5	0.49	0.52	0.43	0.55	0.43	0.27	0.33	0.5	0.44
192H	0.46	0.30	0.36	0.47	0.45	0.48	0.39	0.51	0.37	0.22	0.3	0.46	0.40
216H	0.42	0.25	0.30	0.45	0.41	0.45	0.36	0.47	0.36	0.17	0.28	0.46	0.37
240H	0.39	0.21	0.28	0.42	0.39	0.42	0.36	0.44	0.35	0.15	0.28	0.45	0.35

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.06	-0.09	-0.07	-0.07	-0.03	0.01	0.02	-0.09	0.01	-0.02	0.02	-0.05	-0.04
48H	-0.08	-0.13	-0.04	-0.06	0.06	0.12	0.18	-0.03	0.12	0.03	0.16	-0.06	0.02
72H	-0.07	-0.19	-0.02	-0.04	0.16	0.19	0.38	0	0.25	0.11	0.3	0	0.09
96H	-0.02	-0.14	-0.06	-0.04	0.15	0.25	0.51	0.07	0.37	0.16	0.42	0.06	0.14
120H	0.07	-0.13	-0.01	0	0.15	0.31	0.6	0.2	0.48	0.25	0.46	0.12	0.21
144H	0.15	-0.12	0.05	0.06	0.17	0.4	0.68	0.31	0.55	0.33	0.46	0.19	0.27
168H	0.20	-0.10	0.15	0.16	0.29	0.51	0.68	0.38	0.62	0.41	0.46	0.32	0.34
192H	0.27	-0.11	0.21	0.25	0.36	0.55	0.72	0.44	0.64	0.47	0.49	0.41	0.39
216H	0.32	-0.08	0.25	0.25	0.42	0.51	0.84	0.47	0.65	0.56	0.49	0.55	0.44
240H	0.36	-0.05	0.32	0.25	0.41	0.46	0.82	0.47	0.6	0.69	0.54	0.62	0.46

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	3.88	4.17	4.83	4.53	4.99	5.15	4.74	4.63	4.86	4.48	4.16	3.92	4.53
48H	5.75	6.23	7.21	6.88	7.52	7.92	7.54	7.32	7.55	7.12	6.55	6.03	6.97
72H	7.13	7.78	8.74	8.67	9.53	9.89	9.59	9.19	9.46	9.05	8.5	7.54	8.76
96H	8.28	9.03	9.81	10.1	11.07	11.29	11.02	10.43	10.92	10.51	9.88	8.73	10.09
120H	9.20	9.99	10.72	11.12	12.13	12.21	12.14	11.36	12.12	11.65	10.9	9.71	11.10
144H	9.90	10.74	11.43	11.73	12.9	12.99	12.97	12.21	12.83	12.43	11.54	10.35	11.84
168H	10.55	11.21	12.18	12.21	13.59	13.52	13.5	12.8	13.36	12.85	11.79	10.63	12.35
192H	10.99	11.50	12.63	12.66	13.85	13.91	14.01	13.1	13.59	13.23	11.82	10.87	12.68
216H	11.39	11.77	13.04	12.97	14.19	14.18	14.19	13.45	13.64	13.34	11.86	11.15	12.93
240H	11.60	12.13	13.07	13.16	14.33	14.31	14.28	13.9	13.64	13.41	11.94	11.31	13.09

다) 500 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	3.04	2.84	2.15	2.52	2.94	3.01	2.88	2.64	2.9	3.15	2.56	3.03	2.81
48H	2.82	2.14	1.57	2.52	2.78	3.84	3.02	2.11	2.76	3.38	2.25	2.92	2.68
72H	2.55	1.47	1.07	2.24	2.67	4.95	2.92	2.41	3.03	3.88	2.47	2.97	2.72
96H	2.37	0.99	0.40	1.87	2.33	5.12	2.46	2.45	2.56	4.35	2.7	3.35	2.58
120H	2.22	0.69	-0.36	1.57	1.99	5.57	2.81	2.75	2.33	4.79	3.14	3.65	2.60
144H	1.75	0.31	-1.43	2.07	1.45	6.09	4.01	4.22	3.34	5.49	4.32	3.72	2.95
168H	1.53	0.14	-2.27	1.8	0.47	6.23	4.67	5.22	5.01	5.76	4.63	3.45	3.05
192H	1.35	0.17	-2.86	1.71	-0.53	6.58	5.2	5.37	6.68	6.02	5.14	2.73	3.13
216H	1.01	-0.11	-3.51	1.85	-1.58	6.4	5.6	5.26	7.98	5.59	5.43	2.09	3.00
240H	1.09	-0.63	-3.95	1.33	-2.73	5.75	6.06	5.56	8.8	4.88	5.04	2.54	2.81

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	19.99	20.62	23.93	22.62	25.17	26.9	24.63	24.53	26.09	23.33	22.37	19.91	23.34
48H	35.48	37.21	44.70	42.74	47.29	50.47	47.44	46.04	48.23	43.98	42.42	37.21	43.60
72H	50.79	54.39	63.94	64.34	70.05	72.28	69.73	64.95	70.67	64.67	62.19	53.81	63.48
96H	65.15	71.41	79.72	84.24	92.26	91.86	88.98	79.64	91.64	84.12	80.02	67.77	81.40
120H	77.21	85.72	92.58	101.47	110.96	107.17	104.42	93.22	109.51	100.82	94.25	81.33	96.56
144H	87.62	97.89	102.75	113.55	124.11	120.73	116.91	108.64	122.38	113.99	105.89	93.25	108.98
168H	97.02	105.95	113.70	122.31	133.9	129.19	128.4	117.67	130.44	123.12	110.68	100.03	117.70
192H	104.21	111.24	121.49	129.08	140.49	136.63	136.95	123.77	135.55	130.68	112.82	104.43	123.95
216H	108.78	117.46	131.11	135.21	144.26	141.54	142.26	131.26	138.08	134.75	115.49	107.16	128.95
240H	112.36	122.38	137.09	139.56	147.23	143.47	146.48	139.27	140.96	136.52	117.28	110.66	132.77

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	22.01	20.77	22.08	20.31	21.59	23.61	22.38	21.8	22.4	20.91	22.08	20.83	21.73
48H	33.82	33.65	36.95	34.26	36.42	38.61	36.39	35.22	36.09	34.7	36.01	33.42	35.46
72H	43.29	43.55	47.63	45.45	47.89	49.21	47.09	45.11	46.58	45.84	47	43.03	45.97
96H	50.69	51.61	55.01	53.88	56.64	57.03	54.89	51.17	54	54.29	55.11	49.96	53.69
120H	56.54	57.78	60.30	60.32	62.41	61.57	60.79	55.89	59.64	60.37	60.45	55.93	59.33
144H	60.53	62.01	64.36	63.93	66.22	65.31	64.59	60.5	63.6	64.42	64.25	60.3	63.34
168H	63.69	64.58	68.13	66.4	69.1	67.57	67.04	63.13	66.41	67.15	65.88	62.96	66.00
192H	66.75	66.33	70.29	68.14	71.21	69.59	69.41	64.61	67.97	69.17	67.21	64.62	67.94
216H	68.93	68.14	73.00	69.62	72.9	70.84	70.26	66.46	68.48	70.39	67.85	65.69	69.38
240H	70.15	69.55	74.19	70.73	73.29	71.28	70.39	68.94	68.82	70.58	68.07	66.53	70.21

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.98	0.98	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.98	0.97
48H	0.93	0.93	0.90	0.91	0.9	0.9	0.9	0.89	0.9	0.91	0.88	0.92	0.91
72H	0.85	0.84	0.79	0.8	0.8	0.8	0.79	0.79	0.78	0.81	0.75	0.84	0.80
96H	0.76	0.73	0.68	0.66	0.66	0.67	0.67	0.7	0.64	0.68	0.59	0.75	0.68
120H	0.66	0.61	0.56	0.52	0.53	0.55	0.55	0.6	0.5	0.54	0.45	0.63	0.56
144H	0.57	0.49	0.46	0.41	0.42	0.45	0.44	0.48	0.38	0.4	0.33	0.51	0.45
168H	0.47	0.41	0.34	0.32	0.34	0.38	0.32	0.39	0.3	0.29	0.29	0.44	0.36
192H	0.39	0.36	0.25	0.26	0.28	0.31	0.23	0.33	0.24	0.18	0.25	0.4	0.29
216H	0.33	0.29	0.13	0.19	0.23	0.26	0.18	0.25	0.21	0.12	0.21	0.38	0.23
240H	0.28	0.23	0.06	0.14	0.19	0.23	0.14	0.15	0.18	0.12	0.19	0.33	0.19

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.08	-0.10	-0.09	-0.08	-0.11	-0.1	-0.18	-0.2	-0.12	-0.15	-0.11	-0.15	-0.12
48H	-0.13	-0.15	-0.13	-0.12	-0.14	-0.11	-0.25	-0.27	-0.12	-0.16	-0.08	-0.19	-0.15
72H	-0.15	-0.21	-0.15	-0.17	-0.15	-0.11	-0.26	-0.31	-0.1	-0.15	-0.04	-0.21	-0.17
96H	-0.18	-0.27	-0.21	-0.22	-0.17	-0.17	-0.29	-0.39	-0.09	-0.14	-0.01	-0.22	-0.20
120H	-0.21	-0.35	-0.28	-0.24	-0.22	-0.24	-0.26	-0.45	-0.03	-0.12	0.03	-0.23	-0.22
144H	-0.23	-0.42	-0.32	-0.26	-0.27	-0.23	-0.24	-0.47	0.01	-0.09	0.04	-0.23	-0.23
168H	-0.24	-0.47	-0.33	-0.28	-0.27	-0.28	-0.23	-0.43	0.02	-0.1	0.04	-0.22	-0.23
192H	-0.22	-0.49	-0.33	-0.25	-0.28	-0.31	-0.22	-0.4	0.03	-0.08	0.04	-0.19	-0.23
216H	-0.22	-0.51	-0.35	-0.22	-0.28	-0.3	-0.2	-0.38	0.07	-0.04	0.04	-0.14	-0.21
240H	-0.20	-0.51	-0.40	-0.18	-0.28	-0.31	-0.16	-0.39	0.09	-0.03	0.04	-0.11	-0.20

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.03	1.08	1.18	1.15	1.29	1.41	1.37	1.4	1.41	1.34	1.23	1.14	1.25
48H	1.78	1.88	2.14	2.04	2.32	2.44	2.38	2.33	2.4	2.24	2.13	1.92	2.17
72H	2.41	2.56	2.87	2.84	3.14	3.25	3.21	3.06	3.22	2.97	2.89	2.55	2.91
96H	2.91	3.16	3.44	3.51	3.81	3.87	3.81	3.55	3.81	3.53	3.46	3.03	3.49
120H	3.28	3.63	3.86	4.11	4.28	4.31	4.24	3.87	4.27	3.95	3.87	3.46	3.93
144H	3.64	4.00	4.15	4.52	4.6	4.6	4.54	4.25	4.64	4.26	4.19	3.89	4.27
168H	3.89	4.28	4.45	4.74	4.89	4.81	4.77	4.54	4.84	4.43	4.32	4.16	4.51
192H	4.09	4.45	4.65	4.88	5.1	4.97	5.04	4.74	4.97	4.56	4.4	4.32	4.68
216H	4.22	4.65	4.86	4.98	5.26	5.1	5.23	4.95	5.05	4.65	4.44	4.31	4.81
240H	4.36	4.74	5.07	5.09	5.35	5.16	5.25	5.06	5.01	4.73	4.49	4.31	4.89

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	37.14	36.28	38.36	37.27	39.04	42.83	42.32	42.88	42.51	41.33	40.68	39.91	40.05
48H	57.08	56.87	59.44	58.25	60.05	62.47	60.3	60.55	60.26	58.19	59.22	57.67	59.20
72H	66.85	66.98	69.57	68.36	69.84	71.61	68.88	69.16	69.37	67.68	69.11	67.16	68.71
96H	72.64	73.64	74.87	74.23	75.73	76.78	74.12	73.69	74.4	73.45	75.07	72.45	74.26
120H	76.31	77.55	78.10	78.1	78.79	78.88	77.51	76.33	77.17	77	78.03	76.19	77.50
144H	79.18	79.99	80.30	80.55	80.35	80.59	79.2	78.6	79.17	79.2	79.78	78.91	79.65
168H	80.86	81.43	82.06	81.76	82.32	80.93	80.23	80.08	80.18	80.06	80.62	80.67	80.93
192H	82.39	82.79	83.33	82.76	83.47	81.68	81.56	80.74	80.61	81.06	81.61	81.88	81.99
216H	83.39	83.60	84.42	83.56	84.62	82.32	81.71	81.56	80.99	81.86	81.64	81.79	82.62
240H	83.96	83.69	85.44	83.42	84.77	82.47	81.72	82.54	80.55	82.24	81.44	82.13	82.86

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.96	0.95	0.95	0.95	0.94	0.94	0.93	0.93	0.94	0.93	0.93	0.94	0.94
48H	0.87	0.84	0.82	0.85	0.81	0.81	0.81	0.81	0.82	0.8	0.8	0.83	0.82
72H	0.75	0.71	0.68	0.72	0.65	0.67	0.66	0.66	0.68	0.65	0.63	0.71	0.68
96H	0.64	0.57	0.55	0.57	0.5	0.53	0.53	0.55	0.55	0.51	0.48	0.58	0.55
120H	0.54	0.44	0.43	0.42	0.39	0.43	0.42	0.47	0.44	0.39	0.36	0.44	0.43
144H	0.43	0.34	0.35	0.31	0.3	0.35	0.32	0.37	0.33	0.28	0.26	0.3	0.33
168H	0.35	0.26	0.26	0.25	0.22	0.29	0.24	0.29	0.27	0.22	0.21	0.2	0.26
192H	0.27	0.20	0.20	0.2	0.16	0.23	0.16	0.24	0.22	0.18	0.16	0.14	0.20
216H	0.22	0.14	0.14	0.17	0.11	0.19	0.11	0.17	0.19	0.14	0.15	0.15	0.16
240H	0.17	0.13	0.07	0.13	0.09	0.15	0.1	0.12	0.18	0.11	0.15	0.15	0.13

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.01	-0.03	0.01	-0.03	0.05	0.18	0.17	0.16	0.24	0.13	0.15	0	0.09
48H	-0.08	-0.14	-0.08	-0.14	0.1	0.24	0.3	0.3	0.32	0.15	0.22	-0.05	0.10
72H	-0.09	-0.19	-0.12	-0.21	0.22	0.26	0.52	0.42	0.4	0.21	0.34	-0.06	0.14
96H	-0.08	-0.21	-0.08	-0.29	0.26	0.23	0.66	0.52	0.47	0.21	0.47	0.06	0.18
120H	-0.05	-0.22	-0.01	-0.33	0.32	0.27	0.72	0.56	0.56	0.23	0.58	0.03	0.22
144H	-0.01	-0.20	0.07	-0.33	0.31	0.41	0.71	0.66	0.68	0.22	0.66	0.06	0.27
168H	-0.01	-0.16	0.18	-0.23	0.32	0.55	0.74	0.78	0.69	0.3	0.68	0.16	0.33
192H	0.00	-0.17	0.26	-0.17	0.43	0.62	0.81	0.86	0.63	0.42	0.68	0.28	0.39
216H	-0.02	-0.13	0.30	-0.11	0.54	0.61	0.93	0.89	0.63	0.48	0.67	0.39	0.43
240H	-0.03	-0.08	0.32	-0.02	0.62	0.63	0.99	0.81	0.59	0.62	0.74	0.39	0.47

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	4.13	4.19	4.74	4.59	5.06	5.86	5.55	5.67	5.73	5.45	5.18	4.61	5.06
48H	6.99	7.24	8.31	8.17	8.97	9.97	9.28	9.35	9.52	9.15	8.59	7.57	8.59
72H	9.21	9.76	11.00	11.2	12.18	13.06	12.3	12.08	12.44	12.07	11.26	9.84	11.37
96H	11.00	11.87	13.01	13.65	14.77	15.49	14.68	13.82	14.66	14.34	13.39	11.6	13.52
120H	12.53	13.56	14.67	15.6	16.64	17.02	16.55	15.16	16.34	16.02	14.98	13.13	15.18
144H	13.69	14.90	15.80	16.75	17.85	18.23	17.82	16.65	17.66	17.2	16.13	14.3	16.42
168H	14.60	15.64	16.85	17.64	18.88	19.05	18.62	17.63	18.54	17.93	16.51	15.02	17.24
192H	15.52	16.21	17.63	18.22	19.63	19.72	19.41	18.2	19.05	18.5	16.75	15.5	17.86
216H	16.10	16.74	18.53	18.68	20.28	20.09	19.83	18.78	19.21	18.85	16.9	15.77	18.31
240H	16.38	17.21	18.90	19.12	20.49	20.28	20	19.58	19.11	18.94	16.94	16.01	18.58

라) 250 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	3.65	2.65	2.39	2.89	3.28	4.22	2.86	2.59	3.94	3.73	3.61	2.73	3.21
48H	1.65	-0.76	0.03	1.27	1.78	3.57	1.08	-0.08	2.13	2.78	2.81	0.19	1.37
72H	-0.06	-3.49	-1.82	-0.65	0.89	3.57	0.37	-1.68	1.29	2.53	3.03	-1.54	0.20
96H	-1.69	-5.68	-4.08	-2.65	-0.59	2.41	-0.63	-3.89	0.13	2.4	3.22	-2.19	-1.10
120H	-3.13	-7.64	-6.35	-3.98	-2.04	1.81	-0.33	-5.35	0.21	2.61	3.28	-2.66	-1.96
144H	-4.27	-9.61	-7.82	-4.41	-3.49	2.15	0.38	-4.86	1.82	2.67	3.93	-2.89	-2.20
168H	-4.79	-10.85	-8.65	-5.03	-4.9	2.63	0.56	-4	3.01	2.6	3.67	-2.97	-2.39
192H	-4.98	-11.40	-9.52	-4.88	-6.21	2.69	1.21	-3.81	4.26	2.79	3.2	-3.25	-2.49
216H	-5.32	-11.82	-11.01	-4.06	-7.05	1.82	2.09	-4.12	5.38	2.26	2.58	-3.19	-2.70
240H	-5.27	-12.41	-12.00	-3.88	-8.19	0.27	2.43	-4.71	6.09	1.84	2.07	-2.05	-2.98

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	24.40	25.23	28.60	26.93	29.72	32.28	29.01	29.64	29.91	28.04	27.7	25.06	28.04
48H	45.96	47.72	55.88	53.34	59	62.62	59.4	58.46	58.43	54.92	55.46	50.32	55.13
72H	68.71	72.04	83.12	83.67	89.61	93.08	90.23	84.4	88.25	83.03	83.5	75.04	82.89
96H	89.66	95.72	107.55	110.94	118.23	120.86	115.97	103.88	115.05	108.37	108.61	95.39	107.52
120H	107.28	116.99	126.10	136.31	142.72	143.01	134.85	119.74	138.13	130.52	127.92	114.03	128.13
144H	122.36	134.38	139.45	154.06	159.84	159.87	150.3	138.63	156.39	148.66	144.2	132.05	145.02
168H	134.53	146.82	154.11	164.76	173.52	171.37	164.28	151.27	168.1	160.9	151.15	144.72	157.13
192H	145.82	154.77	164.57	173.77	185.27	180.91	176.85	161.01	175.77	169.5	154.38	152.8	166.29
216H	152.62	163.10	177.14	181.38	192.46	187.44	185.82	170.9	179.03	175.63	157.65	155.35	173.21
240H	157.89	170.74	186.04	188.84	197.79	190.49	190.45	179.08	181.54	178.51	161.39	158.19	178.41

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	18.20	17.43	17.90	16.51	16.97	18.46	16.82	16.77	17.1	16.42	17.79	17.61	17.33
48H	29.68	29.45	31.12	28.84	29.71	31.52	28.79	28.73	28.92	28.33	30.55	29.56	29.60
72H	39.44	39.54	41.48	39.61	40.54	41.95	38.71	37.81	38.83	39.04	41.33	39.48	39.81
96H	47.27	47.54	49.66	47.9	49.07	49.79	46.26	43.81	46.04	47.16	49.69	46.59	47.57
120H	53.17	54.05	55.23	54.73	54.98	54.84	51.93	48.24	51.4	53.17	54.96	52.37	53.26
144H	57.53	58.39	59.16	58.84	59.09	58.29	55.6	52.68	55.61	57.46	58.87	56.92	57.37
168H	60.53	61.18	62.81	61.37	62.09	60.58	58.25	55.64	58.1	60.24	60.88	60.34	60.17
192H	63.89	63.24	64.98	63.24	64.54	62.55	60.83	57.52	59.75	62.08	62.11	62.25	62.25
216H	65.92	64.84	67.78	64.67	66.5	63.65	62.15	59.56	60.22	63.7	62.51	63.01	63.71
240H	67.08	66.38	69.38	65.64	67.07	64.04	62.45	61.44	60.41	64.07	63.04	63.49	64.54

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.98	0.98	0.97	0.98	0.98
48H	0.94	0.93	0.91	0.93	0.91	0.91	0.91	0.89	0.91	0.92	0.89	0.92	0.91
72H	0.86	0.85	0.80	0.82	0.8	0.81	0.8	0.78	0.8	0.82	0.76	0.84	0.81
96H	0.77	0.73	0.67	0.69	0.67	0.68	0.67	0.68	0.67	0.69	0.59	0.74	0.69
120H	0.67	0.61	0.55	0.54	0.54	0.56	0.57	0.6	0.54	0.55	0.45	0.62	0.57
144H	0.57	0.49	0.46	0.42	0.44	0.46	0.46	0.48	0.42	0.4	0.33	0.49	0.45
168H	0.48	0.40	0.34	0.35	0.35	0.4	0.34	0.39	0.34	0.3	0.28	0.4	0.36
192H	0.40	0.34	0.26	0.28	0.27	0.33	0.24	0.32	0.28	0.21	0.24	0.35	0.29
216H	0.34	0.29	0.14	0.23	0.21	0.27	0.16	0.24	0.25	0.16	0.22	0.34	0.24
240H	0.29	0.23	0.07	0.16	0.17	0.24	0.13	0.16	0.22	0.14	0.21	0.32	0.20

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.00	-0.10	0.03	0	0.03	0.01	-0.11	-0.19	-0.15	-0.13	-0.12	-0.16	-0.07
48H	-0.15	-0.32	-0.07	-0.12	-0.1	-0.1	-0.22	0.34	-0.3	0.28	-0.26	0.36	0.22
72H	-0.27	-0.45	-0.14	-0.2	-0.18	-0.17	-0.28	-0.46	-0.41	-0.38	-0.34	-0.49	-0.31
96H	-0.38	-0.55	-0.20	-0.28	0.26	-0.24	-0.35	-0.57	-0.47	-0.41	0.41	0.6	0.39
120H	-0.47	-0.62	-0.27	-0.36	-0.32	0.3	-0.42	-0.66	0.51	0.44	0.49	0.66	-0.46
144H	-0.52	-0.67	-0.30	-0.42	-0.38	-0.33	-0.48	-0.73	-0.54	-0.53	-0.54	-0.7	-0.51
168H	-0.57	-0.72	-0.32	-0.44	-0.42	-0.3	-0.56	-0.77	0.59	0.61	0.62	-0.74	0.56
192H	-0.62	-0.74	-0.37	-0.47	-0.47	-0.34	-0.63	-0.83	-0.65	-0.69	-0.73	-0.76	-0.61
216H	-0.66	-0.75	-0.43	-0.51	-0.51	-0.45	-0.68	-0.92	-0.72	-0.76	-0.82	0.79	0.67
240H	-0.71	-0.77	-0.45	-0.53	-0.51	-0.58	-0.77	-1.01	-0.73	-0.78	-0.85	-0.81	-0.71

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.00	1.04	1.12	1.05	1.2	1.34	1.26	1.3	1.31	1.18	1.16	1.1	1.17
48H	1.75	1.85	2.05	1.88	2.11	2.29	2.16	2.14	2.2	2.06	1.99	1.9	2.03
72H	2.35	2.49	2.73	2.55	2.85	3.03	2.85	2.81	2.9	2.74	2.65	2.53	2.71
96H	2.82	3.02	3.19	3.1	3.46	3.57	3.36	3.28	3.37	3.23	3.13	3.01	3.21
120H	3.19	3.40	3.49	3.49	3.86	3.88	3.78	3.62	3.79	3.6	3.5	3.35	3.58
144H	3.51	3.68	3.74	3.76	4.16	4.12	4.09	3.95	4.07	3.89	3.81	3.67	3.87
168H	3.76	3.83	4.02	3.92	4.34	4.28	4.37	4.14	4.25	4.09	3.96	3.87	4.07
192H	3.96	3.95	4.17	4.04	4.47	4.45	4.59	4.32	4.4	4.24	4.11	4.01	4.23
216H	4.13	4.13	4.33	4.19	4.57	4.58	4.64	4.5	4.49	4.31	4.16	4.13	4.35
240H	4.26	4.20	4.37	4.23	4.64	4.67	4.76	4.64	4.54	4.35	4.16	4.23	4.42

③ S1 score

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	42.30	42.21	43.14	42.01	42.02	46.82	45.83	46.32	47.67	44.7	45.04	45.34	44.45
48H	65.21	65.62	67.78	65.61	65.49	68.56	65.77	65.66	67.25	64.27	64.83	65.45	65.96
72H	76.42	77.22	79.39	77.8	77.09	78.78	75.52	75.49	77.02	74.68	75.38	76.42	76.77
96H	82.71	84.24	85.44	84.61	83.47	84.09	80.73	80.26	82.22	80.18	81.34	82.47	82.65
120H	86.56	88.11	88.46	88.05	86.61	85.97	84.01	82.57	84.79	83.6	84.25	86.65	85.80
144H	89.05	90.11	90.38	90.17	88.5	87.86	85.97	85.02	86.27	85.18	86.2	88.56	87.77
168H	90.65	90.96	92.13	90.82	89.64	88.47	87.22	86.09	86.86	86.02	87	89.81	88.81
192H	91.59	91.91	92.86	90.99	90.6	89.05	88.08	86.57	87.18	86.89	87.67	90.85	89.52
216H	92.48	93.06	94.10	91.72	90.82	89.67	88.2	87.12	87.39	87.6	87.83	91.64	90.14
240H	92.84	92.94	94.04	91.67	91.32	90.07	88.19	88.05	87.48	87.84	87.61	92.08	90.34

④ AC

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.94	0.93	0.93	0.93	0.93	0.91	0.92	0.91	0.91	0.93	0.93	0.93	0.93
48H	0.82	0.80	0.77	0.79	0.78	0.75	0.79	0.76	0.75	0.8	0.81	0.81	0.79
72H	0.69	0.65	0.60	0.63	0.61	0.58	0.65	0.6	0.58	0.65	0.68	0.67	0.63
96H	0.57	0.51	0.47	0.47	0.45	0.43	0.53	0.47	0.44	0.52	0.57	0.54	0.50
120H	0.46	0.39	0.37	0.35	0.32	0.35	0.43	0.37	0.32	0.41	0.47	0.43	0.39
144H	0.36	0.31	0.30	0.26	0.22	0.27	0.33	0.27	0.22	0.32	0.38	0.33	0.30
168H	0.28	0.27	0.21	0.21	0.16	0.21	0.24	0.19	0.15	0.26	0.35	0.27	0.23
192H	0.22	0.22	0.16	0.17	0.12	0.15	0.18	0.14	0.1	0.22	0.33	0.23	0.19
216H	0.19	0.16	0.10	0.12	0.1	0.12	0.15	0.09	0.07	0.19	0.32	0.2	0.15
240H	0.16	0.15	0.08	0.11	0.08	0.1	0.12	0.04	0.05	0.17	0.33	0.18	0.13

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	0.18	0.21	0.19	0.16	0.21	0.27	0.26	0.24	0.11	0.12	0.25	0.18	0.20
48H	0.32	0.32	0.39	0.31	0.53	0.48	0.61	0.58	0.25	0.37	0.57	0.37	0.43
72H	0.46	0.54	0.60	0.44	0.76	0.72	1.05	0.91	0.53	0.6	0.89	0.58	0.67
96H	0.55	0.69	0.77	0.59	0.96	0.79	1.39	1.06	0.76	0.87	1.18	0.78	0.87
120H	0.63	0.72	0.96	0.69	1.15	0.91	1.59	1.13	0.97	0.95	1.5	0.97	1.01
144H	0.84	0.89	1.21	0.71	1.31	1.06	1.66	1.37	1.18	0.97	1.74	1.26	1.18
168H	0.94	0.90	1.36	0.9	1.46	1.3	1.72	1.67	1.21	1.18	1.9	1.43	1.33
192H	0.92	0.91	1.50	0.94	1.61	1.42	1.88	1.84	1.22	1.33	1.86	1.59	1.42
216H	0.95	0.93	1.48	1.02	1.72	1.41	2.15	2	1.25	1.42	1.91	1.72	1.50
240H	1.01	0.98	1.61	1.11	1.86	1.31	2.29	1.96	1.33	1.59	2.08	1.84	1.58

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	5.68	5.80	6.18	6.12	6.34	7.31	6.65	6.79	6.95	6.80	6.84	6.43	6.49
48H	10.02	10.24	11.08	10.94	11.49	12.79	11.56	11.73	11.84	11.81	11.82	11.00	11.36
72H	13.65	14.22	15.20	15.42	16.1	17.67	15.87	15.76	16.1	16.28	16.07	14.86	15.60
96H	16.72	17.57	18.82	19.18	19.97	21.61	19.38	18.55	19.36	19.71	19.48	17.77	19.01
120H	19.18	20.34	21.44	22.49	23.04	24.18	22.13	20.47	21.92	22.34	21.9	20.14	21.63
144H	21.11	22.39	23.16	24.42	25.15	26.11	24.1	22.51	23.99	24.33	23.8	22.08	23.60
168H	22.53	23.55	24.80	25.88	26.81	27.44	25.46	24.28	25.23	25.56	24.8	23.68	25.00
192H	23.97	24.77	25.80	26.87	27.99	28.37	26.91	25.49	26.02	26.24	25.2	24.48	26.01
216H	24.85	25.38	27.27	27.51	29.16	28.85	27.78	26.45	26.12	26.83	25.46	24.76	26.70
240H	25.36	26.16	28.08	28.05	29.83	29.14	28.10	27.39	26.13	27.11	25.76	25.00	27.18

4.1.3. 관측 검증

o 검증 변수: 고도, 기온, 바람

o 검증 요소: 평균 오차, RMSE, TREND

o 검증 영역: 아시아, 유럽/북아프리카, 북미, 호주/뉴질랜드, 열대 (20S-20N)

가. 아시아

가) 850 hPa

1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	2.81	7.29	6.24	6.16	3.82	-1.88	0.43	0.41	-0.12	2.55	2.87	3.85	2.87
24H	0.61	2.72	3.33	5.66	0.02	-4.80	-5.36	-8.39	-6.20	-1.54	0.39	1.70	-1.09
36H	-1.51	2.51	3.07	7.23	0.07	-7.15	-7.79	-8.40	-6.90	-0.52	2.16	0.87	-1.36
48H	-1.51	0.81	3.04	6.74	-1.11	-6.16	-8.47	-9.79	-8.19	-3.04	0.19	-0.90	-2.40
60H	-1.83	1.37	1.93	6.57	-2.80	-8.43	-9.80	-9.08	8.70	2.57	0.54	0.75	-2.80
72H	0.42	2.15	4.85	10.40	0.92	-1.50	-4.04	-4.52	-5.33	-0.79	0.56	0.12	0.27
84H	-2.56	1.35	0.33	6.23	-7.72	-8.90	-11.42	-9.98	-11.44	-4.16	2.68	2.10	-4.42
96H	-1.58	1.06	4.39	9.59	-3.80	-3.89	-6.81	-6.30	-7.57	-1.64	-1.58	-3.28	-1.78
108H	-2.48	3.14	3.15	7.75	-9.67	-8.19	-12.06	-9.81	-9.89	0.19	-0.81	-3.11	-3.48
120H	-4.73	1.00	5.30	8.43	-5.89	-7.48	-12.59	-10.70	8.54	2.43	0.16	-4.67	-3.13
132H	-7.65	1.40	2.90	6.35	-10.37	-8.78	-15.39	-12.29	-10.22	3.86	-0.06	-3.76	4.50
144H	-6.14	1.58	6.20	7.45	-8.88	-7.38	-15.95	-13.43	-7.30	5.44	1.17	-1.94	-3.27
156H	-7.99	0.10	4.64	5.95	-13.49	-7.26	-16.43	-14.53	-9.33	7.59	-0.78	-0.36	-4.32
168H	-4.33	1.05	10.07	10.51	-9.13	-5.81	-15.73	-16.18	-6.52	8.96	4.76	2.66	-1.64
180H	-8.31	-1.10	8.24	9.07	-13.49	-6.52	-14.92	-16.58	-10.29	8.56	5.47	1.89	-3.17
192H	-5.95	-1.19	10.58	11.28	-6.79	-7.18	-12.59	-15.67	-7.62	8.48	13.08	4.01	0.80
204H	-6.82	-2.81	6.30	10.37	-9.46	-10.11	-11.16	-16.07	-12.08	11.81	13.21	4.28	-1.88
216H	-5.40	-5.23	5.46	10.76	-7.90	-13.02	-10.34	-16.20	-11.75	10.02	18.09	5.44	1.67
228H	-7.06	-4.21	0.02	10.17	-12.87	-17.14	-11.96	-19.08	-16.50	14.22	15.06	5.66	-3.64
240H	-4.08	5.98	1.79	12.30	-10.06	-17.45	-10.67	-16.34	-13.26	11.33	18.99	6.75	2.22

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	11.19	13.35	12.99	13.34	11.62	9.94	10.43	9.39	9.69	10.40	10.50	11.32	11.18
24H	14.38	13.29	14.62	15.96	14.19	13.33	15.03	14.51	13.93	13.05	11.74	14.57	14.05
36H	15.53	14.86	16.77	18.27	15.43	15.59	17.99	16.21	15.33	14.83	12.88	15.02	15.73
48H	20.49	17.65	19.81	22.66	19.01	18.61	21.66	19.25	18.87	18.33	15.42	19.36	19.26
60H	20.58	19.30	22.50	24.54	20.31	20.67	24.05	20.17	20.89	18.72	17.42	19.47	20.72
72H	26.10	22.96	26.71	30.82	25.23	22.47	26.35	21.72	23.11	22.45	21.46	25.67	24.59
84H	25.33	25.28	29.05	31.96	28.52	26.86	30.90	24.23	25.93	24.10	23.21	26.32	26.81
96H	32.38	29.38	33.80	37.24	32.62	29.44	32.44	27.47	28.21	28.88	27.21	32.43	30.96
108H	30.98	31.63	36.86	38.34	33.11	31.86	33.34	28.16	29.91	30.21	27.26	31.78	31.95
120H	39.01	36.82	42.48	42.92	37.70	34.24	35.79	33.08	33.25	36.16	31.18	37.56	36.68
132H	38.49	35.71	42.04	44.10	36.88	36.33	36.20	32.81	32.48	38.35	30.09	35.23	36.56
144H	44.85	39.89	45.63	49.15	42.22	37.38	39.60	37.27	36.12	43.05	36.27	41.50	41.08
156H	42.33	38.33	44.16	48.64	41.46	38.28	39.23	37.15	37.16	44.48	36.30	40.28	40.65
168H	48.91	46.21	49.86	54.12	46.71	39.71	42.39	41.17	40.24	48.32	44.72	45.86	45.69
180H	47.12	44.31	49.57	53.15	45.28	40.60	42.04	40.72	39.33	48.11	43.84	45.48	44.96
192H	52.76	52.98	55.61	57.62	49.10	42.98	44.02	44.18	43.03	53.21	50.25	52.43	49.85
204H	48.27	49.06	53.84	55.97	45.83	42.54	43.00	43.02	42.88	50.91	48.42	50.15	47.82
216H	53.38	57.18	60.91	59.29	50.25	45.17	45.33	47.11	49.19	56.54	53.64	55.97	52.83
228H	49.34	53.66	56.82	55.19	50.22	46.52	44.09	44.57	48.34	53.70	50.63	50.72	50.32
240H	55.21	58.73	64.27	58.14	54.95	48.31	46.93	47.47	51.50	60.51	56.05	54.46	54.71

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.90	0.85	0.90	0.89	0.84	0.84	0.80	0.79	0.82	0.87	0.89	0.86	0.85
24H	0.94	0.92	0.94	0.93	0.90	0.86	0.84	0.86	0.89	0.94	0.95	0.90	0.91
36H	0.94	0.92	0.93	0.93	0.91	0.86	0.85	0.86	0.89	0.93	0.95	0.93	0.91
48H	0.93	0.92	0.93	0.93	0.91	0.87	0.84	0.86	0.90	0.92	0.95	0.92	0.91
60H	0.91	0.92	0.90	0.91	0.89	0.84	0.82	0.85	0.88	0.91	0.93	0.92	0.89
72H	0.89	0.90	0.89	0.89	0.87	0.86	0.81	0.86	0.88	0.91	0.92	0.88	0.88
84H	0.86	0.85	0.83	0.85	0.79	0.78	0.74	0.82	0.83	0.88	0.89	0.88	0.83
96H	0.83	0.84	0.81	0.84	0.79	0.78	0.74	0.81	0.83	0.86	0.88	0.84	0.82
108H	0.84	0.78	0.75	0.79	0.75	0.72	0.71	0.80	0.77	0.83	0.85	0.83	0.79
120H	0.79	0.78	0.74	0.77	0.75	0.73	0.71	0.75	0.77	0.78	0.83	0.81	0.77
132H	0.71	0.76	0.71	0.70	0.72	0.63	0.68	0.76	0.73	0.73	0.81	0.77	0.73
144H	0.64	0.75	0.70	0.67	0.71	0.67	0.70	0.73	0.73	0.73	0.78	0.72	0.71
156H	0.67	0.72	0.65	0.62	0.65	0.58	0.68	0.72	0.66	0.67	0.72	0.69	0.67
168H	0.65	0.67	0.63	0.62	0.64	0.60	0.68	0.71	0.66	0.69	0.70	0.68	0.66
180H	0.65	0.62	0.56	0.58	0.56	0.53	0.66	0.68	0.62	0.62	0.68	0.65	0.62
192H	0.62	0.59	0.60	0.64	0.57	0.56	0.68	0.65	0.59	0.61	0.67	0.59	0.61
204H	0.62	0.58	0.56	0.57	0.54	0.52	0.66	0.62	0.55	0.55	0.63	0.56	0.58
216H	0.62	0.54	0.58	0.62	0.56	0.55	0.68	0.59	0.48	0.55	0.62	0.57	0.58
228H	0.62	0.52	0.57	0.60	0.49	0.45	0.65	0.56	0.47	0.54	0.60	0.58	0.55
240H	0.64	0.52	0.58	0.63	0.51	0.50	0.67	0.56	0.47	0.49	0.59	0.59	0.56

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.27	0.30	-0.19	-0.39	-0.34	-0.17	-0.15	-0.27	-0.21	-0.16	0.02	0.35	-0.08
24H	0.22	0.09	-0.48	-0.35	0.20	0.44	0.77	0.47	0.27	-0.05	0.13	0.53	0.19
36H	0.45	0.47	-0.28	-0.37	0.11	0.28	0.46	0.14	0.10	-0.02	0.27	0.73	0.20
48H	0.36	0.29	-0.51	-0.24	0.64	0.89	1.39	0.91	0.60	0.07	0.32	0.94	0.47
60H	0.54	0.67	-0.42	-0.32	0.54	0.63	0.90	0.50	0.39	0.01	0.32	0.99	0.40
72H	0.48	0.41	-0.62	-0.10	0.95	1.17	1.76	1.23	0.76	0.06	0.35	1.09	0.63
84H	0.50	0.75	-0.51	-0.06	0.77	0.87	1.18	0.66	0.49	-0.02	0.37	1.09	0.51
96H	0.35	0.43	-0.65	0.24	1.04	1.36	2.04	1.38	0.76	0.07	0.44	1.13	0.72
108H	0.24	0.84	-0.55	0.33	0.99	1.12	1.41	0.75	0.58	-0.04	0.50	1.13	0.61
120H	0.22	0.56	-0.72	0.52	1.19	1.59	2.28	1.47	0.83	0.01	0.68	1.30	0.83
132H	0.38	1.03	-0.61	0.55	1.16	1.24	1.52	0.82	0.67	-0.04	0.91	1.33	0.75
144H	0.42	0.74	-0.75	0.73	1.35	1.73	2.38	1.59	0.82	0.07	1.05	1.50	0.97
156H	0.55	1.28	-0.55	0.67	1.19	1.48	1.57	0.99	0.70	-0.06	1.22	1.56	0.88
168H	0.57	0.78	-0.70	0.72	1.29	1.99	2.50	1.79	0.82	0.09	1.25	1.72	1.07
180H	0.69	1.00	-0.62	0.71	1.17	1.64	1.74	1.21	0.76	0.07	1.20	1.85	0.95
192H	0.57	0.35	-0.57	0.66	1.27	2.29	2.62	1.93	0.92	0.10	1.08	1.93	1.10
204H	0.51	0.67	-0.22	0.71	1.14	1.86	1.74	1.37	0.84	-0.01	1.14	1.88	0.97
216H	0.15	0.11	-0.16	0.82	1.24	2.45	2.62	2.02	1.09	0.16	0.93	1.67	1.09
228H	-0.13	0.43	0.30	0.90	1.17	2.04	1.66	1.52	1.04	0.44	0.87	1.24	0.96
240H	-0.28	-0.06	0.25	1.15	1.23	2.59	2.46	2.16	1.32	0.80	0.64	0.99	1.10

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	2.15	2.04	1.95	2.13	1.88	1.73	1.65	1.60	1.68	1.86	1.75	2.16	1.88
24H	2.13	1.94	2.21	2.19	2.22	2.06	2.09	1.91	1.81	1.88	1.86	2.23	2.04
36H	2.51	2.40	2.39	2.62	2.32	2.24	2.09	1.96	2.02	2.19	2.09	2.55	2.28
48H	2.53	2.37	2.67	2.72	2.78	2.60	2.80	2.39	2.21	2.15	2.17	2.72	2.51
60H	2.89	2.80	2.92	2.99	2.87	2.61	2.52	2.29	2.36	2.44	2.45	3.02	2.68
72H	3.04	2.85	3.15	3.17	3.40	2.97	3.28	2.88	2.59	2.50	2.67	3.32	2.99
84H	3.39	3.21	3.39	3.34	3.28	2.95	2.86	2.67	2.64	2.74	2.88	3.62	3.08
96H	3.65	3.25	3.63	3.66	3.76	3.34	3.70	3.34	2.91	2.88	3.17	3.97	3.44
108H	3.97	3.62	3.96	3.70	3.54	3.38	3.17	2.95	2.91	3.07	3.38	4.21	3.49
120H	4.19	3.75	4.16	4.21	4.07	3.83	4.10	3.72	3.25	3.26	3.65	4.51	3.89
132H	4.40	4.02	4.44	4.49	3.84	3.71	3.41	3.27	3.27	3.42	3.87	4.74	3.91
144H	4.43	4.28	4.44	5.05	4.39	4.15	4.42	4.03	3.64	3.70	4.08	4.99	4.30
156H	4.46	4.44	4.60	5.19	4.08	4.01	3.56	3.51	3.50	3.76	4.27	5.15	4.21
168H	4.45	4.85	4.67	5.65	4.75	4.49	4.60	4.15	3.90	4.02	4.65	5.35	4.63
180H	4.44	4.99	5.00	5.73	4.37	4.41	3.84	3.73	3.74	4.08	4.93	5.55	4.57
192H	4.57	5.29	5.17	6.21	4.97	4.92	4.86	4.35	4.16	4.38	5.18	5.84	4.99
204H	4.79	5.30	5.45	6.17	4.56	4.68	3.98	3.88	3.97	4.46	5.30	5.99	4.88
216H	5.17	5.63	5.70	6.51	5.04	5.13	5.04	4.57	4.34	4.82	5.38	6.38	5.31
228H	5.13	5.77	5.62	6.35	4.69	4.80	4.05	4.10	4.29	4.94	5.30	6.49	5.13
240H	5.30	6.05	5.89	6.51	5.21	5.17	4.99	4.74	4.72	5.25	5.32	6.87	5.50

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.76	0.70	0.79	0.81	0.81	0.81	0.78	0.76	0.79	0.80	0.78	0.71	0.78
24H	0.86	0.83	0.84	0.87	0.81	0.69	0.58	0.66	0.79	0.86	0.84	0.81	0.79
36H	0.84	0.79	0.86	0.87	0.84	0.79	0.74	0.75	0.84	0.86	0.86	0.81	0.82
48H	0.85	0.85	0.86	0.88	0.83	0.73	0.60	0.68	0.83	0.88	0.88	0.83	0.81
60H	0.82	0.80	0.85	0.88	0.81	0.77	0.70	0.72	0.85	0.88	0.86	0.82	0.81
72H	0.82	0.83	0.84	0.89	0.80	0.74	0.60	0.67	0.82	0.88	0.85	0.83	0.80
84H	0.78	0.77	0.81	0.88	0.77	0.76	0.67	0.68	0.84	0.87	0.83	0.82	0.79
96H	0.76	0.79	0.78	0.86	0.76	0.73	0.57	0.63	0.81	0.85	0.79	0.82	0.76
108H	0.73	0.71	0.73	0.86	0.73	0.72	0.63	0.65	0.83	0.84	0.77	0.82	0.75
120H	0.71	0.74	0.72	0.82	0.73	0.69	0.53	0.59	0.79	0.80	0.74	0.79	0.72
132H	0.63	0.70	0.70	0.79	0.68	0.67	0.61	0.62	0.81	0.80	0.72	0.77	0.71
144H	0.64	0.72	0.69	0.71	0.70	0.64	0.52	0.57	0.74	0.77	0.70	0.76	0.68
156H	0.60	0.69	0.68	0.67	0.66	0.62	0.60	0.59	0.77	0.79	0.67	0.76	0.68
168H	0.68	0.69	0.65	0.62	0.65	0.59	0.52	0.57	0.67	0.75	0.66	0.74	0.65
180H	0.68	0.64	0.64	0.58	0.61	0.54	0.58	0.59	0.71	0.77	0.63	0.73	0.64
192H	0.69	0.65	0.62	0.59	0.61	0.52	0.51	0.55	0.58	0.73	0.62	0.69	0.61
204H	0.66	0.59	0.58	0.59	0.58	0.49	0.59	0.58	0.66	0.77	0.63	0.68	0.62
216H	0.63	0.59	0.57	0.59	0.61	0.50	0.49	0.52	0.58	0.70	0.62	0.62	0.59
228H	0.63	0.51	0.55	0.59	0.56	0.49	0.59	0.53	0.65	0.72	0.63	0.61	0.59
240H	0.65	0.56	0.57	0.57	0.61	0.49	0.50	0.47	0.56	0.65	0.60	0.55	0.57

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.04	-0.13	-0.19	-0.06	-0.58	-0.45	-0.41	-0.37	-0.29	-0.12	-0.15	0.13	-0.24
24H	-0.05	0.00	0.01	0.07	-0.18	0.07	0.19	0.30	0.28	0.05	-0.01	0.02	0.06
36H	-0.01	-0.25	-0.21	-0.05	-0.63	-0.35	-0.45	-0.41	-0.35	-0.17	0.00	-0.33	-0.27
48H	-0.13	0.09	0.24	0.32	0.07	0.35	0.24	0.35	0.28	0.00	0.08	-0.02	0.16
60H	-0.10	-0.15	0.21	0.06	-0.30	-0.33	-0.46	-0.39	-0.49	-0.17	0.08	-0.26	-0.19
72H	-0.15	0.03	0.51	0.19	0.42	0.35	0.22	0.25	0.26	0.07	0.20	-0.03	0.19
84H	-0.21	-0.21	0.34	-0.28	-0.07	-0.36	-0.56	-0.41	-0.49	-0.27	0.13	-0.34	-0.23
96H	-0.33	-0.15	0.56	0.06	0.40	0.45	0.13	0.35	0.24	0.17	0.09	0.08	0.16
108H	-0.23	-0.28	0.29	-0.27	-0.02	-0.10	-0.65	-0.44	-0.40	-0.17	0.02	0.48	0.23
120H	-0.20	-0.07	0.60	0.16	0.55	0.53	0.11	0.43	0.28	0.25	0.04	-0.09	0.22
132H	-0.10	-0.02	0.48	-0.32	0.08	-0.09	-0.74	-0.39	0.20	0.05	-0.17	-0.38	0.15
144H	-0.15	0.08	0.42	0.11	0.69	0.42	0.09	0.52	0.48	0.35	-0.18	0.06	0.24
156H	-0.22	-0.09	0.08	-0.28	0.13	-0.31	-0.69	-0.21	-0.04	0.15	-0.26	-0.32	0.17
168H	-0.25	0.20	0.20	0.02	0.68	0.41	0.21	0.83	0.76	0.38	-0.19	-0.03	0.27
180H	-0.33	0.28	-0.10	-0.36	0.14	-0.28	-0.66	-0.01	0.05	0.14	-0.33	0.40	0.16
192H	-0.28	0.55	0.15	-0.10	0.62	0.51	0.32	0.84	0.71	0.50	-0.17	-0.01	0.30
204H	-0.25	0.54	-0.04	-0.67	0.01	-0.20	-0.56	-0.20	0.22	0.28	-0.49	0.36	0.14
216H	0.14	0.61	0.03	-0.15	0.71	0.72	0.49	0.42	1.03	0.58	0.22	0.13	0.35
228H	-0.28	0.73	-0.24	-0.87	0.14	-0.10	-0.58	-0.57	0.43	0.15	-0.27	-0.24	-0.14
240H	-0.29	0.86	0.10	-0.39	0.80	0.79	0.40	0.27	0.86	0.47	-0.05	0.10	0.33

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	4.59	4.44	4.95	5.30	5.03	4.95	4.76	4.51	4.53	4.53	4.54	4.54	4.72
24H	4.88	4.76	4.96	5.50	5.44	5.36	5.19	5.01	4.73	4.80	4.62	4.72	5.00
36H	5.27	5.14	5.78	6.32	5.94	6.00	6.06	5.41	5.30	5.31	5.27	5.17	5.58
48H	5.69	5.53	6.00	6.68	6.35	6.38	6.45	5.88	5.62	5.59	5.22	5.41	5.90
60H	6.01	5.91	6.90	7.25	6.83	6.88	7.24	6.19	5.97	6.08	5.77	5.94	6.41
72H	6.45	6.21	7.18	7.69	7.33	7.27	7.38	6.58	6.51	6.32	5.95	6.04	6.74
84H	6.62	6.51	7.91	8.31	7.72	8.05	8.01	6.78	6.92	6.79	6.56	6.76	7.25
96H	7.06	6.93	8.14	8.65	8.09	8.25	8.05	7.32	7.41	7.28	6.61	6.85	7.55
108H	7.32	7.18	8.87	9.04	8.43	8.74	8.55	7.44	7.88	7.61	6.99	7.34	7.95
120H	7.93	7.54	9.03	9.50	8.63	8.80	8.47	7.90	8.00	8.08	7.11	7.36	8.20
132H	8.08	7.61	9.54	9.75	8.84	9.19	8.68	8.01	8.17	8.47	7.42	7.77	8.46
144H	8.29	7.80	9.40	10.16	9.15	9.36	8.78	8.45	8.37	8.83	7.50	7.93	8.67
156H	8.57	8.09	9.27	10.33	9.35	9.56	9.27	8.68	8.40	9.30	8.06	8.17	8.92
168H	8.65	8.38	9.59	10.53	9.70	9.54	9.40	9.05	8.94	9.62	8.32	8.21	9.16
180H	8.85	9.01	10.00	10.54	9.90	9.77	9.80	9.25	8.85	9.75	8.59	8.72	9.42
192H	8.94	9.57	10.24	10.81	10.21	9.92	9.63	9.37	9.08	10.14	8.79	8.82	9.63
204H	9.17	9.49	10.66	10.79	10.27	10.04	9.96	9.42	9.15	9.96	9.01	9.11	9.75
216H	9.26	9.53	10.66	11.06	10.58	10.26	9.73	9.33	9.84	10.19	9.25	9.28	9.91
228H	9.16	9.69	10.54	10.78	10.46	10.02	10.04	9.43	9.83	10.17	9.58	9.39	9.92
240H	9.20	9.94	10.80	10.79	10.47	10.17	9.73	9.49	10.02	10.40	9.47	9.15	9.97

나) 500 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	5.00	9.68	7.78	7.31	5.69	3.13	4.57	2.73	2.59	4.09	3.41	4.48	5.04
24H	0.99	4.07	1.93	4.35	3.59	1.95	3.35	-1.78	-0.32	1.60	2.26	2.49	2.04
36H	1.98	6.15	3.98	7.30	5.02	1.13	1.11	-3.02	-0.82	3.37	5.05	2.02	2.77
48H	0.48	3.61	1.22	5.71	6.06	3.65	4.51	-0.37	0.59	1.29	3.62	0.23	2.55
60H	2.94	6.80	3.28	7.52	6.56	2.68	3.19	0.86	-0.25	1.79	5.18	1.47	3.36
72H	-4.61	7.09	4.02	11.09	12.68	10.76	12.67	7.93	5.59	4.15	6.31	2.03	7.41
84H	2.27	7.48	1.96	10.81	6.91	3.68	4.33	0.05	1.76	0.38	3.31	0.52	3.24
96H	1.17	5.96	4.05	14.00	11.22	9.18	11.95	7.43	3.93	3.25	5.06	-1.18	6.34
108H	0.41	10.53	6.07	17.65	8.59	6.27	5.81	1.03	1.18	5.26	6.55	-0.63	5.73
120H	-2.35	7.39	5.08	17.46	11.59	7.66	7.52	3.69	3.89	8.08	8.90	-0.87	6.50
132H	-3.24	10.51	5.83	20.44	11.45	7.70	2.86	-0.23	1.70	10.73	10.91	0.50	6.60
144H	-2.28	9.60	5.74	18.00	11.39	9.26	4.31	3.40	5.21	13.29	14.25	3.62	7.98
156H	-2.62	12.21	7.75	19.89	10.50	12.19	1.89	1.00	3.76	14.68	14.56	6.29	8.51
168H	0.56	9.04	10.49	20.19	12.45	14.46	5.51	4.12	7.37	18.54	20.39	11.56	11.22
180H	-1.38	7.49	12.00	21.89	11.02	15.56	4.02	2.61	4.42	19.13	22.08	13.50	11.03
192H	-1.31	2.28	12.76	21.88	15.03	15.91	9.98	7.80	7.95	19.43	28.80	14.96	12.96
204H	-2.73	4.24	15.09	24.59	15.19	14.55	9.62	5.77	3.99	22.50	32.18	16.29	13.44
216H	-6.65	-2.63	12.38	23.48	15.40	12.86	13.96	8.45	6.40	23.43	34.42	13.63	12.93
228H	-10.88	1.31	15.04	28.48	13.86	9.92	10.04	4.31	3.59	32.25	33.89	12.79	12.88
240H	-10.47	-4.60	14.04	30.13	13.64	10.09	14.47	8.59	8.15	34.00	35.82	10.32	13.68

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	15.32	17.75	16.48	16.23	15.15	14.48	15.02	13.66	14.06	14.95	15.09	15.00	15.27
24H	18.74	17.90	18.36	19.11	18.62	15.87	16.70	16.20	16.06	16.52	16.87	17.85	17.40
36H	21.20	20.82	21.62	22.49	20.84	18.71	18.68	17.95	17.88	19.02	19.59	20.87	19.97
48H	28.14	24.68	27.29	27.80	25.81	22.41	23.07	21.77	21.12	22.53	23.53	26.44	24.55
60H	29.84	28.22	32.35	30.20	26.46	24.50	24.64	23.03	22.61	25.55	26.31	28.26	26.83
72H	39.66	33.68	38.52	39.76	35.61	30.18	32.17	28.66	28.16	30.98	33.47	36.38	33.94
84H	40.28	36.41	40.92	39.19	33.10	30.51	31.53	27.58	27.46	33.01	35.29	38.59	34.49
96H	51.51	43.05	48.87	51.12	42.55	36.31	37.90	34.56	33.58	39.83	42.95	49.22	42.62
108H	49.19	44.71	52.37	52.22	38.16	36.74	36.52	32.20	34.27	40.12	43.82	47.37	42.31
120H	57.90	52.86	61.78	62.55	47.63	41.44	41.71	39.90	40.51	49.17	51.67	57.31	50.37
132H	56.99	50.17	63.46	63.28	43.25	41.97	40.10	36.10	39.12	49.28	52.98	55.13	49.32
144H	66.04	62.92	66.96	73.05	53.00	47.11	45.84	43.45	47.22	58.63	61.35	65.58	57.60
156H	63.16	61.61	64.97	73.09	48.28	47.53	44.40	40.07	45.58	57.68	61.11	64.71	56.02
168H	70.51	77.00	72.02	79.84	59.22	53.38	51.79	46.12	53.08	68.71	71.15	74.89	64.81
180H	66.96	73.60	71.78	80.51	53.72	54.15	49.45	44.33	49.87	66.68	71.96	74.00	63.08
192H	76.50	86.01	82.40	87.95	65.63	58.72	56.64	51.79	58.50	75.39	82.77	84.88	72.27
204H	73.64	80.64	83.07	87.49	59.28	56.13	52.44	47.91	55.69	71.57	81.78	81.34	69.25
216H	81.93	92.44	92.45	92.21	68.72	59.20	58.12	57.59	64.76	83.89	87.95	89.08	77.36
228H	77.49	89.58	87.40	89.68	62.79	58.50	52.16	50.62	61.93	80.14	84.05	85.01	73.28
240H	88.29	99.04	94.96	92.34	74.93	62.57	58.72	60.19	68.80	92.10	92.57	95.00	81.63

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.92	0.88	0.89	0.90	0.84	0.77	0.69	0.71	0.77	0.84	0.87	0.87	0.83
24H	0.95	0.94	0.95	0.94	0.91	0.88	0.83	0.85	0.89	0.93	0.95	0.93	0.91
36H	0.95	0.94	0.94	0.95	0.92	0.88	0.85	0.85	0.90	0.93	0.95	0.93	0.92
48H	0.94	0.94	0.94	0.94	0.92	0.88	0.85	0.87	0.92	0.93	0.95	0.93	0.92
60H	0.92	0.93	0.91	0.93	0.91	0.87	0.84	0.86	0.91	0.92	0.93	0.93	0.91
72H	0.88	0.93	0.91	0.91	0.88	0.86	0.81	0.86	0.89	0.91	0.92	0.92	0.89
84H	0.86	0.91	0.87	0.89	0.86	0.84	0.78	0.85	0.89	0.89	0.90	0.91	0.87
96H	0.83	0.89	0.83	0.86	0.83	0.83	0.77	0.83	0.87	0.86	0.89	0.88	0.85
108H	0.84	0.84	0.79	0.84	0.82	0.79	0.76	0.82	0.84	0.82	0.87	0.87	0.83
120H	0.80	0.83	0.78	0.80	0.82	0.79	0.75	0.79	0.83	0.79	0.84	0.85	0.81
132H	0.77	0.83	0.74	0.77	0.81	0.74	0.74	0.80	0.81	0.78	0.82	0.83	0.79
144H	0.73	0.79	0.75	0.74	0.79	0.75	0.74	0.78	0.79	0.75	0.81	0.80	0.77
156H	0.74	0.78	0.70	0.69	0.79	0.69	0.72	0.78	0.75	0.73	0.76	0.80	0.74
168H	0.74	0.71	0.68	0.70	0.74	0.70	0.69	0.76	0.71	0.68	0.74	0.77	0.72
180H	0.76	0.68	0.64	0.66	0.73	0.62	0.67	0.75	0.67	0.66	0.67	0.75	0.69
192H	0.72	0.66	0.62	0.69	0.69	0.66	0.64	0.72	0.62	0.63	0.66	0.69	0.67
204H	0.70	0.65	0.60	0.64	0.68	0.65	0.63	0.71	0.59	0.63	0.60	0.66	0.65
216H	0.66	0.62	0.60	0.69	0.66	0.68	0.61	0.65	0.55	0.57	0.63	0.63	0.63
228H	0.67	0.59	0.59	0.61	0.63	0.64	0.62	0.68	0.55	0.59	0.59	0.59	0.61
240H	0.66	0.59	0.60	0.68	0.59	0.67	0.62	0.63	0.53	0.52	0.61	0.57	0.61

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.05	-0.05	-0.12	-0.13	-0.16	0.03	0.15	0.11	0.09	-0.03	-0.12	-0.14	-0.04
24H	-0.08	-0.15	-0.24	-0.27	-0.21	-0.01	0.21	0.22	0.14	0.03	-0.07	-0.16	-0.05
36H	0.04	0.02	-0.12	-0.28	-0.15	0.09	0.29	0.26	0.30	0.13	0.05	-0.15	0.04
48H	-0.03	-0.03	-0.18	-0.27	-0.04	0.05	0.31	0.35	0.34	0.19	0.11	-0.14	0.06
60H	0.19	0.04	0.01	-0.18	0.09	0.16	0.35	0.42	0.47	0.31	0.27	-0.04	0.17
72H	0.15	-0.01	0.01	-0.14	0.25	0.20	0.37	0.49	0.50	0.37	0.27	-0.09	0.20
84H	0.22	-0.03	0.11	0.05	0.40	0.27	0.39	0.49	0.59	0.49	0.43	-0.07	0.28
96H	0.10	-0.04	0.05	0.05	0.51	0.27	0.37	0.52	0.60	0.48	0.42	-0.07	0.27
108H	0.11	0.06	0.17	0.35	0.71	0.35	0.36	0.50	0.69	0.67	0.58	-0.08	0.37
120H	0.07	0.03	0.12	0.31	0.75	0.32	0.31	0.53	0.63	0.64	0.56	-0.07	0.35
132H	0.19	0.22	0.23	0.50	0.95	0.45	0.26	0.61	0.70	0.86	0.80	-0.02	0.48
144H	0.14	0.22	0.13	0.35	0.94	0.44	0.23	0.67	0.60	0.86	0.86	0.01	0.45
156H	0.26	0.41	0.26	0.52	1.12	0.58	0.19	0.79	0.70	1.04	1.14	0.08	0.59
168H	0.24	0.22	0.18	0.29	1.11	0.58	0.25	0.90	0.64	1.12	1.10	0.23	0.57
180H	0.32	0.21	0.33	0.43	1.27	0.76	0.20	1.08	0.76	1.32	1.33	0.39	0.70
192H	0.21	-0.01	0.26	0.40	1.18	0.75	0.38	1.18	0.69	1.26	1.17	0.41	0.66
204H	0.23	0.21	0.53	0.52	1.35	0.93	0.38	1.33	0.79	1.49	1.61	0.51	0.82
216H	-0.12	-0.03	0.53	0.52	1.37	0.95	0.56	1.33	0.79	1.51	1.46	0.35	0.77
228H	-0.28	0.11	0.90	0.76	1.56	1.09	0.56	1.42	0.96	1.98	1.93	0.42	0.95
240H	-0.45	-0.17	0.84	0.84	1.43	1.08	0.75	1.38	0.97	2.01	1.72	0.30	0.89

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.21	1.33	1.19	1.21	1.21	1.11	1.14	1.08	1.10	1.09	1.17	1.18	1.17
24H	1.42	1.54	1.46	1.50	1.46	1.33	1.37	1.27	1.27	1.29	1.35	1.42	1.39
36H	1.58	1.61	1.62	1.59	1.62	1.40	1.45	1.28	1.43	1.43	1.45	1.67	1.51
48H	1.90	1.94	1.97	1.97	1.89	1.64	1.72	1.53	1.59	1.65	1.66	1.86	1.78
60H	2.06	2.07	2.12	2.09	2.07	1.71	1.75	1.58	1.73	1.85	1.76	2.03	1.90
72H	2.36	2.34	2.45	2.46	2.36	2.00	1.98	1.82	1.92	2.09	2.09	2.29	2.18
84H	2.44	2.43	2.58	2.48	2.41	2.06	2.00	1.86	2.00	2.22	2.20	2.44	2.26
96H	2.84	2.70	2.92	2.98	2.70	2.27	2.22	2.15	2.28	2.57	2.56	2.77	2.58
108H	2.88	2.76	3.02	3.04	2.71	2.27	2.23	2.10	2.37	2.57	2.62	2.80	2.61
120H	3.29	2.96	3.45	3.48	3.01	2.48	2.49	2.36	2.60	2.92	2.99	3.18	2.93
132H	3.33	2.94	3.53	3.52	2.99	2.45	2.41	2.25	2.55	2.83	3.02	3.21	2.92
144H	3.57	3.32	3.89	3.85	3.30	2.70	2.66	2.51	2.90	3.17	3.56	3.60	3.25
156H	3.50	3.40	3.85	3.75	3.29	2.75	2.57	2.34	2.85	3.16	3.57	3.63	3.22
168H	3.56	3.94	4.22	4.19	3.66	3.01	2.80	2.59	3.13	3.61	4.00	3.96	3.56
180H	3.55	4.11	4.20	4.23	3.52	3.02	2.68	2.56	3.06	3.59	4.08	4.00	3.55
192H	3.88	4.49	4.62	4.64	3.79	3.20	2.94	2.94	3.46	3.87	4.53	4.47	3.90
204H	3.96	4.44	4.68	4.63	3.64	3.17	2.76	2.84	3.33	3.77	4.54	4.47	3.85
216H	4.21	4.79	5.12	4.87	3.99	3.36	2.98	3.24	3.68	4.21	4.71	4.82	4.17
228H	4.22	4.78	4.94	4.80	3.86	3.35	2.77	3.05	3.65	4.27	4.54	4.85	4.09
240H	4.62	5.18	5.29	4.89	4.27	3.45	2.97	3.32	3.94	4.75	4.87	5.21	4.40

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.82	0.79	0.85	0.83	0.74	0.69	0.59	0.61	0.68	0.78	0.79	0.80	0.75
24H	0.90	0.87	0.90	0.88	0.82	0.75	0.65	0.69	0.80	0.86	0.86	0.86	0.82
36H	0.90	0.88	0.91	0.91	0.83	0.78	0.70	0.74	0.81	0.87	0.88	0.87	0.84
48H	0.88	0.88	0.91	0.90	0.85	0.79	0.71	0.77	0.83	0.87	0.90	0.88	0.85
60H	0.87	0.88	0.89	0.89	0.81	0.78	0.71	0.76	0.81	0.84	0.89	0.87	0.83
72H	0.84	0.87	0.88	0.87	0.81	0.78	0.71	0.77	0.81	0.84	0.88	0.88	0.83
84H	0.83	0.86	0.86	0.87	0.78	0.75	0.70	0.75	0.78	0.81	0.85	0.87	0.81
96H	0.80	0.84	0.83	0.83	0.78	0.77	0.69	0.74	0.78	0.79	0.82	0.86	0.79
108H	0.79	0.82	0.80	0.82	0.77	0.74	0.67	0.74	0.74	0.76	0.78	0.85	0.77
120H	0.74	0.81	0.77	0.78	0.77	0.75	0.66	0.73	0.75	0.72	0.78	0.83	0.76
132H	0.72	0.80	0.74	0.75	0.74	0.72	0.64	0.73	0.73	0.71	0.75	0.82	0.74
144H	0.71	0.78	0.71	0.73	0.74	0.73	0.65	0.72	0.72	0.71	0.72	0.79	0.73
156H	0.71	0.77	0.69	0.73	0.70	0.69	0.64	0.72	0.70	0.67	0.70	0.77	0.71
168H	0.74	0.72	0.66	0.70	0.69	0.70	0.64	0.71	0.68	0.67	0.67	0.75	0.69
180H	0.74	0.67	0.65	0.67	0.67	0.65	0.64	0.68	0.65	0.63	0.61	0.73	0.67
192H	0.72	0.65	0.63	0.65	0.67	0.67	0.64	0.64	0.62	0.63	0.59	0.69	0.65
204H	0.70	0.63	0.63	0.63	0.65	0.63	0.65	0.62	0.64	0.62	0.55	0.66	0.63
216H	0.67	0.59	0.60	0.63	0.64	0.66	0.66	0.58	0.59	0.60	0.57	0.63	0.62
228H	0.67	0.57	0.62	0.60	0.63	0.59	0.67	0.58	0.60	0.55	0.56	0.59	0.60
240H	0.64	0.54	0.60	0.62	0.60	0.65	0.67	0.57	0.57	0.53	0.57	0.57	0.59

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.58	-0.51	-0.51	-0.49	-0.66	-0.84	-0.58	-0.62	-0.50	-0.43	-0.58	-0.63	-0.58
24H	-0.19	0.05	0.00	-0.25	-0.44	-0.80	-0.75	-0.89	-0.48	-0.64	-0.40	-0.32	-0.43
36H	-0.47	-0.32	-0.35	-0.50	-1.03	-1.34	-1.11	-1.02	-0.74	-0.63	-0.61	-0.58	-0.73
48H	-0.45	0.04	-0.12	-0.39	-0.74	-1.17	-1.19	-1.04	-0.71	-0.85	-0.63	-0.49	-0.65
60H	-0.79	-0.64	-0.45	-0.74	-1.50	-1.77	-1.54	-1.06	-0.74	-0.95	-0.71	-0.89	-0.98
72H	-0.50	0.24	0.19	-0.34	-0.87	-1.39	-1.43	-1.02	0.63	-0.89	-0.59	-0.46	0.64
84H	-0.88	-0.59	-0.56	-1.02	-1.80	-1.96	-1.80	-1.03	-0.71	-1.22	-1.06	-0.93	-1.13
96H	-0.42	0.11	0.03	-0.79	-1.15	-1.52	-1.63	-1.13	0.63	-1.22	-0.89	-0.47	0.81
108H	-0.62	-0.55	-0.41	-1.50	-1.75	-2.09	-1.91	-1.14	-0.87	-1.53	1.21	-0.78	1.20
120H	-0.09	0.04	0.24	-1.03	-1.38	-1.68	-1.65	-1.30	-0.66	-1.52	-1.05	-0.26	-0.86
132H	-0.79	-0.84	-0.25	-1.62	-2.05	-2.19	-1.89	-1.55	-0.81	-1.48	-1.30	0.77	1.30
144H	-0.16	-0.03	0.03	-1.25	-1.44	-1.71	-1.69	-1.38	-0.73	-1.35	-1.17	-0.42	-0.94
156H	-0.75	-0.77	-0.84	-1.89	-2.21	-2.25	-1.95	-1.53	-0.98	-1.51	-1.41	-0.89	1.42
168H	-0.21	0.20	-0.46	-1.30	-1.80	-1.70	-1.65	-1.33	-0.73	-1.55	-1.16	-0.22	-0.99
180H	-0.89	-0.41	-1.21	-2.15	-2.36	-1.96	-1.92	-1.42	-0.89	-1.87	1.64	-0.81	-1.46
192H	0.01	0.48	-0.64	-1.79	-2.07	-1.34	-1.55	-1.28	-0.66	-1.83	-1.70	0.10	-1.04
204H	-0.17	-0.01	-1.35	-2.91	-2.85	-1.59	-1.99	-1.53	0.65	1.98	1.97	0.56	1.46
216H	0.47	0.42	-0.75	-2.50	-2.10	-1.26	-1.71	-1.45	-0.28	-2.11	-1.99	-0.10	1.11
228H	0.02	0.05	-1.31	-3.38	-2.68	-1.51	-2.30	-1.70	-0.58	-2.69	-2.00	-0.33	-1.53
240H	0.38	0.76	-0.85	-2.87	-1.99	-1.16	-1.96	-1.37	-0.36	-2.47	-1.88	0.32	-1.12

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	5.53	5.81	5.68	5.84	5.41	5.16	4.73	4.55	4.43	4.81	5.21	5.78	5.25
24H	6.46	6.53	6.15	6.61	6.46	6.04	5.54	5.24	5.13	5.60	5.79	6.24	5.98
36H	7.01	7.20	7.17	7.39	7.03	6.46	6.09	5.52	5.49	6.14	6.42	7.34	6.61
48H	7.94	7.99	7.88	8.22	8.11	7.37	6.91	6.33	6.13	6.83	6.82	7.78	7.36
60H	8.43	8.56	9.13	8.70	8.58	7.82	7.45	6.53	6.51	7.40	7.48	8.52	7.93
72H	9.60	9.42	9.60	9.80	9.25	8.49	8.19	7.45	7.27	8.03	8.31	9.02	8.70
84H	9.83	9.93	10.54	10.17	9.76	8.94	8.46	7.47	7.64	8.76	8.96	9.78	9.19
96H	10.81	10.60	11.05	11.28	10.19	9.54	9.25	8.14	8.62	9.26	9.55	10.54	9.90
108H	11.24	10.82	11.95	11.85	10.33	9.62	9.34	8.08	8.82	9.84	9.75	10.79	10.20
120H	12.18	11.31	12.64	12.70	10.86	10.15	9.84	8.83	9.39	10.30	10.32	11.30	10.82
132H	12.33	11.56	12.98	13.05	10.84	10.48	9.82	8.62	9.47	10.83	10.87	11.67	11.04
144H	12.96	12.50	12.81	13.53	11.51	10.74	10.53	9.34	10.34	11.19	11.67	12.22	11.61
156H	13.03	13.01	13.03	13.85	11.47	10.93	10.34	9.23	10.07	11.47	12.28	12.57	11.77
168H	13.45	13.60	13.80	14.46	12.22	11.33	10.97	10.04	11.08	12.10	12.94	13.27	12.44
180H	13.07	13.92	14.25	14.81	12.34	11.61	10.86	10.00	11.07	12.05	13.09	13.86	12.58
192H	13.75	14.91	14.69	15.31	13.28	12.07	11.52	10.79	11.83	12.89	13.81	14.32	13.26
204H	13.96	15.02	15.17	15.66	13.26	12.17	11.13	10.40	11.59	13.13	14.31	14.24	13.34
216H	14.59	15.34	15.86	15.79	13.69	12.28	11.53	11.07	12.63	13.84	14.78	15.15	13.88
228H	14.28	15.60	15.83	16.02	13.48	12.24	11.30	10.67	12.44	13.88	14.56	15.12	13.79
240H	15.22	15.99	16.05	15.49	13.90	12.59	11.68	11.43	13.05	14.28	14.91	15.83	14.20

다) 250 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	11.03	17.78	13.03	6.66	2.54	3.14	6.24	5.48	5.43	5.28	5.20	6.79	7.38
24H	5.34	9.37	3.51	-0.50	-2.59	0.17	1.95	-0.93	1.82	5.22	5.11	4.38	2.74
36H	9.94	14.59	9.84	2.64	-1.93	2.13	2.26	0.64	3.68	8.27	9.49	7.79	5.78
48H	5.14	7.80	4.14	0.12	-0.52	3.60	3.53	1.56	4.74	8.10	8.48	5.44	4.34
60H	13.20	15.54	11.35	3.49	2.20	5.12	5.35	4.99	7.26	10.29	12.35	11.07	8.52
72H	11.96	11.50	9.25	6.58	11.66	12.88	12.21	11.66	14.01	14.01	13.63	10.78	11.68
84H	12.86	15.21	10.21	7.63	9.10	8.23	6.30	6.61	9.05	11.43	12.94	12.00	10.13
96H	6.68	8.24	7.80	10.98	16.45	13.11	10.05	11.14	15.08	16.47	14.33	9.52	11.65
108H	8.17	15.78	14.85	17.35	17.18	12.94	5.96	7.11	13.46	21.81	19.06	13.04	13.89
120H	0.86	9.70	11.63	16.84	21.09	12.78	3.16	6.99	15.30	26.34	21.87	10.94	13.13
132H	1.70	18.08	16.66	22.09	24.56	16.56	0.19	7.32	13.88	32.98	28.40	16.33	16.56
144H	-1.72	13.71	12.55	18.82	24.77	16.57	-1.91	8.73	15.52	37.26	33.50	17.83	16.30
156H	1.48	20.58	18.07	23.42	27.46	22.32	-2.27	11.60	15.04	42.11	38.74	24.12	20.22
168H	1.91	13.98	17.64	22.18	28.67	23.73	0.41	14.90	18.63	48.65	44.81	28.43	22.00
180H	1.42	17.73	23.63	24.14	30.49	28.71	1.42	20.71	17.52	53.94	51.56	35.45	25.56
192H	1.36	10.24	21.11	23.87	33.90	29.06	7.93	25.65	21.20	55.73	56.74	35.89	26.66
204H	0.59	16.56	28.42	28.56	37.80	31.72	10.73	28.63	19.77	63.06	67.74	43.29	31.41
216H	7.69	4.22	23.59	28.24	36.73	30.18	15.27	28.40	23.75	63.90	69.38	37.89	29.49
228H	-9.64	12.76	31.88	36.24	38.70	30.33	14.04	28.81	24.12	80.14	76.08	42.23	33.81
240H	-12.88	2.86	27.49	37.29	37.67	29.91	19.13	29.96	29.58	82.69	75.65	34.14	32.79

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	26.61	29.80	27.87	25.84	24.14	23.54	22.88	22.69	22.90	23.14	23.39	23.61	24.70
24H	28.90	29.77	30.11	30.36	29.04	26.23	26.53	25.86	26.73	28.04	27.82	29.34	28.23
36H	33.44	35.45	38.28	36.99	36.72	31.15	29.74	27.67	28.12	31.35	31.96	34.77	32.97
48H	38.86	40.24	43.56	43.86	42.80	37.20	37.06	33.86	34.09	38.28	38.04	40.70	39.05
60H	43.53	45.24	51.38	48.47	48.61	42.84	40.28	36.47	35.81	43.01	41.55	44.14	43.44
72H	52.75	50.60	57.57	57.34	57.97	50.97	49.43	46.85	46.90	52.16	50.46	52.71	52.14
84H	54.41	51.50	60.71	59.89	58.37	54.77	51.03	47.20	46.35	53.24	51.79	54.75	53.67
96H	65.92	58.62	70.19	72.17	68.07	60.92	60.21	57.54	57.76	65.22	62.23	67.51	63.86
108H	65.40	59.17	75.83	76.13	66.70	62.79	62.07	56.46	60.75	65.85	64.90	67.85	65.33
120H	76.40	68.75	85.95	88.44	76.72	67.69	69.74	65.93	70.34	78.40	75.77	79.84	75.33
132H	75.72	66.69	90.69	93.10	78.28	71.42	70.95	62.26	69.37	79.73	79.33	78.51	76.34
144H	84.70	82.97	96.95	102.99	88.39	78.77	78.41	71.79	80.71	91.74	92.65	89.12	86.60
156H	81.53	84.11	97.59	104.66	87.29	84.42	80.11	66.86	78.89	91.13	95.92	92.78	87.11
168H	88.51	102.96	105.05	112.98	99.19	92.63	89.39	76.32	90.21	109.01	109.71	103.67	98.30
180H	85.60	104.47	107.36	116.54	96.85	96.78	87.49	75.63	86.82	108.89	116.06	108.57	99.26
192H	95.65	121.03	119.37	126.80	108.84	101.87	95.40	87.82	100.57	119.67	129.24	119.19	110.45
204H	97.78	118.58	125.33	130.63	105.09	103.31	90.56	84.78	98.31	119.31	132.63	120.10	110.53
216H	110.10	131.31	135.20	136.97	114.35	106.65	96.39	98.17	111.89	134.54	138.70	127.48	120.15
228H	106.62	130.70	132.29	137.03	112.49	108.07	90.34	89.98	110.06	137.92	137.82	128.62	118.50
240H	120.28	142.75	138.35	139.83	124.24	112.46	97.41	103.26	121.87	154.47	146.22	137.00	128.18

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.87	0.83	0.88	0.88	0.84	0.79	0.74	0.75	0.78	0.85	0.84	0.84	0.82
24H	0.93	0.91	0.93	0.93	0.92	0.88	0.82	0.85	0.89	0.92	0.92	0.89	0.90
36H	0.94	0.92	0.93	0.93	0.91	0.89	0.84	0.88	0.90	0.92	0.92	0.90	0.91
48H	0.93	0.93	0.93	0.93	0.92	0.90	0.85	0.90	0.91	0.93	0.93	0.90	0.91
60H	0.92	0.93	0.91	0.92	0.89	0.88	0.84	0.88	0.91	0.91	0.92	0.91	0.90
72H	0.90	0.93	0.91	0.90	0.87	0.88	0.82	0.87	0.89	0.90	0.91	0.91	0.89
84H	0.89	0.92	0.88	0.89	0.84	0.86	0.80	0.86	0.89	0.89	0.90	0.91	0.88
96H	0.86	0.91	0.85	0.87	0.84	0.86	0.79	0.85	0.87	0.85	0.88	0.89	0.86
108H	0.86	0.89	0.81	0.85	0.84	0.84	0.76	0.85	0.84	0.83	0.86	0.87	0.84
120H	0.81	0.87	0.80	0.83	0.84	0.85	0.75	0.83	0.83	0.79	0.84	0.85	0.82
132H	0.79	0.88	0.74	0.80	0.81	0.81	0.72	0.83	0.82	0.77	0.79	0.84	0.80
144H	0.75	0.84	0.75	0.78	0.80	0.81	0.71	0.82	0.79	0.75	0.78	0.82	0.78
156H	0.77	0.82	0.70	0.75	0.78	0.77	0.67	0.82	0.77	0.73	0.71	0.79	0.76
168H	0.76	0.75	0.69	0.75	0.75	0.76	0.67	0.80	0.73	0.68	0.69	0.77	0.73
180H	0.77	0.70	0.67	0.71	0.74	0.72	0.66	0.78	0.71	0.66	0.59	0.72	0.70
192H	0.75	0.68	0.65	0.72	0.71	0.74	0.66	0.74	0.66	0.64	0.60	0.69	0.69
204H	0.73	0.65	0.63	0.67	0.70	0.71	0.65	0.73	0.68	0.62	0.54	0.65	0.66
216H	0.69	0.63	0.62	0.69	0.68	0.73	0.67	0.69	0.63	0.58	0.58	0.63	0.65
228H	0.70	0.61	0.62	0.64	0.66	0.69	0.66	0.71	0.65	0.55	0.52	0.58	0.63
240H	0.67	0.57	0.62	0.68	0.64	0.72	0.67	0.67	0.59	0.52	0.55	0.57	0.62

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.52	0.31	0.79	0.38	0.18	0.37	-0.02	0.08	0.06	0.30	0.17	0.35	0.29
24H	0.29	0.07	0.50	0.02	-0.05	0.29	-0.22	-0.10	0.03	0.47	0.27	0.35	0.16
36H	0.47	0.30	0.64	0.02	-0.24	0.34	-0.24	-0.07	-0.07	0.27	0.12	0.45	0.17
48H	0.26	0.23	0.48	-0.21	-0.31	0.25	-0.36	-0.18	-0.07	0.39	0.25	0.51	0.10
60H	0.69	0.62	0.80	-0.22	-0.35	0.27	-0.25	-0.07	-0.01	0.26	0.20	0.87	0.23
72H	0.57	0.30	0.61	-0.36	-0.17	0.23	-0.34	-0.21	0.11	0.49	0.43	1.03	0.22
84H	0.81	0.45	0.78	-0.44	-0.11	0.26	-0.22	-0.12	0.10	0.27	0.28	1.25	0.28
96H	0.45	0.10	0.54	-0.47	0.05	0.24	-0.38	-0.21	0.23	0.59	0.60	1.29	0.25
108H	0.48	0.29	0.68	-0.48	0.07	0.35	-0.32	-0.08	0.22	0.50	0.51	1.51	0.31
120H	0.05	0.12	0.50	-0.49	0.20	0.34	-0.48	-0.15	0.31	0.80	0.84	1.58	0.30
132H	0.05	0.29	0.76	-0.43	0.24	0.45	-0.37	0.02	0.31	0.77	0.70	1.80	0.38
144H	-0.13	-0.07	0.59	-0.32	0.27	0.36	-0.49	-0.01	0.32	1.09	1.05	1.74	0.37
156H	0.04	0.10	0.85	-0.28	0.38	0.50	-0.37	0.24	0.38	1.18	0.97	1.85	0.49
168H	-0.05	0.03	0.70	-0.21	0.38	0.42	-0.41	0.21	0.52	1.39	1.36	1.72	0.51
180H	0.19	0.32	0.87	-0.33	0.51	0.63	-0.21	0.56	0.66	1.49	1.29	1.86	0.65
192H	0.11	0.30	0.77	-0.41	0.62	0.67	-0.19	0.62	0.88	1.87	1.54	1.88	0.72
204H	0.47	0.42	0.93	-0.51	0.75	0.91	-0.01	0.85	1.04	2.00	1.52	2.08	0.87
216H	0.54	0.13	0.65	-0.44	0.62	0.91	-0.08	0.77	1.22	2.14	1.68	2.04	0.85
228H	0.85	0.24	0.66	-0.48	0.78	1.14	-0.01	1.00	1.32	2.07	1.68	2.16	0.95
240H	0.70	0.17	0.39	-0.47	0.80	1.14	0.00	0.85	1.47	2.34	1.86	2.00	0.94

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.92	1.96	2.07	1.76	1.63	1.56	1.47	1.40	1.38	1.46	1.50	1.67	1.65
24H	2.15	2.25	2.12	1.92	1.88	1.74	1.61	1.56	1.61	1.71	1.73	1.83	1.84
36H	2.37	2.49	2.37	2.10	2.05	1.97	1.87	1.74	1.69	1.76	1.80	2.12	2.03
48H	2.63	2.65	2.44	2.34	2.29	2.14	2.01	1.90	1.95	1.98	2.11	2.28	2.23
60H	2.87	2.89	2.74	2.40	2.46	2.37	2.17	2.08	2.00	2.09	2.16	2.52	2.40
72H	3.11	2.95	2.87	2.72	2.64	2.58	2.36	2.25	2.25	2.43	2.58	2.75	2.62
84H	3.15	3.12	3.00	2.76	2.70	2.77	2.55	2.32	2.23	2.46	2.62	2.93	2.72
96H	3.40	3.29	3.14	3.10	2.99	2.87	2.69	2.53	2.50	2.80	2.88	3.18	2.95
108H	3.55	3.43	3.24	3.13	2.93	2.93	2.73	2.63	2.51	2.73	2.94	3.38	3.01
120H	3.74	3.57	3.47	3.30	3.21	3.08	2.82	2.84	2.70	3.10	3.25	3.64	3.23
132H	3.95	3.46	3.53	3.31	3.23	3.17	2.83	2.91	2.62	3.09	3.26	3.73	3.26
144H	4.10	3.72	3.64	3.59	3.53	3.38	2.97	3.06	2.75	3.43	3.62	3.89	3.47
156H	4.11	3.78	3.69	3.63	3.52	3.41	3.10	3.01	2.83	3.52	3.58	3.99	3.51
168H	4.38	4.02	3.84	3.80	3.72	3.62	3.26	3.08	3.05	3.82	3.85	4.16	3.72
180H	4.35	3.93	4.00	3.80	3.68	3.62	3.37	3.13	3.09	3.90	3.77	4.17	3.73
192H	4.53	4.15	4.23	3.91	4.06	3.79	3.45	3.30	3.34	4.33	4.07	4.39	3.96
204H	4.52	4.09	4.14	3.92	3.99	3.78	3.54	3.34	3.38	4.48	4.12	4.50	3.98
216H	4.71	4.29	4.34	4.06	4.13	3.94	3.60	3.39	3.70	4.79	4.35	4.72	4.17
228H	4.75	4.34	4.20	3.93	4.03	4.03	3.63	3.48	3.76	4.60	4.37	4.85	4.16
240H	4.99	4.57	4.40	4.12	4.28	4.18	3.68	3.61	4.06	4.75	4.65	4.97	4.36

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.75	0.75	0.69	0.67	0.67	0.62	0.62	0.62	0.58	0.66	0.70	0.67	0.67
24H	0.83	0.81	0.78	0.76	0.75	0.72	0.70	0.68	0.68	0.76	0.80	0.77	0.75
36H	0.82	0.83	0.79	0.77	0.76	0.70	0.73	0.69	0.71	0.76	0.83	0.74	0.76
48H	0.80	0.82	0.81	0.76	0.78	0.75	0.74	0.70	0.72	0.78	0.82	0.77	0.77
60H	0.77	0.81	0.78	0.75	0.75	0.70	0.74	0.69	0.73	0.76	0.82	0.74	0.75
72H	0.75	0.80	0.80	0.71	0.75	0.74	0.74	0.68	0.70	0.75	0.78	0.75	0.75
84H	0.73	0.77	0.78	0.69	0.73	0.69	0.70	0.69	0.72	0.72	0.78	0.73	0.73
96H	0.71	0.76	0.76	0.67	0.72	0.73	0.67	0.67	0.68	0.69	0.75	0.72	0.71
108H	0.68	0.73	0.71	0.66	0.70	0.71	0.65	0.67	0.68	0.69	0.75	0.69	0.69
120H	0.63	0.71	0.69	0.65	0.70	0.74	0.66	0.66	0.66	0.63	0.72	0.67	0.68
132H	0.54	0.72	0.68	0.59	0.68	0.71	0.66	0.66	0.70	0.60	0.72	0.63	0.66
144H	0.54	0.70	0.68	0.55	0.66	0.71	0.67	0.65	0.68	0.58	0.69	0.65	0.65
156H	0.55	0.70	0.64	0.50	0.66	0.68	0.66	0.66	0.68	0.52	0.67	0.63	0.63
168H	0.55	0.68	0.64	0.54	0.65	0.68	0.67	0.66	0.65	0.54	0.63	0.62	0.63
180H	0.56	0.67	0.57	0.50	0.64	0.67	0.65	0.63	0.66	0.48	0.62	0.63	0.61
192H	0.56	0.62	0.59	0.55	0.59	0.66	0.66	0.61	0.62	0.47	0.59	0.61	0.59
204H	0.58	0.58	0.58	0.51	0.59	0.64	0.64	0.61	0.63	0.41	0.57	0.60	0.58
216H	0.56	0.57	0.58	0.53	0.58	0.63	0.65	0.62	0.58	0.39	0.54	0.57	0.57
228H	0.56	0.55	0.58	0.52	0.57	0.59	0.64	0.60	0.59	0.39	0.52	0.55	0.56
240H	0.52	0.53	0.58	0.54	0.55	0.60	0.64	0.59	0.53	0.40	0.47	0.53	0.54

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.80	-0.89	-0.59	-0.80	-0.55	-0.48	-0.87	-0.76	-0.58	-0.64	-0.83	-1.29	-0.76
24H	-0.64	-0.85	-0.86	-0.87	-0.45	-0.51	-0.67	-0.72	-0.45	-0.40	-1.16	-1.27	-0.74
36H	-1.22	-1.23	-0.62	-0.72	-0.48	-0.49	-0.79	-0.67	-0.43	-0.66	-1.32	-1.41	-0.84
48H	-1.27	-1.66	-1.06	-0.89	-0.43	-0.45	-0.63	-0.57	-0.52	-0.85	-1.59	-1.35	-0.94
60H	-1.49	-1.64	-0.78	-0.80	-0.73	-0.57	-0.60	-0.22	-0.44	-1.09	-1.55	-1.34	-0.94
72H	-1.28	-1.56	0.98	-0.66	-0.39	-0.46	-0.27	-0.01	0.37	-1.03	-1.72	-1.17	-0.83
84H	-1.22	-1.51	-0.83	-1.05	-1.14	-0.81	-0.39	0.06	-0.27	-1.43	-1.93	-0.77	-0.94
96H	-0.91	-1.58	-1.04	-1.00	0.89	-0.65	-0.25	0.14	-0.34	-1.40	-2.15	-0.88	-0.91
108H	-0.82	-1.41	-0.78	-1.37	-1.50	-0.82	-0.01	0.40	-0.23	-1.82	-1.98	-0.43	-0.90
120H	-0.55	-1.61	-0.58	-1.57	-0.81	-0.74	0.06	0.42	-0.30	-1.55	-1.95	-0.52	-0.81
132H	-0.94	-1.67	-0.56	-2.11	-1.64	-0.83	0.48	0.46	0.25	-1.80	-1.91	-0.19	0.91
144H	-0.68	-1.45	-1.00	-2.05	-1.15	-0.55	0.73	0.22	-0.20	-1.52	-1.85	-0.64	-0.85
156H	-1.14	-1.49	1.25	-2.36	-2.35	-0.98	0.82	0.42	0.10	-2.07	-1.78	-0.42	-1.04
168H	-0.53	-0.97	-1.26	-2.30	-1.72	-0.73	1.01	0.30	0.19	-1.73	-1.79	-0.40	-0.83
180H	-1.00	-1.55	-1.52	-2.70	-2.67	-0.52	1.16	0.39	0.62	-2.19	-2.23	0.23	-1.00
192H	-0.29	-0.89	-1.76	-2.83	-1.92	-0.12	1.06	0.25	0.68	-1.71	-1.98	0.30	-0.77
204H	0.00	-1.49	-1.79	-3.76	-3.17	-0.34	0.66	0.18	1.13	-2.24	-2.01	0.77	-1.01
216H	0.28	-0.71	-2.00	-3.63	-2.06	0.08	0.40	0.16	1.08	-2.42	2.07	0.55	-0.86
228H	0.52	-0.78	-2.26	-4.85	-3.04	-0.63	-0.31	0.32	1.26	-3.39	-1.95	1.16	-1.16
240H	0.45	-0.30	-2.29	-4.57	-1.92	-0.04	-0.15	0.48	0.87	-2.92	-1.82	0.89	-0.94

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	7.21	7.42	7.76	7.83	7.85	6.96	6.55	6.10	5.71	6.25	6.29	7.08	6.92
24H	7.75	8.03	8.76	9.23	9.65	8.55	8.37	7.75	7.12	7.66	7.22	8.21	8.19
36H	8.56	8.91	9.67	10.44	11.06	10.01	9.33	8.43	7.89	8.35	7.70	9.19	9.13
48H	9.56	10.01	10.89	11.50	12.55	11.68	10.99	10.21	9.31	9.65	8.56	10.17	10.42
60H	10.43	10.86	12.23	12.66	13.89	13.01	12.10	10.76	10.17	10.54	9.04	10.83	11.38
72H	11.49	11.87	12.91	13.64	14.76	14.23	13.80	12.60	11.68	11.97	10.50	11.61	12.59
84H	12.08	12.50	13.78	15.10	15.80	15.56	14.34	12.63	12.52	12.66	11.08	12.51	13.38
96H	13.60	13.07	15.12	16.07	16.31	16.16	15.84	14.24	14.03	14.09	12.34	13.59	14.54
108H	14.40	13.37	16.17	17.55	16.41	16.55	16.28	13.80	14.44	14.74	12.15	13.88	14.98
120H	15.60	14.24	17.31	18.66	17.18	17.51	17.34	15.52	15.63	16.10	13.64	14.90	16.14
132H	16.22	14.54	17.67	19.98	17.66	18.02	17.77	15.20	15.29	16.40	14.56	15.32	16.55
144H	16.78	16.13	18.34	20.37	18.56	18.79	18.94	16.37	16.89	17.58	16.54	16.29	17.63
156H	17.09	16.83	18.41	21.22	19.29	19.23	19.17	15.99	16.60	17.46	17.10	16.88	17.94
168H	17.67	18.28	19.86	21.78	20.37	19.85	20.00	17.69	18.28	18.97	18.40	17.76	19.08
180H	17.35	18.92	20.07	22.66	20.94	20.56	20.15	17.45	18.16	19.04	18.86	18.94	19.43
192H	18.18	20.15	21.89	22.88	22.26	21.52	21.22	19.14	19.72	20.41	20.17	19.53	20.59
204H	19.17	20.85	22.81	24.46	22.53	21.66	20.61	18.35	19.57	20.34	21.05	19.49	20.91
216H	20.41	21.66	24.43	25.10	23.15	22.43	20.82	19.79	21.23	21.59	21.93	20.20	21.90
228H	21.14	22.40	24.52	25.84	23.53	22.14	20.18	18.94	21.14	21.47	21.76	21.00	22.01
240H	21.39	23.57	25.13	24.77	23.72	23.19	20.51	20.11	22.53	22.77	21.82	22.08	22.63

나. 유럽

가) 850 hPa - 1) 고도 - ① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	1.38	0.72	1.04	-0.80	-2.89	-5.22	-2.11	-1.67	-0.07	0.88	0.89	2.27	0.47
24H	-2.91	-3.10	-1.64	-2.10	-1.88	-2.53	0.18	-1.42	-1.02	0.53	1.06	2.31	-1.04
36H	2.17	4.10	1.90	-3.09	-6.89	-6.30	-4.28	-4.57	-0.17	4.19	8.32	9.31	0.39
48H	-2.85	0.29	0.52	-2.94	-5.80	-1.76	-2.78	-5.79	-2.81	3.78	8.34	9.90	0.16
60H	4.39	8.73	8.60	-1.62	-7.93	-3.38	-6.37	-10.10	-2.23	7.87	17.09	17.78	2.74
72H	1.22	3.08	6.86	-3.25	-8.85	-2.96	-7.22	-13.94	-7.18	5.31	16.92	17.07	0.59
84H	6.85	8.34	12.88	-1.92	-8.89	0.85	-3.18	-12.34	-4.11	9.23	22.38	21.49	4.30
96H	6.54	7.10	11.53	-3.40	-10.31	1.87	-2.26	-14.24	-7.07	7.47	17.97	21.12	3.03
108H	10.25	13.12	10.80	-5.22	-12.21	2.69	2.04	10.92	5.51	9.88	19.81	21.63	4.70
120H	8.62	14.05	5.40	-7.35	-12.21	1.66	3.76	-10.66	-6.28	5.84	18.15	19.62	3.38
132H	14.06	20.99	6.93	-10.91	-13.49	2.78	6.88	7.38	-2.74	5.78	19.84	24.37	5.59
144H	10.24	13.90	6.85	-12.65	-12.97	2.56	6.72	-6.84	-2.38	3.75	14.61	23.56	3.95
156H	12.30	19.31	12.21	-12.32	-15.79	4.00	6.98	-6.56	3.06	6.00	14.05	26.42	5.81
168H	4.56	12.75	11.29	-10.98	-13.19	3.32	7.58	4.50	3.24	4.18	11.50	22.49	4.35
180H	3.11	20.16	13.81	-9.63	-11.36	3.86	6.59	6.23	5.05	4.85	12.40	26.50	5.76
192H	-6.30	17.62	9.89	-5.87	9.23	5.34	9.71	4.28	3.33	5.93	10.81	25.27	5.19
204H	-4.94	29.70	11.68	-8.24	11.84	4.53	10.51	7.69	1.26	12.31	10.78	28.85	6.41
216H	-8.50	22.91	4.38	-5.90	9.83	6.95	13.90	-5.26	1.95	13.43	6.60	29.35	5.83
228H	-1.65	31.91	-0.39	-7.05	-8.37	8.09	15.85	-6.70	2.09	16.27	7.53	31.52	7.43
240H	-4.45	24.56	-9.18	-3.03	-8.97	5.40	12.42	-8.25	-0.07	16.06	7.13	24.79	4.70

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	10.21	11.58	10.50	8.89	9.24	9.91	7.71	7.90	7.60	8.21	9.82	9.75	9.28
24H	15.07	18.22	16.27	12.39	12.29	11.76	10.50	10.14	10.19	12.66	15.44	14.12	13.25
36H	18.88	21.06	19.81	14.51	16.74	16.08	13.34	13.08	12.40	17.00	20.45	19.19	16.88
48H	23.21	26.50	25.34	18.23	19.94	17.76	16.27	16.51	16.39	20.41	24.10	23.14	20.65
60H	28.89	34.13	30.95	21.19	23.53	21.05	19.33	20.66	20.41	24.22	29.91	29.84	25.34
72H	33.28	38.19	36.12	24.33	27.36	24.81	23.52	25.11	24.86	28.55	33.95	34.35	29.54
84H	37.98	48.54	42.60	28.08	32.72	28.70	25.45	26.44	27.74	33.73	42.25	40.94	34.60
96H	44.15	56.64	48.87	33.39	38.74	33.68	29.57	29.92	31.55	39.58	48.32	42.50	39.74
108H	50.28	64.75	55.21	41.81	44.61	38.35	34.24	31.12	34.15	44.69	56.18	46.18	45.13
120H	54.99	72.20	64.53	50.42	49.73	45.32	40.24	33.52	37.71	49.97	58.84	48.99	50.54
132H	64.10	84.00	72.84	62.44	54.94	51.45	46.10	35.71	41.60	55.71	66.33	56.30	57.63
144H	70.07	91.06	78.61	70.42	56.65	55.01	48.69	38.30	47.75	63.28	67.89	60.62	62.36
156H	76.46	98.54	81.57	74.68	64.96	59.22	50.59	41.66	52.51	69.91	71.68	68.22	67.50
168H	78.64	99.45	83.16	72.67	70.92	63.16	51.85	44.10	55.66	72.33	69.94	77.37	69.94
180H	84.98	103.57	90.19	74.17	76.89	63.89	54.16	46.32	57.83	79.68	71.43	88.53	74.30
192H	92.92	98.85	94.35	74.08	78.77	64.73	55.85	48.11	58.93	80.88	75.31	92.46	76.27
204H	99.19	100.41	96.25	79.38	81.72	64.41	57.79	50.58	61.88	86.62	85.98	97.88	80.17
216H	98.74	107.74	96.04	81.34	80.11	66.26	59.06	52.62	64.63	88.19	88.11	98.57	81.78
228H	98.78	117.41	94.50	83.54	81.41	68.01	59.37	52.47	69.44	93.04	91.90	102.27	84.35
240H	97.21	121.60	92.10	86.42	79.84	70.23	58.10	52.77	74.91	94.80	93.68	102.38	85.34

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.92	0.95	0.95	0.92	0.93	0.90	0.91	0.89	0.90	0.90	0.96	0.91	0.92
24H	0.94	0.96	0.96	0.95	0.95	0.93	0.93	0.93	0.94	0.92	0.96	0.93	0.94
36H	0.93	0.95	0.96	0.96	0.95	0.92	0.94	0.92	0.95	0.92	0.95	0.92	0.94
48H	0.91	0.93	0.95	0.95	0.94	0.92	0.93	0.91	0.93	0.91	0.93	0.91	0.93
60H	0.89	0.92	0.93	0.95	0.94	0.91	0.91	0.87	0.93	0.90	0.91	0.89	0.91
72H	0.87	0.91	0.90	0.94	0.93	0.90	0.88	0.84	0.91	0.88	0.86	0.87	0.89
84H	0.83	0.83	0.87	0.92	0.90	0.90	0.88	0.82	0.89	0.86	0.83	0.83	0.86
96H	0.79	0.76	0.83	0.90	0.88	0.87	0.84	0.77	0.87	0.81	0.80	0.82	0.83
108H	0.74	0.71	0.82	0.85	0.86	0.84	0.81	0.78	0.85	0.76	0.78	0.82	0.80
120H	0.70	0.69	0.77	0.79	0.80	0.77	0.76	0.77	0.82	0.74	0.75	0.80	0.76
132H	0.66	0.64	0.74	0.73	0.78	0.73	0.74	0.76	0.78	0.72	0.69	0.75	0.73
144H	0.63	0.59	0.70	0.70	0.74	0.68	0.73	0.74	0.70	0.65	0.69	0.74	0.69
156H	0.60	0.63	0.67	0.69	0.70	0.64	0.72	0.70	0.61	0.62	0.66	0.68	0.66
168H	0.63	0.64	0.65	0.72	0.66	0.59	0.69	0.66	0.56	0.61	0.68	0.62	0.64
180H	0.61	0.62	0.63	0.74	0.63	0.59	0.69	0.64	0.52	0.58	0.69	0.53	0.62
192H	0.53	0.61	0.61	0.72	0.59	0.59	0.64	0.61	0.47	0.56	0.65	0.50	0.59
204H	0.49	0.64	0.61	0.70	0.57	0.60	0.65	0.60	0.46	0.48	0.58	0.46	0.57
216H	0.49	0.57	0.59	0.67	0.56	0.58	0.64	0.57	0.44	0.41	0.56	0.44	0.54
228H	0.53	0.53	0.59	0.67	0.57	0.56	0.66	0.56	0.40	0.38	0.58	0.42	0.54
240H	0.55	0.44	0.59	0.61	0.57	0.53	0.66	0.58	0.36	0.37	0.56	0.44	0.52

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.18	0.12	0.08	0.09	0.10	0.11	0.02	-0.13	-0.06	0.27	0.14	0.13	0.09
24H	0.08	0.10	0.06	0.24	0.25	0.28	0.29	0.08	0.06	0.24	0.12	0.06	0.16
36H	0.09	-0.02	-0.07	0.11	0.13	0.17	0.04	-0.22	-0.09	0.35	0.22	0.13	0.07
48H	-0.05	-0.08	-0.14	0.26	0.25	0.25	0.21	-0.05	0.04	0.28	0.27	0.07	0.11
60H	-0.09	-0.23	-0.23	0.05	0.05	0.02	-0.15	-0.40	-0.12	0.39	0.44	0.18	-0.01
72H	-0.14	-0.26	-0.24	0.16	0.09	0.04	-0.01	-0.22	-0.01	0.26	0.33	0.04	0.00
84H	-0.07	-0.65	-0.34	0.00	-0.09	-0.21	-0.22	-0.42	-0.09	0.22	0.50	0.09	-0.11
96H	-0.11	-0.76	-0.45	0.14	-0.02	-0.12	0.03	-0.16	0.06	0.15	0.47	-0.06	-0.07
108H	-0.05	-0.91	-0.80	-0.04	-0.27	-0.40	-0.01	-0.34	-0.01	0.25	0.48	-0.19	-0.19
120H	-0.17	-0.86	-1.09	0.11	-0.33	-0.25	0.30	-0.08	0.20	0.26	0.38	-0.40	-0.16
132H	-0.19	-0.62	-1.71	-0.07	-0.58	-0.51	0.17	-0.34	0.20	0.44	0.50	-0.49	-0.27
144H	-0.14	-0.76	-1.94	0.11	-0.47	-0.33	0.41	-0.05	0.48	0.46	0.56	-0.56	-0.19
156H	-0.02	-1.01	-2.37	0.01	-0.79	-0.62	0.33	-0.26	0.57	0.53	0.77	-0.46	-0.28
168H	-0.21	-1.14	-2.34	0.24	-0.83	-0.44	0.32	0.06	0.80	0.43	0.67	-0.27	-0.23
180H	-0.33	-1.46	-2.26	0.21	-1.34	-0.67	0.07	-0.19	0.94	0.42	0.87	-0.22	-0.33
192H	-0.82	-1.59	-1.97	0.34	-1.10	-0.52	0.24	0.06	1.09	0.20	0.76	-0.36	-0.31
204H	-1.38	-1.50	-2.17	0.06	-1.58	-0.95	0.17	0.22	1.10	0.30	0.97	-0.39	-0.47
216H	-1.72	-1.45	-2.03	0.11	-1.41	-0.75	0.45	-0.10	1.14	0.43	0.91	-0.46	-0.41
228H	-2.13	-1.46	-2.39	-0.27	-1.84	-0.95	0.55	-0.61	1.08	0.69	0.97	-0.41	-0.56
240H	-2.08	-1.57	-2.25	-0.26	-1.62	-0.69	0.70	-0.54	1.14	0.72	0.74	-0.39	-0.51

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.43	1.45	1.38	1.31	1.30	1.32	1.34	1.19	1.12	1.35	1.29	1.45	1.33
24H	1.57	1.66	1.56	1.54	1.48	1.57	1.53	1.42	1.24	1.51	1.49	1.60	1.51
36H	1.80	1.88	1.86	1.71	1.76	1.82	1.75	1.52	1.41	1.71	1.69	1.75	1.72
48H	2.03	2.13	2.01	1.84	1.90	1.92	1.88	1.70	1.58	1.83	1.97	1.95	1.90
60H	2.29	2.46	2.39	2.08	2.14	2.08	2.19	1.93	1.76	2.10	2.17	2.05	2.14
72H	2.48	2.75	2.68	2.21	2.23	2.15	2.21	2.11	1.94	2.26	2.32	2.20	2.30
84H	2.70	3.18	3.03	2.44	2.60	2.53	2.48	2.31	2.11	2.44	2.55	2.30	2.56
96H	2.96	3.44	3.23	2.53	2.69	2.72	2.69	2.46	2.32	2.72	2.91	2.62	2.77
108H	3.27	3.92	3.59	2.77	3.09	3.15	3.03	2.57	2.47	3.01	3.10	2.89	3.07
120H	3.62	4.44	3.89	2.89	3.39	3.22	3.27	2.75	2.64	3.24	3.39	3.29	3.34
132H	3.99	4.76	4.60	3.26	4.01	3.74	3.71	2.98	2.88	3.64	3.55	3.68	3.73
144H	4.23	5.12	4.78	3.47	4.09	3.85	3.92	3.12	3.05	3.82	3.95	4.01	3.95
156H	4.60	5.18	5.23	3.94	4.53	4.16	4.36	3.30	3.36	4.25	4.26	4.23	4.28
168H	4.95	5.30	5.22	4.14	4.57	4.00	4.31	3.39	3.50	4.53	4.34	4.41	4.39
180H	5.47	5.48	5.27	4.41	5.05	4.27	4.46	3.53	3.72	4.87	4.33	4.41	4.61
192H	5.81	5.64	5.12	4.32	5.14	4.18	4.30	3.60	3.84	4.91	4.28	4.69	4.65
204H	5.97	5.58	5.43	4.43	5.72	4.44	4.46	3.57	4.10	5.06	4.41	5.01	4.85
216H	6.02	5.41	5.53	4.36	5.54	4.46	4.44	3.74	4.04	5.07	4.53	5.33	4.87
228H	6.03	5.25	5.80	4.73	5.75	4.91	4.54	3.81	4.20	5.04	4.60	5.42	5.01
240H	5.98	5.56	5.86	4.52	5.36	4.78	4.39	3.89	4.26	5.30	4.85	5.72	5.04

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.78	0.79	0.78	0.70	0.75	0.74	0.72	0.67	0.68	0.72	0.79	0.70	0.74
24H	0.86	0.85	0.85	0.80	0.85	0.81	0.82	0.77	0.79	0.82	0.86	0.81	0.82
36H	0.88	0.87	0.85	0.84	0.87	0.83	0.85	0.81	0.83	0.85	0.87	0.81	0.85
48H	0.86	0.85	0.86	0.86	0.87	0.83	0.86	0.82	0.82	0.86	0.85	0.81	0.85
60H	0.83	0.82	0.84	0.85	0.85	0.84	0.83	0.81	0.82	0.86	0.85	0.79	0.83
72H	0.83	0.80	0.81	0.85	0.86	0.85	0.83	0.81	0.80	0.86	0.85	0.78	0.83
84H	0.82	0.75	0.79	0.85	0.84	0.84	0.80	0.79	0.77	0.85	0.83	0.77	0.81
96H	0.82	0.73	0.78	0.85	0.82	0.83	0.78	0.79	0.74	0.83	0.79	0.73	0.79
108H	0.78	0.69	0.74	0.84	0.78	0.81	0.73	0.77	0.71	0.79	0.79	0.72	0.76
120H	0.75	0.64	0.70	0.83	0.75	0.80	0.71	0.76	0.70	0.75	0.77	0.68	0.74
132H	0.70	0.62	0.60	0.80	0.68	0.75	0.67	0.73	0.67	0.68	0.75	0.64	0.69
144H	0.68	0.58	0.56	0.77	0.68	0.71	0.64	0.72	0.66	0.64	0.73	0.60	0.66
156H	0.63	0.57	0.49	0.73	0.62	0.68	0.59	0.71	0.62	0.59	0.67	0.56	0.62
168H	0.59	0.55	0.51	0.70	0.61	0.69	0.57	0.72	0.61	0.58	0.64	0.54	0.61
180H	0.52	0.52	0.52	0.67	0.56	0.66	0.56	0.69	0.57	0.54	0.58	0.53	0.58
192H	0.46	0.48	0.55	0.67	0.54	0.67	0.56	0.69	0.58	0.50	0.61	0.51	0.57
204H	0.42	0.47	0.51	0.66	0.44	0.65	0.56	0.68	0.54	0.49	0.60	0.47	0.54
216H	0.43	0.52	0.49	0.66	0.45	0.63	0.56	0.65	0.55	0.48	0.60	0.45	0.54
228H	0.44	0.55	0.46	0.60	0.44	0.57	0.56	0.62	0.52	0.47	0.60	0.43	0.52
240H	0.45	0.50	0.45	0.60	0.50	0.57	0.57	0.60	0.51	0.43	0.56	0.39	0.51

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.47	-0.79	-0.19	-0.42	-0.35	-0.39	-0.47	-0.35	-0.73	-0.57	-0.42	-0.46	-0.47
24H	-0.23	-0.59	-0.25	-0.17	-0.15	-0.39	-0.36	-0.45	-0.57	-0.50	-0.47	-0.60	-0.39
36H	-0.47	-0.83	-0.15	-0.28	-0.16	-0.55	-0.62	-0.59	-0.80	-0.58	-0.67	-0.65	-0.53
48H	-0.31	-0.76	-0.26	-0.12	-0.01	-0.49	-0.44	-0.58	-0.60	-0.59	-0.58	-0.84	-0.47
60H	-0.63	-0.98	-0.42	-0.19	-0.08	-0.76	-0.64	-0.59	-0.77	-0.65	-0.65	-0.87	-0.60
72H	-0.83	-0.79	-0.48	0.04	-0.08	-0.62	-0.61	-0.44	-0.73	-0.75	-0.73	-1.05	-0.59
84H	-1.06	-0.69	-0.38	0.02	0.02	-0.78	-0.74	-0.47	-0.96	-0.76	-0.76	-1.08	-0.64
96H	-0.91	-0.74	-0.48	0.23	0.14	-0.65	-0.70	-0.44	-0.78	-0.70	0.35	0.93	-0.53
108H	-1.07	-0.71	-0.48	0.31	0.13	-0.85	-0.87	0.44	-1.05	0.84	-0.28	-0.86	0.58
120H	-1.10	-0.76	-0.49	0.33	-0.02	-0.68	-0.59	-0.45	-0.97	-0.43	-0.17	-0.87	-0.52
132H	-1.09	-0.79	-0.04	0.57	0.04	-0.79	-0.68	-0.50	-1.11	0.45	0.29	0.82	0.50
144H	-0.99	-0.89	-0.13	0.66	-0.08	-0.60	-0.60	-0.39	-0.98	-0.41	-0.18	-0.66	-0.44
156H	-1.05	-0.85	-0.24	0.73	0.19	-0.90	-0.74	-0.34	-1.14	-0.60	0.10	0.59	0.45
168H	0.94	-1.08	0.02	0.71	0.07	-0.70	-0.60	-0.32	-0.83	-0.39	0.46	0.39	0.33
180H	1.08	-1.16	0.11	0.67	0.08	-0.89	-0.90	-0.46	-0.96	-0.37	0.87	-0.53	-0.39
192H	-0.76	-1.36	0.47	0.58	0.06	-0.68	-0.75	-0.40	-0.77	-0.24	0.70	0.41	0.30
204H	-0.51	-1.96	0.41	0.68	0.30	-1.16	-1.10	0.46	-0.87	0.64	0.78	-0.21	-0.40
216H	-0.79	-2.06	0.33	0.43	0.15	-0.89	-0.81	-0.53	-0.87	0.46	0.89	-0.21	-0.40
228H	-0.75	-2.46	0.53	0.52	0.44	-1.19	-1.11	-0.40	-0.86	-0.25	0.70	-0.11	-0.41
240H	-1.03	-2.30	0.36	0.08	0.38	-0.72	-0.58	-0.45	-0.57	-0.14	0.56	0.06	-0.36

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	4.84	5.39	5.34	4.73	4.64	4.49	4.47	4.42	4.28	4.52	5.20	4.69	4.75
24H	5.15	5.97	5.57	4.64	4.54	4.52	4.41	4.32	4.14	4.72	5.30	5.06	4.86
36H	5.98	6.89	6.57	5.36	5.55	5.31	5.18	5.02	4.91	5.42	6.23	5.54	5.66
48H	6.45	7.36	6.86	5.42	5.33	5.23	5.25	5.10	4.76	5.58	6.41	5.99	5.81
60H	7.31	8.24	7.96	6.29	6.35	6.07	5.98	5.75	5.53	6.42	7.44	6.42	6.65
72H	7.66	8.80	8.08	6.35	6.22	5.98	5.82	5.83	5.67	6.58	7.51	6.68	6.77
84H	8.30	10.12	9.38	7.20	7.39	7.05	6.69	6.47	6.40	7.52	8.42	7.19	7.68
96H	8.66	10.38	9.48	7.22	7.57	7.03	6.60	6.45	6.59	7.46	8.92	7.73	7.84
108H	9.21	11.58	10.73	8.38	8.85	7.96	7.84	7.25	7.43	8.47	9.73	8.28	8.81
120H	9.73	12.29	10.80	8.64	9.00	8.05	7.62	7.01	7.56	8.56	10.01	8.78	9.00
132H	10.56	13.47	12.31	9.91	10.36	9.33	8.64	7.62	8.48	9.44	10.86	9.64	10.05
144H	10.94	13.73	12.12	10.37	10.05	9.05	8.49	7.32	8.65	9.98	10.64	10.12	10.12
156H	11.56	13.80	13.00	11.06	11.46	10.11	9.46	7.99	9.20	11.06	11.36	10.72	10.90
168H	11.98	14.29	12.59	10.49	11.16	9.62	8.85	7.96	9.25	10.96	11.24	11.62	10.83
180H	12.78	14.60	13.40	10.68	12.33	10.48	9.76	8.70	9.79	11.74	12.13	12.38	11.56
192H	13.09	14.15	13.24	10.64	11.95	9.77	9.23	8.19	9.62	11.10	12.03	12.74	11.31
204H	13.68	14.52	13.85	11.82	12.92	10.65	9.90	8.72	10.18	11.80	12.53	13.45	12.00
216H	13.79	14.52	13.41	11.57	11.98	10.12	9.38	8.41	10.09	11.83	12.31	13.45	11.74
228H	13.74	14.74	14.03	12.44	13.01	11.00	10.08	9.08	10.51	12.77	12.90	13.67	12.33
240H	13.52	14.70	13.14	11.81	11.99	10.34	9.62	8.79	10.66	12.38	12.97	13.96	11.99

나) 500 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	3.28	2.62	2.99	1.51	0.21	-1.40	1.06	1.01	2.83	3.86	2.73	3.33	2.00
24H	-1.81	-2.45	0.42	0.40	2.18	2.61	5.93	3.67	2.70	3.64	1.76	2.36	1.78
36H	2.38	2.95	2.32	-2.01	-4.12	-2.66	-1.22	-2.56	2.05	7.62	9.21	8.38	1.86
48H	-3.84	-1.35	0.29	-1.11	-2.23	3.27	1.07	-1.43	0.78	6.42	10.22	8.83	1.70
60H	2.15	4.68	6.65	-1.16	-6.36	-0.78	-6.33	-8.28	-0.28	10.60	20.40	15.76	3.09
72H	-1.44	-1.92	4.59	1.98	-8.15	-0.63	-5.99	-10.06	3.88	6.36	20.48	13.92	0.94
84H	3.17	-2.37	7.94	-2.17	-11.27	0.43	-3.71	-10.28	-2.27	8.56	27.50	18.17	2.81
96H	2.69	-4.88	6.51	-2.67	-11.77	2.67	0.63	-9.95	-4.40	5.79	23.97	17.16	2.04
108H	4.30	-2.81	0.98	-6.33	16.20	1.42	3.50	-7.81	3.01	9.09	25.31	15.01	1.95
120H	2.04	-0.11	-8.15	-7.35	-17.18	0.60	7.49	-5.45	-1.96	7.77	23.76	12.09	1.13
132H	5.87	9.93	-16.29	-13.18	21.49	-1.14	10.21	-4.90	2.32	9.45	26.46	14.97	1.85
144H	4.52	4.07	-21.28	-12.99	-21.75	0.24	11.54	-1.81	6.13	8.39	23.55	15.21	1.32
156H	7.52	5.91	-22.53	-12.64	-30.05	0.33	11.09	-3.35	13.76	11.75	23.87	18.76	1.98
168H	-0.12	-0.82	-20.97	-8.70	30.64	-0.09	11.07	1.45	16.84	9.71	19.95	16.89	1.21
180H	-5.66	2.24	15.53	-7.54	34.28	2.39	8.79	-2.85	20.46	10.96	20.94	18.32	1.12
192H	-21.87	-1.23	16.02	-3.58	30.70	0.85	12.82	0.82	20.69	9.49	19.31	15.50	0.51
204H	30.90	11.31	17.16	-9.30	37.90	-4.14	13.59	-6.02	18.35	15.96	21.17	16.87	-0.68
216H	38.69	6.80	22.60	-7.07	-34.34	0.05	20.20	-3.30	19.08	20.23	18.01	18.16	0.29
228H	-39.61	13.91	-30.90	-13.18	-35.71	-0.19	22.82	-8.80	17.77	25.29	17.79	19.52	-0.94
240H	40.86	5.71	39.46	-10.20	-36.61	-0.10	21.21	9.69	15.99	26.73	16.93	13.80	-3.05

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	13.70	14.30	13.27	11.47	11.31	11.59	10.98	10.54	10.72	12.60	12.39	12.53	12.12
24H	19.13	20.65	19.61	15.31	15.50	15.82	15.43	13.54	13.34	16.78	18.10	17.92	16.76
36H	26.03	25.81	25.50	19.33	20.64	19.54	18.47	17.13	17.27	22.66	24.63	23.34	21.70
48H	32.63	34.81	31.90	25.57	25.59	24.46	22.81	21.39	22.25	26.96	31.39	28.50	27.36
60H	40.44	46.29	41.41	31.48	31.79	28.50	27.19	27.88	28.65	32.74	39.77	35.26	34.28
72H	47.61	53.39	49.31	37.67	38.95	34.55	32.63	33.45	34.94	37.53	46.40	40.78	40.60
84H	55.50	65.71	58.28	45.08	47.10	43.58	37.87	38.14	41.26	45.13	57.32	49.67	48.72
96H	63.15	80.06	66.44	51.00	54.66	52.06	44.37	42.65	46.43	52.19	65.63	52.60	55.94
108H	72.47	94.67	79.05	61.36	65.69	61.39	52.63	46.01	52.99	60.00	73.92	59.89	65.01
120H	78.98	108.63	93.47	73.20	76.36	70.42	60.30	50.74	58.46	69.93	81.75	65.53	73.98
132H	88.31	122.18	110.07	89.50	88.53	81.41	71.26	54.86	65.35	79.09	87.85	76.41	84.57
144H	100.99	131.04	116.79	100.31	93.49	87.30	77.58	60.16	74.28	89.46	93.91	83.87	92.43
156H	115.57	141.14	124.04	109.18	105.45	94.60	83.68	64.50	83.39	103.38	103.56	92.77	101.77
168H	125.48	145.24	122.62	112.08	113.40	98.41	88.28	67.40	87.96	108.13	104.80	104.58	106.53
180H	133.80	157.79	125.42	116.04	123.30	102.98	94.46	70.86	92.25	114.58	103.96	118.23	112.81
192H	143.40	154.75	131.04	116.31	125.81	101.34	95.37	73.83	94.73	115.80	104.91	124.06	115.11
204H	153.46	151.06	138.11	121.43	133.60	103.46	95.72	76.42	100.61	122.56	117.25	129.92	120.30
216H	153.40	155.52	140.21	123.21	132.10	105.23	95.86	79.29	103.31	126.79	124.71	131.31	122.58
228H	153.60	165.62	143.83	126.80	134.25	108.99	96.39	79.98	111.11	133.61	133.21	133.43	126.74
240H	148.65	172.25	146.31	127.96	130.92	110.35	93.51	80.87	117.71	139.02	133.19	133.37	127.84

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.96	0.97	0.96	0.94	0.95	0.93	0.92	0.88	0.91	0.94	0.96	0.93	0.94
24H	0.97	0.97	0.97	0.96	0.97	0.96	0.95	0.93	0.95	0.95	0.97	0.95	0.96
36H	0.96	0.97	0.97	0.96	0.96	0.96	0.94	0.93	0.95	0.95	0.95	0.95	0.95
48H	0.94	0.95	0.96	0.95	0.95	0.95	0.94	0.92	0.94	0.95	0.94	0.94	0.94
60H	0.91	0.92	0.94	0.94	0.94	0.94	0.92	0.88	0.93	0.95	0.92	0.93	0.93
72H	0.90	0.90	0.92	0.92	0.92	0.93	0.90	0.85	0.91	0.93	0.89	0.91	0.91
84H	0.87	0.84	0.90	0.91	0.91	0.90	0.88	0.82	0.88	0.91	0.86	0.86	0.88
96H	0.85	0.79	0.88	0.90	0.88	0.87	0.86	0.80	0.85	0.87	0.83	0.86	0.85
108H	0.80	0.74	0.85	0.87	0.86	0.83	0.82	0.79	0.84	0.83	0.81	0.85	0.82
120H	0.77	0.69	0.80	0.82	0.82	0.78	0.78	0.78	0.82	0.81	0.78	0.84	0.79
132H	0.75	0.64	0.74	0.75	0.78	0.72	0.73	0.75	0.79	0.78	0.77	0.80	0.75
144H	0.73	0.60	0.71	0.69	0.75	0.64	0.72	0.71	0.72	0.70	0.73	0.77	0.71
156H	0.65	0.60	0.68	0.68	0.69	0.60	0.70	0.69	0.66	0.63	0.68	0.73	0.67
168H	0.62	0.58	0.68	0.67	0.65	0.56	0.66	0.68	0.62	0.60	0.65	0.67	0.64
180H	0.59	0.51	0.70	0.67	0.63	0.54	0.61	0.67	0.58	0.59	0.66	0.60	0.61
192H	0.56	0.52	0.68	0.67	0.60	0.54	0.59	0.67	0.55	0.56	0.66	0.55	0.60
204H	0.53	0.56	0.64	0.65	0.54	0.55	0.61	0.66	0.53	0.49	0.61	0.51	0.57
216H	0.54	0.55	0.62	0.63	0.54	0.54	0.64	0.64	0.53	0.44	0.57	0.48	0.56
228H	0.57	0.53	0.59	0.61	0.54	0.52	0.67	0.62	0.46	0.43	0.55	0.46	0.55
240H	0.61	0.47	0.57	0.58	0.55	0.52	0.67	0.62	0.41	0.39	0.56	0.47	0.54

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.04	-0.16	-0.10	-0.13	-0.16	-0.12	-0.25	-0.17	-0.17	-0.15	-0.20	-0.15	-0.14
24H	0.01	-0.17	-0.06	-0.14	-0.10	-0.09	-0.18	-0.06	-0.14	-0.14	-0.33	-0.26	-0.14
36H	0.04	-0.28	-0.10	-0.24	-0.22	-0.22	-0.36	-0.23	-0.25	-0.13	-0.37	-0.28	-0.22
48H	-0.06	-0.23	-0.18	-0.18	-0.17	-0.10	-0.31	-0.10	-0.15	-0.18	-0.31	-0.33	-0.19
60H	-0.09	-0.36	-0.22	-0.26	-0.29	-0.25	-0.49	-0.21	-0.26	-0.21	-0.26	-0.38	-0.27
72H	-0.19	-0.39	-0.26	-0.19	-0.39	-0.17	-0.38	-0.10	-0.16	-0.27	-0.26	-0.49	-0.27
84H	-0.23	-0.78	-0.43	-0.31	-0.63	-0.36	-0.49	-0.24	-0.26	-0.45	-0.15	-0.47	-0.40
96H	-0.37	-0.82	-0.35	-0.25	-0.55	-0.22	-0.35	-0.10	-0.22	-0.48	-0.13	-0.54	-0.37
108H	-0.57	-1.17	-0.67	-0.36	-0.73	-0.32	-0.46	-0.21	-0.19	-0.43	-0.10	-0.67	-0.49
120H	-0.70	-0.93	-0.83	-0.29	-0.75	-0.28	-0.30	-0.12	-0.10	-0.15	-0.07	-0.73	-0.44
132H	-0.68	-0.79	-1.45	-0.48	-0.97	-0.43	-0.37	-0.28	-0.04	-0.05	0.02	-0.79	-0.53
144H	-0.56	-0.62	-1.73	-0.34	-1.00	-0.26	-0.28	-0.13	0.17	0.01	0.14	-0.80	-0.45
156H	-0.52	-0.91	-2.13	-0.34	-1.40	-0.42	-0.38	-0.25	0.34	0.01	0.17	-0.71	-0.55
168H	-0.55	-0.81	-1.87	-0.23	-1.68	-0.34	-0.37	-0.10	0.49	0.04	0.14	-0.71	-0.50
180H	-0.91	-1.09	-1.75	-0.30	-1.95	-0.63	-0.45	-0.25	0.59	0.07	0.10	-0.84	-0.62
192H	-1.33	-1.03	-1.62	-0.33	-1.91	-0.47	-0.43	-0.18	0.72	-0.05	0.11	-0.96	-0.62
204H	-1.91	-1.10	-1.76	-0.58	-2.09	-0.72	-0.48	-0.44	0.69	-0.17	0.19	-1.04	-0.78
216H	-2.13	-0.97	-1.62	-0.52	-1.99	-0.59	-0.21	-0.42	0.74	0.02	0.42	-1.01	-0.69
228H	-2.56	-1.16	-1.82	-0.84	2.08	0.68	0.23	-0.67	0.66	0.04	0.30	-1.02	-0.84
240H	-2.51	-1.14	-1.80	-0.83	-2.16	-0.40	-0.11	-0.60	0.70	0.19	0.32	-1.00	-0.78

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.01	1.00	1.03	0.89	0.88	0.91	0.94	0.89	0.81	0.93	1.03	0.92	0.94
24H	1.27	1.29	1.28	1.08	1.08	1.12	1.09	1.00	0.95	1.17	1.32	1.22	1.16
36H	1.55	1.53	1.51	1.27	1.42	1.32	1.29	1.17	1.13	1.34	1.65	1.42	1.38
48H	1.91	1.86	1.74	1.56	1.58	1.46	1.48	1.29	1.34	1.68	1.89	1.63	1.62
60H	2.34	2.28	2.16	1.89	1.80	1.66	1.69	1.50	1.58	1.85	2.17	1.78	1.89
72H	2.66	2.79	2.47	2.07	2.18	1.84	1.82	1.70	1.78	2.20	2.40	1.96	2.16
84H	3.27	3.16	2.78	2.39	2.55	2.31	2.12	1.90	2.02	2.46	2.73	2.17	2.49
96H	3.52	3.77	3.09	2.61	2.89	2.51	2.37	2.10	2.17	2.77	3.12	2.41	2.78
108H	3.97	4.27	3.61	2.98	3.24	2.73	2.64	2.26	2.46	2.96	3.34	2.84	3.11
120H	4.22	4.62	4.11	3.15	3.71	3.00	2.72	2.42	2.67	3.27	3.75	3.08	3.39
132H	4.24	4.86	4.71	3.57	4.06	3.28	3.00	2.45	2.93	3.62	3.88	3.44	3.67
144H	4.68	5.12	4.95	3.77	4.23	3.36	3.11	2.56	3.24	3.95	4.03	3.72	3.89
156H	4.99	5.40	5.19	4.01	4.54	3.53	3.47	2.65	3.50	4.40	4.39	3.97	4.17
168H	5.26	5.47	5.11	4.17	4.79	3.58	3.62	2.69	3.61	4.63	4.43	4.06	4.29
180H	5.51	5.91	4.99	4.33	5.00	3.77	3.90	2.68	3.78	4.80	4.51	4.28	4.46
192H	5.76	6.09	4.99	4.41	5.09	3.72	3.80	2.78	3.90	4.85	4.59	4.49	4.54
204H	5.96	5.68	5.10	4.54	5.29	3.90	3.74	2.89	4.11	5.20	4.90	4.74	4.67
216H	5.90	5.66	5.15	4.57	5.26	3.97	3.58	2.98	4.03	5.26	4.98	5.02	4.70
228H	6.00	5.83	5.37	4.77	5.35	4.04	3.59	3.11	4.23	5.14	5.30	5.23	4.83
240H	5.87	6.10	5.39	4.84	5.32	3.95	3.49	3.27	4.27	5.29	5.56	5.27	4.89

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.90	0.91	0.88	0.84	0.86	0.83	0.81	0.73	0.77	0.83	0.90	0.87	0.84
24H	0.94	0.93	0.92	0.90	0.90	0.87	0.87	0.82	0.85	0.89	0.92	0.90	0.89
36H	0.93	0.92	0.92	0.90	0.90	0.88	0.88	0.84	0.86	0.90	0.89	0.90	0.89
48H	0.91	0.89	0.92	0.89	0.88	0.88	0.87	0.84	0.85	0.89	0.87	0.88	0.88
60H	0.88	0.81	0.89	0.86	0.87	0.88	0.84	0.83	0.83	0.89	0.87	0.86	0.86
72H	0.85	0.82	0.88	0.83	0.85	0.87	0.83	0.78	0.80	0.88	0.86	0.84	0.84
84H	0.81	0.77	0.86	0.80	0.82	0.84	0.80	0.75	0.77	0.87	0.84	0.82	0.81
96H	0.78	0.69	0.85	0.78	0.77	0.81	0.78	0.71	0.75	0.84	0.80	0.81	0.78
108H	0.71	0.67	0.81	0.75	0.74	0.80	0.75	0.70	0.73	0.81	0.77	0.78	0.75
120H	0.71	0.60	0.76	0.74	0.67	0.78	0.72	0.67	0.70	0.77	0.72	0.75	0.72
132H	0.72	0.58	0.71	0.70	0.62	0.74	0.69	0.69	0.68	0.73	0.69	0.72	0.69
144H	0.69	0.49	0.67	0.67	0.58	0.68	0.68	0.65	0.62	0.69	0.68	0.68	0.65
156H	0.63	0.53	0.65	0.68	0.57	0.66	0.61	0.62	0.60	0.64	0.62	0.65	0.62
168H	0.62	0.53	0.65	0.65	0.54	0.65	0.53	0.64	0.57	0.62	0.57	0.63	0.60
180H	0.61	0.46	0.64	0.63	0.50	0.63	0.49	0.64	0.55	0.60	0.57	0.60	0.58
192H	0.61	0.41	0.61	0.58	0.45	0.64	0.50	0.64	0.54	0.57	0.57	0.57	0.56
204H	0.56	0.50	0.58	0.55	0.39	0.63	0.52	0.62	0.51	0.52	0.53	0.55	0.54
216H	0.55	0.49	0.56	0.53	0.39	0.62	0.54	0.60	0.52	0.48	0.53	0.50	0.53
228H	0.54	0.48	0.52	0.50	0.41	0.61	0.54	0.56	0.49	0.50	0.53	0.49	0.51
240H	0.55	0.45	0.52	0.47	0.43	0.60	0.56	0.53	0.46	0.46	0.47	0.46	0.50

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.27	0.17	0.52	-0.02	0.12	0.12	0.07	-0.12	-0.15	-0.03	-0.06	-0.23	0.06
24H	0.13	-0.20	0.04	-0.02	0.18	0.16	-0.14	-0.23	-0.25	0.01	-0.17	-0.45	0.08
36H	0.08	0.00	0.20	-0.26	0.23	-0.17	-0.38	-0.28	-0.20	-0.28	-0.47	-0.51	-0.17
48H	-0.10	-0.12	-0.20	-0.24	0.34	-0.44	-0.53	-0.46	-0.33	-0.40	-0.36	-0.88	-0.31
60H	-0.09	0.22	-0.01	-0.20	0.41	-0.52	-0.66	-0.46	-0.41	-0.59	-0.52	-0.90	-0.31
72H	-0.33	-0.01	-0.47	-0.17	0.59	-0.83	-0.95	-0.82	-0.57	-0.90	-0.88	-1.00	-0.53
84H	-0.32	0.57	-0.29	-0.15	0.54	-0.98	-1.10	-0.51	-0.62	-1.05	0.68	1.08	0.47
96H	-0.31	0.01	-0.50	-0.07	0.50	-1.23	-1.26	-0.87	-0.80	-0.81	-0.80	1.11	-0.60
108H	-0.24	-0.04	-0.17	-0.09	0.42	-1.25	-1.28	-0.42	-0.64	1.02	-0.72	1.00	-0.54
120H	-0.28	-0.33	-0.52	-0.06	0.33	-1.31	-1.26	-0.44	-0.97	-0.82	-0.94	-0.95	-0.63
132H	0.13	-0.48	-0.36	0.13	0.26	-1.39	-1.10	0.05	-0.85	0.90	0.66	-0.70	0.49
144H	-0.29	-0.43	-0.42	0.42	0.45	-1.30	-1.13	-0.50	-1.00	-0.75	-1.12	-0.47	-0.55
156H	0.14	-0.94	-0.37	0.46	0.47	-1.38	-0.99	0.00	-0.93	-1.18	-1.04	-0.21	-0.50
168H	-0.20	-1.02	-0.27	0.60	0.35	-1.14	-1.28	-0.30	-1.20	-0.83	-0.49	-0.25	-0.50
180H	-0.21	-1.27	-0.15	0.44	0.57	-1.31	-1.31	0.12	-1.25	-0.99	-0.29	0.30	-0.45
192H	-0.49	-1.06	0.19	0.44	0.95	-1.26	-1.71	-0.07	1.31	-0.71	0.32	0.46	0.41
204H	-0.45	-1.96	0.41	0.42	1.07	-1.58	-1.97	0.16	-1.04	-1.32	0.17	0.82	-0.44
216H	-0.45	-1.59	0.08	0.15	1.13	-1.66	-2.29	-0.13	-1.11	-1.01	0.69	0.87	-0.44
228H	-0.27	-2.43	0.49	0.41	1.16	-1.82	-2.20	0.22	-0.78	-1.69	0.59	1.04	-0.44
240H	-0.50	-1.60	0.25	0.09	1.29	-1.42	-2.06	-0.07	-0.86	-1.46	0.23	0.96	-0.43

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	5.22	5.73	5.77	4.69	4.65	4.64	4.17	4.11	3.85	4.57	5.15	4.77	4.78
24H	6.26	6.87	6.63	5.77	5.48	5.44	5.08	5.06	4.79	5.45	6.33	5.85	5.75
36H	7.36	7.94	7.83	6.53	6.55	6.14	5.72	5.32	5.39	6.16	7.29	6.64	6.57
48H	8.90	9.11	8.64	7.56	7.53	6.88	6.60	6.11	6.20	7.02	8.44	7.54	7.54
60H	10.11	10.68	9.92	8.80	8.49	7.47	7.27	6.64	7.09	7.79	9.53	8.28	8.51
72H	11.13	11.95	11.15	9.89	9.26	8.20	7.99	7.65	8.06	8.49	10.22	9.00	9.42
84H	12.54	13.37	12.25	11.18	10.53	9.43	8.74	8.27	9.00	9.82	11.44	9.77	10.53
96H	13.76	14.67	13.89	11.81	11.58	10.54	9.63	9.02	9.86	10.49	12.71	10.68	11.55
108H	14.98	16.53	15.32	13.15	13.26	11.90	10.64	9.44	10.97	11.80	14.02	11.57	12.80
120H	15.42	17.84	16.79	14.50	14.57	13.01	11.60	10.02	12.23	12.65	14.40	12.80	13.82
132H	16.48	19.21	18.64	16.07	16.38	14.60	12.73	10.55	13.18	14.08	15.65	14.02	15.13
144H	17.77	20.12	20.02	16.93	16.87	15.21	13.57	11.13	14.12	14.61	15.79	15.22	15.95
156H	19.44	20.78	20.65	17.73	18.11	15.80	14.24	11.43	14.78	16.24	16.80	16.13	16.84
168H	20.42	21.12	20.58	18.00	18.70	16.04	14.69	12.15	14.85	16.20	17.36	17.25	17.28
180H	21.40	23.06	20.87	18.24	19.20	16.33	15.12	12.41	15.31	17.00	17.72	18.17	17.90
192H	21.64	23.14	21.52	18.47	20.08	16.32	15.51	12.79	16.01	16.84	17.97	19.10	18.28
204H	22.38	23.27	22.56	19.24	20.22	16.60	15.70	12.76	16.55	17.65	18.82	19.61	18.78
216H	22.59	22.76	22.51	19.75	20.65	16.97	15.76	13.29	16.97	18.19	19.62	20.13	19.10
228H	22.15	22.97	23.17	20.02	20.70	17.25	15.87	13.50	17.14	18.72	20.16	21.03	19.39
240H	22.05	23.17	22.83	20.20	20.35	17.06	15.91	14.10	17.28	19.12	20.66	20.78	19.46

다) 250 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	8.15	6.41	7.92	4.53	-0.18	-2.52	-2.05	-1.41	0.61	5.80	5.74	5.76	3.23
24H	5.83	3.88	7.86	4.81	3.72	4.60	5.22	4.41	3.11	7.51	5.06	4.96	5.08
36H	8.24	7.49	11.60	2.13	-1.43	-0.38	-4.32	-2.59	3.17	13.78	9.95	10.52	4.85
48H	1.18	4.53	9.21	3.04	1.94	8.45	0.82	1.16	4.42	12.23	12.34	9.93	5.77
60H	4.86	10.27	14.92	0.69	-3.28	2.87	-10.39	-8.18	4.75	14.67	22.06	14.60	5.65
72H	1.61	4.98	13.77	-0.46	-5.42	5.46	-8.66	-8.63	2.86	9.05	24.73	11.41	4.23
84H	2.81	-0.20	15.08	-1.62	-12.46	4.09	-9.63	-11.59	3.36	9.04	31.16	12.65	3.56
96H	2.33	-5.87	12.32	-0.25	-13.25	8.14	-4.18	-9.08	1.56	4.81	28.36	11.15	3.00
108H	0.04	-10.02	2.50	-5.59	-21.05	3.50	-4.02	-8.56	3.64	8.03	29.37	6.13	0.33
120H	-1.57	-5.13	-11.02	-6.35	-25.19	4.13	4.17	-4.28	4.18	11.07	29.23	2.52	0.15
132H	-1.00	6.57	-28.33	-14.59	-34.22	0.24	4.96	-7.10	7.69	15.30	31.50	4.24	-1.23
144H	0.33	3.45	-37.15	-12.13	-35.70	4.95	6.52	-1.29	15.01	15.73	30.20	6.03	-0.34
156H	0.80	1.48	-42.65	-10.68	-50.11	1.46	3.70	-4.33	27.53	17.32	29.50	10.06	-1.33
168H	-6.70	-5.96	-39.37	-5.71	-52.62	3.07	5.41	3.45	34.50	15.20	26.64	8.39	-1.14
180H	-19.33	-6.79	-33.96	-7.01	-61.45	-3.99	0.68	-2.96	39.69	17.70	25.07	7.53	-3.74
192H	-38.43	-12.39	-33.72	-4.24	-59.17	1.16	4.70	2.06	42.25	14.95	25.76	4.66	-4.37
204H	-52.90	-5.09	-37.20	-12.42	-69.10	-8.70	2.03	-9.49	41.02	18.18	33.10	6.60	-7.83
216H	-64.73	-9.16	-41.77	-10.22	-62.09	-1.90	12.24	-7.86	41.58	22.28	36.57	11.27	-6.15
228H	-74.29	-7.35	-51.96	-18.77	-64.44	-4.88	12.86	-17.51	38.87	26.57	36.09	11.89	-9.41
240H	-78.81	-15.59	-61.47	-16.19	-64.20	0.97	16.24	-16.90	38.17	31.96	32.35	5.98	-10.62

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	19.39	19.70	18.30	15.88	15.68	16.47	16.91	16.84	17.09	19.10	18.08	17.30	17.56
24H	25.31	26.23	24.62	21.03	19.67	22.27	22.19	21.26	20.10	24.35	25.31	25.65	23.17
36H	35.84	33.27	31.04	25.26	27.03	27.93	27.85	28.02	28.25	34.05	34.98	33.79	30.61
48H	44.11	45.36	38.35	33.90	34.23	35.72	34.57	34.58	34.86	41.03	42.15	40.46	38.28
60H	54.32	59.97	51.03	42.68	42.65	41.17	42.24	44.36	45.31	49.40	53.60	47.22	47.83
72H	63.12	71.21	62.92	51.73	54.60	49.58	51.19	52.54	52.99	55.94	63.14	53.87	56.90
84H	78.47	86.82	74.69	61.75	66.64	63.32	60.48	62.46	65.03	66.90	80.05	64.54	69.26
96H	86.07	108.16	86.28	70.89	78.56	76.96	69.71	69.29	71.91	75.14	93.91	69.83	79.73
108H	100.98	131.07	100.76	81.97	93.74	89.26	81.25	75.71	83.88	87.47	104.79	83.98	92.91
120H	105.95	149.61	120.96	95.13	111.83	101.54	90.40	81.67	92.38	102.15	118.73	93.80	105.35
132H	117.87	167.45	146.26	113.42	130.58	116.78	103.75	86.83	104.70	117.36	125.39	108.47	119.91
144H	136.35	179.55	155.72	129.61	140.83	125.70	114.14	92.66	119.25	132.76	136.39	121.28	132.02
156H	157.94	191.99	164.04	144.20	155.28	136.80	127.98	98.63	135.08	154.68	151.29	136.06	146.16
168H	172.69	193.05	163.18	151.21	163.54	139.75	135.62	101.51	141.16	158.65	156.73	145.00	151.84
180H	182.33	210.30	163.79	158.89	175.04	147.28	147.43	104.75	147.78	167.75	156.64	158.96	160.08
192H	192.64	212.75	169.07	161.15	180.10	145.57	145.96	107.76	150.87	170.39	156.08	166.77	163.26
204H	204.96	209.41	175.88	167.40	193.41	149.40	146.82	113.19	160.50	179.90	170.62	179.37	170.91
216H	208.78	211.37	180.49	169.78	195.20	152.45	145.42	118.72	162.62	185.25	181.79	184.08	174.66
228H	209.61	220.28	188.70	174.24	199.88	158.37	145.47	122.73	175.36	191.10	198.72	186.36	180.90
240H	202.68	229.22	193.76	175.19	194.31	158.25	141.74	126.65	182.30	195.32	199.89	187.96	182.27

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.96	0.97	0.96	0.95	0.95	0.94	0.92	0.89	0.92	0.93	0.96	0.95	0.94
24H	0.97	0.98	0.97	0.96	0.97	0.96	0.96	0.94	0.96	0.96	0.97	0.95	0.96
36H	0.96	0.97	0.98	0.96	0.97	0.96	0.95	0.93	0.95	0.96	0.95	0.96	0.96
48H	0.95	0.95	0.96	0.95	0.96	0.95	0.94	0.92	0.94	0.95	0.95	0.94	0.95
60H	0.92	0.93	0.95	0.93	0.94	0.95	0.92	0.88	0.92	0.95	0.92	0.93	0.93
72H	0.92	0.90	0.93	0.91	0.92	0.94	0.90	0.84	0.90	0.95	0.91	0.92	0.91
84H	0.88	0.84	0.92	0.90	0.90	0.91	0.88	0.79	0.87	0.93	0.88	0.89	0.88
96H	0.87	0.80	0.90	0.88	0.86	0.88	0.86	0.75	0.84	0.90	0.85	0.88	0.86
108H	0.80	0.74	0.87	0.86	0.83	0.85	0.83	0.76	0.82	0.85	0.83	0.86	0.83
120H	0.81	0.68	0.82	0.83	0.79	0.80	0.78	0.75	0.80	0.81	0.78	0.85	0.79
132H	0.79	0.63	0.75	0.77	0.72	0.73	0.75	0.73	0.77	0.78	0.78	0.80	0.75
144H	0.75	0.57	0.72	0.71	0.69	0.66	0.72	0.70	0.70	0.71	0.74	0.77	0.70
156H	0.66	0.58	0.70	0.67	0.65	0.61	0.66	0.69	0.65	0.64	0.67	0.72	0.66
168H	0.63	0.58	0.70	0.66	0.63	0.58	0.61	0.69	0.62	0.62	0.61	0.69	0.64
180H	0.62	0.50	0.72	0.65	0.60	0.55	0.56	0.70	0.59	0.61	0.62	0.64	0.61
192H	0.62	0.47	0.70	0.63	0.56	0.57	0.56	0.70	0.57	0.59	0.61	0.59	0.60
204H	0.56	0.51	0.67	0.62	0.46	0.57	0.58	0.67	0.53	0.56	0.57	0.55	0.57
216H	0.55	0.50	0.63	0.60	0.45	0.57	0.59	0.64	0.53	0.51	0.52	0.51	0.55
228H	0.57	0.49	0.58	0.58	0.47	0.55	0.62	0.62	0.45	0.50	0.48	0.48	0.53
240H	0.60	0.45	0.56	0.56	0.51	0.55	0.63	0.59	0.39	0.47	0.49	0.48	0.52

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.75	0.73	1.02	1.09	0.84	0.82	0.59	0.60	0.51	0.82	1.07	0.83	0.81
24H	0.84	0.88	1.16	1.15	0.87	0.97	0.72	0.72	0.78	1.01	1.09	0.82	0.92
36H	0.72	0.80	1.19	1.16	0.97	1.02	0.71	0.81	0.84	1.08	0.99	0.68	0.91
48H	0.77	0.81	1.26	1.11	1.08	1.20	0.86	0.82	1.01	1.21	0.83	0.66	0.97
60H	0.67	0.74	1.13	1.05	1.06	1.12	0.83	0.81	1.03	1.12	0.96	0.48	0.92
72H	0.80	0.90	1.26	0.94	1.19	1.19	0.81	0.79	1.15	1.06	0.93	0.50	0.96
84H	0.78	0.78	1.16	0.81	1.21	1.22	0.79	0.74	1.06	1.01	0.76	0.20	0.88
96H	0.95	0.72	1.08	0.77	1.09	1.18	0.74	0.76	1.11	0.98	0.83	0.24	0.87
108H	0.86	0.39	0.95	0.64	0.99	1.06	0.45	0.76	0.97	0.67	0.66	0.22	0.72
120H	0.94	0.19	0.98	0.57	1.02	1.01	0.44	0.79	0.92	0.69	0.56	0.19	0.69
132H	0.68	-0.13	1.02	0.52	0.82	1.12	0.47	0.73	0.77	0.78	0.53	0.05	0.61
144H	0.64	0.10	0.86	0.62	0.84	1.08	0.30	0.84	0.92	0.83	0.56	0.13	0.64
156H	0.53	-0.06	0.63	0.55	0.88	0.99	0.12	0.94	0.94	0.74	0.48	0.03	0.56
168H	0.46	0.09	0.48	0.56	1.06	0.92	0.03	1.02	1.27	0.85	0.52	0.07	0.61
180H	0.33	-0.03	0.23	0.37	0.74	0.85	-0.24	1.01	1.34	0.84	0.49	0.04	0.50
192H	0.62	0.04	0.21	0.44	0.72	0.78	-0.33	1.06	1.52	1.03	0.66	0.22	0.58
204H	0.71	-0.53	0.15	0.39	0.59	0.77	-0.50	0.94	1.53	0.78	0.89	0.24	0.50
216H	0.57	-0.49	0.32	0.42	0.80	0.84	-0.43	0.86	1.65	0.57	1.03	0.44	0.55
228H	0.16	-0.97	0.31	0.47	0.73	0.71	0.53	0.70	1.47	0.72	1.16	0.27	0.43
240H	-0.14	-0.91	0.36	0.49	0.94	0.76	-0.25	0.72	1.60	0.93	1.11	0.29	0.49

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.50	1.72	1.83	1.74	1.57	1.54	1.51	1.40	1.18	1.46	1.74	1.53	1.56
24H	1.71	2.02	2.12	1.94	1.73	1.82	1.73	1.62	1.48	1.72	1.92	1.73	1.80
36H	1.96	2.22	2.26	2.15	2.04	2.02	1.91	1.81	1.64	1.96	2.22	1.90	2.01
48H	2.26	2.45	2.60	2.37	2.26	2.31	2.21	1.91	1.91	2.23	2.39	2.11	2.25
60H	2.57	2.76	2.74	2.61	2.52	2.37	2.45	2.10	2.11	2.35	2.60	2.23	2.45
72H	2.76	3.04	3.01	2.78	2.82	2.57	2.70	2.22	2.40	2.54	2.76	2.30	2.66
84H	3.13	3.34	3.25	2.95	3.08	2.81	2.88	2.26	2.53	2.75	2.90	2.46	2.86
96H	3.39	3.75	3.43	3.25	3.27	3.02	3.07	2.41	2.67	2.95	3.23	2.55	3.08
108H	3.65	4.08	3.79	3.44	3.57	3.12	3.10	2.53	2.84	2.99	3.37	2.73	3.27
120H	3.85	4.29	4.07	3.63	3.93	3.34	3.19	2.65	2.91	3.14	3.58	2.82	3.45
132H	3.74	4.43	4.48	3.77	4.09	3.49	3.34	2.74	3.03	3.31	3.74	3.04	3.60
144H	3.98	4.65	4.57	4.07	4.14	3.70	3.56	3.00	3.08	3.48	3.89	3.18	3.78
156H	4.01	4.85	4.92	4.01	4.56	3.70	3.71	3.07	3.27	3.65	3.86	3.39	3.92
168H	4.14	4.87	4.64	4.08	4.67	3.85	3.83	3.17	3.48	3.76	4.01	3.45	4.00
180H	4.21	5.16	4.61	4.16	4.66	3.93	3.88	3.09	3.52	3.75	3.99	3.59	4.05
192H	4.25	5.14	4.72	4.24	4.55	4.02	3.84	3.28	3.56	3.84	4.24	3.61	4.11
204H	4.39	5.19	4.81	4.39	4.54	4.01	3.69	3.32	3.65	4.08	4.42	3.76	4.19
216H	4.25	5.23	4.84	4.43	4.62	4.23	3.68	3.29	3.70	3.99	4.54	3.78	4.22
228H	4.12	5.35	4.96	4.58	4.69	4.14	3.73	3.18	3.74	4.03	4.66	3.88	4.26
240H	4.23	5.36	5.13	4.55	4.70	4.42	3.77	3.21	3.76	4.09	4.70	3.97	4.32

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.83	0.84	0.77	0.79	0.81	0.77	0.76	0.69	0.69	0.75	0.81	0.75	0.77
24H	0.87	0.84	0.82	0.84	0.86	0.81	0.81	0.73	0.73	0.81	0.85	0.83	0.82
36H	0.85	0.82	0.84	0.82	0.85	0.81	0.81	0.74	0.72	0.79	0.84	0.82	0.81
48H	0.83	0.82	0.82	0.80	0.81	0.79	0.76	0.74	0.70	0.76	0.82	0.80	0.79
60H	0.78	0.77	0.83	0.76	0.78	0.79	0.71	0.72	0.65	0.74	0.81	0.78	0.76
72H	0.74	0.79	0.81	0.73	0.79	0.76	0.65	0.72	0.60	0.70	0.80	0.77	0.74
84H	0.70	0.73	0.80	0.69	0.77	0.75	0.63	0.71	0.59	0.66	0.77	0.73	0.71
96H	0.67	0.67	0.78	0.64	0.73	0.69	0.59	0.69	0.54	0.61	0.73	0.71	0.67
108H	0.64	0.64	0.73	0.61	0.69	0.65	0.55	0.66	0.48	0.59	0.70	0.67	0.63
120H	0.59	0.63	0.68	0.58	0.62	0.60	0.52	0.64	0.45	0.54	0.65	0.65	0.60
132H	0.60	0.60	0.60	0.56	0.60	0.55	0.49	0.61	0.42	0.52	0.61	0.62	0.57
144H	0.56	0.57	0.60	0.51	0.60	0.52	0.46	0.53	0.40	0.49	0.58	0.57	0.53
156H	0.55	0.59	0.56	0.54	0.53	0.52	0.46	0.47	0.38	0.48	0.57	0.52	0.51
168H	0.53	0.58	0.60	0.53	0.50	0.50	0.44	0.45	0.39	0.44	0.52	0.52	0.50
180H	0.50	0.55	0.62	0.53	0.51	0.51	0.41	0.47	0.42	0.47	0.53	0.51	0.50
192H	0.47	0.53	0.60	0.53	0.50	0.51	0.40	0.44	0.41	0.48	0.51	0.52	0.49
204H	0.44	0.55	0.58	0.51	0.49	0.52	0.41	0.43	0.38	0.43	0.52	0.52	0.48
216H	0.47	0.52	0.58	0.52	0.49	0.50	0.41	0.48	0.37	0.43	0.49	0.51	0.48
228H	0.51	0.51	0.56	0.51	0.48	0.52	0.39	0.48	0.39	0.41	0.47	0.50	0.48
240H	0.47	0.49	0.51	0.51	0.48	0.47	0.39	0.51	0.34	0.39	0.42	0.44	0.45

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.12	-0.06	-0.04	-0.37	0.03	-0.18	-0.27	-0.09	0.01	-0.26	-0.20	-0.31	-0.16
24H	-0.09	0.11	-0.09	0.10	0.17	-0.03	-0.32	-0.17	0.13	0.26	-0.32	-0.52	-0.06
36H	-0.53	-0.15	0.11	-0.10	0.04	0.06	-0.65	-0.06	0.21	0.00	-0.59	-0.52	-0.18
48H	-0.22	-0.15	0.26	0.08	0.37	0.14	-0.61	0.04	0.39	0.11	-0.04	-0.32	0.00
60H	-0.36	0.14	0.54	-0.02	0.67	0.55	-0.93	0.02	0.18	-0.26	0.27	-0.41	0.03
72H	-0.29	0.31	0.50	0.48	0.87	0.47	-0.99	-0.10	0.17	-0.74	0.45	-0.22	0.08
84H	-0.96	0.42	0.24	0.36	1.05	0.68	-1.00	0.27	0.33	-1.25	0.49	-0.49	0.01
96H	-0.36	-0.36	0.46	0.71	0.84	0.79	-0.99	0.15	0.63	-0.50	0.69	0.17	0.19
108H	-0.57	-0.41	0.48	0.12	1.11	0.80	-1.09	0.13	0.64	-0.41	0.03	-0.58	0.02
120H	0.37	0.05	0.34	0.49	0.80	0.89	-0.70	0.72	0.17	0.06	0.69	0.01	0.32
132H	0.02	0.24	0.06	0.18	1.61	0.97	-1.16	1.02	0.00	-0.40	0.68	0.19	0.28
144H	0.70	0.49	0.26	0.58	1.39	1.27	-1.02	0.63	0.63	-0.16	0.92	1.29	0.50
156H	0.05	-1.29	0.32	0.44	1.42	1.10	-0.65	0.74	0.56	-0.99	0.54	0.76	0.25
168H	0.10	-1.21	0.42	0.87	1.40	1.24	-1.13	0.66	0.25	-0.33	0.68	0.68	0.30
180H	-1.06	-1.66	0.44	0.38	1.28	1.16	-1.67	1.05	-0.17	-0.92	0.67	1.00	0.04
192H	-0.92	-1.36	0.85	0.76	1.88	1.52	-2.02	0.57	0.11	-0.40	1.22	2.03	0.35
204H	-2.15	-2.10	0.75	0.43	2.17	1.05	-2.33	0.84	0.08	-1.23	2.16	2.05	0.14
216H	-1.20	-1.55	0.77	0.48	2.27	1.09	-2.36	0.88	0.23	-0.59	3.18	2.92	0.51
228H	-1.88	-2.74	0.94	0.58	2.22	0.90	-1.82	1.54	0.39	-1.42	2.48	2.52	0.31
240H	-1.02	-1.73	0.85	0.83	2.66	1.32	-1.31	1.37	0.61	-0.47	2.99	3.08	0.77

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	6.28	6.53	6.32	5.41	5.82	6.01	6.45	6.05	5.68	5.97	6.59	5.66	6.06
24H	7.84	8.03	7.71	6.85	7.26	7.21	7.63	7.58	7.06	7.64	8.01	7.41	7.52
36H	9.78	8.97	9.04	7.86	8.76	8.84	9.55	9.26	8.93	9.13	10.34	9.19	9.14
48H	11.57	10.71	10.70	9.46	10.48	10.27	10.83	10.46	10.41	10.43	11.35	10.60	10.61
60H	13.84	13.19	12.44	11.65	12.34	11.45	12.63	12.69	12.48	11.76	13.30	11.58	12.45
72H	15.09	15.15	14.07	13.45	14.18	12.98	14.14	14.27	13.96	12.52	14.52	13.00	13.94
84H	17.50	17.26	15.37	15.71	15.79	15.44	15.79	15.96	15.96	14.98	17.14	14.02	15.91
96H	19.12	20.77	17.44	17.08	17.46	17.32	17.09	17.27	17.53	16.23	18.44	15.81	17.63
108H	21.86	24.06	19.58	19.07	20.01	19.79	18.71	18.04	19.89	18.99	21.48	17.66	19.93
120H	22.60	25.93	22.11	20.42	22.31	21.67	20.00	18.62	21.81	20.40	22.10	19.47	21.45
132H	24.39	28.27	25.32	22.64	25.78	23.95	22.01	19.86	23.64	23.49	23.75	21.22	23.69
144H	26.01	29.36	27.30	24.13	27.37	24.80	23.26	20.78	25.64	24.36	25.02	23.71	25.15
156H	29.11	30.05	28.35	26.42	28.10	25.76	25.21	21.05	26.45	26.84	26.59	26.35	26.69
168H	30.15	29.55	28.41	26.92	29.05	26.08	25.38	22.14	26.53	26.01	27.05	25.92	26.93
180H	32.04	33.09	28.73	27.24	29.05	26.43	26.19	22.35	27.06	27.83	28.07	27.69	27.98
192H	31.56	33.84	29.75	28.30	30.22	26.66	26.76	22.30	28.20	27.40	28.42	28.62	28.50
204H	32.92	34.62	30.36	29.38	31.32	27.09	27.27	22.85	28.86	28.56	30.28	30.22	29.48
216H	32.91	34.19	30.99	29.90	32.41	27.18	27.52	23.34	29.22	28.74	31.28	31.21	29.91
228H	33.28	33.97	31.95	29.60	32.46	28.18	28.24	24.22	29.80	29.81	32.65	33.07	30.60
240H	32.98	33.65	31.67	30.00	31.96	27.46	28.23	24.84	29.70	30.61	34.28	33.06	30.70

다. 북미

가) 850 hPa - 1) 고도 - ① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Avc
12H	6.00	4.12	5.68	5.38	3.36	0.68	-0.66	-0.64	-0.60	0.97	3.85	4.67	2.73
24H	8.51	6.82	8.39	8.45	6.75	5.29	2.71	2.97	1.30	2.27	5.62	6.16	5.44
36H	11.56	6.50	8.13	8.41	5.03	4.33	2.44	2.45	0.41	1.51	6.79	8.62	5.52
48H	16.22	7.88	9.39	9.46	4.70	3.18	1.07	1.12	-0.60	1.67	8.65	12.56	6.28
60H	16.48	7.33	8.21	9.62	5.42	5.03	4.69	5.05	2.71	2.39	8.10	13.13	7.35
72H	17.73	5.96	5.57	6.52	2.73	1.10	-1.47	-0.32	-1.64	0.20	6.50	13.27	4.68
84H	18.59	6.61	7.35	8.11	4.49	2.82	0.78	3.22	1.61	1.64	8.03	14.78	6.50
96H	16.34	5.82	4.72	4.55	3.91	0.34	-2.35	1.11	-0.90	-0.54	5.98	12.34	4.28
108H	18.44	8.78	8.49	6.91	5.51	0.58	-0.72	3.80	1.34	3.41	9.22	15.06	6.74
120H	17.25	8.36	8.48	8.39	10.80	5.44	3.51	7.87	2.92	6.08	8.84	12.95	8.41
132H	16.81	6.31	9.32	7.49	8.16	1.41	1.38	4.90	0.38	6.88	9.79	13.27	7.11
144H	14.91	4.78	10.97	10.33	13.53	5.80	6.61	8.27	0.11	7.36	10.03	9.80	8.54
156H	16.92	5.51	12.24	9.56	12.42	2.69	5.13	5.86	-0.59	7.45	12.30	11.62	8.43
168H	14.47	3.13	11.93	12.35	17.59	3.45	5.53	5.15	-1.03	5.36	10.49	6.95	7.95
180H	16.69	2.39	12.69	12.91	17.28	-0.15	2.95	4.67	0.67	4.72	10.31	10.29	7.95
192H	14.44	1.58	13.21	14.25	18.47	-0.61	3.13	3.98	2.12	1.84	8.06	10.64	7.59
204H	16.04	2.13	15.42	14.74	19.73	-1.39	2.02	4.21	3.75	1.63	7.53	16.83	8.55
216H	16.46	4.04	17.50	16.59	21.50	1.48	2.31	5.02	4.49	0.12	7.78	18.60	9.66
228H	15.67	5.02	17.03	18.08	20.94	2.85	1.18	2.77	2.60	-1.16	7.74	19.47	9.35
240H	15.48	8.87	17.28	22.12	22.56	6.76	3.25	3.23	3.06	-0.26	9.73	17.99	10.84

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	13.22	11.29	12.29	10.85	10.64	9.14	8.35	8.40	8.28	8.42	9.80	11.35	10.17
24H	18.71	16.46	16.58	15.59	15.29	12.33	10.79	11.23	11.15	12.16	13.89	15.29	14.12
36H	24.67	20.86	20.33	18.57	17.99	14.49	12.61	13.57	14.44	15.31	17.88	20.08	17.57
48H	30.91	26.07	25.51	25.04	22.68	18.22	16.50	16.50	18.03	19.81	23.54	25.93	22.40
60H	36.85	31.67	29.82	28.28	25.19	21.12	19.34	19.94	21.25	23.04	27.26	30.09	26.15
72H	43.19	36.82	36.23	33.84	29.99	26.32	24.26	22.51	24.15	28.97	32.74	34.43	31.12
84H	47.99	40.89	38.72	38.60	32.73	29.14	26.17	25.97	27.88	32.01	36.37	38.15	34.55
96H	51.45	45.23	41.81	44.45	37.38	33.66	30.75	29.10	30.79	37.15	41.82	41.11	38.73
108H	53.55	49.25	43.43	45.94	41.94	34.45	33.16	31.45	33.39	39.67	45.58	46.17	41.50
120H	57.13	52.68	46.86	50.39	47.61	39.08	36.37	34.07	35.63	44.22	50.02	50.27	45.36
132H	60.94	54.12	50.71	51.41	46.69	37.88	37.04	34.93	39.69	49.24	50.74	53.55	47.25
144H	64.38	56.56	56.91	55.34	49.90	42.98	38.76	37.22	43.42	54.87	52.87	56.45	50.81
156H	65.56	59.26	60.40	56.28	50.77	44.64	38.70	37.42	48.01	58.16	55.01	61.29	52.96
168H	65.88	62.76	65.02	60.65	54.88	50.05	42.01	39.16	51.24	60.36	58.57	62.68	56.11
180H	67.83	65.41	69.91	62.24	55.41	50.00	43.06	39.65	54.84	61.53	60.69	67.38	58.16
192H	69.71	69.61	72.70	66.62	58.14	53.23	46.31	41.91	56.76	64.22	65.14	70.32	61.22
204H	70.54	72.23	75.34	67.51	56.45	54.31	45.51	41.99	57.39	65.04	68.97	74.28	62.46
216H	72.62	74.32	75.82	69.74	59.75	56.95	45.86	44.29	58.62	64.59	72.80	76.63	64.33
228H	72.78	77.73	77.64	66.94	58.88	57.06	44.60	44.12	59.09	63.67	75.45	79.73	64.81
240H	72.66	79.73	79.70	68.27	60.96	58.55	46.72	46.87	58.67	65.93	79.34	81.58	66.58

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.92	0.93	0.94	0.94	0.93	0.90	0.90	0.89	0.93	0.93	0.91	0.93	0.92
24H	0.93	0.94	0.96	0.95	0.95	0.93	0.93	0.91	0.95	0.95	0.95	0.95	0.94
36H	0.91	0.94	0.96	0.95	0.95	0.94	0.94	0.92	0.95	0.95	0.95	0.95	0.94
48H	0.88	0.92	0.95	0.92	0.94	0.93	0.92	0.90	0.93	0.93	0.93	0.92	0.92
60H	0.85	0.88	0.94	0.91	0.93	0.92	0.91	0.88	0.92	0.92	0.92	0.91	0.91
72H	0.80	0.84	0.92	0.88	0.90	0.89	0.87	0.88	0.90	0.89	0.90	0.90	0.88
84H	0.75	0.80	0.91	0.86	0.86	0.88	0.85	0.85	0.88	0.87	0.86	0.90	0.86
96H	0.72	0.75	0.88	0.82	0.84	0.86	0.79	0.82	0.87	0.83	0.81	0.88	0.82
108H	0.69	0.74	0.85	0.80	0.80	0.86	0.74	0.78	0.85	0.81	0.78	0.85	0.80
120H	0.66	0.72	0.82	0.76	0.76	0.83	0.68	0.75	0.84	0.76	0.74	0.82	0.76
132H	0.66	0.70	0.80	0.76	0.75	0.83	0.68	0.73	0.80	0.70	0.75	0.81	0.75
144H	0.65	0.66	0.76	0.74	0.73	0.78	0.68	0.70	0.75	0.63	0.74	0.78	0.72
156H	0.65	0.65	0.73	0.74	0.70	0.75	0.67	0.71	0.69	0.58	0.74	0.75	0.70
168H	0.65	0.65	0.69	0.71	0.68	0.70	0.61	0.69	0.65	0.55	0.73	0.75	0.67
180H	0.65	0.66	0.65	0.69	0.69	0.71	0.59	0.70	0.62	0.54	0.71	0.72	0.66
192H	0.64	0.62	0.63	0.64	0.66	0.67	0.54	0.67	0.59	0.53	0.67	0.67	0.63
204H	0.64	0.57	0.59	0.63	0.67	0.65	0.55	0.67	0.59	0.52	0.63	0.65	0.61
216H	0.59	0.50	0.56	0.60	0.65	0.60	0.55	0.63	0.56	0.52	0.61	0.64	0.58
228H	0.58	0.45	0.52	0.62	0.65	0.59	0.58	0.64	0.56	0.54	0.60	0.64	0.58
240H	0.56	0.45	0.50	0.61	0.61	0.55	0.54	0.60	0.55	0.53	0.58	0.62	0.56

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.12	-0.34	-0.05	-0.13	0.14	0.04	0.08	0.20	0.07	0.15	0.17	-0.06	0.01
24H	-0.09	-0.29	0.06	-0.15	0.13	0.05	0.06	0.19	0.01	0.11	0.22	0.07	0.03
36H	-0.10	-0.45	0.19	-0.08	0.28	0.32	0.40	0.46	0.14	0.23	0.31	-0.05	0.14
48H	-0.08	-0.45	0.11	-0.17	0.20	0.28	0.37	0.49	0.08	0.22	0.26	0.06	0.11
60H	-0.17	-0.66	0.18	-0.14	0.45	0.52	0.69	0.72	0.25	0.27	0.27	-0.13	0.19
72H	-0.21	-0.65	0.01	-0.29	0.25	0.39	0.65	0.67	0.17	0.19	0.11	0.03	0.11
84H	-0.32	-0.74	0.11	-0.34	0.57	0.60	1.00	0.87	0.24	0.32	0.22	-0.05	0.21
96H	-0.22	-0.67	-0.12	-0.38	0.49	0.50	0.89	0.79	0.06	0.18	0.13	0.12	0.15
108H	-0.20	-0.69	0.05	-0.29	0.81	0.73	1.26	1.02	0.08	0.27	0.18	0.05	0.27
120H	-0.19	-0.58	-0.07	-0.17	0.76	0.64	1.12	0.98	-0.07	0.07	0.04	0.16	0.22
132H	-0.30	-0.74	0.22	0.00	1.07	0.79	1.41	1.20	-0.04	0.13	0.12	0.11	0.33
144H	-0.31	-0.91	0.20	0.00	0.98	0.62	1.16	1.22	-0.23	0.01	-0.07	0.24	0.24
156H	-0.22	-0.96	0.47	-0.04	1.26	0.80	1.49	1.34	-0.13	0.14	0.00	0.19	0.36
168H	-0.08	-1.09	0.39	-0.18	1.12	0.52	1.25	1.24	-0.25	0.07	0.00	0.35	0.28
180H	0.05	-1.12	0.63	-0.23	1.39	0.72	1.42	1.29	-0.04	0.26	0.21	0.23	0.40
192H	0.05	-1.23	0.61	-0.40	1.21	0.53	1.05	1.13	-0.10	0.08	0.14	0.43	0.29
204H	-0.02	-1.18	0.69	-0.40	1.36	0.86	1.33	1.29	0.10	0.27	0.34	0.45	0.42
216H	-0.11	-1.02	0.57	-0.51	1.21	0.68	0.97	1.23	0.05	0.17	0.35	0.67	0.36
228H	-0.46	-0.75	0.80	-0.49	1.32	1.02	1.27	1.27	0.21	0.40	0.49	0.65	0.48
240H	-0.78	-0.32	0.68	-0.35	1.11	0.87	0.87	1.14	0.10	0.47	0.36	0.76	0.41

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.90	1.96	2.08	1.96	1.94	1.73	1.54	1.49	1.41	1.47	1.67	1.76	1.74
24H	2.05	2.15	2.23	2.12	2.15	1.89	1.73	1.81	1.56	1.70	2.00	2.05	1.95
36H	2.45	2.42	2.70	2.36	2.39	2.19	2.01	2.00	1.85	1.92	2.16	2.17	2.22
48H	2.66	2.80	2.96	2.58	2.65	2.30	2.13	2.24	1.96	2.12	2.48	2.49	2.45
60H	3.07	3.28	3.48	2.99	2.89	2.62	2.47	2.56	2.20	2.34	2.69	2.74	2.78
72H	3.46	3.65	3.89	3.50	3.22	2.84	2.70	2.84	2.44	2.58	3.02	3.03	3.10
84H	4.01	4.17	4.41	3.85	3.45	3.11	3.21	3.12	2.60	2.96	3.18	3.20	3.44
96H	4.44	4.59	4.70	4.36	3.78	3.32	3.46	3.25	3.00	3.28	3.64	3.49	3.78
108H	4.88	4.88	5.14	4.65	3.95	3.63	3.85	3.51	3.19	3.59	4.04	3.63	4.08
120H	5.05	5.03	5.42	5.04	4.26	3.87	4.01	3.64	3.50	4.02	4.29	3.83	4.33
132H	5.34	5.21	5.71	5.02	4.52	4.11	4.34	3.91	3.74	4.47	4.41	4.02	4.57
144H	5.53	5.48	6.08	5.36	4.80	4.21	4.45	4.10	4.08	4.82	4.66	4.39	4.83
156H	5.68	5.68	6.47	5.28	5.03	4.34	4.68	4.25	4.34	5.10	4.89	4.66	5.03
168H	5.91	6.03	6.88	5.75	5.42	4.56	4.81	4.34	4.57	5.21	5.27	5.02	5.31
180H	6.06	6.21	7.17	5.78	5.51	4.59	4.94	4.38	4.66	5.36	5.57	5.23	5.46
192H	6.34	6.64	7.55	6.24	5.75	4.77	4.96	4.47	4.80	5.70	5.82	5.54	5.72
204H	6.86	6.88	7.59	6.25	5.73	4.75	4.98	4.61	4.92	5.98	6.04	5.76	5.86
216H	7.00	7.01	7.82	6.78	5.90	4.94	4.98	4.78	4.92	6.18	6.21	5.96	6.04
228H	7.22	7.05	7.73	6.81	5.90	4.89	4.93	4.76	4.92	6.28	6.43	6.01	6.08
240H	7.34	7.17	7.69	7.27	5.91	5.01	5.00	4.70	4.96	6.30	6.56	6.13	6.17

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.80	0.83	0.84	0.84	0.84	0.81	0.80	0.81	0.83	0.85	0.79	0.84	0.82
24H	0.87	0.90	0.90	0.89	0.88	0.82	0.79	0.76	0.83	0.89	0.84	0.90	0.86
36H	0.87	0.91	0.91	0.91	0.89	0.87	0.84	0.83	0.86	0.90	0.87	0.91	0.88
48H	0.87	0.89	0.92	0.90	0.89	0.86	0.82	0.78	0.84	0.90	0.87	0.90	0.87
60H	0.86	0.86	0.91	0.88	0.89	0.88	0.83	0.79	0.85	0.89	0.87	0.89	0.87
72H	0.84	0.83	0.90	0.85	0.86	0.84	0.78	0.72	0.82	0.86	0.85	0.88	0.84
84H	0.80	0.79	0.88	0.82	0.85	0.85	0.75	0.75	0.83	0.84	0.84	0.87	0.82
96H	0.75	0.75	0.85	0.79	0.82	0.82	0.66	0.70	0.77	0.80	0.80	0.85	0.78
108H	0.71	0.75	0.80	0.79	0.83	0.81	0.65	0.71	0.76	0.78	0.78	0.84	0.77
120H	0.71	0.71	0.77	0.77	0.80	0.77	0.52	0.65	0.73	0.75	0.75	0.81	0.73
132H	0.70	0.68	0.77	0.80	0.79	0.77	0.56	0.67	0.73	0.70	0.76	0.81	0.73
144H	0.70	0.63	0.74	0.78	0.75	0.73	0.45	0.60	0.68	0.66	0.75	0.79	0.69
156H	0.70	0.64	0.73	0.80	0.73	0.74	0.54	0.63	0.65	0.61	0.72	0.78	0.69
168H	0.68	0.64	0.72	0.77	0.63	0.67	0.43	0.55	0.61	0.61	0.69	0.74	0.65
180H	0.67	0.68	0.73	0.76	0.66	0.70	0.51	0.62	0.60	0.59	0.66	0.73	0.66
192H	0.65	0.64	0.71	0.70	0.59	0.64	0.41	0.55	0.58	0.56	0.64	0.70	0.61
204H	0.61	0.60	0.69	0.68	0.67	0.68	0.51	0.61	0.56	0.49	0.61	0.68	0.62
216H	0.62	0.55	0.65	0.62	0.62	0.59	0.41	0.53	0.58	0.48	0.55	0.67	0.57
228H	0.61	0.55	0.64	0.62	0.68	0.67	0.52	0.58	0.55	0.46	0.50	0.66	0.59
240H	0.59	0.54	0.60	0.55	0.63	0.57	0.42	0.50	0.55	0.46	0.47	0.65	0.54

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.14	-0.31	-0.10	0.05	0.06	-0.02	-0.14	0.02	-0.19	-0.27	-0.46	-0.35	-0.15
24H	-0.87	-0.80	-0.77	-0.67	-0.30	-0.56	-0.63	-0.74	-0.66	-0.56	-0.76	0.83	-0.68
36H	-0.57	-0.71	-0.13	0.16	0.09	-0.08	-0.33	-0.12	-0.39	-0.44	-0.70	-0.80	-0.34
48H	-1.16	-1.02	-0.71	-0.61	-0.44	-0.58	-0.67	-0.92	-0.79	-0.79	-0.82	-1.25	-0.81
60H	-0.83	-0.84	0.01	0.31	0.02	-0.07	-0.42	-0.20	-0.49	-0.50	-0.68	-1.06	-0.40
72H	-1.44	-1.19	-0.66	-0.48	-0.67	-0.53	-0.79	-0.93	-0.77	-0.82	-0.68	-1.43	-0.87
84H	-1.06	-0.85	0.10	0.49	0.04	-0.01	-0.46	-0.39	-0.41	-0.52	-0.60	-1.21	-0.41
96H	-1.64	-1.08	-0.55	-0.35	-0.74	-0.46	-0.67	-0.99	-0.70	-0.82	-0.69	1.32	0.83
108H	-1.14	-0.72	0.20	0.51	-0.20	0.11	-0.33	-0.44	-0.35	-0.62	-0.49	-0.98	0.37
120H	-1.55	-0.97	-0.26	-0.48	-0.86	-0.23	-0.58	-1.05	-0.63	-0.82	-0.51	-1.15	-0.76
132H	-1.07	-0.54	0.29	0.65	-0.44	0.40	-0.28	-0.42	0.29	-0.41	0.47	1.01	-0.30
144H	-1.48	-0.74	-0.31	-0.50	-1.24	0.04	-0.24	-1.11	-0.58	-0.50	-0.68	-1.29	-0.72
156H	-1.17	-0.25	-0.04	0.62	-0.56	0.45	0.18	-0.49	0.00	-0.01	-0.45	-1.21	-0.24
168H	-1.43	-0.57	-0.83	-0.49	-1.14	-0.09	-0.03	-1.08	-0.32	-0.18	-0.49	-1.45	-0.68
180H	-0.82	-0.53	-0.37	0.53	-0.70	0.43	0.31	-0.60	0.22	0.10	-0.15	1.29	-0.24
192H	-1.21	-0.76	-1.12	-0.62	-1.09	0.01	-0.14	-1.01	-0.29	0.08	-0.52	1.64	0.69
204H	-0.71	-0.65	-0.65	0.41	-0.58	0.69	0.21	-0.46	0.15	0.45	0.12	1.56	0.24
216H	-1.07	-1.03	-1.31	-0.42	-1.06	0.15	-0.19	-0.91	-0.40	0.27	-0.56	1.61	-0.68
228H	-0.62	-0.78	-0.36	0.47	-0.40	0.64	0.11	-0.34	0.01	0.68	-0.31	-1.30	-0.18
240H	-1.16	-0.99	-0.87	-0.60	-0.73	0.23	-0.33	-0.86	-0.52	0.30	-0.50	-1.31	-0.61

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	4.48	4.51	4.67	4.44	4.51	4.22	3.93	3.94	3.97	4.00	4.23	4.27	4.26
24H	5.30	5.38	5.34	5.20	5.26	5.02	4.50	4.53	4.70	4.81	5.10	5.09	5.02
36H	5.87	5.88	5.89	5.38	5.37	5.09	4.69	4.64	4.85	5.14	5.58	5.55	5.33
48H	6.65	6.72	6.87	6.47	6.49	6.16	5.41	5.54	5.71	6.05	6.63	6.44	6.26
60H	7.33	7.57	7.49	6.97	6.53	6.18	5.62	5.60	5.99	6.29	7.10	6.94	6.63
72H	8.18	8.49	8.89	8.01	7.91	7.19	6.45	6.53	6.82	7.54	7.93	7.50	7.62
84H	8.76	9.16	9.05	8.48	7.97	7.28	6.76	6.40	7.05	7.60	8.32	8.17	7.92
96H	9.78	9.86	9.72	9.70	8.95	8.41	7.60	7.38	7.88	8.64	9.21	8.67	8.82
108H	10.10	10.12	9.65	9.78	8.87	8.47	7.71	7.18	7.83	8.57	9.52	9.19	8.92
120H	10.94	10.79	10.17	10.34	9.94	9.40	8.40	7.97	8.40	9.57	10.40	9.40	9.64
132H	11.13	10.92	10.69	10.50	9.65	9.38	8.30	7.81	8.68	9.69	10.53	9.81	9.76
144H	11.45	11.62	11.53	11.06	10.43	10.08	8.69	8.37	9.36	10.80	10.64	10.27	10.36
156H	11.30	12.13	11.83	10.90	10.43	9.88	8.54	8.16	9.61	10.71	10.86	10.77	10.43
168H	11.66	12.69	12.63	11.66	11.26	10.61	9.06	8.70	10.42	10.98	11.47	11.21	11.03
180H	11.89	12.68	12.76	11.65	10.88	10.15	9.18	8.44	10.53	10.82	11.76	11.71	11.04
192H	12.54	13.10	13.26	12.13	11.54	10.92	9.45	8.99	10.83	11.44	11.99	11.90	11.51
204H	12.40	13.31	13.13	11.86	11.00	10.81	9.19	8.59	10.64	11.35	12.30	12.53	11.43
216H	12.72	13.82	13.47	12.65	11.53	11.19	9.32	9.07	10.96	11.78	12.23	12.82	11.80
228H	12.74	13.78	13.25	12.44	11.13	10.94	8.84	8.76	10.72	11.52	12.78	13.43	11.69
240H	12.94	13.82	13.54	12.77	11.85	11.33	9.18	9.30	11.12	11.57	13.06	13.48	12.00

나) 500 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Avc
12H	7.74	4.94	6.48	7.01	6.32	3.81	3.04	3.92	4.51	4.61	6.55	6.19	5.43
24H	10.73	7.94	11.33	11.61	12.22	10.95	8.87	9.25	7.29	7.14	9.17	7.98	9.54
36H	13.60	5.74	10.20	10.55	9.55	9.55	8.12	9.27	6.42	6.18	10.06	9.65	9.07
48H	19.30	7.14	12.26	12.35	10.42	10.20	8.62	9.01	5.89	7.54	12.35	14.27	10.78
60H	18.28	3.70	8.40	10.29	9.57	10.32	11.68	12.90	8.89	7.45	10.62	13.05	10.43
72H	19.37	2.72	5.99	6.90	7.49	7.75	7.26	8.29	4.62	6.08	9.44	13.34	8.27
84H	20.18	2.48	5.61	6.83	9.21	7.95	8.41	11.17	6.87	6.54	11.53	13.76	9.21
96H	19.62	2.84	2.69	4.07	10.09	7.40	7.36	9.84	2.71	4.47	9.98	12.63	7.81
108H	22.26	3.84	5.49	5.16	11.48	6.30	7.66	12.16	3.52	6.46	13.93	14.87	9.43
120H	20.88	5.37	8.00	8.30	19.77	14.02	14.24	18.11	4.68	9.08	13.68	12.65	12.40
132H	19.96	1.20	10.24	6.30	16.52	8.61	10.44	15.49	-0.45	8.29	14.77	11.47	10.24
144H	17.11	-1.47	15.35	10.88	23.94	15.30	17.96	20.17	0.14	9.96	15.02	8.62	12.75
156H	18.48	-1.58	15.58	8.43	23.22	10.65	15.24	17.11	-1.38	9.08	18.22	10.95	12.00
168H	16.42	-3.01	15.40	11.73	30.12	13.19	17.75	16.97	-0.12	9.01	18.81	7.09	12.78
180H	18.72	-6.20	12.56	9.33	30.15	7.18	12.78	15.39	2.14	9.03	19.33	8.34	11.56
192H	16.67	7.13	14.64	9.56	33.20	8.24	13.73	15.96	5.14	8.25	17.47	10.27	12.17
204H	16.77	7.98	14.41	7.63	33.43	5.15	10.74	16.12	7.85	7.93	16.86	17.05	12.16
216H	16.28	-4.85	18.02	10.62	35.31	9.53	11.30	18.55	10.61	7.21	17.23	22.61	14.37
228H	12.04	-5.16	17.42	11.20	33.84	9.84	7.68	16.17	8.49	6.18	17.74	24.60	13.34
240H	9.10	3.18	17.29	18.49	37.03	17.17	10.32	17.48	9.77	9.25	18.87	25.63	16.13

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	17.72	15.17	16.05	14.56	14.80	13.76	12.15	12.18	12.21	12.94	14.53	14.87	14.25
24H	26.00	22.39	22.95	20.75	20.87	18.40	15.98	16.03	15.60	17.16	19.88	20.96	19.75
36H	34.68	29.24	29.72	25.54	25.50	22.04	19.16	19.67	19.54	21.58	25.55	27.59	24.98
48H	44.43	38.47	37.77	35.17	31.65	25.15	22.18	23.21	23.08	26.79	32.95	35.46	31.36
60H	53.81	46.84	43.80	42.40	36.66	30.28	27.72	29.94	28.25	31.95	40.27	41.74	37.81
72H	62.68	56.85	52.52	52.47	43.43	34.45	31.99	32.32	31.93	38.49	47.93	47.30	44.36
84H	71.92	64.67	59.06	59.15	49.38	40.32	38.45	38.50	37.31	45.14	54.62	53.72	51.02
96H	78.81	72.13	64.34	67.79	56.17	45.50	43.13	41.71	41.15	52.37	59.94	57.46	56.71
108H	85.32	78.58	70.81	72.86	62.05	50.23	48.13	46.47	46.26	58.75	67.91	63.19	62.55
120H	89.52	82.89	74.39	81.42	68.30	55.15	53.36	52.43	49.92	67.70	71.41	68.30	67.90
132H	96.64	86.09	82.65	86.12	70.82	58.03	56.27	56.05	57.27	77.06	77.38	74.80	73.27
144H	101.33	91.12	93.15	93.02	76.64	63.63	59.45	59.63	65.22	85.56	82.80	80.00	79.30
156H	104.83	94.70	101.90	96.89	81.31	68.00	61.73	61.35	74.62	91.88	89.37	87.61	84.52
168H	108.72	100.13	110.63	101.65	87.90	73.47	64.99	62.38	78.94	96.55	94.09	92.41	89.32
180H	114.14	107.23	117.86	105.46	91.66	75.45	67.78	64.19	84.46	100.74	100.70	99.63	94.11
192H	118.12	115.07	123.13	108.40	94.87	77.93	69.96	67.53	86.58	105.95	106.99	105.25	98.32
204H	120.89	122.80	128.46	110.60	95.73	79.44	70.50	69.49	89.02	109.43	115.74	112.75	102.07
216H	121.70	127.71	129.08	112.63	98.34	80.87	71.01	72.08	87.28	109.84	118.83	117.34	103.89
228H	125.11	132.10	129.76	112.62	98.09	82.00	72.12	72.57	87.03	110.96	123.79	121.91	105.67
240H	127.69	133.90	133.48	113.42	98.28	84.56	73.76	74.37	84.88	111.89	130.33	124.65	107.60

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.94	0.96	0.96	0.95	0.94	0.92	0.91	0.89	0.92	0.92	0.92	0.95	0.93
24H	0.95	0.97	0.97	0.95	0.96	0.94	0.93	0.92	0.95	0.95	0.94	0.96	0.95
36H	0.93	0.96	0.97	0.95	0.96	0.95	0.93	0.92	0.95	0.95	0.94	0.96	0.95
48H	0.90	0.95	0.95	0.92	0.94	0.95	0.92	0.91	0.95	0.94	0.93	0.94	0.93
60H	0.88	0.93	0.95	0.90	0.93	0.94	0.91	0.88	0.94	0.93	0.91	0.93	0.92
72H	0.84	0.89	0.93	0.87	0.90	0.92	0.88	0.86	0.92	0.90	0.89	0.91	0.89
84H	0.79	0.85	0.92	0.85	0.87	0.91	0.85	0.83	0.90	0.87	0.87	0.90	0.87
96H	0.76	0.83	0.89	0.81	0.85	0.88	0.80	0.82	0.88	0.83	0.84	0.89	0.84
108H	0.74	0.81	0.86	0.79	0.82	0.88	0.77	0.80	0.87	0.81	0.80	0.87	0.82
120H	0.73	0.79	0.82	0.74	0.80	0.84	0.70	0.76	0.85	0.76	0.79	0.84	0.79
132H	0.73	0.77	0.80	0.73	0.78	0.83	0.69	0.73	0.81	0.72	0.77	0.83	0.77
144H	0.72	0.73	0.76	0.71	0.74	0.79	0.67	0.70	0.76	0.66	0.74	0.82	0.73
156H	0.72	0.72	0.73	0.70	0.72	0.77	0.69	0.69	0.69	0.61	0.71	0.80	0.71
168H	0.71	0.71	0.70	0.68	0.69	0.72	0.64	0.68	0.64	0.57	0.68	0.79	0.68
180H	0.69	0.70	0.68	0.64	0.69	0.73	0.63	0.69	0.58	0.54	0.65	0.78	0.67
192H	0.67	0.65	0.64	0.61	0.67	0.70	0.57	0.65	0.57	0.50	0.61	0.74	0.63
204H	0.67	0.59	0.62	0.63	0.69	0.70	0.58	0.65	0.55	0.47	0.57	0.71	0.62
216H	0.66	0.54	0.59	0.62	0.67	0.66	0.56	0.61	0.57	0.48	0.56	0.67	0.60
228H	0.65	0.49	0.58	0.63	0.66	0.66	0.57	0.62	0.58	0.47	0.54	0.65	0.59
240H	0.62	0.51	0.53	0.60	0.64	0.61	0.53	0.56	0.61	0.48	0.50	0.64	0.57

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.06	-0.07	-0.01	-0.02	0.02	-0.02	0.05	0.07	0.06	-0.08	-0.11	-0.10	-0.02
24H	0.01	0.03	0.10	0.12	0.14	0.10	0.20	0.14	0.08	-0.05	-0.07	-0.05	0.06
36H	0.07	-0.04	0.03	-0.01	0.06	-0.07	0.04	0.05	0.03	-0.08	-0.15	-0.12	-0.02
48H	0.13	0.03	0.12	0.11	0.13	0.03	0.18	0.06	0.03	-0.07	-0.11	-0.04	0.05
60H	0.12	-0.10	-0.05	-0.05	-0.01	-0.14	0.03	-0.02	-0.04	-0.08	-0.20	-0.13	-0.06
72H	0.19	-0.08	-0.02	-0.01	0.03	-0.05	0.13	-0.01	-0.05	-0.08	-0.15	-0.16	-0.02
84H	0.18	-0.13	-0.15	-0.12	-0.02	-0.15	-0.02	-0.10	-0.15	-0.13	-0.03	-0.23	-0.09
96H	0.33	-0.10	-0.14	-0.07	0.05	-0.01	0.14	-0.10	-0.23	-0.14	0.05	-0.11	-0.03
108H	0.27	-0.23	-0.24	-0.23	-0.06	-0.05	0.00	-0.12	-0.31	-0.28	0.18	-0.16	-0.10
120H	0.23	-0.10	-0.11	-0.10	0.12	0.14	0.14	-0.05	-0.35	-0.34	0.23	-0.13	-0.03
132H	0.15	-0.28	-0.09	-0.24	0.05	0.07	0.02	0.03	-0.47	-0.40	0.25	-0.25	-0.10
144H	0.04	-0.33	-0.03	-0.10	0.22	0.24	0.21	0.06	-0.43	-0.36	0.32	-0.17	-0.03
156H	-0.10	-0.35	-0.10	-0.31	0.17	0.19	0.06	0.04	-0.46	-0.32	0.40	-0.18	-0.08
168H	-0.10	-0.21	-0.14	-0.28	0.32	0.28	0.20	0.03	-0.32	-0.16	0.60	-0.19	0.00
180H	-0.12	-0.37	-0.39	-0.52	0.26	0.13	0.05	0.04	-0.27	-0.02	0.58	-0.34	-0.08
192H	-0.09	-0.39	-0.34	-0.52	0.42	0.28	0.13	0.08	-0.18	0.13	0.61	-0.22	-0.01
204H	-0.17	-0.52	-0.47	-0.67	0.32	0.07	-0.02	0.15	-0.07	0.14	0.57	-0.26	-0.08
216H	-0.12	-0.48	-0.41	-0.52	0.38	0.16	0.05	0.22	0.07	0.22	0.51	0.00	0.01
228H	-0.30	-0.68	-0.44	-0.61	0.32	0.09	-0.07	0.21	0.09	0.22	0.59	0.08	-0.04
240H	-0.45	-0.45	-0.46	-0.35	0.47	0.33	0.03	0.24	0.15	0.31	0.51	0.30	0.05

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.29	1.24	1.26	1.15	1.14	1.04	0.93	0.95	0.98	1.01	1.11	1.14	1.10
24H	1.60	1.51	1.60	1.32	1.37	1.20	1.08	1.05	1.10	1.18	1.40	1.40	1.32
36H	1.96	1.93	1.97	1.66	1.64	1.33	1.16	1.24	1.33	1.39	1.68	1.69	1.58
48H	2.38	2.29	2.32	1.99	1.98	1.57	1.30	1.44	1.53	1.68	1.96	2.04	1.87
60H	2.76	2.64	2.71	2.44	2.21	1.78	1.47	1.63	1.76	1.90	2.38	2.33	2.17
72H	3.13	3.11	2.97	2.84	2.45	2.00	1.70	1.85	1.98	2.21	2.65	2.62	2.46
84H	3.53	3.47	3.34	3.29	2.72	2.17	1.97	1.97	2.21	2.53	3.00	2.96	2.76
96H	3.73	3.81	3.45	3.37	3.03	2.42	2.07	2.13	2.36	2.89	3.21	3.17	2.97
108H	4.02	4.01	3.77	3.64	3.24	2.60	2.31	2.24	2.59	3.18	3.46	3.31	3.20
120H	4.17	4.22	3.93	3.93	3.38	2.77	2.49	2.45	2.82	3.52	3.57	3.48	3.39
132H	4.45	4.42	4.31	4.27	3.57	2.90	2.59	2.61	3.06	3.93	4.03	3.71	3.65
144H	4.68	4.64	4.60	4.49	3.64	3.12	2.68	2.76	3.32	4.23	4.28	3.87	3.86
156H	4.82	4.85	5.08	4.74	3.80	3.25	2.86	2.85	3.55	4.51	4.60	4.09	4.08
168H	5.06	4.97	5.37	4.90	4.02	3.48	2.98	2.89	3.67	4.72	4.78	4.31	4.26
180H	5.39	5.30	5.70	5.13	4.15	3.61	3.14	2.95	3.86	4.91	5.12	4.55	4.48
192H	5.55	5.58	5.91	5.25	4.21	3.72	3.17	3.06	3.88	5.09	5.32	4.59	4.61
204H	5.74	6.03	6.06	5.42	4.45	3.71	3.17	3.13	3.97	5.22	5.59	4.88	4.78
216H	5.86	6.13	5.99	5.44	4.58	3.70	3.23	3.21	4.04	5.35	5.68	5.05	4.86
228H	6.02	6.26	6.00	5.58	4.85	3.72	3.31	3.31	4.10	5.42	5.76	5.20	4.96
240H	6.13	6.33	6.07	5.58	4.79	3.75	3.42	3.36	4.07	5.50	5.84	5.17	5.00

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.86	0.88	0.87	0.84	0.87	0.78	0.75	0.76	0.76	0.85	0.85	0.89	0.83
24H	0.90	0.92	0.92	0.90	0.92	0.86	0.81	0.84	0.84	0.90	0.89	0.92	0.89
36H	0.90	0.92	0.92	0.89	0.92	0.89	0.85	0.85	0.85	0.92	0.89	0.93	0.89
48H	0.87	0.91	0.91	0.88	0.91	0.89	0.84	0.84	0.85	0.90	0.89	0.90	0.88
60H	0.84	0.89	0.90	0.84	0.90	0.88	0.84	0.83	0.84	0.89	0.87	0.89	0.87
72H	0.81	0.85	0.89	0.82	0.87	0.86	0.80	0.80	0.81	0.87	0.86	0.86	0.84
84H	0.76	0.83	0.86	0.79	0.84	0.86	0.77	0.80	0.80	0.84	0.83	0.84	0.82
96H	0.73	0.80	0.84	0.77	0.80	0.83	0.74	0.77	0.78	0.79	0.79	0.83	0.79
108H	0.70	0.78	0.79	0.75	0.80	0.82	0.69	0.77	0.75	0.77	0.77	0.81	0.77
120H	0.69	0.75	0.75	0.72	0.79	0.80	0.63	0.75	0.72	0.74	0.76	0.78	0.74
132H	0.67	0.72	0.73	0.70	0.77	0.79	0.63	0.72	0.70	0.69	0.74	0.77	0.72
144H	0.67	0.67	0.71	0.67	0.75	0.74	0.61	0.70	0.67	0.64	0.73	0.76	0.69
156H	0.67	0.67	0.68	0.66	0.72	0.72	0.60	0.69	0.62	0.60	0.70	0.75	0.67
168H	0.65	0.68	0.66	0.64	0.68	0.66	0.57	0.68	0.59	0.57	0.67	0.73	0.65
180H	0.63	0.66	0.65	0.60	0.67	0.66	0.57	0.68	0.54	0.55	0.62	0.72	0.63
192H	0.61	0.62	0.64	0.58	0.67	0.62	0.54	0.66	0.55	0.52	0.59	0.72	0.61
204H	0.61	0.55	0.63	0.57	0.66	0.65	0.55	0.66	0.53	0.49	0.52	0.70	0.59
216H	0.60	0.49	0.63	0.56	0.64	0.63	0.50	0.63	0.53	0.48	0.52	0.69	0.58
228H	0.58	0.44	0.61	0.54	0.61	0.66	0.50	0.61	0.53	0.47	0.50	0.68	0.56
240H	0.55	0.45	0.58	0.54	0.59	0.64	0.46	0.58	0.53	0.46	0.48	0.67	0.54

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.60	-0.65	0.49	-0.30	-0.37	-0.69	-0.57	-0.70	-0.63	-0.70	-0.70	-0.66	-0.59
24H	-0.96	-0.88	-0.70	-0.17	-0.25	-0.60	-0.55	-0.69	-0.80	-0.86	-1.03	-1.06	-0.71
36H	-1.28	-1.19	-0.93	-0.51	-0.49	-0.89	-0.81	-1.03	-1.06	-1.19	-1.17	-1.09	-0.97
48H	-1.51	-1.20	-0.88	-0.18	-0.26	-0.89	-0.81	-1.02	-1.18	-1.21	-1.35	-1.13	-0.97
60H	-1.60	-1.23	-0.71	-0.64	-0.63	-0.97	-0.90	-1.34	-1.30	-1.29	-1.57	-1.35	-1.13
72H	-1.78	-1.28	-0.82	-0.29	-0.42	-1.03	-0.91	-1.34	1.22	-1.19	-1.83	-1.51	-1.14
84H	-1.98	-1.33	-0.94	-0.71	-0.72	-1.15	-1.04	-1.68	-1.36	-1.29	-1.76	-1.21	-1.26
96H	-2.18	-1.35	-0.86	-0.46	-0.54	-1.11	-0.93	-1.65	-1.21	-1.16	-2.04	-1.10	-1.22
108H	-2.28	-1.09	-0.81	-1.04	-1.20	-1.20	-1.06	-2.10	-1.30	-1.18	-1.51	-1.14	1.33
120H	-2.36	-0.97	-0.78	-0.70	-1.20	-0.93	-0.78	-1.85	-1.05	-1.17	-1.71	-1.07	-1.21
132H	-2.55	-0.85	-1.07	-1.05	-1.79	-1.04	-0.95	-2.11	-1.05	-1.39	-1.79	-1.01	-1.39
144H	-2.83	-0.96	-1.33	-0.77	-1.60	-0.78	-0.59	-1.92	-0.70	-1.11	-2.04	-1.20	-1.32
156H	-2.98	-0.86	1.28	-1.33	-2.17	-0.95	-0.88	-2.07	0.94	-1.18	-1.84	1.60	-1.51
168H	-2.64	-0.76	-1.48	-1.01	-1.81	-0.74	-0.38	-1.74	0.80	-0.93	-1.97	-1.55	-1.32
180H	-2.37	-0.96	-1.37	-1.65	2.23	-0.73	-0.73	-1.93	-1.05	-0.99	-1.87	-1.60	1.46
192H	-2.31	-1.11	-1.45	-1.13	-1.88	-0.69	-0.48	-1.45	-1.09	-1.04	-1.99	-1.83	-1.37
204H	2.26	-1.24	-1.94	-1.35	-2.23	-0.63	-0.86	-1.57	1.12	-0.80	1.75	1.84	-1.47
216H	-2.11	-1.31	-2.13	-1.14	-2.04	-0.84	-0.50	-1.33	0.96	0.71	2.00	-1.60	-1.39
228H	-2.24	-1.33	-2.46	-1.61	-2.24	-0.87	-1.06	-1.50	-0.98	-0.99	-2.07	-1.81	-1.60
240H	-1.97	-1.30	-2.37	-1.53	-1.97	-0.92	-0.77	-1.36	-0.90	-1.04	-2.54	-1.49	-1.51

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	6.11	5.87	5.71	5.24	5.32	4.82	4.25	4.23	4.44	4.52	5.20	5.48	5.10
24H	7.56	7.06	6.97	6.23	6.29	5.69	4.95	4.92	5.07	5.25	6.28	6.67	6.08
36H	8.81	8.46	8.29	7.27	7.13	6.25	5.36	5.54	5.66	6.06	7.44	7.85	7.01
48H	10.59	9.91	9.48	8.63	8.22	7.14	6.25	6.30	6.60	6.96	8.75	9.15	8.17
60H	11.61	11.45	10.80	9.89	9.11	7.67	6.77	7.21	7.31	7.89	10.11	10.30	9.18
72H	12.84	12.83	12.23	11.34	10.07	8.71	7.81	7.84	8.19	8.84	10.87	11.25	10.24
84H	14.01	13.94	12.66	12.25	10.87	9.13	8.48	8.59	8.77	9.90	12.07	12.38	11.09
96H	14.95	14.69	13.83	13.03	11.89	10.38	9.47	9.18	9.70	10.66	12.94	13.04	11.98
108H	15.82	15.42	14.26	13.81	12.44	10.68	9.77	9.67	10.13	11.64	14.01	13.52	12.60
120H	16.79	16.51	15.17	15.05	13.12	11.75	10.26	10.20	10.95	12.59	14.51	13.83	13.39
132H	17.31	17.02	16.02	15.69	13.46	11.96	10.69	10.80	11.51	13.73	15.24	14.46	13.99
144H	18.01	17.63	17.44	16.06	14.36	12.82	11.26	11.51	12.56	14.67	15.96	14.85	14.76
156H	18.30	18.26	18.31	16.37	14.48	12.95	11.22	11.55	13.44	15.28	17.04	16.25	15.29
168H	18.58	19.14	19.32	16.99	15.07	13.83	12.13	12.01	14.21	15.59	17.82	16.87	15.96
180H	19.10	19.62	19.54	17.46	15.20	13.61	12.34	11.97	14.44	16.09	18.35	17.75	16.29
192H	19.94	20.45	20.49	18.10	15.87	14.40	13.10	12.32	14.77	16.86	19.01	18.27	16.97
204H	20.13	21.00	20.31	18.38	15.69	14.41	12.95	12.44	14.86	17.13	19.59	19.18	17.17
216H	20.32	21.66	20.71	18.80	16.27	15.01	13.09	12.85	15.13	17.33	19.98	19.57	17.56
228H	20.73	21.93	20.75	18.77	16.31	14.77	12.66	12.94	14.91	17.46	20.56	19.94	17.64
240H	20.97	21.97	20.86	18.89	16.88	15.38	12.83	13.47	15.03	17.25	20.82	20.34	17.89

다) 250 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	8.73	7.50	10.10	5.71	6.08	0.67	1.61	3.66	4.92	5.44	6.48	6.86	5.65
24H	13.94	13.69	17.77	14.39	15.92	10.89	10.35	11.60	10.24	9.60	11.15	10.01	12.46
36H	13.63	8.82	13.21	11.10	10.79	6.38	7.38	9.24	7.87	7.14	9.80	10.38	9.65
48H	21.87	12.05	16.44	16.44	14.23	9.50	10.87	10.38	9.32	9.55	13.56	16.48	13.39
60H	17.25	3.73	8.72	12.28	9.80	7.69	12.46	12.09	10.36	7.82	10.15	11.82	10.35
72H	19.62	3.44	6.29	11.00	9.37	6.88	9.94	9.38	7.95	7.51	10.66	12.51	9.55
84H	16.86	-1.60	1.92	8.15	8.65	5.95	9.28	10.33	7.91	6.00	12.66	10.67	8.07
96H	18.72	0.66	1.73	6.63	12.25	8.04	11.18	10.39	4.83	4.71	14.15	12.41	8.41
108H	17.12	4.01	2.87	5.04	11.11	6.47	10.41	12.33	2.35	3.82	20.27	12.41	7.87
120H	16.82	-0.18	1.79	9.99	22.78	17.30	20.00	21.15	4.04	6.23	22.24	11.41	12.80
132H	10.44	8.89	2.05	5.03	18.49	11.94	14.60	19.12	4.71	3.60	24.42	6.40	8.54
144H	6.19	-11.77	7.87	10.11	29.88	21.24	24.80	26.26	-1.20	7.13	27.12	4.45	12.67
156H	2.12	14.35	2.67	3.58	28.62	15.67	20.52	21.93	4.95	5.97	30.32	4.69	9.73
168H	1.96	12.51	3.44	7.98	38.35	18.99	25.27	22.91	0.68	11.13	31.49	1.96	12.52
180H	1.74	20.08	3.77	0.74	36.29	9.81	18.87	20.47	0.18	12.73	30.70	0.76	8.91
192H	2.44	18.84	0.21	2.63	40.84	12.41	20.69	23.40	5.25	17.21	28.16	3.40	11.45
204H	0.30	24.67	2.10	2.24	40.17	6.80	15.85	23.96	7.16	16.71	26.12	9.00	9.76
216H	4.03	18.98	1.21	3.47	43.64	13.60	17.30	28.82	13.67	19.57	26.61	20.17	14.43
228H	-3.52	-24.14	-2.33	0.87	41.03	12.32	12.16	25.26	11.57	18.07	26.50	24.09	11.82
240H	6.14	-13.36	1.22	12.17	47.69	23.60	16.45	27.41	15.85	23.43	26.85	29.61	16.86

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	25.84	23.05	24.53	20.92	22.37	20.82	19.68	18.97	18.90	18.85	20.55	20.80	21.27
24H	36.89	32.88	35.86	31.59	32.25	26.09	23.87	23.90	24.66	24.45	30.13	29.51	29.34
36H	48.28	39.87	42.90	39.05	40.17	33.51	28.83	29.34	31.63	33.27	39.41	39.41	37.14
48H	61.22	50.47	52.99	51.94	49.35	40.21	34.30	37.48	38.85	41.16	49.27	50.56	46.48
60H	71.26	62.10	59.75	62.03	57.63	48.70	41.52	47.10	47.68	49.53	60.27	59.13	55.56
72H	82.89	74.96	70.36	76.55	65.54	56.38	48.82	53.75	53.97	58.16	70.49	67.57	64.95
84H	94.12	87.56	78.66	85.94	76.98	64.20	60.52	61.17	61.34	70.25	82.84	77.39	75.08
96H	102.76	96.15	86.12	96.16	85.71	73.68	68.89	67.28	66.56	81.32	87.44	81.37	82.79
108H	111.83	105.67	94.11	103.92	95.84	82.15	77.10	75.10	75.46	92.92	99.06	87.06	91.69
120H	116.63	113.08	99.97	116.14	103.06	88.56	86.51	84.79	81.71	105.62	104.81	92.68	99.46
132H	125.25	119.60	112.27	127.12	108.10	95.05	92.36	91.04	92.53	120.20	117.06	102.27	108.57
144H	131.67	126.75	124.69	137.16	114.70	101.60	97.45	98.12	103.07	134.44	124.39	108.24	116.86
156H	139.32	133.62	139.06	145.41	122.28	108.16	103.60	101.70	116.51	145.75	135.48	119.77	125.89
168H	146.52	136.99	150.98	151.15	131.94	116.18	108.91	104.79	123.14	153.34	141.68	127.17	132.73
180H	155.14	144.65	163.94	158.59	138.96	121.83	113.66	107.83	131.42	161.36	153.70	135.52	140.55
192H	160.76	155.73	172.27	160.91	144.23	125.18	114.60	113.82	132.51	167.54	161.60	141.67	145.90
204H	167.43	171.30	182.35	166.25	149.70	125.59	116.73	118.29	137.64	174.80	175.08	153.72	153.24
216H	169.59	177.63	184.01	168.36	151.92	125.97	117.61	121.14	138.69	176.37	178.89	159.78	155.83
228H	175.23	186.82	187.25	169.91	157.82	127.85	119.52	123.95	139.35	180.68	185.20	163.22	159.73
240H	180.31	193.88	190.67	172.00	155.79	132.93	123.16	126.28	136.01	181.15	192.45	166.47	162.59

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.94	0.95	0.94	0.94	0.95	0.93	0.92	0.92	0.93	0.94	0.94	0.96	0.94
24H	0.95	0.96	0.96	0.95	0.96	0.95	0.94	0.95	0.95	0.96	0.94	0.96	0.95
36H	0.93	0.96	0.96	0.95	0.96	0.96	0.95	0.94	0.95	0.95	0.94	0.96	0.95
48H	0.91	0.95	0.95	0.92	0.94	0.94	0.93	0.92	0.94	0.94	0.93	0.94	0.93
60H	0.89	0.94	0.94	0.90	0.93	0.94	0.93	0.90	0.92	0.92	0.92	0.93	0.92
72H	0.86	0.91	0.92	0.87	0.90	0.92	0.89	0.87	0.91	0.91	0.90	0.91	0.90
84H	0.82	0.88	0.91	0.85	0.87	0.91	0.86	0.85	0.89	0.87	0.87	0.90	0.87
96H	0.79	0.86	0.88	0.81	0.85	0.88	0.81	0.84	0.87	0.83	0.84	0.89	0.85
108H	0.76	0.84	0.85	0.79	0.82	0.87	0.78	0.82	0.84	0.81	0.80	0.87	0.82
120H	0.74	0.82	0.82	0.74	0.80	0.84	0.71	0.79	0.82	0.77	0.80	0.85	0.79
132H	0.75	0.80	0.80	0.73	0.79	0.83	0.69	0.77	0.80	0.73	0.77	0.85	0.78
144H	0.75	0.75	0.76	0.70	0.75	0.79	0.66	0.73	0.75	0.68	0.76	0.84	0.74
156H	0.75	0.73	0.73	0.70	0.71	0.77	0.66	0.72	0.69	0.63	0.73	0.82	0.72
168H	0.74	0.73	0.70	0.67	0.67	0.72	0.62	0.70	0.64	0.60	0.71	0.81	0.69
180H	0.73	0.72	0.67	0.63	0.67	0.73	0.63	0.70	0.58	0.56	0.66	0.81	0.67
192H	0.71	0.68	0.64	0.60	0.65	0.70	0.59	0.67	0.57	0.53	0.62	0.79	0.65
204H	0.69	0.60	0.61	0.61	0.66	0.71	0.60	0.66	0.55	0.48	0.57	0.77	0.63
216H	0.68	0.56	0.61	0.60	0.64	0.68	0.55	0.62	0.56	0.49	0.58	0.74	0.61
228H	0.66	0.49	0.60	0.61	0.64	0.69	0.55	0.61	0.57	0.47	0.56	0.72	0.60
240H	0.61	0.47	0.57	0.58	0.61	0.64	0.51	0.56	0.60	0.49	0.53	0.69	0.57

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.62	0.58	0.57	0.44	0.44	0.21	0.22	0.37	0.43	0.27	0.34	0.36	0.40
24H	0.68	0.52	0.55	0.61	0.54	0.39	0.50	0.52	0.61	0.31	0.38	0.33	0.50
36H	0.26	0.26	0.19	0.49	0.44	0.24	0.38	0.50	0.50	0.13	0.31	0.23	0.33
48H	0.32	0.22	0.16	0.60	0.47	0.38	0.58	0.48	0.60	0.19	0.39	0.24	0.39
60H	-0.02	-0.06	-0.10	0.53	0.32	0.28	0.49	0.41	0.43	0.07	0.39	0.16	0.24
72H	0.02	-0.09	-0.09	0.69	0.32	0.39	0.65	0.43	0.58	0.23	0.51	0.23	0.32
84H	-0.34	-0.36	-0.38	0.52	0.27	0.26	0.52	0.43	0.45	0.18	0.44	0.08	0.17
96H	-0.35	-0.32	-0.38	0.59	0.33	0.45	0.71	0.44	0.61	0.32	0.50	0.08	0.25
108H	-0.68	-0.56	-0.70	0.43	0.28	0.34	0.68	0.41	0.42	0.21	0.48	-0.03	0.11
120H	-0.62	-0.61	-0.66	0.46	0.36	0.52	0.87	0.45	0.55	0.37	0.61	-0.04	0.19
132H	-0.99	-0.84	-0.91	0.27	0.41	0.43	0.75	0.43	0.36	0.20	0.58	-0.24	0.04
144H	-0.95	-0.78	-0.94	0.22	0.48	0.60	0.90	0.55	0.56	0.38	0.63	-0.23	0.12
156H	-1.34	-1.07	-1.28	0.04	0.45	0.37	0.82	0.50	0.43	0.27	0.44	-0.45	-0.07
168H	-1.24	-1.00	-1.21	0.13	0.42	0.50	0.98	0.57	0.57	0.51	0.41	-0.20	0.04
180H	-1.53	-1.19	-1.34	-0.07	0.43	0.26	0.91	0.52	0.33	0.48	0.23	-0.32	-0.11
192H	-1.32	-1.06	-1.28	0.03	0.39	0.43	1.02	0.60	0.52	0.68	0.22	-0.26	0.00
204H	-1.59	-1.15	-1.36	-0.15	0.34	0.32	0.87	0.61	0.26	0.71	0.10	-0.39	-0.12
216H	-1.37	-0.95	-1.26	-0.11	0.40	0.48	1.04	0.74	0.45	1.02	0.27	-0.16	0.05
228H	-1.49	-1.07	-1.50	-0.37	0.36	0.31	0.92	0.72	0.31	1.04	0.08	0.14	0.07
240H	-1.30	-1.18	-1.40	-0.33	0.38	0.50	1.09	0.71	0.47	1.21	0.24	-0.07	0.03

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.87	1.88	1.83	1.52	1.52	1.40	1.27	1.29	1.27	1.29	1.48	1.64	1.52
24H	2.23	2.22	2.09	1.74	1.78	1.62	1.46	1.44	1.53	1.48	1.79	1.94	1.78
36H	2.47	2.43	2.34	1.98	1.91	1.87	1.63	1.64	1.67	1.75	2.05	2.22	2.00
48H	2.80	2.83	2.55	2.26	2.20	2.03	1.81	1.80	1.87	2.00	2.28	2.49	2.24
60H	3.06	3.10	2.83	2.52	2.37	2.29	1.99	2.03	2.07	2.22	2.60	2.75	2.49
72H	3.35	3.46	3.06	2.77	2.66	2.50	2.21	2.24	2.20	2.39	2.83	2.93	2.72
84H	3.65	3.70	3.37	2.90	2.79	2.72	2.43	2.32	2.37	2.58	3.07	3.14	2.92
96H	3.89	3.94	3.46	2.99	3.08	2.83	2.60	2.43	2.41	2.85	3.19	3.31	3.08
108H	4.11	4.16	3.74	3.13	3.20	2.95	2.76	2.51	2.53	3.12	3.36	3.40	3.25
120H	4.23	4.23	3.75	3.25	3.26	3.06	2.87	2.62	2.62	3.28	3.39	3.63	3.35
132H	4.40	4.43	4.01	3.31	3.33	3.21	2.94	2.71	2.71	3.53	3.53	3.78	3.49
144H	4.54	4.51	4.16	3.46	3.50	3.22	2.98	2.82	2.88	3.63	3.57	3.81	3.59
156H	4.60	4.68	4.39	3.54	3.51	3.31	3.12	2.96	3.08	3.79	3.70	3.98	3.72
168H	4.63	4.89	4.54	3.64	3.57	3.38	3.23	3.08	3.17	3.90	3.81	4.11	3.83
180H	4.77	5.31	4.62	3.70	3.67	3.32	3.31	3.09	3.22	4.02	3.94	4.28	3.94
192H	4.66	5.39	4.66	3.72	3.73	3.40	3.32	3.17	3.29	4.05	4.10	4.33	3.99
204H	4.88	5.47	4.76	3.77	3.70	3.54	3.31	3.14	3.34	4.13	4.29	4.51	4.07
216H	4.86	5.61	4.69	3.89	3.86	3.45	3.30	3.23	3.44	4.28	4.51	4.65	4.15
228H	5.08	5.71	4.73	3.93	4.03	3.59	3.35	3.33	3.50	4.43	4.64	4.91	4.27
240H	5.00	5.64	4.64	4.03	4.09	3.64	3.40	3.27	3.58	4.47	4.71	4.90	4.28

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.80	0.82	0.82	0.77	0.77	0.73	0.71	0.72	0.71	0.81	0.77	0.82	0.77
24H	0.83	0.86	0.86	0.82	0.83	0.79	0.72	0.77	0.74	0.84	0.83	0.85	0.81
36H	0.80	0.88	0.84	0.81	0.84	0.80	0.76	0.77	0.76	0.83	0.82	0.84	0.81
48H	0.76	0.84	0.84	0.76	0.81	0.81	0.72	0.74	0.73	0.81	0.81	0.80	0.79
60H	0.71	0.80	0.82	0.71	0.78	0.79	0.75	0.73	0.72	0.79	0.80	0.78	0.77
72H	0.68	0.75	0.80	0.68	0.74	0.77	0.69	0.70	0.70	0.78	0.77	0.75	0.73
84H	0.62	0.69	0.77	0.67	0.72	0.76	0.67	0.70	0.68	0.77	0.74	0.75	0.71
96H	0.59	0.69	0.74	0.66	0.66	0.76	0.58	0.67	0.66	0.73	0.71	0.75	0.68
108H	0.57	0.68	0.69	0.64	0.64	0.75	0.58	0.66	0.61	0.68	0.68	0.73	0.66
120H	0.56	0.68	0.68	0.63	0.65	0.74	0.54	0.61	0.60	0.66	0.65	0.70	0.64
132H	0.54	0.64	0.65	0.65	0.63	0.73	0.56	0.60	0.59	0.60	0.63	0.68	0.63
144H	0.52	0.63	0.64	0.63	0.61	0.71	0.51	0.55	0.58	0.56	0.60	0.70	0.60
156H	0.47	0.59	0.63	0.64	0.60	0.69	0.52	0.50	0.55	0.53	0.59	0.68	0.58
168H	0.46	0.56	0.63	0.61	0.57	0.66	0.46	0.43	0.52	0.53	0.58	0.67	0.56
180H	0.43	0.53	0.64	0.59	0.54	0.68	0.50	0.46	0.53	0.50	0.59	0.66	0.55
192H	0.47	0.53	0.64	0.58	0.55	0.65	0.48	0.42	0.52	0.52	0.56	0.65	0.55
204H	0.42	0.54	0.61	0.58	0.55	0.65	0.52	0.45	0.52	0.49	0.53	0.63	0.54
216H	0.45	0.50	0.61	0.55	0.52	0.63	0.48	0.41	0.48	0.49	0.46	0.60	0.52
228H	0.41	0.44	0.58	0.57	0.47	0.61	0.52	0.38	0.50	0.47	0.44	0.59	0.50
240H	0.41	0.45	0.60	0.54	0.46	0.58	0.46	0.38	0.43	0.47	0.43	0.58	0.48

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.87	-0.25	-0.23	-0.05	0.18	-0.36	-0.45	-0.59	-0.65	-0.55	-0.88	-0.80	-0.46
24H	-1.27	-0.58	-0.29	0.25	0.06	-0.52	-0.55	-0.91	-0.94	-0.63	-0.83	-0.90	-0.59
36H	-1.81	-1.07	-0.94	0.00	-0.17	-0.89	-0.48	-1.01	-0.98	-1.02	-1.36	-1.04	-0.90
48H	-1.72	-0.96	-0.83	0.29	-0.35	-0.88	-0.43	-1.12	-1.21	-0.97	-1.26	0.74	-0.85
60H	-1.91	-1.03	-0.91	0.07	-0.48	-0.50	-0.42	-1.33	-1.03	-0.97	-1.27	-0.59	-0.86
72H	-1.68	-1.10	-0.71	0.22	-0.50	-0.77	-0.57	-1.52	-1.26	-0.85	-1.29	-0.72	-0.90
84H	-2.30	-0.90	-0.97	-0.04	-0.69	-0.88	-0.48	-1.51	-1.32	-0.65	-1.10	-0.64	-0.96
96H	1.95	0.53	-0.60	0.16	-0.79	-1.19	-0.60	-1.69	-1.06	-0.55	-0.91	-0.11	0.82
108H	2.41	-0.37	-0.69	-0.23	-0.97	-1.34	-0.38	-1.64	-0.89	0.56	-0.48	0.07	0.84
120H	-2.53	0.44	-0.20	-0.27	-1.30	-1.15	-0.19	-1.65	-0.62	-0.49	-0.94	-0.13	-0.75
132H	-2.86	0.26	-0.65	-0.80	-1.41	-1.08	0.24	-2.10	-0.85	-0.65	-0.67	0.18	-0.91
144H	-2.98	0.63	-0.34	-0.61	-1.80	-0.63	-0.21	-1.88	-0.16	-0.25	-0.76	-0.16	-0.76
156H	3.12	0.28	-0.53	-0.81	-1.77	-0.81	-0.05	-1.92	-0.75	-0.04	-0.94	0.17	-0.89
168H	-2.43	0.84	-0.53	-0.88	-2.02	-0.55	0.36	-1.87	-0.43	0.62	-1.18	-0.22	-0.69
180H	-2.26	-0.18	-0.41	-1.29	-1.79	-0.50	0.52	-1.95	-0.81	-0.06	-0.96	-0.26	-0.83
192H	1.49	-0.31	-0.37	-0.76	-1.99	-0.55	0.60	-1.71	-0.65	0.19	-0.59	0.08	-0.63
204H	-1.57	-1.05	-1.13	-1.15	-1.89	-0.77	0.60	-1.45	-0.52	-0.10	-0.59	0.31	-0.78
216H	-0.97	-0.48	-1.08	-0.90	-1.95	-0.66	0.68	-1.58	-0.18	0.27	-0.24	0.45	-0.55
228H	-1.51	-0.72	-1.42	-1.01	-1.46	-0.90	0.56	-1.62	-0.51	0.19	-1.18	0.48	-0.76
240H	-1.25	-0.23	-0.84	0.93	-1.42	-0.64	0.81	-1.97	-0.29	0.08	-1.24	1.04	-0.57

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	8.27	7.88	7.81	7.36	7.48	6.98	6.09	6.06	6.62	6.31	7.15	7.34	7.11
24H	10.43	9.15	9.25	9.25	9.31	8.42	7.58	7.48	8.22	7.35	8.78	9.13	8.70
36H	12.39	10.75	11.03	11.01	10.73	10.55	9.07	8.85	10.03	9.35	10.74	10.93	10.45
48H	14.09	12.48	12.56	13.12	12.79	11.81	9.98	10.68	11.46	10.82	12.76	12.45	12.08
60H	16.18	14.87	14.59	15.00	13.91	13.91	11.69	12.33	13.09	12.55	14.93	14.74	13.98
72H	17.85	17.31	16.13	16.98	15.68	15.00	13.12	13.77	14.38	13.68	16.42	16.10	15.54
84H	19.19	18.53	17.66	18.23	16.73	17.09	14.96	14.99	16.19	15.62	18.46	18.20	17.15
96H	20.63	19.77	17.92	19.53	18.21	17.67	16.13	16.15	17.12	17.15	19.46	18.81	18.21
108H	22.05	21.07	18.45	21.08	19.42	19.20	17.29	17.29	18.23	19.12	21.01	20.40	19.55
120H	23.15	22.52	19.50	22.46	20.22	20.16	18.02	18.28	19.09	20.41	21.97	20.41	20.52
132H	24.32	24.23	21.68	24.24	21.03	21.13	18.82	19.21	20.22	22.41	23.37	21.83	21.87
144H	25.24	25.29	22.69	24.70	21.85	21.38	19.25	20.36	21.45	23.66	24.55	22.10	22.71
156H	26.46	26.14	25.11	25.50	22.61	22.77	20.04	21.60	23.14	25.12	26.45	24.15	24.09
168H	27.17	26.48	26.11	25.90	23.58	23.74	20.99	21.39	23.66	26.04	27.47	25.23	24.81
180H	27.93	27.03	27.88	26.79	24.48	24.28	22.21	21.69	24.26	27.13	29.30	26.45	25.79
192H	28.85	27.95	28.12	27.27	25.03	24.56	22.54	21.87	24.63	27.74	29.98	27.13	26.31
204H	29.65	29.51	29.54	28.24	25.68	25.15	22.46	22.52	25.58	28.28	31.55	29.10	27.27
216H	30.62	30.06	29.46	28.26	26.13	25.14	22.44	22.61	26.00	28.72	31.62	29.53	27.55
228H	31.04	31.08	30.56	28.53	26.85	25.85	22.31	23.98	26.42	29.33	32.99	30.05	28.25
240H	31.76	31.37	30.53	28.90	26.91	26.12	22.84	24.10	26.04	29.30	33.03	30.31	28.43

라. 호주/뉴질랜드

가) 850 hPa - 1) 고도 - ① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.62	-1.73	-2.49	-3.62	-3.72	-3.59	-7.26	-4.43	-1.19	-0.59	1.34	-2.90	2.79
24H	-4.31	-6.40	-4.79	-3.98	-2.97	-2.47	-6.46	-3.49	0.03	-1.88	0.41	-3.38	-3.38
36H	-4.96	-8.86	-6.70	-7.03	-5.46	-5.59	-10.45	-8.88	-0.32	-2.80	-4.24	-7.42	-6.06
48H	-3.63	-8.67	-5.01	-4.66	-3.37	-2.85	-7.32	-4.83	1.44	-3.73	-2.02	-6.50	4.26
60H	-5.26	-12.72	-8.87	-7.96	-4.95	-3.67	-7.00	-6.52	3.73	-1.85	-5.65	-10.05	-5.90
72H	-0.92	-10.12	-4.81	-5.49	-3.94	-2.24	-4.41	-3.14	4.33	-2.20	-1.68	-4.23	3.24
84H	-7.27	-15.48	-10.81	-10.04	-5.66	0.56	-6.63	-6.26	4.88	-5.07	-8.40	-10.58	-6.73
96H	-2.44	-12.98	-7.24	-8.81	-3.68	-1.25	-4.40	-2.22	4.92	-4.96	-3.99	5.23	4.36
108H	-5.77	-12.66	-7.84	-8.69	1.94	6.99	-2.67	2.53	11.65	-0.32	-5.05	-4.31	2.44
120H	-6.55	-13.90	-9.45	-9.64	1.83	0.60	-6.14	-2.00	6.03	-7.61	-3.48	-4.74	-4.59
132H	-6.55	-13.25	-10.27	-8.35	6.89	7.74	-6.98	-2.68	12.57	-1.03	5.87	-3.93	-2.64
144H	-4.88	-11.65	-7.79	-5.87	8.61	4.61	-4.25	1.80	12.72	-4.75	-1.32	-3.03	-1.32
156H	-5.55	14.61	-8.89	-7.73	9.43	12.65	-7.32	-2.12	13.43	1.95	-4.33	-3.38	-1.37
168H	-2.86	12.86	-3.82	5.16	10.45	10.21	-4.09	2.53	12.12	1.26	-3.18	1.59	0.25
180H	-2.84	13.24	-4.79	-8.28	8.06	15.32	-10.34	-4.46	10.47	0.75	6.54	5.36	1.77
192H	0.09	-11.81	-0.50	7.79	7.51	15.14	-8.72	-1.15	5.75	-2.14	2.96	-3.48	-0.84
204H	0.97	-12.12	2.56	11.58	6.68	19.43	-11.29	-7.95	8.80	-0.92	4.52	-7.15	-1.85
216H	1.42	-13.80	-3.58	15.16	4.61	11.20	-10.06	-7.20	3.33	-5.67	-3.71	-5.86	-3.71
228H	-0.12	-15.41	-5.52	-17.19	4.05	18.86	-12.47	-9.66	7.69	-3.16	-6.96	-7.82	-3.98
240H	2.30	-10.93	-4.06	-16.92	4.00	14.09	-12.59	-9.20	6.57	-6.50	4.92	4.51	3.56

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	8.44	8.91	9.46	9.72	11.26	11.27	12.36	10.34	9.91	8.35	7.04	8.10	9.60
24H	11.77	14.01	14.55	13.03	15.04	13.28	12.11	10.92	11.22	9.28	8.72	12.05	12.17
36H	16.22	19.01	18.74	18.15	20.14	19.81	19.19	18.26	17.90	14.48	12.01	14.62	17.38
48H	17.06	20.74	20.81	19.68	21.35	17.55	16.32	14.33	15.86	11.78	9.56	14.35	16.62
60H	22.84	25.43	25.18	23.88	25.89	25.74	23.16	22.39	24.42	18.91	15.95	18.25	22.67
72H	22.39	24.87	23.36	25.34	27.56	19.68	19.18	17.90	21.98	15.10	9.86	14.30	20.13
84H	28.47	32.01	28.89	31.06	32.70	32.90	26.76	26.52	30.45	23.47	19.66	21.52	27.87
96H	28.48	30.79	27.73	34.35	33.61	28.55	23.64	20.47	24.01	17.95	13.83	15.79	24.93
108H	35.49	36.20	30.61	39.76	37.85	41.49	32.24	28.10	34.77	26.03	21.33	20.18	32.00
120H	36.57	34.12	30.92	42.31	40.31	36.86	27.78	21.56	26.67	18.79	17.67	16.48	29.17
132H	41.71	39.64	34.00	43.33	48.19	47.42	36.14	32.52	40.34	32.15	21.69	22.74	36.66
144H	41.82	40.70	34.87	44.85	49.89	41.01	33.39	25.61	33.46	23.49	22.39	20.40	34.32
156H	44.13	47.25	37.72	47.12	56.01	54.04	40.86	33.99	45.51	35.30	27.75	27.08	41.40
168H	43.24	47.90	39.87	46.02	55.53	43.22	35.88	31.04	39.20	29.98	26.34	26.40	38.72
180H	47.16	48.86	42.90	51.03	60.18	56.62	43.82	37.91	48.09	34.65	27.29	26.05	43.71
192H	47.89	44.32	45.87	53.47	55.72	50.12	35.92	32.52	35.14	27.83	22.42	22.18	39.45
204H	51.06	45.00	49.52	54.68	64.71	60.63	43.85	44.99	45.37	33.97	28.78	27.48	45.84
216H	51.19	45.42	49.32	58.12	61.10	49.36	34.94	34.90	31.27	23.93	19.54	23.34	40.20
228H	55.69	46.56	53.29	60.37	61.99	63.86	46.29	46.12	48.00	34.16	27.83	31.21	47.95
240H	54.17	42.49	54.17	62.97	57.40	51.28	39.66	34.94	34.58	24.17	19.62	24.96	41.70

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.83	0.79	0.79	0.81	0.81	0.71	0.61	0.63	0.72	0.69	0.81	0.72	0.74
24H	0.90	0.83	0.86	0.90	0.85	0.76	0.74	0.78	0.70	0.68	0.68	0.75	0.79
36H	0.88	0.81	0.85	0.89	0.83	0.77	0.70	0.79	0.79	0.63	0.74	0.77	0.79
48H	0.90	0.81	0.86	0.90	0.83	0.80	0.71	0.81	0.75	0.64	0.61	0.76	0.78
60H	0.86	0.79	0.84	0.88	0.77	0.76	0.74	0.81	0.76	0.64	0.68	0.75	0.77
72H	0.86	0.79	0.87	0.89	0.79	0.78	0.70	0.83	0.66	0.66	0.62	0.80	0.77
84H	0.78	0.70	0.81	0.84	0.77	0.70	0.73	0.71	0.69	0.46	0.56	0.68	0.70
96H	0.76	0.70	0.81	0.82	0.74	0.65	0.70	0.75	0.66	0.54	0.59	0.74	0.71
108H	0.65	0.59	0.78	0.73	0.74	0.62	0.66	0.68	0.65	0.42	0.59	0.76	0.66
120H	0.64	0.62	0.78	0.69	0.69	0.53	0.64	0.67	0.63	0.43	0.56	0.73	0.63
132H	0.56	0.51	0.76	0.63	0.65	0.54	0.58	0.62	0.54	0.33	0.58	0.79	0.59
144H	0.58	0.48	0.75	0.60	0.60	0.54	0.55	0.56	0.49	0.45	0.58	0.75	0.58
156H	0.52	0.40	0.74	0.60	0.61	0.54	0.58	0.60	0.42	0.30	0.55	0.69	0.55
168H	0.56	0.43	0.70	0.64	0.59	0.52	0.60	0.53	0.38	0.45	0.59	0.69	0.56
180H	0.53	0.45	0.63	0.62	0.63	0.56	0.53	0.48	0.34	0.28	0.59	0.69	0.53
192H	0.58	0.52	0.55	0.60	0.66	0.42	0.48	0.35	0.34	0.41	0.58	0.69	0.52
204H	0.49	0.53	0.49	0.59	0.58	0.54	0.58	0.34	0.35	0.27	0.52	0.67	0.50
216H	0.50	0.49	0.50	0.55	0.56	0.46	0.58	0.36	0.35	0.50	0.45	0.65	0.50
228H	0.44	0.52	0.46	0.52	0.61	0.54	0.61	0.29	0.30	0.21	0.39	0.58	0.46
240H	0.51	0.52	0.45	0.49	0.62	0.48	0.55	0.36	0.35	0.37	0.54	0.49	0.48

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.04	0.11	0.05	0.01	0.19	0.20	0.81	0.39	0.18	-0.28	-0.41	-0.38	0.08
24H	-0.32	-0.22	-0.22	-0.19	-0.04	0.17	0.53	0.16	0.00	-0.47	-0.77	-0.96	-0.19
36H	0.06	0.17	0.03	0.00	0.24	0.37	0.92	0.63	0.12	-0.23	-0.54	-0.64	0.09
48H	-0.11	-0.05	-0.19	-0.17	-0.06	0.21	0.69	0.44	0.10	-0.28	-0.66	-0.94	-0.09
60H	0.29	0.24	0.09	0.09	0.16	0.26	1.04	0.88	0.24	-0.07	-0.52	-0.49	0.18
72H	0.15	0.12	-0.16	0.01	-0.04	0.07	0.86	0.74	0.11	-0.18	-0.43	-0.84	0.03
84H	0.54	0.42	0.28	0.23	0.16	0.20	1.16	1.00	0.45	-0.10	-0.26	-0.35	0.31
96H	0.32	0.21	-0.14	0.17	-0.13	0.14	0.92	0.93	0.33	-0.29	-0.06	-0.87	0.13
108H	0.71	0.63	0.26	0.26	0.14	0.30	1.06	1.17	0.70	0.04	0.13	-0.33	0.42
120H	0.32	0.33	-0.03	-0.06	-0.05	0.23	0.94	1.06	0.49	-0.15	0.22	-0.78	0.21
132H	0.62	0.78	0.30	0.08	0.26	0.46	0.96	1.39	0.85	-0.04	0.07	-0.17	0.46
144H	0.39	0.47	-0.15	-0.15	0.18	0.55	0.72	1.23	0.69	-0.09	0.17	-0.58	0.29
156H	0.72	0.83	0.10	0.00	0.57	0.70	0.94	1.48	0.90	-0.39	0.21	-0.07	0.50
168H	0.60	0.41	-0.22	-0.32	0.35	0.76	0.56	1.21	0.80	-0.40	0.21	-0.34	0.30
180H	0.88	0.82	0.08	-0.14	0.63	0.92	0.75	1.50	1.01	-0.31	0.19	-0.19	0.51
192H	0.54	0.32	-0.18	-0.50	0.16	0.90	0.62	1.11	0.51	-0.55	0.22	-0.35	0.23
204H	1.13	0.64	0.03	-0.06	0.54	1.14	0.72	1.40	0.92	-0.33	0.10	0.08	0.53
216H	0.87	0.40	-0.31	-0.29	0.23	1.03	0.38	1.17	0.52	-0.32	0.10	-0.13	0.30
228H	1.11	0.80	-0.21	-0.02	0.53	1.21	0.32	1.19	0.98	-0.25	0.17	0.27	0.51
240H	0.81	0.62	-0.48	-0.19	0.26	0.84	0.20	0.98	0.70	-0.49	0.14	-0.03	0.28

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.50	1.57	1.48	1.41	1.50	1.48	1.59	1.54	1.45	1.59	1.71	1.66	1.54
24H	1.76	1.77	1.67	1.68	1.54	1.50	1.50	1.49	1.59	1.79	1.96	2.05	1.69
36H	1.89	2.06	1.91	1.93	1.81	1.80	1.99	1.96	1.95	1.99	2.11	2.18	1.97
48H	2.16	2.21	1.94	2.11	1.76	1.74	1.73	1.94	1.83	1.87	2.04	2.29	1.97
60H	2.26	2.38	2.06	2.21	2.05	2.02	2.20	2.39	2.30	2.43	2.30	2.36	2.25
72H	2.41	2.46	2.18	2.45	2.07	1.94	2.00	2.16	2.20	2.11	2.12	2.40	2.21
84H	2.68	2.75	2.54	2.68	2.39	2.32	2.44	2.70	2.67	2.85	2.55	2.67	2.60
96H	2.89	2.82	2.46	2.83	2.41	2.35	2.28	2.56	2.65	2.61	2.09	2.50	2.54
108H	3.25	3.18	2.70	3.10	2.69	2.74	2.63	3.03	3.06	3.31	2.54	2.81	2.92
120H	3.29	3.36	2.92	3.25	2.62	2.74	2.55	2.73	2.82	2.68	2.35	2.68	2.83
132H	3.65	3.60	3.26	3.52	2.85	3.15	3.06	3.45	3.69	3.45	2.97	3.01	3.31
144H	3.85	3.64	3.40	3.38	2.83	3.04	2.78	3.39	3.23	3.16	2.76	2.75	3.18
156H	4.26	4.02	3.72	3.60	3.20	3.12	3.29	3.68	3.99	3.60	3.34	3.41	3.60
168H	4.22	4.06	3.92	3.68	3.13	2.94	3.07	3.36	3.42	3.46	3.18	3.23	3.47
180H	4.41	4.29	4.04	3.96	3.48	3.38	3.26	3.62	4.34	3.44	3.52	3.61	3.78
192H	4.52	4.27	4.01	3.87	3.30	3.40	2.99	3.24	3.75	3.21	3.06	3.13	3.56
204H	4.91	4.32	4.44	3.81	3.75	3.82	3.44	3.70	4.49	3.40	3.70	3.39	3.93
216H	4.87	4.27	4.40	3.58	3.72	3.68	3.24	3.23	3.97	3.16	3.03	2.74	3.66
228H	5.02	4.41	4.44	3.94	4.07	3.86	3.65	3.70	4.63	3.68	3.54	3.42	4.03
240H	4.68	4.34	4.35	4.06	3.88	3.68	3.30	3.58	4.27	3.11	2.91	2.99	3.76

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.78	0.74	0.72	0.72	0.65	0.58	0.54	0.64	0.69	0.62	0.77	0.76	0.68
24H	0.81	0.79	0.80	0.78	0.74	0.63	0.66	0.63	0.75	0.50	0.54	0.55	0.68
36H	0.86	0.84	0.83	0.82	0.80	0.71	0.64	0.68	0.78	0.66	0.72	0.78	0.76
48H	0.84	0.82	0.85	0.82	0.82	0.58	0.58	0.63	0.79	0.66	0.65	0.62	0.72
60H	0.84	0.83	0.87	0.81	0.79	0.73	0.57	0.64	0.79	0.69	0.77	0.77	0.76
72H	0.83	0.83	0.85	0.78	0.76	0.67	0.61	0.67	0.78	0.66	0.55	0.64	0.72
84H	0.80	0.80	0.83	0.76	0.74	0.69	0.60	0.63	0.80	0.67	0.74	0.70	0.73
96H	0.76	0.75	0.80	0.73	0.71	0.59	0.59	0.63	0.77	0.49	0.56	0.66	0.67
108H	0.71	0.72	0.75	0.70	0.73	0.59	0.56	0.56	0.75	0.53	0.75	0.67	0.67
120H	0.67	0.67	0.69	0.67	0.70	0.57	0.61	0.52	0.72	0.42	0.48	0.63	0.61
132H	0.60	0.65	0.64	0.63	0.71	0.58	0.45	0.42	0.65	0.48	0.67	0.68	0.60
144H	0.51	0.58	0.62	0.64	0.68	0.58	0.45	0.43	0.65	0.50	0.51	0.64	0.57
156H	0.45	0.56	0.60	0.58	0.67	0.64	0.39	0.39	0.55	0.52	0.61	0.63	0.55
168H	0.47	0.55	0.57	0.57	0.66	0.63	0.37	0.51	0.60	0.51	0.44	0.59	0.54
180H	0.43	0.56	0.56	0.56	0.60	0.59	0.36	0.49	0.50	0.61	0.59	0.62	0.54
192H	0.43	0.57	0.53	0.55	0.62	0.52	0.41	0.47	0.59	0.53	0.42	0.47	0.51
204H	0.44	0.61	0.50	0.59	0.58	0.51	0.37	0.47	0.51	0.53	0.61	0.62	0.53
216H	0.46	0.60	0.48	0.60	0.58	0.47	0.39	0.45	0.52	0.41	0.34	0.58	0.49
228H	0.46	0.60	0.52	0.55	0.57	0.49	0.38	0.44	0.44	0.50	0.58	0.68	0.52
240H	0.52	0.55	0.53	0.49	0.60	0.50	0.40	0.39	0.43	0.50	0.43	0.61	0.50

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.22	-0.15	-0.22	-0.19	-0.16	-0.37	-0.43	-0.42	-0.73	-0.35	-0.22	-0.51	-0.33
24H	0.06	0.17	0.23	0.09	0.24	0.20	0.18	-0.17	-0.35	0.14	-0.05	-0.23	0.04
36H	-0.33	-0.16	-0.27	-0.30	-0.32	-0.05	-0.86	-0.66	-0.99	-0.39	-0.12	-0.38	-0.40
48H	-0.05	0.16	0.17	-0.11	-0.05	0.12	-0.31	-0.30	-0.71	0.13	0.03	-0.25	-0.10
60H	-0.39	-0.20	-0.25	-0.31	-0.31	0.22	-0.77	-0.50	-1.08	-0.12	-0.06	-0.08	-0.32
72H	-0.05	-0.01	0.14	-0.11	-0.09	0.44	-0.23	-0.41	-0.50	0.54	0.01	0.14	-0.01
84H	-0.14	-0.10	-0.33	-0.29	-0.56	0.07	-0.47	-0.41	-1.01	0.21	0.10	0.24	-0.22
96H	-0.01	0.05	0.08	-0.10	-0.25	0.64	0.04	0.06	-0.54	0.86	0.26	0.43	0.13
108H	0.06	-0.28	0.43	-0.32	-0.58	0.16	-0.43	0.06	1.08	0.23	0.18	0.28	0.18
120H	0.32	0.01	-0.03	0.02	0.09	-0.03	0.10	0.75	-0.19	1.97	0.48	0.43	0.33
132H	0.08	-0.23	-0.29	-0.17	-0.51	-0.36	-0.08	0.41	-0.68	0.69	0.65	0.38	0.01
144H	0.41	-0.06	0.07	0.39	0.10	0.35	0.29	0.68	-0.16	1.95	0.87	0.31	0.43
156H	0.29	-0.12	-0.25	0.27	-0.28	-0.20	-0.38	0.53	-0.24	0.59	0.99	-0.04	0.10
168H	0.59	0.18	-0.07	0.87	0.52	-0.17	0.04	0.56	0.19	1.59	0.89	0.29	0.46
180H	0.57	0.18	-0.64	0.52	0.04	-0.38	-0.71	0.30	0.05	0.65	0.84	0.26	0.14
192H	0.58	0.50	-0.10	1.02	0.87	-0.21	0.36	0.40	1.21	1.50	0.77	0.15	0.59
204H	0.34	0.40	-0.39	0.86	0.38	0.56	-0.25	0.13	0.16	0.55	0.73	0.09	0.19
216H	0.59	0.52	-0.07	0.90	1.08	0.02	0.68	0.27	1.23	1.70	0.91	-0.25	0.63
228H	0.49	0.38	-0.13	0.69	0.35	-1.02	0.20	-0.05	0.24	0.50	0.74	-0.35	0.17
240H	0.66	0.42	0.36	0.73	1.04	-0.59	0.98	0.10	0.90	1.48	0.60	-0.14	0.55

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	4.82	5.02	4.64	4.46	4.91	4.53	4.32	4.32	4.92	4.79	5.16	4.65	4.71
24H	5.20	5.76	5.20	4.88	5.26	5.16	4.49	4.57	4.93	5.05	4.91	4.81	5.02
36H	5.79	6.03	5.48	5.54	5.74	6.18	5.53	5.68	6.23	6.00	5.76	5.57	5.79
48H	6.10	6.68	6.01	5.79	5.89	6.43	4.97	5.53	5.92	5.63	5.12	5.21	5.77
60H	6.77	7.06	6.23	6.31	6.38	7.54	6.55	6.82	7.43	7.15	6.39	6.07	6.73
72H	7.02	7.49	6.51	6.76	6.65	7.35	6.02	6.48	7.16	6.61	5.48	5.67	6.60
84H	7.56	7.79	7.02	7.27	7.39	8.69	7.72	7.77	8.74	7.89	7.34	6.99	7.68
96H	7.97	8.49	7.25	7.55	7.64	8.24	7.12	7.37	8.23	7.15	6.28	6.43	7.48
108H	8.52	8.91	7.67	8.08	8.27	9.65	8.73	8.38	9.54	8.98	7.77	7.07	8.46
120H	9.09	9.26	8.02	8.46	8.44	9.51	7.97	8.04	8.77	7.65	6.96	6.50	8.22
132H	9.21	9.58	8.66	8.64	9.01	10.62	9.55	9.55	10.13	9.75	8.22	7.37	9.19
144H	9.66	9.87	8.80	9.13	9.18	10.30	8.96	9.11	9.45	8.37	7.40	6.78	8.92
156H	9.79	10.19	8.94	9.31	9.78	10.96	10.37	9.90	10.41	9.95	8.41	7.88	9.66
168H	10.23	10.36	8.82	9.49	9.82	10.23	9.61	9.59	9.72	9.37	7.81	7.30	9.36
180H	10.41	10.50	9.17	9.58	10.69	11.34	10.71	9.95	10.77	10.11	8.13	8.11	9.96
192H	10.67	10.69	9.62	10.18	10.81	11.25	9.55	9.36	10.28	9.12	7.66	7.45	9.72
204H	10.91	10.71	10.41	10.15	11.50	11.79	10.73	10.23	11.19	10.38	8.55	8.22	10.40
216H	11.11	10.68	10.57	10.43	11.72	11.29	9.77	9.32	10.17	9.11	7.58	7.36	9.93
228H	11.17	10.77	10.58	10.44	11.97	12.48	10.95	10.17	11.38	10.51	8.98	8.51	10.66
240H	11.34	10.95	10.82	10.56	11.78	11.54	9.68	9.38	10.31	9.34	7.61	7.82	10.09

나) 500 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	5.29	2.23	1.27	-0.36	1.13	-0.83	-4.18	-0.47	0.42	1.67	0.97	-0.40	0.56
24H	-0.92	-4.70	-1.90	-1.18	1.59	1.94	-2.24	3.12	2.00	-0.18	0.72	-5.69	0.74
36H	-0.42	-5.96	-2.76	-2.98	-1.08	-0.69	-6.71	-3.86	-1.72	-1.88	-2.44	-8.95	-3.29
48H	-0.67	-7.62	-1.75	-0.84	0.26	1.99	-1.78	2.23	2.46	-1.53	-1.74	-10.36	-1.61
60H	-0.85	-10.12	-4.06	-2.39	-1.20	0.43	-4.04	1.80	0.59	-1.63	3.60	-11.35	3.34
72H	3.40	-8.95	-0.96	-0.73	-0.59	2.76	0.24	3.65	2.03	1.56	0.19	-8.20	-0.47
84H	-1.49	-13.04	-5.39	-3.51	-3.41	3.78	-3.81	-1.47	1.92	-2.39	5.93	11.60	-3.86
96H	2.62	-11.14	-3.42	-3.04	-2.39	4.05	-1.51	3.95	4.34	-2.56	-0.80	-9.69	-1.63
108H	1.81	-9.97	-3.09	-2.79	2.27	10.34	-2.46	0.63	10.38	2.92	-1.25	-6.34	0.20
120H	-0.69	-11.37	-6.27	-6.57	2.83	4.98	-3.53	4.16	4.89	-3.93	-1.20	-9.65	2.20
132H	0.74	-8.22	-6.23	-4.68	8.00	9.92	-8.01	0.99	12.22	3.35	-0.89	3.79	0.28
144H	1.18	-8.04	-5.33	-3.98	11.52	10.06	-2.38	10.90	12.96	1.61	3.05	6.96	2.05
156H	4.03	-9.16	-5.26	-5.01	13.23	14.08	-7.52	6.61	13.86	6.94	1.67	4.86	2.38
168H	5.58	-8.44	-1.66	-4.29	15.13	11.60	-5.91	11.18	13.47	6.61	0.44	-4.99	3.23
180H	7.02	-7.16	-1.58	-5.44	14.72	13.97	-12.76	3.16	11.41	4.36	-1.21	-5.79	1.73
192H	8.20	-6.57	2.00	-6.26	14.15	13.64	-10.03	7.54	4.32	0.13	-0.23	-5.21	1.81
204H	13.05	-5.78	1.12	-6.86	15.48	18.56	-15.29	-3.56	12.44	2.55	-0.86	-4.29	2.21
216H	13.16	-8.15	-2.26	-11.80	13.00	6.64	-15.22	-0.52	3.21	2.74	-3.10	5.46	1.10
228H	13.38	-7.64	-3.56	-12.55	13.66	16.04	-18.10	-5.68	11.65	1.19	3.54	5.58	0.06
240H	14.91	-2.18	-1.89	-12.84	13.10	8.87	-15.98	-2.11	9.54	-2.75	5.00	3.83	0.01

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	13.73	11.80	12.83	14.13	16.34	15.59	13.46	13.86	13.84	12.11	9.85	10.34	13.16
24H	16.29	18.14	19.36	19.39	19.98	21.82	13.78	16.96	17.33	13.67	13.89	15.96	17.21
36H	22.02	22.05	21.92	25.87	27.50	28.30	24.52	27.53	22.37	20.73	15.04	20.40	23.19
48H	24.03	25.98	27.23	30.05	28.23	29.99	20.87	23.94	22.81	14.85	15.52	19.70	23.60
60H	29.63	29.03	30.74	36.38	36.58	37.96	31.15	35.26	32.85	23.30	22.57	25.13	30.88
72H	30.84	30.65	31.68	40.36	39.72	33.64	25.10	31.23	30.14	19.68	15.88	20.64	29.13
84H	36.59	34.54	34.37	46.44	48.18	45.58	37.42	43.26	42.53	28.96	25.92	29.42	37.77
96H	37.57	35.47	36.88	54.88	46.79	44.30	33.87	34.67	34.68	21.98	17.53	22.19	35.07
108H	46.08	40.73	40.27	62.34	56.24	60.54	46.95	46.99	49.04	33.72	29.83	27.23	45.00
120H	48.85	41.34	41.16	67.73	56.26	58.48	41.66	35.17	36.24	23.09	25.31	23.26	41.55
132H	54.97	43.67	46.64	70.87	66.20	74.06	55.00	54.86	51.28	40.48	34.40	32.83	52.11
144H	55.47	48.33	47.17	71.98	68.66	64.20	50.77	43.07	42.67	32.76	31.59	29.12	48.82
156H	58.14	55.48	53.40	73.21	75.93	73.92	60.02	55.22	54.68	44.49	38.15	40.71	56.95
168H	57.23	57.92	60.28	75.72	77.01	64.90	52.79	52.17	50.33	40.37	35.77	38.14	55.22
180H	64.38	63.08	66.38	79.02	84.83	81.08	63.34	57.93	62.37	45.28	38.62	38.55	62.07
192H	67.97	58.87	65.20	79.95	83.53	75.34	56.00	48.10	48.89	36.21	29.76	31.95	56.81
204H	71.53	62.15	69.18	78.37	98.00	87.47	66.36	61.91	65.81	43.13	42.30	39.28	65.46
216H	72.81	64.00	71.01	82.70	91.80	73.48	55.53	52.35	52.02	35.14	27.87	30.18	59.07
228H	75.78	64.84	75.61	84.18	93.83	90.38	69.08	71.06	68.32	45.51	40.29	43.01	68.49
240H	72.65	59.66	75.81	89.44	90.13	73.54	59.05	56.88	57.33	32.35	27.77	32.29	60.58

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.81	0.84	0.80	0.85	0.84	0.82	0.84	0.80	0.83	0.67	0.65	0.79	0.80
24H	0.89	0.83	0.86	0.92	0.88	0.81	0.89	0.86	0.82	0.52	0.60	0.71	0.80
36H	0.88	0.85	0.92	0.90	0.85	0.87	0.81	0.81	0.87	0.69	0.70	0.81	0.83
48H	0.89	0.81	0.90	0.91	0.88	0.75	0.74	0.80	0.79	0.73	0.56	0.74	0.79
60H	0.89	0.81	0.90	0.90	0.84	0.84	0.75	0.79	0.80	0.71	0.59	0.82	0.80
72H	0.89	0.81	0.89	0.88	0.81	0.62	0.80	0.80	0.68	0.73	0.60	0.79	0.78
84H	0.85	0.76	0.86	0.85	0.73	0.75	0.81	0.72	0.71	0.64	0.63	0.73	0.75
96H	0.84	0.77	0.83	0.81	0.72	0.61	0.79	0.72	0.68	0.60	0.68	0.76	0.73
108H	0.76	0.72	0.81	0.73	0.73	0.59	0.75	0.66	0.66	0.52	0.63	0.77	0.69
120H	0.73	0.69	0.78	0.69	0.73	0.47	0.73	0.65	0.65	0.50	0.53	0.75	0.66
132H	0.65	0.68	0.77	0.60	0.69	0.50	0.67	0.62	0.63	0.49	0.59	0.71	0.63
144H	0.62	0.59	0.79	0.58	0.61	0.48	0.63	0.68	0.70	0.46	0.61	0.69	0.62
156H	0.61	0.59	0.74	0.57	0.60	0.52	0.55	0.70	0.58	0.44	0.56	0.68	0.60
168H	0.61	0.60	0.70	0.57	0.55	0.55	0.60	0.68	0.61	0.43	0.56	0.65	0.59
180H	0.54	0.57	0.63	0.58	0.59	0.58	0.58	0.68	0.50	0.34	0.54	0.71	0.57
192H	0.56	0.59	0.63	0.58	0.59	0.48	0.54	0.68	0.62	0.29	0.59	0.67	0.57
204H	0.51	0.59	0.60	0.61	0.52	0.61	0.65	0.59	0.42	0.36	0.50	0.65	0.55
216H	0.55	0.55	0.58	0.59	0.51	0.54	0.63	0.56	0.51	0.38	0.56	0.64	0.55
228H	0.55	0.55	0.55	0.58	0.55	0.55	0.64	0.45	0.39	0.32	0.53	0.60	0.52
240H	0.63	0.53	0.55	0.52	0.55	0.52	0.59	0.44	0.42	0.41	0.54	0.57	0.52

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.10	-0.06	-0.02	-0.06	-0.04	-0.01	-0.23	0.01	-0.22	-0.12	-0.16	-0.10	-0.08
24H	0.03	-0.14	-0.05	-0.05	-0.06	0.04	-0.28	0.07	-0.22	-0.19	-0.08	-0.17	-0.09
36H	-0.01	-0.12	0.01	0.04	-0.07	0.28	-0.39	0.03	-0.40	-0.10	-0.20	-0.21	-0.10
48H	-0.11	-0.31	0.00	0.02	-0.12	0.21	-0.38	0.07	-0.27	-0.14	-0.03	-0.30	-0.11
60H	0.01	-0.19	0.05	0.08	-0.14	0.34	-0.44	0.05	-0.52	-0.17	-0.15	-0.28	-0.11
72H	0.01	-0.38	0.03	0.07	-0.21	0.28	-0.43	-0.02	-0.58	-0.07	0.27	-0.19	-0.10
84H	0.03	-0.23	0.10	0.18	-0.19	0.27	-0.50	-0.15	-0.52	0.07	0.02	-0.21	-0.09
96H	0.01	-0.39	-0.04	0.12	-0.25	0.29	-0.61	-0.23	-0.53	0.11	0.22	-0.17	-0.12
108H	0.09	-0.23	0.00	0.18	-0.32	0.07	-0.70	-0.29	-0.57	0.11	0.03	-0.32	-0.16
120H	0.01	-0.27	-0.03	0.00	-0.33	0.04	-0.70	-0.24	-0.82	0.37	0.16	-0.20	-0.17
132H	0.05	-0.11	0.07	0.01	-0.29	-0.13	-0.71	-0.24	-0.54	0.28	0.33	-0.15	-0.12
144H	0.07	-0.20	0.00	-0.06	-0.20	0.03	-0.57	0.03	-0.74	0.50	0.36	-0.17	-0.08
156H	0.24	-0.01	0.08	0.01	-0.10	-0.25	-0.56	0.03	-0.33	0.46	0.57	-0.21	-0.01
168H	0.18	-0.09	-0.01	-0.02	-0.02	-0.48	-0.73	-0.07	-0.48	0.56	0.58	-0.09	-0.06
180H	0.26	0.11	0.08	0.20	0.20	-0.58	-0.74	-0.19	-0.25	0.32	0.50	-0.05	-0.01
192H	0.22	0.06	0.14	0.24	0.18	-0.76	-0.64	0.05	-0.64	0.32	0.53	0.05	-0.02
204H	0.51	0.30	0.24	0.45	0.39	-0.72	-0.80	-0.25	-0.17	0.31	0.45	0.12	0.07
216H	0.44	0.16	0.26	0.37	0.43	-1.15	-0.97	0.05	-0.66	0.17	0.34	0.16	-0.03
228H	0.51	0.40	0.20	0.55	0.45	-0.85	-0.62	-0.14	-0.17	0.25	0.42	0.19	0.10
240H	0.54	0.33	0.28	0.40	0.49	-1.06	-0.53	0.21	-0.39	0.55	0.28	0.07	0.10

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.20	1.10	1.11	1.20	1.19	1.24	1.35	1.46	1.40	1.27	1.20	1.14	1.24
24H	1.41	1.23	1.22	1.40	1.36	1.41	1.53	1.69	1.50	1.29	1.27	1.17	1.37
36H	1.45	1.36	1.42	1.68	1.39	1.83	1.68	1.93	1.96	1.54	1.33	1.33	1.58
48H	1.63	1.51	1.48	1.82	1.58	1.98	1.69	1.98	2.02	1.43	1.35	1.26	1.64
60H	1.72	1.55	1.66	1.98	1.78	2.07	1.95	2.43	2.52	1.71	1.61	1.51	1.87
72H	1.81	1.67	1.62	2.15	1.94	2.30	1.90	2.32	2.47	1.54	1.45	1.43	1.88
84H	1.93	1.75	1.70	2.28	2.08	2.60	2.37	2.89	2.75	1.77	1.68	1.66	2.12
96H	1.99	1.91	1.73	2.49	2.21	2.57	2.29	2.37	2.59	1.68	1.43	1.60	2.07
108H	2.15	2.05	1.84	2.59	2.44	3.04	2.69	3.03	2.98	2.03	1.69	2.00	2.38
120H	2.20	2.13	2.02	2.80	2.54	3.06	2.44	2.67	2.73	2.06	1.53	1.64	2.32
132H	2.44	2.19	2.29	2.90	2.68	3.79	3.12	3.42	3.06	2.28	1.94	2.21	2.69
144H	2.45	2.45	2.54	2.94	2.71	3.51	2.96	2.94	3.02	2.03	1.88	2.05	2.62
156H	2.59	2.43	2.71	3.00	3.00	3.74	3.70	3.39	3.04	2.50	2.17	2.24	2.88
168H	2.63	2.54	2.88	3.23	3.21	3.54	3.23	3.42	2.99	2.34	2.18	2.22	2.87
180H	2.85	2.83	2.97	3.15	3.53	3.99	3.51	3.71	3.34	2.57	2.19	2.41	3.09
192H	2.90	2.67	2.91	3.30	3.61	3.96	3.53	3.68	3.21	2.25	2.10	2.21	3.03
204H	3.06	2.83	2.88	3.23	4.00	4.19	3.85	3.72	3.72	2.34	2.56	2.24	3.22
216H	3.14	3.00	3.12	3.09	3.94	3.99	3.57	3.34	3.68	2.03	2.14	2.02	3.09
228H	3.16	2.94	3.17	3.25	4.11	4.29	4.15	3.93	3.74	2.33	2.35	2.13	3.30
240H	3.08	2.77	3.11	3.27	3.94	4.13	3.71	3.73	3.35	1.97	2.01	2.11	3.10

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.56	0.57	0.55	0.62	0.65	0.70	0.62	0.64	0.68	0.45	0.49	0.48	0.58
24H	0.61	0.68	0.67	0.73	0.76	0.77	0.71	0.67	0.69	0.30	0.48	0.60	0.64
36H	0.74	0.73	0.68	0.74	0.81	0.81	0.81	0.71	0.69	0.60	0.56	0.62	0.71
48H	0.71	0.68	0.74	0.77	0.80	0.76	0.75	0.68	0.64	0.45	0.45	0.58	0.67
60H	0.75	0.70	0.73	0.76	0.80	0.80	0.71	0.69	0.64	0.61	0.53	0.61	0.69
72H	0.72	0.64	0.77	0.77	0.74	0.66	0.69	0.72	0.66	0.60	0.50	0.49	0.66
84H	0.74	0.61	0.75	0.72	0.73	0.70	0.70	0.65	0.68	0.60	0.56	0.59	0.67
96H	0.71	0.61	0.76	0.72	0.71	0.62	0.68	0.71	0.70	0.54	0.56	0.52	0.65
108H	0.70	0.58	0.75	0.69	0.69	0.65	0.69	0.67	0.65	0.56	0.63	0.49	0.65
120H	0.67	0.59	0.71	0.70	0.66	0.63	0.66	0.61	0.65	0.46	0.60	0.54	0.62
132H	0.65	0.59	0.65	0.63	0.66	0.52	0.57	0.58	0.68	0.57	0.52	0.41	0.59
144H	0.62	0.52	0.61	0.61	0.63	0.58	0.58	0.67	0.61	0.51	0.46	0.47	0.57
156H	0.57	0.54	0.56	0.57	0.57	0.56	0.48	0.63	0.68	0.49	0.49	0.50	0.55
168H	0.52	0.55	0.53	0.52	0.52	0.56	0.51	0.61	0.67	0.49	0.53	0.46	0.54
180H	0.45	0.47	0.53	0.53	0.51	0.51	0.47	0.57	0.67	0.57	0.49	0.48	0.52
192H	0.42	0.52	0.53	0.52	0.45	0.49	0.37	0.50	0.66	0.53	0.62	0.39	0.50
204H	0.41	0.46	0.52	0.57	0.39	0.50	0.53	0.52	0.62	0.62	0.41	0.49	0.50
216H	0.41	0.46	0.45	0.58	0.39	0.51	0.51	0.51	0.51	0.61	0.47	0.48	0.49
228H	0.43	0.46	0.45	0.53	0.38	0.48	0.51	0.43	0.53	0.63	0.42	0.56	0.48
240H	0.49	0.51	0.46	0.50	0.43	0.44	0.47	0.41	0.53	0.61	0.43	0.47	0.48

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.40	-0.36	-0.25	-0.24	-0.24	-0.37	-0.02	-0.38	-0.65	-0.46	-0.26	-0.26	-0.32
24H	-0.07	-0.34	-0.19	-0.16	-0.19	-0.39	-0.17	-0.68	-0.64	-0.68	-0.37	-0.44	-0.36
36H	-0.42	-0.59	-0.39	-0.28	-0.31	-0.52	-0.69	-0.58	-1.18	-0.78	-0.74	-0.45	-0.58
48H	-0.20	-0.36	-0.32	-0.53	-0.30	-0.70	-0.61	-0.59	-1.36	-1.33	-0.57	-0.45	-0.61
60H	-0.71	-0.74	-0.40	-0.61	-0.34	-0.80	-0.86	-0.60	-1.56	-1.36	-1.04	-0.27	-0.77
72H	-0.46	-0.40	-0.28	-0.83	-0.49	-0.96	-1.05	-1.08	-1.60	-1.35	-0.94	-0.20	-0.80
84H	-0.78	-0.59	-0.47	-0.70	-0.25	-0.79	-1.44	-0.89	-2.07	-1.60	-1.20	-0.31	-0.92
96H	-0.45	-0.07	-0.37	-0.68	-0.59	-0.90	-1.21	-0.98	-2.04	-1.63	-1.00	-0.11	-0.84
108H	-0.72	-0.28	-0.29	-0.46	-0.70	-1.43	-1.19	-0.81	-2.62	-1.83	-1.04	-0.39	-0.98
120H	-0.46	-0.06	-0.40	-0.62	-0.66	-1.26	-0.90	-0.69	-2.62	-1.67	-0.79	0.10	-0.84
132H	-0.73	0.02	-0.46	-0.56	-0.88	-2.08	-1.11	-0.64	-3.16	-1.80	-0.54	-0.51	-1.04
144H	-0.26	0.10	-0.39	-0.51	-1.21	-2.18	-0.94	-1.25	-2.86	-1.42	-0.24	0.02	-0.93
156H	-0.70	0.27	-0.32	-0.50	-1.04	-2.58	-1.38	-1.34	-2.70	-2.32	0.14	-0.55	-1.09
168H	-0.60	0.48	-0.29	-0.16	-1.16	-2.31	-0.79	-1.42	-2.18	-2.73	0.32	-0.16	-0.92
180H	-0.79	0.56	-0.48	-0.01	-1.10	-2.44	-1.16	-1.63	-2.46	-2.69	0.14	-0.44	-1.04
192H	-0.61	0.48	-0.25	-0.27	-1.20	-2.08	-0.25	-1.29	-1.75	-2.52	-0.12	-0.02	-0.82
204H	-1.13	0.72	-0.11	0.18	-1.06	-2.68	-0.26	-0.99	-2.23	-2.47	0.08	-0.60	-0.88
216H	-0.78	0.62	0.16	0.40	-1.15	-2.45	0.27	-1.09	-2.17	-2.11	-0.10	-0.17	-0.71
228H	-0.93	0.38	-0.08	0.70	-0.88	-3.37	0.25	-0.80	-2.55	-2.34	0.29	-0.62	-0.83
240H	-0.53	0.04	0.13	0.55	-0.61	-3.19	1.08	-0.66	-2.29	-2.25	0.43	-0.52	-0.65

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	5.27	5.29	4.87	5.41	5.32	6.28	5.77	6.37	6.07	5.29	5.40	4.99	5.53
24H	6.12	6.22	5.58	6.07	6.01	6.83	6.65	7.28	6.82	5.48	5.57	5.37	6.17
36H	6.72	6.78	6.36	7.51	6.67	8.38	8.13	8.57	8.12	6.70	6.56	6.23	7.23
48H	7.12	7.39	6.79	7.75	7.27	8.95	7.71	9.36	8.79	6.40	6.12	5.99	7.47
60H	7.90	8.09	7.36	8.52	8.07	10.13	9.48	10.69	10.13	8.09	7.48	7.55	8.62
72H	8.29	8.50	7.83	9.44	8.69	10.17	9.02	11.14	10.64	7.73	6.46	6.95	8.74
84H	9.21	9.11	8.63	10.10	9.66	11.56	10.58	12.40	12.54	9.13	8.31	8.12	9.95
96H	9.84	9.67	8.86	10.45	10.12	11.64	10.53	11.94	12.37	9.32	7.21	7.39	9.95
108H	10.77	10.21	9.87	11.18	10.85	13.84	12.60	13.97	13.27	10.49	9.35	8.75	11.26
120H	10.98	10.74	9.90	11.60	11.34	13.13	12.40	12.67	12.37	9.38	8.34	7.68	10.88
132H	11.65	11.32	11.00	12.04	12.33	15.64	14.63	14.76	13.80	12.08	9.49	8.83	12.30
144H	12.00	11.47	11.04	12.46	12.47	14.95	13.27	13.99	12.56	10.90	8.96	8.34	11.87
156H	12.82	12.12	12.06	12.84	13.56	15.39	15.60	15.48	14.23	12.53	10.13	9.84	13.05
168H	12.70	12.59	12.27	12.78	14.09	14.46	13.91	14.92	13.12	11.69	9.85	9.42	12.65
180H	13.43	12.86	12.67	13.47	15.03	16.37	15.97	15.22	14.62	12.37	10.77	10.54	13.61
192H	13.41	12.93	13.02	13.59	14.76	15.80	14.68	15.18	13.93	11.73	9.80	9.52	13.20
204H	14.10	13.25	14.30	13.87	15.82	17.28	15.96	16.53	15.50	12.56	11.05	10.32	14.21
216H	14.25	13.07	14.29	14.30	15.71	16.08	14.67	15.33	13.87	11.56	9.35	9.31	13.48
228H	14.72	13.04	14.59	14.36	16.91	17.79	16.57	16.43	16.55	13.37	11.29	10.19	14.65
240H	14.20	12.77	14.57	14.31	16.66	16.78	15.20	15.35	15.15	12.80	10.22	9.71	13.98

다) 250 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	8.66	6.11	6.24	3.54	5.98	3.63	-3.76	-0.24	0.08	1.20	3.26	-0.79	1.90
24H	-0.37	-5.02	1.53	2.62	4.78	5.70	-6.31	0.11	-1.99	-2.61	1.18	7.47	-0.52
36H	2.93	-3.37	3.81	3.97	5.04	8.08	-6.36	-3.28	-4.12	-1.81	1.64	-7.80	-0.67
48H	-0.58	-10.13	3.15	3.78	3.75	7.67	-6.70	-1.14	-3.07	-2.24	3.10	-11.35	-1.01
60H	2.30	-8.52	4.88	4.84	4.81	10.91	-4.09	-2.42	-0.53	-1.71	3.29	-9.01	0.12
72H	5.56	-11.84	6.62	4.81	2.56	10.36	-5.05	1.61	-3.83	1.90	9.48	6.23	1.45
84H	3.99	-10.42	4.39	3.47	1.13	12.83	-4.30	-0.44	0.61	3.16	3.66	-5.79	1.01
96H	7.01	-10.57	5.22	3.68	-2.45	12.82	-6.37	4.35	-3.91	2.90	11.20	-4.24	2.06
108H	9.40	-5.45	7.68	6.14	4.85	17.27	-2.61	2.86	6.47	11.26	9.51	1.21	5.51
120H	4.74	-7.96	3.28	0.06	1.59	10.32	-6.07	7.25	-3.64	4.62	13.39	-2.27	2.65
132H	10.41	-1.51	6.04	2.36	10.11	12.84	-4.37	6.25	7.16	15.87	15.53	6.55	7.14
144H	9.96	-3.13	6.00	2.15	12.37	12.08	-2.19	19.11	6.39	14.91	21.87	1.77	8.77
156H	17.87	0.76	9.29	3.20	20.57	11.63	-2.08	9.39	14.94	20.92	22.07	4.92	11.11
168H	18.72	0.55	10.25	4.79	23.48	3.94	-4.56	12.80	11.50	23.03	20.41	5.84	11.38
180H	23.51	6.36	16.35	7.93	28.35	6.33	-6.54	3.39	15.30	20.83	21.93	4.24	12.13
192H	21.69	3.90	19.70	10.15	28.02	5.22	-8.47	10.38	2.25	17.32	22.39	7.57	12.02
204H	34.99	8.06	21.62	13.25	36.89	11.01	-9.64	0.17	15.78	19.83	20.65	13.14	15.03
216H	32.98	2.65	17.30	8.49	31.22	-8.11	-16.70	4.17	3.78	13.81	20.61	10.60	10.62
228H	38.21	9.28	17.07	11.72	34.70	6.50	-13.37	2.78	17.15	20.61	18.98	12.86	15.02
240H	38.59	13.02	17.47	9.46	30.91	-6.55	-15.92	6.71	13.34	18.60	17.85	10.50	12.81

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	19.72	19.04	20.79	20.18	23.43	24.79	19.90	22.45	24.53	19.57	17.42	16.60	20.70
24H	24.56	25.66	30.28	28.69	28.31	33.36	23.53	28.34	28.38	18.21	21.04	22.85	26.10
36H	30.13	30.51	34.26	37.07	36.23	43.71	31.73	40.27	39.77	30.37	21.82	28.12	33.67
48H	36.08	35.29	42.80	43.74	38.41	46.71	29.45	35.57	37.66	24.12	22.88	26.78	34.96
60H	41.35	38.75	43.68	53.66	47.80	57.03	38.95	55.03	54.28	33.25	32.76	34.30	44.24
72H	44.73	44.03	47.58	60.75	53.49	55.23	33.95	46.85	49.98	28.15	26.29	29.83	43.41
84H	52.00	47.55	49.67	68.15	65.44	73.17	48.64	64.89	66.45	43.55	39.68	39.85	54.92
96H	56.53	49.72	53.71	78.62	65.34	69.55	47.44	53.18	54.87	36.07	31.79	34.11	52.58
108H	68.25	55.37	58.57	86.54	78.19	96.61	61.42	73.19	70.54	54.35	46.34	44.36	66.14
120H	71.49	58.28	63.45	96.28	80.16	90.21	56.46	53.09	60.55	40.91	38.89	36.60	62.20
132H	81.01	61.30	70.15	102.01	94.08	120.32	76.41	82.23	75.40	63.89	53.03	51.79	77.64
144H	83.15	67.90	75.85	104.84	98.79	102.04	72.42	71.97	61.93	52.64	50.58	51.20	74.44
156H	90.47	77.29	86.80	108.81	113.33	113.29	90.94	81.54	76.77	69.71	59.71	64.44	86.09
168H	90.87	80.91	94.52	114.46	114.55	111.38	83.05	77.50	70.79	65.89	58.86	63.20	85.50
180H	102.14	91.89	102.13	117.89	127.50	127.67	96.83	83.17	89.67	69.22	64.25	65.28	94.80
192H	107.29	87.35	99.92	120.87	130.01	124.17	91.32	72.43	75.70	56.09	58.62	57.42	90.10
204H	116.49	96.18	109.14	117.88	147.51	141.54	109.88	84.93	101.64	62.37	73.25	65.78	102.22
216H	118.60	101.52	115.88	118.23	141.55	121.79	93.35	73.70	88.49	49.60	54.99	51.57	94.11
228H	121.75	102.34	118.51	123.49	149.05	140.73	111.47	98.72	105.24	66.53	72.00	63.99	106.15
240H	118.89	95.33	114.83	129.21	140.08	118.21	95.64	91.59	89.97	48.51	54.83	52.11	95.77

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.85	0.86	0.82	0.88	0.86	0.85	0.84	0.81	0.72	0.57	0.61	0.81	0.79
24H	0.88	0.86	0.86	0.92	0.91	0.84	0.83	0.83	0.78	0.65	0.72	0.73	0.82
36H	0.91	0.89	0.91	0.92	0.91	0.90	0.90	0.83	0.82	0.68	0.73	0.82	0.85
48H	0.90	0.86	0.90	0.91	0.91	0.86	0.85	0.80	0.75	0.66	0.71	0.77	0.82
60H	0.90	0.87	0.91	0.90	0.89	0.87	0.87	0.78	0.73	0.67	0.77	0.84	0.83
72H	0.90	0.82	0.90	0.88	0.84	0.78	0.85	0.78	0.65	0.54	0.66	0.78	0.78
84H	0.89	0.80	0.89	0.85	0.78	0.74	0.85	0.74	0.68	0.57	0.66	0.78	0.77
96H	0.87	0.79	0.85	0.83	0.76	0.61	0.84	0.76	0.68	0.46	0.60	0.76	0.73
108H	0.82	0.77	0.84	0.78	0.74	0.55	0.80	0.72	0.71	0.55	0.63	0.74	0.72
120H	0.79	0.73	0.82	0.75	0.72	0.58	0.77	0.73	0.73	0.38	0.62	0.73	0.70
132H	0.72	0.74	0.81	0.68	0.70	0.45	0.67	0.68	0.74	0.50	0.54	0.64	0.66
144H	0.68	0.66	0.78	0.66	0.63	0.52	0.64	0.66	0.80	0.33	0.58	0.63	0.63
156H	0.64	0.68	0.71	0.63	0.56	0.54	0.56	0.70	0.73	0.41	0.54	0.64	0.61
168H	0.63	0.70	0.69	0.57	0.55	0.50	0.61	0.67	0.77	0.38	0.59	0.65	0.61
180H	0.54	0.64	0.66	0.55	0.54	0.52	0.58	0.70	0.64	0.41	0.53	0.73	0.59
192H	0.52	0.63	0.65	0.55	0.51	0.41	0.56	0.65	0.59	0.39	0.55	0.65	0.56
204H	0.47	0.60	0.59	0.58	0.44	0.43	0.50	0.62	0.58	0.44	0.53	0.69	0.54
216H	0.50	0.54	0.53	0.58	0.44	0.54	0.51	0.57	0.50	0.40	0.56	0.65	0.53
228H	0.49	0.57	0.53	0.56	0.44	0.50	0.50	0.49	0.51	0.47	0.51	0.71	0.52
240H	0.58	0.57	0.54	0.54	0.44	0.52	0.47	0.45	0.40	0.44	0.47	0.66	0.51

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.58	0.44	0.44	0.65	0.59	0.52	-0.20	-0.45	-0.02	0.04	0.53	0.31	0.29
24H	0.50	0.15	0.42	0.54	0.47	0.42	-0.25	-0.67	-0.16	0.03	0.48	0.21	0.18
36H	0.67	0.36	0.50	0.70	0.56	0.59	0.30	-0.29	-0.03	0.20	0.76	0.68	0.42
48H	0.48	0.03	0.46	0.49	0.46	0.43	0.15	-0.28	-0.02	0.10	0.51	0.38	0.27
60H	0.52	0.23	0.63	0.60	0.61	0.83	0.57	-0.11	0.34	0.45	0.78	0.76	0.52
72H	0.53	0.15	0.66	0.40	0.50	0.60	0.10	-0.10	0.20	0.29	0.67	0.55	0.38
84H	0.65	0.30	0.67	0.52	0.65	0.94	0.44	0.29	0.46	0.66	0.79	0.73	0.59
96H	0.66	0.22	0.72	0.39	0.43	0.93	0.35	0.32	0.34	0.62	0.66	0.63	0.52
108H	0.69	0.30	0.75	0.52	0.52	0.98	0.60	0.63	0.49	0.92	0.69	0.91	0.67
120H	0.72	0.24	0.74	0.41	0.34	0.85	0.37	0.61	0.68	0.73	0.86	0.59	0.60
132H	0.94	0.35	0.93	0.47	0.45	0.76	1.00	0.71	0.37	1.01	0.83	0.82	0.72
144H	0.84	0.26	0.85	0.41	0.42	0.53	0.49	0.70	0.51	0.96	0.89	0.85	0.64
156H	1.03	0.50	1.00	0.69	0.63	0.54	0.89	0.32	0.58	1.36	0.78	0.89	0.77
168H	1.11	0.41	1.04	0.82	0.78	0.37	0.64	0.23	0.39	1.40	0.83	0.73	0.73
180H	1.29	0.63	1.23	1.07	0.95	0.47	1.17	0.21	0.62	1.38	0.97	0.84	0.90
192H	1.24	0.40	1.08	1.14	1.03	0.21	0.87	0.22	0.51	1.24	1.04	0.78	0.81
204H	1.42	0.49	1.22	1.41	1.43	0.21	1.39	0.32	0.62	1.40	1.08	1.09	1.01
216H	1.48	0.45	1.08	1.46	1.22	0.24	0.95	0.20	1.02	1.24	1.01	0.79	0.93
228H	1.71	0.65	1.31	1.69	1.39	0.02	1.33	0.56	0.91	1.44	1.16	1.03	1.10
240H	1.63	0.57	1.12	1.57	1.15	-0.14	0.64	0.60	0.93	1.36	1.04	0.63	0.93

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.45	1.50	1.44	1.56	1.61	1.61	1.53	1.48	1.33	1.19	1.33	1.25	1.44
24H	1.45	1.60	1.66	1.60	1.74	1.71	1.56	1.65	1.53	1.04	1.36	1.37	1.52
36H	1.78	1.78	1.77	1.89	1.90	2.05	1.96	1.97	1.82	1.48	1.57	1.74	1.81
48H	1.68	1.85	1.96	1.88	1.92	2.09	1.81	1.86	1.79	1.07	1.40	1.56	1.74
60H	1.93	2.00	2.00	2.08	2.27	2.38	2.37	2.46	2.24	1.56	1.84	1.93	2.09
72H	1.98	2.12	2.11	2.10	2.32	2.31	2.17	2.26	2.29	1.28	1.52	1.73	2.02
84H	2.26	2.25	2.05	2.21	2.77	2.78	2.68	2.70	2.61	1.86	1.96	2.04	2.35
96H	2.32	2.41	2.23	2.31	2.81	2.70	2.41	2.22	2.27	1.54	1.71	1.83	2.23
108H	2.63	2.52	2.34	2.38	3.22	3.16	3.06	2.90	2.67	2.17	2.06	2.26	2.61
120H	2.53	2.71	2.43	2.53	3.12	2.99	2.70	2.42	2.30	1.91	1.99	1.83	2.46
132H	3.01	2.81	2.63	2.71	3.16	3.42	3.42	3.25	2.98	2.42	2.31	2.43	2.88
144H	2.94	2.85	2.78	2.91	3.22	3.23	3.24	2.95	2.63	2.24	2.36	2.05	2.78
156H	3.21	2.98	2.85	3.13	3.42	3.78	3.91	3.54	3.08	2.80	2.51	2.47	3.14
168H	3.17	3.03	3.02	3.17	3.57	3.27	3.94	3.42	2.90	2.76	2.28	2.22	3.06
180H	3.38	3.27	3.16	3.28	3.65	3.82	4.21	3.86	3.42	2.98	2.56	2.45	3.34
192H	3.26	3.07	3.22	3.12	3.82	3.73	3.80	3.47	2.86	2.52	2.40	2.19	3.12
204H	3.62	3.15	3.27	3.42	4.16	4.17	4.17	3.82	3.54	2.78	2.75	2.65	3.46
216H	3.69	3.29	3.30	3.50	4.08	3.75	3.79	3.30	2.70	2.52	2.40	2.27	3.22
228H	3.98	3.37	3.44	3.74	4.11	4.11	4.30	3.66	3.80	2.95	2.76	2.82	3.59
240H	3.85	3.28	3.38	3.63	4.14	3.63	3.92	3.08	3.26	2.72	2.33	2.14	3.28

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.52	0.5	0.52	0.52	0.61	0.52	0.48	0.63	0.6	0.44	0.43	0.41	0.52
24H	0.64	0.59	0.61	0.62	0.7	0.61	0.53	0.59	0.52	0.34	0.57	0.39	0.56
36H	0.64	0.65	0.63	0.63	0.71	0.66	0.68	0.68	0.67	0.43	0.51	0.48	0.61
48H	0.67	0.66	0.61	0.63	0.7	0.65	0.71	0.51	0.45	0.39	0.53	0.47	0.58
60H	0.65	0.66	0.68	0.65	0.67	0.61	0.67	0.62	0.63	0.53	0.51	0.45	0.61
72H	0.62	0.65	0.6	0.61	0.68	0.61	0.63	0.49	0.48	0.29	0.43	0.44	0.54
84H	0.57	0.66	0.68	0.62	0.61	0.63	0.67	0.53	0.56	0.4	0.51	0.4	0.57
96H	0.5	0.64	0.65	0.58	0.58	0.47	0.52	0.47	0.51	0.26	0.46	0.34	0.50
108H	0.45	0.6	0.67	0.62	0.52	0.56	0.54	0.45	0.58	0.35	0.49	0.34	0.51
120H	0.45	0.58	0.59	0.55	0.51	0.53	0.47	0.41	0.5	0.15	0.47	0.36	0.46
132H	0.35	0.56	0.6	0.54	0.52	0.52	0.58	0.44	0.54	0.32	0.46	0.29	0.48
144H	0.38	0.56	0.52	0.5	0.46	0.45	0.53	0.37	0.42	0.26	0.38	0.35	0.43
156H	0.33	0.51	0.55	0.47	0.43	0.39	0.51	0.37	0.51	0.28	0.5	0.43	0.44
168H	0.38	0.55	0.54	0.46	0.39	0.37	0.45	0.32	0.47	0.22	0.58	0.44	0.43
180H	0.37	0.49	0.52	0.47	0.4	0.31	0.48	0.35	0.54	0.21	0.53	0.48	0.43
192H	0.36	0.56	0.48	0.49	0.38	0.41	0.51	0.29	0.5	0.18	0.5	0.4	0.42
204H	0.3	0.56	0.47	0.45	0.33	0.33	0.54	0.39	0.48	0.26	0.46	0.42	0.42
216H	0.31	0.52	0.49	0.44	0.34	0.4	0.5	0.33	0.48	0.11	0.51	0.48	0.41
228H	0.3	0.5	0.48	0.41	0.41	0.3	0.52	0.39	0.42	0.19	0.42	0.46	0.40
240H	0.35	0.52	0.46	0.38	0.4	0.37	0.43	0.27	0.4	0.05	0.5	0.47	0.38

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.43	-0.56	-0.54	-0.35	-0.66	-1.12	-1.08	-0.75	-1.41	-1.33	-0.67	-0.51	-0.78
24H	-0.76	-0.81	-0.89	-0.99	-1.37	-1.90	-1.30	-0.92	-1.52	-1.34	-1.27	-0.73	-1.15
36H	-0.75	-0.92	-0.89	-0.84	-1.30	-1.81	-1.44	-1.07	-2.21	-2.32	-1.44	-0.89	-1.32
48H	-0.71	-0.95	-1.27	-1.46	-1.24	-2.06	-1.55	-0.81	-2.05	-2.11	-2.02	-0.81	-1.42
60H	-0.85	-0.51	-1.05	-0.95	-1.02	-2.21	-1.47	-0.70	-2.68	-2.39	-1.72	-1.35	-1.41
72H	-1.11	-0.30	-0.94	-1.29	-1.16	-2.61	-1.26	-0.66	-2.08	-2.02	-2.47	-0.90	-1.40
84H	-0.81	-0.20	-1.11	-0.86	-0.78	-1.73	-1.11	-0.20	-2.62	-1.96	-1.36	-1.84	-1.22
96H	-0.87	0.54	-0.74	-1.03	-0.89	-2.27	-1.31	0.10	-1.68	-1.93	-2.68	-1.45	-1.18
108H	-0.90	0.62	-0.60	-0.30	-0.75	-1.58	-0.99	0.17	-2.25	-1.98	-1.51	-1.92	-1.00
120H	-0.99	0.79	-0.62	-0.79	-0.77	-2.43	-1.98	0.94	-1.30	-1.81	-2.51	-1.49	-1.08
132H	-0.64	1.19	-0.05	0.00	-0.43	-1.62	-1.00	1.25	-2.17	-2.26	-0.67	-2.42	-0.74
144H	-0.65	1.65	-0.11	-0.42	-1.33	-2.57	-1.34	0.83	-1.30	-1.92	-1.15	-1.12	-0.79
156H	-0.69	1.64	0.32	0.30	-0.94	-2.26	-1.14	0.39	-1.57	-2.72	-0.66	-1.73	-0.76
168H	-1.10	1.15	-0.10	0.29	-1.34	-1.61	-1.02	0.74	-1.15	-2.64	-1.55	-1.78	-0.84
180H	-0.93	1.36	0.05	1.66	-0.68	-1.63	-0.11	0.81	-1.78	-3.02	-0.52	-2.14	0.58
192H	-1.46	1.26	0.10	0.90	-1.14	-1.09	0.16	0.75	-1.34	-2.59	-1.81	-1.41	-0.64
204H	-0.74	1.15	1.10	1.25	-0.71	-1.57	1.06	1.40	-1.63	-2.59	-0.19	-2.12	-0.30
216H	-1.51	1.18	0.89	0.64	-0.84	-0.28	1.73	0.76	0.02	-1.11	-2.06	-2.74	-0.28
228H	-0.64	0.34	1.89	1.12	0.00	-2.37	1.88	1.60	-1.60	-1.61	-0.53	-2.27	-0.18
240H	-1.06	0.18	1.62	0.34	-0.26	-2.22	1.89	1.34	-0.15	-2.17	-2.54	-3.46	-0.54

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	7.38	7.49	6.97	7.54	7.65	9.02	7.60	8.03	8.37	7.32	7.13	6.92	7.62
24H	8.77	8.99	8.18	9.64	9.12	10.83	8.72	9.44	9.62	7.84	8.45	8.00	8.97
36H	9.95	10.24	9.49	10.87	10.03	12.14	10.13	11.06	11.71	9.97	9.68	9.31	10.38
48H	10.98	11.13	9.99	12.41	11.04	13.82	10.32	11.99	12.19	10.00	9.80	9.80	11.12
60H	12.02	12.05	11.17	13.38	12.01	15.50	11.80	13.95	14.88	12.16	11.56	11.05	12.63
72H	13.20	12.87	11.95	15.31	13.61	16.83	11.68	14.68	14.72	11.62	11.42	11.67	13.30
84H	14.62	13.60	13.29	16.52	14.89	18.17	13.38	16.51	17.38	14.36	13.72	13.00	14.95
96H	15.91	14.99	14.83	17.80	16.65	19.30	14.29	16.74	17.23	13.84	13.48	13.09	15.68
108H	17.66	15.89	15.98	18.09	17.25	21.66	16.21	19.26	19.46	16.43	15.43	14.11	17.29
120H	18.65	17.11	16.64	19.35	19.36	22.06	15.84	18.09	18.21	14.96	15.54	14.51	17.53
132H	19.55	17.58	18.35	19.92	20.60	24.42	19.12	21.35	20.88	18.61	15.77	15.71	19.32
144H	20.51	18.42	19.75	20.74	22.27	23.55	19.47	20.14	19.97	16.88	16.23	15.59	19.46
156H	21.97	18.39	20.97	21.61	23.29	24.42	21.92	22.75	21.23	20.46	16.86	17.18	20.92
168H	21.55	20.16	22.23	23.33	25.03	24.01	22.38	21.84	20.56	19.91	17.15	17.28	21.29
180H	21.96	21.22	21.92	23.94	25.56	26.55	23.89	21.83	22.32	19.75	18.72	18.49	22.18
192H	23.04	21.81	21.89	24.45	26.41	28.25	23.81	22.03	21.23	18.29	18.11	17.14	22.21
204H	24.03	21.60	23.12	24.41	27.24	30.40	25.70	23.18	22.78	18.86	19.08	17.96	23.20
216H	25.25	22.72	24.15	25.30	27.38	29.61	24.52	23.32	20.93	18.06	17.67	17.42	23.03
228H	24.67	21.57	24.04	25.16	28.51	31.14	25.57	24.67	24.46	20.55	18.79	18.54	23.97
240H	25.19	22.33	24.37	24.63	29.79	29.83	24.65	23.81	23.32	18.24	17.99	17.90	23.50

마. 열대

가) 850 hPa - 1) 고도 - ① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-1.39	-1.99	-2.35	-1.34	-1.28	-2.09	-3.49	-1.49	0.01	-0.96	-1.06	-1.39	-1.57
24H	-1.14	-2.23	-2.03	-1.80	-2.71	-2.10	-3.24	-2.05	-1.06	-2.67	-2.95	-2.82	-2.23
36H	-5.67	-6.11	-6.08	-4.86	-4.84	-5.34	-7.88	-4.55	-2.88	-4.94	-4.76	-5.45	-5.28
48H	-4.63	-5.58	-4.83	-4.78	-5.84	-4.69	-4.99	-2.98	-3.36	-6.34	-6.85	-6.64	-5.13
60H	-6.86	-6.68	-6.57	-5.60	-6.13	-6.09	-7.78	-3.09	-2.56	-5.22	-5.83	-7.19	-5.80
72H	-6.00	-6.71	-5.58	-5.21	-6.70	-5.29	-5.35	-2.92	-3.90	-8.05	-8.40	7.93	-6.00
84H	-9.21	-8.97	-8.33	-7.20	-9.27	-8.71	-10.06	-4.42	-4.72	-8.40	-8.75	-9.40	-8.12
96H	-7.31	-7.22	-5.89	-4.57	-7.22	-5.85	-5.72	-2.32	-3.49	-9.40	-8.32	-9.06	-6.36
108H	-7.28	-8.38	-6.01	-5.29	-8.12	-7.82	-8.45	-2.39	-2.71	-7.36	-7.01	-7.62	-6.54
120H	-6.95	-7.69	-4.11	-3.69	-6.49	-4.87	-4.53	-1.34	-1.95	-8.24	-6.85	-7.93	-5.39
132H	-9.23	-11.35	-6.45	-6.52	-8.86	-9.29	-9.37	-3.28	-3.78	-8.34	-7.94	-8.48	-7.74
144H	-7.24	-8.99	-4.10	-4.25	-6.52	-4.84	-3.74	-0.44	-1.28	-7.24	-7.34	-8.23	-5.35
156H	-10.09	-12.02	-6.40	-6.65	-9.20	-9.01	-8.67	-2.05	-2.77	-7.20	-7.66	-7.91	7.47
168H	-7.25	-9.59	-4.61	-3.98	-6.05	-4.81	-2.93	0.16	-0.67	-5.46	-7.43	-7.58	-5.02
180H	-10.87	-12.95	-7.03	-7.22	-9.80	-9.10	-8.53	-2.08	-2.99	-6.62	-8.25	-8.33	7.81
192H	-8.50	-9.63	-4.58	-3.84	-5.68	-5.54	-2.64	1.27	0.03	-3.43	-6.89	-8.21	-4.80
204H	-11.28	-13.24	-7.00	-7.13	-9.10	-9.13	-7.91	-2.02	-3.02	-5.84	-7.93	-8.34	-7.66
216H	-10.08	-9.80	-5.26	-4.32	-5.36	-5.82	-3.69	0.93	-1.17	-2.56	-7.74	-9.01	-5.32
228H	-13.27	-14.61	-8.25	-7.71	-9.42	-9.49	-9.11	-2.78	-3.62	-5.26	-7.98	-8.43	-8.33
240H	-11.20	-10.14	-5.77	-3.93	-5.05	-5.46	-2.58	1.60	-0.99	-1.02	-7.58	-9.06	-5.10

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	9.11	10.10	10.50	10.10	9.58	8.94	9.45	9.66	8.54	8.47	7.28	8.52	9.19
24H	12.34	13.14	13.67	13.30	12.38	11.14	11.55	11.59	11.55	11.68	10.92	12.74	12.17
36H	12.40	13.51	12.69	12.33	11.96	12.06	13.55	12.48	10.52	11.80	10.45	13.18	12.24
48H	12.78	12.97	12.83	12.43	12.81	12.12	12.09	12.40	11.63	13.63	12.91	14.22	12.74
60H	13.35	13.36	12.56	12.57	12.34	12.91	14.50	13.82	11.73	12.34	11.24	14.34	12.92
72H	14.14	13.99	13.59	12.72	14.01	13.01	12.89	13.39	12.87	16.04	14.48	15.85	13.92
84H	16.18	14.97	13.94	13.53	15.34	15.61	17.25	15.59	14.43	15.40	13.69	16.25	15.18
96H	15.15	14.25	13.57	12.22	14.32	13.51	14.02	13.77	13.30	16.21	14.34	16.13	14.23
108H	14.83	15.75	13.05	12.81	15.40	16.23	16.55	15.22	15.17	14.64	13.04	15.44	14.84
120H	16.16	16.26	14.05	13.80	14.59	14.80	14.75	14.82	15.27	16.19	14.01	15.98	15.06
132H	16.61	18.86	13.78	14.04	16.33	17.90	17.98	16.49	16.20	16.13	13.91	16.66	16.24
144H	17.68	17.12	14.77	14.40	15.74	15.51	14.71	15.72	15.20	16.54	14.68	16.90	15.75
156H	18.04	19.52	14.74	15.80	17.70	18.77	18.78	17.60	16.90	16.89	14.48	16.83	17.17
168H	17.36	17.83	16.17	15.03	16.51	15.45	15.00	16.08	15.68	16.40	15.12	17.62	16.19
180H	18.52	20.57	15.24	16.02	19.09	17.92	19.15	17.94	17.49	17.57	15.29	18.12	17.74
192H	19.23	19.46	16.72	15.69	17.62	15.52	15.82	16.95	16.71	16.48	15.61	18.06	16.99
204H	18.85	20.34	16.76	17.31	19.46	17.61	18.18	18.50	17.68	18.51	15.71	18.17	18.09
216H	20.26	19.79	18.11	16.57	18.32	15.95	16.55	17.88	16.14	16.68	16.86	20.00	17.76
228H	20.07	21.90	17.51	17.94	20.48	18.64	19.13	19.92	18.08	18.90	16.55	18.91	19.00
240H	20.66	19.88	18.17	16.34	18.64	16.82	17.15	18.71	16.46	17.44	17.44	20.66	18.20

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.54	0.54	0.55	0.55	0.46	0.40	0.34	0.35	0.39	0.55	0.60	0.61	0.49
24H	0.60	0.53	0.61	0.57	0.51	0.45	0.44	0.54	0.52	0.51	0.45	0.53	0.52
36H	0.53	0.53	0.65	0.66	0.53	0.43	0.37	0.53	0.58	0.61	0.65	0.63	0.56
48H	0.64	0.62	0.72	0.68	0.60	0.53	0.51	0.60	0.66	0.54	0.55	0.66	0.61
60H	0.54	0.54	0.68	0.68	0.53	0.45	0.35	0.53	0.55	0.61	0.66	0.64	0.56
72H	0.65	0.59	0.70	0.69	0.58	0.52	0.57	0.61	0.64	0.54	0.57	0.68	0.61
84H	0.45	0.46	0.59	0.57	0.35	0.31	0.29	0.43	0.40	0.50	0.51	0.57	0.45
96H	0.63	0.54	0.62	0.65	0.47	0.48	0.51	0.55	0.56	0.51	0.56	0.66	0.56
108H	0.52	0.48	0.63	0.58	0.31	0.31	0.33	0.43	0.44	0.53	0.51	0.64	0.48
120H	0.58	0.48	0.62	0.60	0.44	0.47	0.47	0.49	0.51	0.51	0.53	0.64	0.53
132H	0.45	0.39	0.61	0.54	0.31	0.31	0.33	0.44	0.46	0.51	0.47	0.61	0.45
144H	0.53	0.45	0.64	0.61	0.44	0.50	0.49	0.51	0.54	0.51	0.54	0.64	0.53
156H	0.42	0.36	0.64	0.49	0.31	0.35	0.38	0.46	0.45	0.51	0.43	0.64	0.45
168H	0.57	0.44	0.63	0.58	0.46	0.55	0.50	0.55	0.54	0.52	0.53	0.63	0.54
180H	0.45	0.33	0.63	0.47	0.31	0.44	0.40	0.48	0.44	0.50	0.41	0.60	0.46
192H	0.55	0.41	0.61	0.55	0.46	0.56	0.49	0.48	0.49	0.49	0.50	0.61	0.52
204H	0.49	0.36	0.62	0.45	0.35	0.49	0.44	0.41	0.39	0.46	0.44	0.57	0.46
216H	0.54	0.36	0.58	0.54	0.42	0.57	0.48	0.39	0.49	0.46	0.44	0.55	0.49
228H	0.45	0.31	0.61	0.46	0.27	0.45	0.41	0.31	0.31	0.43	0.42	0.54	0.41
240H	0.49	0.34	0.58	0.56	0.39	0.55	0.47	0.35	0.45	0.41	0.41	0.48	0.46

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.20	-0.05	-0.36	-0.78	-0.64	-0.52	-0.20	-0.26	-0.31	-0.60	-0.84	-0.66	-0.45
24H	-0.14	-0.08	-0.34	-0.62	-0.54	-0.49	-0.37	-0.40	-0.44	-0.57	-0.63	-0.52	-0.43
36H	-0.20	-0.01	-0.44	-0.92	-0.71	-0.61	-0.17	-0.29	-0.49	-0.85	-1.04	-0.79	-0.54
48H	-0.16	-0.08	-0.40	-0.63	-0.48	-0.50	-0.35	-0.42	-0.50	-0.59	-0.61	-0.54	-0.44
60H	-0.16	0.00	-0.50	-0.90	-0.65	-0.48	-0.08	-0.21	0.47	0.90	-1.01	-0.73	-0.51
72H	-0.15	-0.08	-0.45	-0.65	-0.43	-0.48	-0.33	-0.35	-0.49	-0.53	-0.54	-0.52	-0.42
84H	-0.20	0.02	-0.54	-0.93	-0.56	-0.45	-0.07	-0.12	-0.48	-0.91	-0.95	-0.68	-0.49
96H	-0.15	-0.10	-0.45	-0.67	-0.39	-0.44	-0.26	-0.29	-0.49	-0.52	-0.44	-0.50	-0.39
108H	-0.21	0.03	-0.56	-0.94	-0.47	-0.34	-0.02	0.03	-0.47	-0.87	-0.80	-0.64	-0.44
120H	-0.14	-0.10	-0.46	-0.69	-0.32	-0.39	-0.25	-0.19	-0.45	-0.49	-0.36	-0.44	-0.36
132H	-0.23	0.03	-0.57	-0.94	-0.40	-0.26	0.10	0.13	-0.32	-0.83	-0.75	-0.61	-0.39
144H	-0.15	-0.12	-0.49	-0.67	-0.25	-0.31	-0.18	-0.10	-0.41	-0.45	-0.25	-0.38	-0.31
156H	-0.18	-0.02	-0.61	-0.90	-0.33	-0.19	0.20	0.24	-0.24	-0.75	-0.62	-0.56	-0.33
168H	-0.14	-0.10	-0.54	-0.69	-0.20	-0.29	-0.12	-0.07	-0.35	-0.37	-0.14	-0.35	-0.28
180H	-0.15	-0.01	-0.67	-0.87	-0.25	-0.08	0.30	0.31	-0.17	-0.64	-0.49	-0.48	-0.27
192H	-0.12	-0.11	-0.62	-0.65	-0.18	-0.23	-0.07	-0.07	-0.23	-0.31	-0.13	-0.30	-0.25
204H	-0.11	0.00	-0.67	-0.89	-0.20	0.05	0.28	0.32	-0.12	-0.61	-0.47	-0.54	-0.25
216H	-0.16	-0.10	-0.62	-0.61	-0.14	-0.17	-0.21	-0.10	-0.16	-0.31	-0.16	-0.36	-0.26
228H	-0.11	0.01	-0.69	-0.87	0.18	0.07	0.16	0.30	-0.11	-0.60	-0.49	0.55	-0.26
240H	-0.10	-0.04	-0.66	-0.62	-0.07	-0.12	-0.23	-0.08	-0.16	-0.29	-0.13	-0.44	-0.25

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.24	1.19	1.28	1.29	1.25	1.31	1.32	1.27	1.26	1.37	1.48	1.35	1.30
24H	1.46	1.33	1.55	1.48	1.44	1.49	1.39	1.48	1.50	1.52	1.60	1.49	1.48
36H	1.40	1.35	1.40	1.47	1.41	1.57	1.52	1.40	1.52	1.59	1.69	1.54	1.49
48H	1.54	1.43	1.63	1.58	1.51	1.55	1.46	1.56	1.64	1.66	1.67	1.57	1.57
60H	1.50	1.40	1.46	1.51	1.47	1.58	1.61	1.44	1.51	1.64	1.64	1.56	1.53
72H	1.54	1.51	1.68	1.58	1.55	1.59	1.52	1.64	1.72	1.74	1.68	1.59	1.61
84H	1.53	1.45	1.48	1.57	1.44	1.54	1.68	1.46	1.58	1.72	1.63	1.60	1.56
96H	1.59	1.57	1.71	1.64	1.60	1.60	1.59	1.66	1.86	1.83	1.68	1.64	1.66
108H	1.56	1.46	1.54	1.60	1.45	1.58	1.70	1.44	1.58	1.68	1.56	1.57	1.56
120H	1.63	1.61	1.68	1.70	1.63	1.60	1.63	1.73	1.88	1.90	1.72	1.64	1.70
132H	1.59	1.47	1.57	1.62	1.47	1.61	1.77	1.48	1.66	1.72	1.59	1.59	1.60
144H	1.65	1.64	1.74	1.72	1.66	1.62	1.69	1.76	1.94	1.94	1.80	1.69	1.74
156H	1.62	1.51	1.60	1.58	1.48	1.68	1.79	1.58	1.67	1.68	1.61	1.61	1.62
168H	1.77	1.70	1.81	1.73	1.72	1.67	1.72	1.81	1.92	1.99	1.88	1.75	1.79
180H	1.66	1.54	1.62	1.56	1.58	1.77	1.80	1.64	1.75	1.70	1.61	1.62	1.65
192H	1.79	1.72	1.87	1.74	1.70	1.71	1.73	1.87	1.93	1.99	1.85	1.79	1.81
204H	1.70	1.53	1.64	1.63	1.62	1.80	1.82	1.69	1.74	1.74	1.66	1.68	1.69
216H	1.82	1.76	1.87	1.78	1.72	1.74	1.80	1.89	1.92	2.00	1.83	1.81	1.83
228H	1.67	1.57	1.71	1.66	1.69	1.84	1.85	1.69	1.81	1.76	1.59	1.71	1.71
240H	1.77	1.83	1.94	1.81	1.78	1.78	1.82	1.90	1.95	2.03	1.87	1.87	1.86

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.64	0.59	0.65	0.64	0.62	0.57	0.53	0.62	0.65	0.66	0.69	0.67	0.63
24H	0.39	0.39	0.41	0.34	0.32	0.35	0.36	0.38	0.42	0.34	0.33	0.36	0.37
36H	0.63	0.55	0.63	0.66	0.61	0.53	0.51	0.59	0.61	0.61	0.65	0.65	0.60
48H	0.52	0.44	0.51	0.44	0.41	0.41	0.44	0.46	0.53	0.43	0.45	0.45	0.46
60H	0.63	0.56	0.64	0.68	0.61	0.55	0.49	0.57	0.63	0.60	0.69	0.65	0.61
72H	0.56	0.45	0.52	0.50	0.44	0.44	0.45	0.46	0.54	0.47	0.50	0.51	0.49
84H	0.65	0.57	0.64	0.70	0.61	0.56	0.48	0.57	0.59	0.55	0.67	0.63	0.60
96H	0.57	0.47	0.51	0.49	0.45	0.45	0.40	0.41	0.52	0.43	0.49	0.50	0.47
108H	0.66	0.55	0.64	0.67	0.59	0.55	0.46	0.56	0.60	0.58	0.69	0.65	0.60
120H	0.58	0.49	0.51	0.46	0.46	0.45	0.39	0.41	0.48	0.41	0.44	0.51	0.47
132H	0.64	0.57	0.63	0.65	0.59	0.54	0.42	0.56	0.52	0.55	0.69	0.66	0.59
144H	0.57	0.45	0.51	0.43	0.46	0.47	0.36	0.43	0.44	0.40	0.43	0.50	0.45
156H	0.63	0.54	0.61	0.66	0.62	0.53	0.42	0.53	0.52	0.56	0.66	0.65	0.58
168H	0.56	0.44	0.48	0.46	0.44	0.45	0.36	0.44	0.42	0.38	0.43	0.51	0.45
180H	0.61	0.56	0.64	0.65	0.57	0.47	0.41	0.51	0.48	0.58	0.66	0.66	0.57
192H	0.52	0.47	0.46	0.47	0.42	0.43	0.37	0.39	0.38	0.38	0.45	0.50	0.44
204H	0.56	0.59	0.62	0.63	0.53	0.43	0.39	0.47	0.49	0.56	0.64	0.63	0.55
216H	0.52	0.45	0.42	0.44	0.42	0.40	0.33	0.33	0.42	0.35	0.44	0.49	0.42
228H	0.56	0.60	0.58	0.63	0.50	0.40	0.40	0.45	0.45	0.53	0.66	0.59	0.53
240H	0.53	0.43	0.36	0.42	0.43	0.37	0.34	0.29	0.43	0.36	0.41	0.46	0.40

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.41	0.22	-0.04	-0.26	-0.09	0.08	0.81	0.97	0.26	-0.10	-0.15	-0.06	0.17
24H	0.55	0.73	0.06	-0.02	0.02	0.38	1.13	1.08	0.42	0.07	0.15	0.14	0.39
36H	0.70	0.65	0.16	-0.09	0.16	0.37	1.53	1.66	0.54	0.22	0.29	0.07	0.52
48H	0.55	0.77	0.14	0.01	0.16	0.42	1.19	1.14	0.42	0.10	0.35	0.10	0.45
60H	0.70	0.85	0.26	0.07	0.41	0.56	1.74	1.87	0.72	0.20	0.41	0.01	0.65
72H	0.75	0.90	0.07	0.02	0.22	0.53	1.43	1.27	0.65	0.11	0.30	0.02	0.52
84H	0.74	0.88	0.24	0.06	0.47	0.80	1.97	1.89	0.81	0.43	0.41	0.05	0.73
96H	0.69	0.86	0.09	0.18	0.24	0.73	1.45	1.29	0.75	0.16	0.30	0.10	0.57
108H	0.66	0.88	0.03	0.06	0.55	0.93	2.37	2.11	0.86	0.62	0.40	0.24	0.81
120H	0.60	0.69	0.05	0.21	0.39	0.80	1.79	1.56	0.66	0.34	0.44	0.21	0.65
132H	0.65	0.56	0.00	0.23	0.70	1.31	2.69	2.31	1.00	0.83	0.61	0.31	0.93
144H	0.50	0.46	-0.08	0.26	0.45	1.04	2.11	1.62	0.69	0.55	0.46	0.12	0.68
156H	0.61	0.33	-0.03	0.20	0.72	1.58	2.99	2.47	1.00	1.00	0.72	0.34	0.99
168H	0.37	0.33	-0.11	0.28	0.54	1.17	2.34	1.68	0.77	0.64	0.40	0.13	0.71
180H	0.32	0.23	-0.02	0.28	0.71	1.78	3.05	2.53	1.09	1.01	0.66	0.30	1.00
192H	0.18	0.40	-0.12	0.21	0.66	1.45	2.30	1.56	0.74	0.74	0.58	0.11	0.73
204H	0.04	0.22	0.06	0.24	1.06	1.99	3.12	2.28	1.09	1.13	0.75	0.34	1.03
216H	0.04	0.46	-0.05	0.28	0.88	1.58	2.40	1.56	0.76	0.90	0.59	0.21	0.80
228H	0.03	0.32	0.14	0.11	1.33	1.98	3.30	2.10	1.13	1.23	0.82	0.40	1.07
240H	0.07	0.42	-0.02	0.29	0.97	1.47	2.55	1.44	0.74	0.95	0.59	0.10	0.80

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	4.39	4.44	4.20	4.07	4.46	4.56	5.07	5.11	4.37	4.33	4.13	4.15	4.44
24H	4.74	4.85	4.41	4.31	4.60	4.79	5.38	5.33	4.77	4.53	4.31	4.28	4.69
36H	5.13	5.19	4.61	4.66	5.20	5.29	5.90	6.15	5.09	5.05	4.58	4.75	5.13
48H	5.16	5.18	4.67	4.64	5.14	5.43	5.75	5.99	5.16	5.01	4.61	4.61	5.11
60H	5.58	5.69	4.99	4.82	5.65	5.78	6.29	6.72	5.39	5.44	4.99	5.02	5.53
72H	5.68	5.54	4.87	4.93	5.49	5.92	6.30	6.44	5.67	5.48	5.05	4.98	5.53
84H	5.98	5.96	5.08	5.22	6.08	6.24	6.72	7.05	5.91	5.92	5.41	5.35	5.91
96H	5.91	5.91	5.13	5.14	5.87	6.31	6.64	6.64	6.13	5.86	5.40	5.34	5.86
108H	6.15	6.19	5.42	5.45	6.41	6.66	7.15	7.39	6.23	6.36	5.90	5.77	6.26
120H	6.24	5.96	5.42	5.46	6.20	6.65	6.97	7.04	6.45	6.32	5.86	5.62	6.18
132H	6.41	6.14	5.73	5.60	6.67	7.14	7.66	7.82	6.54	6.79	6.34	6.09	6.58
144H	6.30	5.96	5.64	5.60	6.44	7.03	7.45	7.36	6.67	6.75	6.13	5.90	6.44
156H	6.51	6.26	5.78	5.79	6.98	7.55	8.14	8.22	6.95	7.19	6.59	6.48	6.87
168H	6.42	6.18	5.72	5.73	6.79	7.17	7.91	7.69	7.14	7.09	6.32	6.21	6.70
180H	6.66	6.39	5.89	5.97	7.16	7.86	8.45	8.49	7.33	7.51	6.96	6.58	7.10
192H	6.53	6.35	5.94	5.82	7.01	7.42	8.03	7.80	7.21	7.14	6.64	6.34	6.85
204H	6.96	6.74	6.28	6.14	7.60	8.03	8.79	8.31	7.44	7.85	7.32	6.75	7.35
216H	6.76	6.61	6.19	6.06	7.30	7.51	8.26	7.77	7.26	7.43	6.92	6.64	7.06
228H	7.33	6.99	6.41	6.31	7.96	8.13	8.93	8.56	7.64	8.16	7.50	6.95	7.57
240H	7.17	6.85	6.33	6.21	7.38	7.52	8.39	7.95	7.38	7.65	7.00	6.67	7.21

나) 500 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.44	0.25	-0.93	-1.40	-1.77	-1.53	-0.77	0.69	1.95	-0.36	-2.15	-2.26	0.73
24H	0.32	0.69	-0.76	-0.87	-1.53	-1.84	-0.46	0.04	-0.01	-2.91	-3.90	3.84	-1.26
36H	-5.68	-4.75	-6.17	-5.75	-5.69	-5.54	-5.12	-2.74	-1.94	-5.33	-6.46	-7.52	-5.22
48H	-3.96	-3.92	-5.21	-4.73	-5.20	-5.29	-3.59	-2.16	-3.45	-7.29	-8.30	-8.47	5.13
60H	-7.55	-6.29	-7.81	-6.58	-6.66	-5.67	-5.22	-1.58	-2.03	-6.05	-7.71	-9.14	-6.02
72H	-6.49	-5.97	-7.32	-5.74	-5.90	-5.93	-4.31	-2.18	-3.94	-8.36	-9.21	-9.57	-6.24
84H	-10.39	-9.61	-10.70	-9.07	-8.99	-7.90	-7.09	-2.82	-4.31	-9.36	-10.44	-11.50	-8.52
96H	-8.41	-7.61	-8.03	-6.02	-5.95	-5.93	3.96	1.19	-3.12	-9.32	-8.55	9.86	-6.50
108H	-9.12	-9.17	-8.79	-7.86	-7.12	-6.76	-4.80	0.04	-1.54	8.01	7.97	-9.36	-6.71
120H	-8.11	-8.36	-6.84	-5.09	-4.51	-4.18	-1.59	0.74	-1.08	-7.32	-5.98	-7.87	-5.02
132H	-11.18	-11.75	-9.94	-8.70	-7.19	-7.30	-4.41	0.36	-1.95	-8.39	-8.63	-9.69	-7.40
144H	-8.67	-10.14	-7.23	-5.35	-4.56	-3.56	0.45	2.95	-0.29	-5.44	-5.50	-7.58	-4.58
156H	-11.95	-12.58	-10.60	-8.63	-7.24	-6.51	-2.12	2.96	-0.31	-6.21	-7.94	-9.26	-6.70
168H	-8.83	-10.51	-8.47	-5.26	-3.63	-3.28	2.66	4.08	0.64	3.04	-5.06	6.60	3.94
180H	-12.43	-13.23	-11.38	-9.48	-7.15	-5.46	-0.48	3.66	0.39	4.82	-8.50	-9.15	-6.50
192H	-9.97	-10.31	-9.19	-5.34	-2.95	-3.37	3.71	5.53	2.50	-0.18	-4.11	-6.61	3.36
204H	-12.89	-12.94	-11.47	-9.31	-5.58	-4.63	0.29	4.07	1.44	3.54	7.50	-9.04	-5.93
216H	-10.77	-10.14	-9.74	-5.25	-2.24	-2.99	2.88	5.86	2.43	0.80	-4.76	7.42	-3.45
228H	-14.73	-13.82	-12.43	-9.46	-5.39	-5.00	-0.95	3.66	1.57	-2.84	-7.79	-9.67	-6.40
240H	-11.59	-9.94	-9.86	-4.77	-1.33	-2.49	3.83	6.64	3.35	2.31	-4.40	-8.34	-3.05

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	12.28	13.47	12.89	13.80	12.02	12.45	12.04	12.64	11.75	11.49	10.94	11.85	12.30
24H	15.16	15.83	15.76	15.14	13.90	13.48	13.08	13.96	13.75	14.15	13.47	14.79	14.37
36H	14.22	15.37	14.96	15.11	13.69	14.15	13.92	13.70	12.13	13.80	13.51	15.61	14.18
48H	15.03	15.57	15.44	14.41	13.95	14.25	13.33	14.16	13.77	15.82	15.22	17.04	14.83
60H	15.47	16.08	15.62	15.32	14.05	14.65	14.84	14.88	13.25	14.78	14.58	16.63	15.01
72H	16.35	16.11	16.31	15.18	15.01	15.52	14.12	15.32	15.05	17.32	16.45	18.42	15.93
84H	17.76	17.38	17.09	16.07	15.46	16.30	15.79	15.76	14.22	16.83	16.77	18.60	16.50
96H	17.85	16.93	16.36	15.27	15.56	15.59	14.75	14.92	15.25	17.13	16.40	18.64	16.22
108H	17.60	18.26	16.18	15.62	14.58	16.63	15.44	15.46	14.64	16.27	16.02	17.69	16.20
120H	19.00	18.70	16.95	16.43	15.85	16.29	15.11	15.34	16.28	16.74	16.11	17.74	16.71
132H	19.72	20.04	17.02	17.10	15.37	17.60	16.51	15.59	15.55	17.40	16.92	18.73	17.30
144H	20.56	20.37	17.23	17.42	16.51	16.34	16.11	15.95	16.22	17.08	15.94	18.38	17.34
156H	20.79	21.60	18.26	18.45	16.76	17.99	17.93	17.10	16.45	18.33	17.44	18.71	18.32
168H	21.16	21.64	18.38	18.23	17.32	16.63	17.11	17.50	16.66	17.36	16.73	18.75	18.12
180H	21.76	23.47	19.28	19.51	17.84	16.87	17.96	18.18	17.31	19.37	18.56	19.69	19.15
192H	22.41	22.18	19.73	19.55	17.42	16.59	17.71	18.57	18.28	18.41	17.26	19.00	18.93
204H	22.87	23.16	20.92	20.73	18.31	17.09	17.94	19.39	17.92	20.78	18.52	20.43	19.84
216H	23.20	22.12	21.27	20.69	18.11	16.89	17.77	19.70	18.19	19.39	17.71	21.64	19.72
228H	23.23	23.32	21.59	21.81	18.93	18.09	17.86	19.94	17.96	21.30	19.35	21.78	20.43
240H	23.56	22.19	21.35	20.76	18.60	17.38	18.17	20.90	18.22	19.68	18.02	22.57	20.12

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.40	0.42	0.45	0.40	0.39	0.32	0.27	0.29	0.33	0.29	0.41	0.45	0.37
24H	0.53	0.46	0.53	0.50	0.47	0.46	0.43	0.47	0.51	0.46	0.42	0.46	0.48
36H	0.56	0.52	0.60	0.55	0.51	0.46	0.39	0.52	0.62	0.51	0.54	0.51	0.52
48H	0.66	0.57	0.67	0.65	0.58	0.56	0.52	0.58	0.63	0.54	0.51	0.56	0.59
60H	0.60	0.58	0.65	0.62	0.54	0.56	0.45	0.55	0.66	0.55	0.56	0.57	0.57
72H	0.66	0.61	0.66	0.67	0.60	0.58	0.55	0.59	0.66	0.56	0.54	0.61	0.61
84H	0.58	0.55	0.58	0.55	0.45	0.51	0.46	0.51	0.60	0.50	0.50	0.56	0.53
96H	0.65	0.60	0.60	0.66	0.53	0.58	0.54	0.57	0.63	0.54	0.54	0.63	0.59
108H	0.62	0.58	0.61	0.62	0.50	0.49	0.52	0.53	0.62	0.52	0.54	0.63	0.57
120H	0.62	0.60	0.61	0.65	0.52	0.57	0.56	0.56	0.61	0.55	0.52	0.66	0.59
132H	0.55	0.53	0.58	0.59	0.48	0.50	0.53	0.58	0.62	0.49	0.51	0.64	0.55
144H	0.57	0.57	0.61	0.63	0.52	0.60	0.54	0.61	0.61	0.51	0.54	0.66	0.58
156H	0.55	0.50	0.58	0.56	0.47	0.57	0.51	0.61	0.60	0.49	0.51	0.67	0.55
168H	0.59	0.53	0.62	0.60	0.55	0.60	0.54	0.60	0.63	0.50	0.51	0.66	0.58
180H	0.54	0.44	0.56	0.52	0.46	0.61	0.52	0.57	0.59	0.46	0.45	0.64	0.53
192H	0.57	0.49	0.60	0.56	0.54	0.59	0.52	0.54	0.55	0.46	0.49	0.64	0.55
204H	0.54	0.41	0.53	0.49	0.45	0.62	0.52	0.48	0.55	0.40	0.49	0.57	0.50
216H	0.57	0.43	0.57	0.52	0.51	0.59	0.50	0.46	0.52	0.41	0.51	0.55	0.51
228H	0.50	0.36	0.53	0.47	0.41	0.58	0.51	0.44	0.52	0.37	0.48	0.51	0.47
240H	0.55	0.37	0.57	0.51	0.47	0.57	0.47	0.39	0.50	0.36	0.51	0.50	0.48

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.04	0.00	0.08	0.06	0.03	0.06	0.08	0.02	0.03	-0.03	0.01	-0.18	0.02
24H	-0.12	-0.06	-0.02	-0.01	0.00	-0.01	0.06	0.07	-0.02	-0.20	-0.06	-0.22	-0.05
36H	-0.03	-0.14	-0.03	0.04	-0.03	-0.02	0.02	-0.04	-0.06	0.07	-0.02	-0.30	-0.06
48H	-0.14	-0.14	-0.10	-0.05	-0.07	-0.11	-0.11	-0.08	-0.12	-0.26	-0.08	-0.28	-0.13
60H	-0.05	-0.13	-0.09	0.02	0.01	-0.04	-0.07	-0.15	0.09	-0.07	0.01	-0.26	-0.08
72H	-0.15	-0.19	-0.18	-0.06	-0.07	-0.09	-0.14	-0.12	-0.09	-0.23	-0.06	-0.24	-0.14
84H	-0.03	-0.16	-0.13	0.04	0.08	0.02	-0.05	-0.21	-0.11	-0.03	0.06	-0.19	-0.06
96H	-0.19	-0.23	-0.17	-0.06	0.00	-0.06	-0.14	-0.14	-0.10	-0.14	0.04	-0.15	-0.11
108H	-0.07	-0.18	-0.11	0.02	0.13	0.08	-0.03	-0.16	-0.06	0.01	0.13	-0.09	-0.03
120H	-0.21	-0.24	-0.16	-0.04	0.07	-0.01	-0.08	-0.05	-0.03	-0.05	0.12	-0.06	-0.06
132H	-0.07	-0.13	-0.14	0.02	0.16	0.14	0.07	-0.08	0.04	0.10	0.14	-0.02	0.02
144H	-0.20	-0.21	-0.20	-0.04	0.07	0.07	0.05	0.08	0.04	0.03	0.15	-0.01	-0.01
156H	-0.08	-0.06	-0.21	0.03	0.13	0.19	0.22	0.01	0.12	0.18	0.14	0.00	0.06
168H	-0.21	-0.20	-0.26	-0.04	0.09	0.14	0.17	0.15	0.07	0.09	0.15	-0.02	0.01
180H	-0.07	-0.02	-0.24	0.00	0.16	0.28	0.33	0.06	0.20	0.21	0.08	0.01	0.08
192H	-0.20	-0.12	-0.31	-0.08	0.11	0.19	0.26	0.23	0.14	0.13	0.15	0.04	0.05
204H	-0.08	-0.01	-0.23	0.07	0.21	0.31	0.42	0.16	0.28	0.25	0.12	0.08	0.13
216H	-0.15	-0.07	-0.31	-0.07	0.16	0.23	0.37	0.30	0.25	0.10	0.19	0.05	0.09
228H	-0.09	0.06	-0.21	0.09	0.24	0.34	0.50	0.20	0.36	0.24	0.12	0.07	0.16
240H	-0.13	-0.05	-0.30	-0.06	0.16	0.22	0.41	0.32	0.31	0.14	0.24	-0.02	0.10

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.02	1.09	1.02	1.03	1.01	1.04	1.11	1.09	1.00	1.03	0.92	1.06	1.04
24H	1.07	1.17	1.11	1.01	1.07	1.10	1.16	1.14	1.00	1.08	0.98	1.05	1.08
36H	1.07	1.19	1.10	1.05	1.07	1.13	1.20	1.14	1.13	1.14	0.98	1.14	1.11
48H	1.12	1.25	1.18	1.07	1.14	1.22	1.22	1.25	1.10	1.19	1.03	1.15	1.16
60H	1.12	1.24	1.15	1.14	1.17	1.27	1.25	1.24	1.18	1.17	1.01	1.16	1.18
72H	1.22	1.32	1.27	1.14	1.25	1.30	1.28	1.30	1.20	1.25	1.08	1.20	1.23
84H	1.18	1.30	1.18	1.17	1.24	1.31	1.31	1.35	1.26	1.24	1.12	1.25	1.24
96H	1.29	1.39	1.28	1.25	1.36	1.34	1.35	1.34	1.23	1.28	1.17	1.28	1.30
108H	1.26	1.40	1.22	1.19	1.32	1.35	1.42	1.34	1.34	1.29	1.21	1.31	1.30
120H	1.33	1.47	1.31	1.30	1.42	1.36	1.44	1.37	1.28	1.34	1.23	1.30	1.35
132H	1.27	1.43	1.25	1.27	1.36	1.40	1.45	1.48	1.34	1.37	1.29	1.30	1.35
144H	1.37	1.48	1.34	1.39	1.44	1.45	1.54	1.45	1.33	1.38	1.32	1.34	1.40
156H	1.37	1.45	1.25	1.28	1.41	1.45	1.56	1.51	1.39	1.38	1.35	1.34	1.40
168H	1.44	1.53	1.43	1.46	1.51	1.53	1.53	1.50	1.41	1.42	1.37	1.39	1.46
180H	1.41	1.54	1.32	1.37	1.44	1.47	1.56	1.57	1.44	1.46	1.31	1.36	1.44
192H	1.52	1.62	1.48	1.50	1.56	1.53	1.55	1.55	1.45	1.44	1.40	1.38	1.50
204H	1.47	1.54	1.36	1.45	1.47	1.49	1.63	1.58	1.50	1.48	1.39	1.42	1.48
216H	1.57	1.63	1.54	1.52	1.58	1.51	1.59	1.63	1.48	1.43	1.44	1.51	1.54
228H	1.38	1.54	1.40	1.41	1.52	1.49	1.67	1.63	1.52	1.58	1.46	1.45	1.50
240H	1.59	1.61	1.58	1.57	1.64	1.52	1.63	1.69	1.50	1.45	1.51	1.51	1.57

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.27	0.31	0.37	0.37	0.36	0.27	0.32	0.26	0.36	0.27	0.32	0.33	0.32
24H	0.35	0.35	0.38	0.37	0.33	0.32	0.29	0.33	0.36	0.29	0.38	0.41	0.35
36H	0.44	0.39	0.47	0.44	0.43	0.38	0.43	0.37	0.39	0.37	0.46	0.44	0.42
48H	0.48	0.48	0.46	0.47	0.42	0.37	0.43	0.40	0.43	0.38	0.45	0.49	0.44
60H	0.50	0.45	0.52	0.47	0.41	0.34	0.46	0.42	0.43	0.40	0.50	0.52	0.45
72H	0.49	0.51	0.49	0.50	0.42	0.39	0.43	0.44	0.43	0.38	0.47	0.50	0.45
84H	0.50	0.49	0.53	0.51	0.43	0.37	0.46	0.44	0.43	0.41	0.43	0.52	0.46
96H	0.50	0.53	0.50	0.49	0.41	0.44	0.42	0.46	0.48	0.38	0.41	0.50	0.46
108H	0.49	0.48	0.53	0.52	0.42	0.38	0.40	0.46	0.41	0.41	0.39	0.51	0.45
120H	0.49	0.56	0.52	0.49	0.38	0.48	0.37	0.45	0.47	0.34	0.38	0.53	0.46
132H	0.50	0.49	0.52	0.50	0.43	0.38	0.37	0.41	0.44	0.34	0.38	0.55	0.44
144H	0.45	0.56	0.48	0.45	0.43	0.46	0.36	0.44	0.44	0.34	0.37	0.51	0.44
156H	0.43	0.50	0.52	0.52	0.44	0.39	0.34	0.45	0.41	0.37	0.42	0.53	0.44
168H	0.43	0.54	0.44	0.41	0.42	0.44	0.38	0.43	0.40	0.32	0.42	0.50	0.43
180H	0.44	0.47	0.49	0.50	0.45	0.36	0.40	0.42	0.38	0.28	0.49	0.54	0.44
192H	0.42	0.52	0.41	0.41	0.43	0.44	0.40	0.40	0.37	0.28	0.44	0.50	0.42
204H	0.40	0.48	0.46	0.46	0.45	0.37	0.35	0.40	0.36	0.29	0.47	0.50	0.42
216H	0.41	0.49	0.39	0.42	0.42	0.43	0.37	0.36	0.38	0.30	0.42	0.44	0.40
228H	0.45	0.45	0.45	0.49	0.47	0.40	0.32	0.39	0.37	0.27	0.45	0.50	0.42
240H	0.40	0.46	0.37	0.40	0.41	0.41	0.36	0.35	0.36	0.32	0.37	0.43	0.39

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.38	-0.43	-0.25	-0.18	-0.43	-0.30	-0.29	0.00	-0.28	-0.18	-0.42	-0.42	-0.30
24H	-0.58	-0.40	-0.27	-0.15	-0.11	-0.22	-0.10	0.07	-0.13	-0.38	-0.48	-0.34	-0.26
36H	-0.54	-0.23	-0.10	-0.14	-0.53	-0.47	-0.12	0.29	-0.24	-0.41	-0.67	-0.51	-0.31
48H	-0.67	-0.17	-0.37	-0.21	-0.22	-0.43	-0.10	-0.07	-0.32	-0.52	-0.69	-0.58	-0.36
60H	-0.54	0.00	-0.11	-0.30	-0.75	-0.49	-0.04	0.15	-0.27	-0.51	-0.75	-0.57	-0.35
72H	-0.58	-0.19	-0.43	-0.26	-0.45	-0.40	0.09	-0.16	-0.39	-0.61	-0.85	-0.64	-0.41
84H	-0.51	-0.02	-0.24	-0.24	-0.65	-0.54	0.13	0.04	-0.25	-0.49	-0.89	-0.64	-0.36
96H	-0.72	-0.44	0.51	-0.19	-0.43	-0.50	0.14	-0.25	-0.44	-0.52	-0.89	-0.65	-0.45
108H	-0.60	-0.27	-0.37	-0.30	-0.55	-0.46	0.56	0.14	-0.41	-0.42	-0.90	-0.55	-0.34
120H	-0.76	-0.58	-0.58	-0.37	-0.36	-0.29	0.45	-0.20	-0.58	-0.52	-0.87	-0.62	-0.44
132H	-0.52	-0.35	-0.44	-0.43	-0.53	-0.31	0.82	0.10	-0.45	-0.53	-0.90	-0.55	-0.34
144H	-0.84	-0.65	0.60	-0.45	-0.35	-0.13	0.71	-0.16	-0.50	-0.40	-0.74	-0.50	-0.38
156H	-0.49	-0.53	-0.66	-0.53	-0.51	-0.26	1.18	0.15	-0.45	-0.37	-0.89	-0.39	-0.31
168H	-0.85	-0.77	-0.75	-0.38	-0.23	-0.15	0.82	0.02	-0.52	-0.37	-0.65	-0.43	-0.36
180H	-0.79	-0.46	-0.60	-0.49	-0.40	-0.22	1.06	0.36	-0.41	-0.47	-0.73	-0.50	-0.30
192H	-0.82	-0.72	-0.67	-0.32	-0.14	0.08	0.71	0.01	-0.66	-0.23	-0.55	-0.48	-0.32
204H	-0.82	-0.58	-0.56	-0.36	-0.21	0.08	1.22	0.37	-0.51	-0.23	-0.55	-0.60	-0.23
216H	-0.85	-0.91	-0.69	-0.29	-0.23	0.27	0.72	0.03	-0.68	0.05	-0.23	-0.52	-0.28
228H	-0.78	-0.78	-0.67	-0.42	-0.23	0.25	1.16	0.36	-0.43	0.05	-0.25	-0.70	-0.20
240H	-0.93	-1.19	-0.81	-0.20	-0.19	0.42	0.63	0.00	-0.63	0.11	-0.10	-0.66	-0.30

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	5.02	5.33	4.74	4.63	4.97	4.75	4.99	5.24	4.78	4.60	4.55	4.71	4.86
24H	5.86	5.97	5.28	5.11	5.40	5.51	5.57	5.97	5.31	5.20	4.97	5.17	5.44
36H	5.80	6.24	5.51	5.34	5.57	5.52	5.88	6.37	5.63	5.50	5.16	5.32	5.65
48H	6.34	6.49	5.88	5.68	5.79	6.24	6.16	6.74	6.01	5.72	5.45	5.68	6.02
60H	6.27	6.74	5.70	5.76	5.87	6.33	6.42	6.92	6.22	6.03	5.59	5.82	6.14
72H	6.88	7.07	6.30	6.02	6.17	6.74	6.74	7.34	6.49	6.21	5.99	6.07	6.50
84H	6.87	7.37	6.00	6.33	6.35	6.74	7.11	7.54	6.94	6.60	6.18	6.26	6.69
96H	7.34	7.63	6.44	6.41	6.58	7.04	7.25	7.54	7.17	6.70	6.48	6.43	6.92
108H	7.25	7.83	6.33	6.69	6.81	7.32	7.82	7.89	7.41	7.24	6.83	6.68	7.18
120H	7.59	7.96	6.84	6.88	7.02	7.40	7.76	7.68	7.49	7.12	6.93	6.84	7.29
132H	7.55	8.05	6.73	6.83	7.22	7.83	8.35	8.19	7.73	7.74	7.33	7.11	7.56
144H	7.91	8.29	7.08	7.06	7.45	7.65	8.21	8.00	7.84	7.62	7.31	7.28	7.64
156H	7.97	8.31	7.03	7.14	7.82	7.99	8.74	8.59	7.92	8.20	7.61	7.67	7.92
168H	8.16	8.46	7.43	7.29	7.96	7.91	8.54	8.31	8.06	7.95	7.64	7.73	7.95
180H	8.23	8.64	7.47	7.34	8.14	8.24	8.85	8.80	8.28	8.36	8.13	8.04	8.21
192H	8.78	8.87	7.90	7.54	8.15	8.13	8.73	8.49	8.33	8.14	7.99	7.99	8.25
204H	8.67	8.98	8.07	7.66	8.39	8.60	9.27	8.91	8.64	8.77	8.64	8.31	8.58
216H	9.26	9.27	8.52	7.85	8.38	8.31	8.90	8.69	8.50	8.67	8.47	8.51	8.61
228H	9.14	9.32	8.46	8.13	8.79	8.91	9.11	9.22	9.02	9.15	8.90	8.58	8.89
240H	9.60	9.54	8.81	8.22	8.52	8.62	8.95	8.91	8.77	8.74	8.53	8.61	8.82

다) 250 hPa - 1) 고도

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-3.95	-3.40	-4.13	-2.80	-4.46	-4.56	-1.76	0.05	-1.00	-5.12	-7.34	-9.24	-3.98
24H	-4.30	-3.03	-4.31	-1.54	-5.03	-6.19	-2.14	-2.08	-3.99	-8.54	-9.17	10.25	-5.05
36H	-10.31	-9.64	-10.29	-6.22	-7.23	-7.38	-5.01	-3.53	-4.83	-10.21	-10.59	-14.69	-8.33
48H	-8.35	-8.15	-9.19	-4.53	-8.17	-8.98	-3.75	-5.11	-7.12	-12.38	-12.55	13.73	8.50
60H	-10.26	-9.96	-11.74	-6.76	-6.71	-4.72	-2.86	-2.35	-3.40	-10.08	-9.16	-14.16	-7.68
72H	-9.61	-10.01	-11.39	-5.72	-7.41	-7.61	-2.84	-4.09	-5.64	-11.00	-11.20	12.65	-8.26
84H	-12.03	-12.27	-14.23	-9.18	-6.46	-4.40	-2.60	-2.33	-4.06	-10.77	-8.85	-14.29	-8.46
96H	-11.42	-10.90	-11.57	-6.24	-5.71	-6.60	-1.08	-2.32	-3.63	-9.61	8.07	-11.01	7.35
108H	-10.58	-10.45	-11.88	-7.73	-3.68	-0.53	1.18	1.17	0.66	7.25	-5.50	10.32	-5.41
120H	-12.25	-10.16	-9.99	-5.45	-3.98	-3.47	2.25	0.87	-0.46	-5.68	-4.30	-8.15	-5.06
132H	-12.76	-11.53	-13.35	-9.01	-3.78	1.02	3.55	2.80	1.92	-5.51	-5.29	-10.11	-5.17
144H	-13.47	-11.10	-11.30	-6.24	-4.29	-1.94	5.17	4.43	1.01	-2.43	-3.39	-7.82	-4.28
156H	-13.94	-12.02	-15.04	-8.46	-3.50	3.15	7.83	6.99	4.08	1.87	-4.68	-9.65	3.93
168H	-14.22	-11.03	-13.36	-7.01	-3.09	-1.33	7.83	6.91	2.55	0.85	-2.79	-6.87	-3.46
180H	-14.80	-12.38	-17.14	-9.29	-1.96	4.71	10.47	9.85	6.69	0.94	-5.26	-9.35	3.13
192H	-15.15	-10.46	-15.38	-7.18	-1.59	-0.95	10.62	9.71	5.54	4.68	-2.13	-6.72	2.42
204H	-15.40	-11.39	-17.95	-9.14	1.45	6.69	13.09	11.97	8.87	3.49	-3.83	-9.15	-1.78
216H	-15.89	-9.98	-17.44	-7.32	-0.42	-0.41	10.73	11.75	6.70	5.69	-2.53	-8.48	-2.30
228H	-17.42	-11.16	-19.59	-8.48	2.38	6.67	12.31	12.47	10.39	4.98	-4.47	-10.81	-1.89
240H	-16.60	-9.59	-18.27	-6.46	0.63	-0.06	12.28	12.58	9.63	7.06	-1.93	-11.14	1.82

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	18.51	20.13	21.95	22.20	19.75	19.15	20.91	20.16	18.60	18.53	19.61	20.22	19.98
24H	20.71	22.20	22.33	20.55	19.04	19.34	19.72	19.43	20.45	20.67	20.02	20.46	20.41
36H	22.19	23.17	25.10	23.53	20.93	19.59	21.81	20.37	19.40	21.48	21.76	24.18	21.96
48H	22.40	23.69	24.20	21.24	21.40	22.30	21.09	20.53	22.01	23.74	22.51	24.42	22.46
60H	22.14	24.94	26.06	24.77	22.17	20.90	22.62	21.48	20.81	22.88	21.94	24.64	22.95
72H	24.34	26.29	25.76	23.25	24.47	25.28	24.26	22.78	24.69	25.95	23.66	25.50	24.69
84H	23.96	27.41	27.35	25.50	22.90	22.18	23.96	23.14	22.88	24.70	23.06	26.38	24.45
96H	25.84	28.60	26.31	25.21	25.55	25.38	25.92	23.44	25.60	26.01	23.57	26.77	25.68
108H	25.23	29.25	27.72	25.86	24.02	24.12	26.40	24.79	23.97	25.12	24.18	26.94	25.63
120H	27.81	30.32	26.79	27.30	27.00	24.87	27.96	24.39	25.94	26.62	23.84	26.90	26.65
132H	28.67	30.34	28.28	29.06	25.02	25.69	28.37	25.95	25.86	26.53	24.74	27.09	27.13
144H	30.54	31.86	27.94	29.50	28.93	26.76	29.59	26.44	27.69	27.88	25.40	27.81	28.36
156H	31.02	31.70	30.54	30.08	26.70	26.44	30.20	28.43	28.22	27.62	27.52	27.85	28.86
168H	33.35	33.78	30.05	31.46	30.28	28.20	31.19	29.27	29.15	29.08	27.43	28.66	30.16
180H	33.05	35.46	33.02	30.43	28.79	27.33	32.46	30.89	30.24	29.79	29.40	28.79	30.80
192H	34.84	35.91	32.95	32.35	30.79	29.56	33.28	31.17	31.59	30.42	28.81	30.96	31.89
204H	34.42	36.11	34.96	32.70	29.26	29.12	35.65	33.06	32.04	31.78	30.06	30.99	32.51
216H	36.54	36.69	35.97	32.40	31.53	29.63	34.14	32.94	31.65	31.97	30.14	34.16	33.15
228H	35.14	35.32	37.24	32.46	29.79	29.03	35.48	33.47	32.24	34.00	31.05	33.48	33.23
240H	37.87	36.87	37.69	33.30	32.57	30.23	35.15	35.38	33.03	33.36	30.64	37.11	34.43

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.40	0.35	0.40	0.32	0.37	0.40	0.34	0.35	0.38	0.30	0.32	0.33	0.36
24H	0.54	0.50	0.57	0.55	0.49	0.45	0.43	0.46	0.45	0.45	0.43	0.49	0.48
36H	0.60	0.55	0.58	0.51	0.54	0.58	0.54	0.57	0.60	0.51	0.48	0.46	0.54
48H	0.66	0.62	0.66	0.68	0.60	0.57	0.55	0.57	0.59	0.53	0.51	0.56	0.59
60H	0.68	0.65	0.65	0.59	0.58	0.59	0.59	0.59	0.66	0.58	0.55	0.51	0.60
72H	0.66	0.67	0.68	0.69	0.60	0.57	0.52	0.54	0.61	0.54	0.54	0.59	0.60
84H	0.71	0.65	0.66	0.61	0.61	0.61	0.58	0.53	0.64	0.57	0.53	0.55	0.60
96H	0.68	0.67	0.64	0.66	0.55	0.58	0.47	0.53	0.61	0.54	0.53	0.61	0.59
108H	0.70	0.64	0.65	0.63	0.62	0.55	0.54	0.49	0.62	0.56	0.51	0.56	0.59
120H	0.67	0.69	0.65	0.66	0.52	0.61	0.44	0.50	0.59	0.52	0.53	0.59	0.58
132H	0.64	0.67	0.63	0.56	0.61	0.54	0.49	0.50	0.57	0.54	0.53	0.58	0.57
144H	0.63	0.69	0.62	0.62	0.52	0.58	0.43	0.50	0.54	0.48	0.53	0.59	0.56
156H	0.62	0.67	0.62	0.57	0.62	0.56	0.47	0.49	0.55	0.53	0.50	0.60	0.57
168H	0.58	0.65	0.62	0.60	0.53	0.57	0.41	0.48	0.52	0.48	0.51	0.59	0.55
180H	0.58	0.58	0.59	0.57	0.58	0.54	0.42	0.47	0.49	0.50	0.48	0.58	0.53
192H	0.55	0.60	0.56	0.57	0.51	0.57	0.39	0.43	0.41	0.44	0.51	0.57	0.51
204H	0.55	0.55	0.56	0.56	0.57	0.51	0.36	0.40	0.43	0.44	0.51	0.54	0.50
216H	0.54	0.55	0.51	0.59	0.50	0.57	0.37	0.38	0.39	0.40	0.53	0.53	0.49
228H	0.54	0.57	0.52	0.58	0.55	0.51	0.37	0.37	0.40	0.39	0.53	0.53	0.49
240H	0.51	0.50	0.47	0.57	0.49	0.55	0.33	0.34	0.35	0.37	0.54	0.50	0.46

2) 기온

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.22	-0.02	-0.15	-0.19	-0.06	0.02	0.12	0.15	0.04	-0.15	-0.14	-0.23	-0.07
24H	-0.14	0.01	-0.19	-0.14	-0.14	-0.08	0.12	0.03	-0.03	-0.10	-0.18	-0.17	-0.08
36H	-0.16	0.09	-0.15	-0.12	0.05	0.15	0.29	0.26	0.13	-0.08	-0.06	-0.23	0.01
48H	-0.09	0.04	-0.18	-0.11	-0.10	0.03	0.27	0.13	0.08	-0.06	-0.09	-0.14	-0.02
60H	-0.03	0.17	-0.17	-0.15	0.09	0.30	0.41	0.36	0.24	0.02	0.02	-0.26	0.08
72H	-0.02	0.08	-0.16	-0.13	-0.07	0.11	0.29	0.21	0.10	0.06	-0.03	-0.11	0.03
84H	0.03	0.18	-0.16	-0.17	0.14	0.40	0.41	0.37	0.30	0.05	0.12	-0.22	0.12
96H	-0.04	0.14	-0.16	-0.21	-0.06	0.11	0.32	0.20	0.12	0.08	0.04	-0.09	0.04
108H	0.01	0.22	-0.19	-0.19	0.16	0.42	0.47	0.29	0.34	0.10	0.14	-0.20	0.13
120H	-0.10	0.18	-0.14	-0.23	-0.12	0.15	0.32	0.14	0.14	0.11	0.05	-0.10	0.03
132H	-0.06	0.24	-0.23	-0.20	0.13	0.55	0.49	0.26	0.34	0.20	0.17	-0.17	0.14
144H	-0.19	0.18	-0.21	-0.27	-0.14	0.20	0.30	0.12	0.13	0.16	0.05	-0.13	0.02
156H	-0.12	0.20	-0.29	-0.20	0.13	0.63	0.54	0.31	0.37	0.23	0.13	-0.17	0.15
168H	-0.27	0.09	-0.24	-0.30	-0.16	0.20	0.32	0.17	0.13	0.19	0.02	-0.12	0.00
180H	-0.16	0.15	-0.34	-0.19	0.17	0.64	0.60	0.45	0.40	0.33	0.12	-0.19	0.17
192H	-0.25	0.07	-0.30	-0.33	0.15	0.23	0.36	0.26	0.18	0.30	0.05	-0.12	0.03
204H	-0.15	0.10	-0.44	-0.21	0.28	0.68	0.66	0.58	0.44	0.38	0.11	-0.18	0.19
216H	-0.29	0.02	-0.42	-0.32	-0.10	0.24	0.43	0.38	0.27	0.33	0.04	-0.08	0.04
228H	-0.20	0.07	-0.54	0.15	0.32	0.73	0.75	0.66	0.53	0.46	0.10	-0.22	0.21
240H	-0.29	0.04	-0.51	-0.28	-0.08	0.23	0.46	0.39	0.35	0.33	0.06	-0.13	0.05

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	1.14	1.06	1.08	1.06	0.94	0.93	1.08	0.98	0.92	0.93	0.91	1.00	1.00
24H	1.18	1.17	1.12	1.10	1.05	0.97	1.07	1.01	0.96	1.02	0.96	1.08	1.06
36H	1.27	1.18	1.22	1.19	1.07	1.06	1.24	1.11	1.02	1.02	1.00	1.19	1.13
48H	1.29	1.33	1.22	1.17	1.15	1.07	1.19	1.14	1.05	1.13	1.07	1.26	1.17
60H	1.29	1.32	1.35	1.23	1.18	1.13	1.31	1.23	1.13	1.11	1.10	1.30	1.22
72H	1.35	1.48	1.30	1.21	1.24	1.16	1.32	1.27	1.15	1.21	1.16	1.29	1.26
84H	1.33	1.44	1.36	1.31	1.26	1.30	1.42	1.35	1.22	1.20	1.20	1.31	1.31
96H	1.36	1.49	1.33	1.25	1.36	1.25	1.40	1.37	1.21	1.29	1.24	1.39	1.33
108H	1.39	1.44	1.46	1.31	1.30	1.38	1.54	1.45	1.27	1.27	1.26	1.38	1.37
120H	1.46	1.49	1.41	1.33	1.42	1.35	1.52	1.45	1.28	1.36	1.28	1.41	1.40
132H	1.49	1.44	1.53	1.40	1.37	1.52	1.58	1.51	1.35	1.38	1.28	1.41	1.44
144H	1.56	1.54	1.55	1.43	1.51	1.42	1.59	1.55	1.35	1.46	1.32	1.43	1.48
156H	1.60	1.56	1.62	1.38	1.44	1.59	1.65	1.62	1.43	1.45	1.31	1.46	1.51
168H	1.72	1.60	1.57	1.44	1.60	1.45	1.66	1.62	1.43	1.54	1.39	1.43	1.54
180H	1.66	1.60	1.68	1.38	1.57	1.63	1.76	1.73	1.51	1.55	1.38	1.51	1.58
192H	1.70	1.64	1.66	1.46	1.63	1.53	1.74	1.73	1.48	1.56	1.40	1.52	1.59
204H	1.68	1.66	1.72	1.43	1.62	1.68	1.82	1.81	1.53	1.63	1.43	1.57	1.63
216H	1.74	1.73	1.72	1.45	1.69	1.54	1.77	1.76	1.52	1.57	1.44	1.57	1.63
228H	1.69	1.73	1.83	1.44	1.71	1.72	1.86	1.89	1.61	1.62	1.35	1.55	1.67
240H	1.79	1.77	1.86	1.46	1.77	1.59	1.81	1.80	1.60	1.56	1.42	1.61	1.67

③ TREND

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	0.31	0.26	0.26	0.33	0.39	0.29	0.28	0.25	0.31	0.37	0.33	0.35	0.31
24H	0.38	0.35	0.31	0.27	0.29	0.28	0.26	0.28	0.28	0.28	0.29	0.34	0.30
36H	0.40	0.36	0.36	0.33	0.40	0.32	0.34	0.29	0.41	0.44	0.37	0.41	0.37
48H	0.45	0.44	0.41	0.32	0.37	0.31	0.36	0.31	0.32	0.35	0.32	0.38	0.36
60H	0.42	0.43	0.43	0.34	0.39	0.32	0.37	0.27	0.37	0.45	0.35	0.38	0.38
72H	0.49	0.45	0.41	0.35	0.38	0.34	0.35	0.31	0.33	0.37	0.35	0.39	0.38
84H	0.44	0.42	0.43	0.38	0.38	0.25	0.36	0.25	0.36	0.42	0.32	0.41	0.37
96H	0.50	0.47	0.43	0.38	0.33	0.37	0.34	0.29	0.34	0.36	0.35	0.35	0.38
108H	0.45	0.50	0.44	0.35	0.39	0.25	0.30	0.26	0.36	0.39	0.29	0.36	0.36
120H	0.54	0.49	0.42	0.35	0.35	0.34	0.28	0.28	0.36	0.32	0.35	0.35	0.37
132H	0.47	0.53	0.42	0.35	0.40	0.19	0.28	0.24	0.36	0.36	0.33	0.33	0.36
144H	0.52	0.47	0.38	0.35	0.37	0.36	0.27	0.25	0.34	0.33	0.35	0.36	0.36
156H	0.46	0.46	0.38	0.37	0.43	0.20	0.27	0.22	0.32	0.34	0.33	0.30	0.34
168H	0.47	0.41	0.40	0.36	0.39	0.37	0.31	0.26	0.32	0.32	0.34	0.35	0.36
180H	0.43	0.44	0.41	0.39	0.38	0.20	0.23	0.20	0.28	0.30	0.34	0.32	0.33
192H	0.46	0.37	0.38	0.37	0.39	0.35	0.25	0.24	0.32	0.30	0.34	0.32	0.34
204H	0.39	0.40	0.39	0.37	0.38	0.22	0.20	0.19	0.27	0.24	0.36	0.32	0.31
216H	0.41	0.35	0.36	0.40	0.39	0.39	0.24	0.26	0.30	0.30	0.37	0.32	0.34
228H	0.39	0.40	0.32	0.37	0.34	0.23	0.20	0.21	0.24	0.24	0.40	0.34	0.31
240H	0.41	0.36	0.28	0.41	0.38	0.40	0.23	0.25	0.24	0.32	0.40	0.35	0.34

3) 바람

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	-0.38	-0.02	-0.03	-0.35	-0.02	0.19	0.53	-0.04	0.17	0.01	-0.02	-0.86	-0.07
24H	-0.33	-0.23	-0.32	-0.64	-0.12	-0.48	-0.10	-0.13	-0.15	-0.19	-0.26	-1.09	-0.34
36H	-0.12	0.09	0.04	-0.41	-0.09	0.08	0.48	0.06	0.51	-0.17	-0.08	-1.07	-0.06
48H	-0.37	-0.41	-0.63	-0.85	-0.26	-0.35	-0.17	-0.21	0.05	-0.28	-0.51	-1.45	-0.45
60H	-0.05	-0.09	-0.36	-0.69	-0.07	0.17	0.74	0.33	0.52	0.10	-0.32	-1.17	-0.07
72H	-0.25	-0.48	-0.77	-0.82	-0.52	-0.45	-0.04	-0.11	0.10	0.23	-0.53	-1.62	-0.48
84H	0.00	-0.33	-0.46	-0.50	-0.10	0.47	0.98	0.45	0.83	0.31	-0.35	-1.25	0.00
96H	-0.08	-0.23	-0.66	-0.79	-0.75	-0.10	0.33	-0.09	0.55	-0.13	-0.33	-1.75	-0.34
108H	0.14	-0.35	-0.25	-0.38	-0.18	0.38	0.98	0.18	1.15	0.14	-0.15	-1.29	0.03
120H	0.02	-0.17	-0.14	-0.61	-0.79	-0.03	0.13	-0.02	0.66	-0.13	-0.10	-1.52	-0.23
132H	0.22	-0.29	0.00	-0.34	-0.07	0.46	0.84	0.46	1.43	0.31	0.17	-0.93	0.19
144H	0.10	-0.40	0.09	-0.73	-0.55	-0.10	-0.17	0.09	0.84	-0.26	-0.13	-1.33	-0.21
156H	0.24	-0.44	0.51	-0.29	0.09	0.68	0.81	0.39	1.69	0.08	0.08	-0.70	0.26
168H	0.19	-0.52	0.56	-0.35	-0.58	0.26	-0.20	-0.11	0.98	-0.08	-0.23	-1.12	-0.10
180H	0.18	-0.25	0.95	-0.29	-0.12	0.80	1.07	0.69	1.74	0.24	-0.08	-0.86	0.34
192H	0.73	-0.18	0.65	-0.17	-0.78	0.37	0.21	0.35	0.78	-0.16	-0.26	-1.31	0.02
204H	0.39	-0.41	0.85	-0.29	-0.08	1.15	1.37	1.26	1.46	0.55	-0.15	-0.98	0.43
216H	0.73	-0.46	0.98	-0.29	-0.37	0.38	0.67	0.53	0.62	0.24	0.00	-1.23	0.15
228H	0.05	-0.52	0.90	-0.05	0.12	1.23	1.86	1.61	1.48	0.86	0.05	-0.98	0.55
240H	0.48	-0.40	0.95	-0.22	-0.50	0.58	1.09	1.08	0.55	0.27	0.06	-1.04	0.24

② RMSEv

FCST	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave
12H	7.25	7.03	7.12	7.06	6.68	6.74	6.83	6.72	6.45	6.32	6.45	6.63	6.77
24H	8.91	8.50	8.48	8.31	8.46	8.17	8.21	8.00	7.89	7.66	7.31	7.82	8.14
36H	8.60	8.46	8.31	8.44	8.52	8.27	8.46	8.22	7.95	8.03	7.81	8.31	8.28
48H	9.67	9.40	9.47	9.55	9.58	9.46	9.45	9.23	8.92	9.05	8.49	9.27	9.30
60H	9.42	9.22	9.17	8.92	9.49	9.31	9.30	9.43	8.77	9.35	8.86	9.22	9.21
72H	10.63	10.18	10.53	10.35	10.78	10.82	10.28	10.01	9.84	10.09	9.72	10.16	10.28
84H	10.48	10.03	9.91	9.68	10.20	10.31	9.78	9.93	9.63	10.18	10.09	9.75	10.00
96H	11.70	11.22	10.99	11.14	11.53	11.47	10.95	10.69	10.69	10.97	10.90	11.04	11.11
108H	11.25	10.75	10.36	10.72	10.91	10.94	10.46	10.64	10.15	11.01	10.77	10.67	10.72
120H	12.44	12.16	11.52	12.13	12.56	11.88	11.18	11.37	11.37	11.70	11.65	11.98	11.83
132H	11.71	11.67	11.07	11.69	12.36	11.09	10.98	11.08	11.10	11.47	11.24	11.52	11.42
144H	12.92	12.91	12.25	12.67	13.32	12.22	11.79	11.55	12.13	12.15	11.95	12.61	12.37
156H	12.27	11.85	12.28	12.02	12.96	11.57	11.84	11.34	11.42	12.28	11.60	12.50	11.99
168H	13.37	12.89	12.95	12.98	13.87	12.57	12.68	11.81	12.31	12.74	12.62	13.18	12.83
180H	12.65	12.26	13.32	12.52	13.63	12.13	12.53	12.06	11.68	12.45	12.30	13.13	12.56
192H	13.90	13.56	13.68	13.63	14.33	13.20	13.16	12.58	12.48	12.93	13.17	13.85	13.37
204H	13.41	13.08	13.41	13.52	14.08	12.76	12.69	12.56	11.73	12.79	12.87	13.42	13.03
216H	14.60	14.17	14.25	14.16	14.35	13.60	13.48	13.19	12.70	13.66	13.80	14.33	13.86
228H	13.65	13.41	14.17	13.85	14.00	13.26	13.11	12.99	12.18	13.59	12.93	13.64	13.40
240H	14.62	14.65	14.82	14.48	14.73	13.95	13.64	13.70	13.03	13.70	13.78	14.79	14.16

4.1.4. 강수 검증

o 검증 변수: 강수

o 검증 요소: Bias Score(BS), Threat Score(TS)

o 검증 영역: 남한

가. Bias Score

가) Rain or Not(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.623	3.200	1.771	1.333	1.308	1.629	1.295	1.473	2.103	1.760	2.600	1.694	1.690
24H	1.630	1.750	1.974	1.628	1.385	1.698	1.434	1.389	2.154	1.909	2.422	1.844	1.776
36H	1.768	3.800	2.000	1.548	1.346	1.543	1.179	1.581	2.333	1.800	3.114	1.903	1.835
48H	1.534	1.357	1.974	1.628	1.400	1.641	1.394	1.407	2.058	1.855	2.667	1.922	1.784
60H	1.536	3.300	1.971	1.643	1.288	1.429	1.126	1.452	2.077	1.960	3.029	1.548	1.717
72H	1.480	1.464	1.789	1.674	1.015	1.189	1.313	1.372	1.962	1.818	2.533	1.812	1.647
84H	1.681	3.300	1.943	1.452	1.269	1.057	1.232	1.452	1.795	1.840	3.429	1.758	1.722
96H	1.562	1.286	1.789	1.302	1.292	1.038	1.505	1.301	1.673	1.454	2.756	1.875	1.619
108H	1.638	2.600	1.743	1.619	1.808	1.314	1.411	1.344	1.615	1.840	3.543	1.806	1.791
120H	1.534	1.536	2.079	1.907	1.569	1.396	1.515	1.248	1.635	1.946	2.844	1.812	1.775
132H	1.493	2.900	2.400	1.976	1.635	1.571	1.179	1.398	1.872	1.820	3.171	1.677	1.822
144H	1.575	1.178	2.184	2.046	1.538	1.415	1.354	1.204	1.808	1.546	2.378	1.781	1.718
156H	1.594	4.200	1.971	2.000	1.462	1.686	1.316	1.237	1.974	1.720	2.886	1.403	1.721
168H	1.452	1.786	1.763	1.628	1.415	1.453	1.313	1.071	1.538	1.927	2.444	1.641	1.607
180H	1.638	7.800	1.714	1.095	1.654	1.657	1.042	1.054	1.744	1.700	2.829	1.339	1.567
192H	1.151	2.607	1.895	1.000	1.615	1.264	1.172	0.982	1.692	1.618	2.178	1.531	1.469
204H	1.290	6.000	1.429	0.905	1.942	1.543	1.084	1.097	2.436	1.880	2.686	1.758	1.651
216H	1.342	1.750	1.632	1.209	1.585	1.434	1.253	0.929	1.865	1.727	2.489	1.719	1.575
228H	1.783	4.400	1.714	1.500	1.558	1.857	1.095	1.000	2.564	1.980	2.857	1.855	1.802
240H	1.699	1.393	1.816	1.884	1.262	1.472	1.030	0.929	2.058	1.764	2.533	1.672	1.649

나) 1mm 이상(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	1.889	2.000	1.280	1.250	1.286	1.286	1.694	1.119	1.409	1.667	2.273	1.615	1.647
24H	1.679	1.818	2.000	1.357	1.303	1.476	2.237	1.603	2.565	1.385	3.643	2.160	1.966
36H	1.482	6.000	1.400	1.583	1.357	1.286	1.778	1.254	1.773	1.417	3.546	1.731	2.134
48H	1.321	1.273	1.722	1.321	1.182	1.333	1.974	1.397	2.261	0.923	3.214	2.080	1.674
60H	1.370	1.000	1.200	1.292	1.179	0.905	1.389	1.254	1.500	1.583	2.636	1.615	1.410
72H	1.286	1.091	1.833	1.643	0.879	0.619	1.789	1.356	2.261	1.577	3.071	2.000	1.647
84H	2.000	5.000	1.160	1.417	1.107	0.809	1.917	1.373	1.500	1.250	3.091	1.808	1.869
96H	1.357	1.182	2.056	1.250	1.667	1.000	2.368	1.260	1.565	1.115	3.429	2.160	1.739
108H	1.333	5.000	1.000	1.708	2.000	1.143	2.389	1.090	0.727	1.208	3.364	2.039	2.000
120H	1.643	1.727	2.444	1.964	2.000	1.667	2.447	1.178	1.174	1.692	3.714	1.720	1.970
132H	1.296	9.000	1.960	2.167	1.964	1.191	1.917	1.090	1.136	1.875	3.636	1.423	2.888
144H	1.429	0.363	2.278	2.179	1.727	1.809	2.053	1.178	2.043	1.115	3.357	1.400	1.813
156H	1.518	17.00	1.360	2.042	2.036	1.381	2.194	0.940	1.636	1.667	4.091	1.077	3.412
168H	1.429	2.091	1.389	1.464	1.758	2.000	2.395	0.863	1.609	1.962	2.643	0.920	1.794
180H	1.185	35.00	0.880	0.958	1.500	1.381	1.778	0.836	1.546	1.375	3.364	0.692	4.958
192H	1.000	4.455	2.000	0.607	2.061	1.857	1.895	0.932	1.739	1.538	2.714	1.520	1.951
204H	1.333	20.00	0.800	0.792	2.429	1.191	1.750	0.806	1.909	1.583	3.454	1.923	3.498
216H	1.286	1.727	1.778	0.750	1.909	1.762	1.711	0.767	2.304	1.654	2.714	2.200	1.774
228H	1.815	20.00	0.800	1.500	2.143	1.714	1.472	0.731	2.500	1.458	2.364	1.923	3.702
240H	2.214	0.818	1.611	1.786	1.546	1.762	1.526	0.644	2.478	1.192	2.429	1.840	1.715

다) 5mm 이상(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.600	0.000	0.714	1.000	0.941	0.625	1.667	0.900	0.800	0.933	0.333	1.273	0.816
24H	0.545	0.600	1.625	1.389	2.182	0.545	1.450	1.078	1.286	0.929	1.667	1.333	1.219
36H	0.500	0.000	0.643	0.944	1.000	0.500	1.889	1.200	0.933	0.867	2.000	1.182	0.972
48H	0.545	0.800	1.250	1.056	1.909	0.364	1.450	1.039	1.500	0.500	1.667	1.333	1.118
60H	0.400	0.000	0.500	0.778	0.647	0.875	1.222	1.075	1.133	0.400	0.333	0.636	0.667
72H	0.636	0.200	1.000	1.056	1.000	0.000	0.900	0.961	0.929	0.643	3.333	0.556	0.935
84H	0.900	0.000	0.929	0.556	1.176	0.750	1.444	1.350	0.933	0.733	3.000	1.091	1.072
96H	1.636	0.000	2.750	1.111	2.091	0.545	2.000	0.784	0.714	0.500	1.667	1.444	1.270
108H	1.200	0.000	0.429	1.000	1.882	1.375	1.333	0.900	0.267	0.400	2.667	1.454	1.076
120H	1.273	0.200	2.375	1.444	3.454	1.364	1.900	0.843	0.214	1.000	5.000	0.889	1.663
132H	1.100	0.000	1.500	1.722	1.353	1.500	2.167	0.825	0.267	1.067	2.667	0.818	1.249
144H	1.273	0.400	1.500	1.889	2.454	0.636	1.800	0.902	0.429	1.000	4.333	0.333	1.412
156H	1.100	0.000	1.143	0.944	1.647	1.875	2.556	0.675	0.933	0.400	4.667	0.364	1.359
168H	0.727	0.800	0.875	0.833	2.182	1.364	2.550	0.549	1.143	1.071	2.667	0.333	1.258
180H	0.600	0.000	0.714	0.444	0.765	2.500	1.611	0.575	0.400	0.733	1.333	0.000	0.806
192H	0.727	4.800	1.625	0.278	2.000	1.818	1.750	0.569	0.786	1.357	2.333	0.778	1.568
204H	1.200	0.000	0.357	0.722	1.941	1.125	1.611	0.825	1.533	1.067	6.667	1.909	1.580
216H	0.545	2.000	1.000	0.667	2.727	0.636	1.550	0.647	1.857	1.000	5.000	1.444	1.589
228H	0.800	0.000	0.571	0.722	1.824	1.250	1.167	0.350	1.667	0.467	2.000	0.818	0.970
240H	1.364	1.000	1.250	1.389	2.818	1.454	0.550	0.157	1.786	0.429	3.333	1.889	1.452

라) 15mm 이상(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.364	0.444	0.500	0.875	0.733	0.833	1.000	0.000	0.000	0.396
24H	0.250	0.600	3.000	0.778	1.500	0.250	1.000	0.667	0.667	0.600	1.000	0.000	0.809
36H	0.000	0.000	0.333	0.545	0.667	0.000	1.625	1.400	1.167	1.000	0.000	1.000	0.645
48H	0.000	0.800	0.000	1.000	2.500	0.000	0.846	0.611	2.000	0.400	1.000	0.200	0.713
60H	0.000	0.000	0.000	0.091	0.111	0.000	0.625	1.200	0.667	0.250	0.000	0.000	0.245
72H	0.750	0.200	3.000	0.889	1.500	0.000	0.769	0.639	0.667	0.200	0.000	0.000	0.701
84H	0.200	0.000	0.333	0.091	0.667	0.000	1.125	1.933	0.833	0.750	0.000	4.000	0.828
96H	1.750	0.000	6.000	0.333	4.000	0.500	1.538	0.444	1.000	0.400	1.000	0.800	1.480
108H	0.400	0.000	0.000	0.545	0.889	0.500	1.250	1.200	0.500	0.500	0.000	2.000	0.649
120H	1.500	0.200	3.000	1.111	8.500	2.750	0.923	0.500	0.667	0.800	0.000	0.200	1.663
132H	0.600	0.000	0.000	0.818	0.889	1.167	1.250	0.867	0.000	0.000	0.000	2.000	0.633
144H	0.250	0.000	1.000	1.222	3.000	0.750	1.154	0.500	0.333	2.200	2.000	0.000	1.117
156H	0.200	0.000	3.000	0.545	1.222	0.833	2.750	0.467	0.333	0.000	0.000	1.000	0.863
168H	0.000	0.200	5.000	0.444	2.000	1.500	1.538	0.361	0.667	1.000	1.000	0.000	1.209
180H	0.000	0.000	0.667	0.000	0.333	1.500	1.750	0.733	0.500	1.750	0.000	0.000	0.603
192H	0.750	4.200	4.000	0.222	2.000	2.500	1.385	0.361	0.333	1.600	0.000	0.000	1.096
204H	0.800	0.000	0.000	0.364	1.000	0.667	1.000	1.133	1.667	1.500	0.000	6.000	1.178
216H	0.500	1.400	0.000	0.333	5.500	0.500	1.308	0.333	2.333	0.400	2.000	0.600	1.151
228H	0.000	0.000	0.333	0.182	0.889	0.167	0.750	0.067	1.833	0.000	0.000	0.000	0.352
240H	0.000	0.400	0.000	0.556	4.000	0.500	0.077	0.028	2.667	0.000	1.000	0.800	0.802

마) 25mm 이상(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.333	0.000	0.250	2.000	0.545	0.545	0.333	0.000	0.000	0.334
24H	0.000	0.000	1.000	0.000	0.000	0.000	0.727	0.357	0.357	1.000	0.000	0.000	0.287
36H	0.000	0.000	0.000	0.167	0.400	0.000	3.000	0.818	0.818	0.667	0.000	0.000	0.489
48H	0.000	0.000	0.000	0.800	2.000	0.000	0.545	0.429	0.429	0.500	0.000	0.000	0.392
60H	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.636	0.636	0.000	0.000	0.000	0.148
72H	0.000	0.000	1.000	0.200	1.000	0.000	0.182	0.536	0.536	0.000	0.000	0.000	0.288
84H	0.000	0.000	0.000	0.000	0.200	0.000	4.000	1.454	1.454	0.333	0.000	0.000	0.620
96H	0.000	0.000	0.000	0.200	2.000	1.000	0.818	0.357	0.357	0.000	0.000	0.500	0.436
108H	0.000	0.000	0.000	0.167	0.400	0.500	3.500	0.545	0.545	0.000	0.000	1.000	0.555
120H	0.000	0.000	0.000	0.600	7.000	5.000	0.091	0.321	0.321	0.000	0.000	0.000	1.111
132H	0.000	0.000	0.000	0.167	0.800	1.000	4.000	0.818	0.818	0.000	0.000	0.000	0.634
144H	0.000	0.000	0.000	0.000	4.000	2.000	0.364	0.393	0.393	2.500	0.000	0.000	0.804
156H	0.000	0.000	0.000	0.000	0.400	0.750	6.500	0.273	0.273	0.000	0.000	0.000	0.683
168H	0.000	0.000	1.000	0.400	0.000	2.000	1.000	0.179	0.179	2.000	0.000	0.000	0.563
180H	0.000	0.000	0.000	0.000	0.000	0.750	4.000	0.273	0.273	0.667	0.000	0.000	0.497
192H	0.000	0.000	0.000	0.000	1.000	4.000	1.091	0.214	0.214	1.500	0.000	0.000	0.668
204H	0.000	0.000	0.000	0.000	0.400	0.250	2.000	0.909	0.909	0.667	0.000	2.000	0.595
216H	0.000	0.000	0.000	0.200	7.000	1.000	0.636	0.179	0.179	0.500	0.000	0.500	0.850
228H	0.000	0.000	0.000	0.167	0.800	0.250	1.500	0.091	0.091	0.000	0.000	0.000	0.242
240H	0.000	0.000	0.000	0.200	3.000	1.000	0.091	0.000	0.000	0.000	0.000	1.000	0.441

바) 50mm 이상(BS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24H	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.267	0.000	0.000	0.000	0.000	0.064
36H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48H	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.267	0.000	0.000	0.000	0.000	0.043
60H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.833	0.000	0.000	0.000	0.000	0.069
72H	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.200	0.000	0.000	0.000	0.000	0.058
84H	0.000	0.000	0.000	0.000	0.000	0.000	6.000	1.000	1.000	0.000	0.000	0.000	0.667
96H	0.000	0.000	0.000	0.000	0.000	0.000	0.750	0.333	0.000	0.000	0.000	0.000	0.090
108H	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.167	0.500	0.000	0.000	0.000	0.139
120H	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083
132H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
144H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133	0.000	0.000	0.000	0.000	0.011
156H	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.083
168H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180H	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.083
192H	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.200	0.000	0.000	0.000	0.000	0.058
204H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.167	0.500	0.000	0.000	0.000	0.056
216H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.000	0.000	0.000	0.000	0.006
228H	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.125
240H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

나. Threat Score

가) Rain or Not(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.547	0.024	0.492	0.633	0.644	0.460	0.535	0.667	0.424	0.568	0.370	0.518	0.506
24H	0.561	0.054	0.449	0.487	0.598	0.474	0.516	0.688	0.439	0.481	0.375	0.480	0.501
36H	0.516	0.021	0.438	0.597	0.506	0.435	0.556	0.579	0.354	0.505	0.297	0.429	0.451
48H	0.529	0.064	0.395	0.412	0.545	0.443	0.481	0.659	0.459	0.427	0.331	0.472	0.469
60H	0.446	0.000	0.425	0.500	0.451	0.465	0.496	0.583	0.319	0.423	0.294	0.436	0.412
72H	0.472	0.131	0.342	0.456	0.409	0.450	0.468	0.654	0.400	0.360	0.347	0.463	0.425
84H	0.423	0.048	0.256	0.411	0.341	0.309	0.472	0.572	0.282	0.379	0.271	0.402	0.346
96H	0.450	0.066	0.325	0.375	0.419	0.317	0.503	0.605	0.336	0.337	0.320	0.384	0.390
108H	0.400	0.058	0.171	0.392	0.391	0.157	0.477	0.473	0.244	0.406	0.252	0.381	0.320
120H	0.412	0.059	0.286	0.374	0.415	0.337	0.456	0.568	0.292	0.306	0.282	0.374	0.357
132H	0.376	0.026	0.190	0.344	0.384	0.233	0.399	0.467	0.217	0.356	0.217	0.395	0.305
144H	0.424	0.034	0.198	0.297	0.422	0.219	0.447	0.528	0.315	0.308	0.256	0.424	0.337
156H	0.326	0.019	0.195	0.370	0.293	0.080	0.438	0.435	0.261	0.308	0.236	0.367	0.285
168H	0.409	0.054	0.167	0.242	0.389	0.204	0.405	0.520	0.282	0.342	0.230	0.363	0.312
180H	0.368	0.035	0.188	0.222	0.314	0.107	0.347	0.364	0.305	0.311	0.218	0.272	0.256
192H	0.377	0.134	0.183	0.162	0.349	0.263	0.396	0.474	0.321	0.309	0.202	0.296	0.294
204H	0.350	0.044	0.118	0.127	0.254	0.141	0.294	0.413	0.276	0.241	0.229	0.239	0.231
216H	0.326	0.167	0.124	0.131	0.355	0.229	0.411	0.483	0.263	0.250	0.199	0.338	0.274
228H	0.333	0.000	0.234	0.193	0.255	0.064	0.372	0.368	0.209	0.263	0.205	0.273	0.233
240H	0.263	0.031	0.059	0.228	0.225	0.272	0.340	0.434	0.272	0.226	0.242	0.239	0.247

나) 1mm 이상(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.444	0.000	0.461	0.742	0.561	0.500	0.347	0.595	0.472	0.454	0.241	0.417	0.464
24H	0.389	0.000	0.460	0.610	0.520	0.268	0.323	0.597	0.323	0.348	0.275	0.339	0.404
36H	0.367	0.000	0.463	0.590	0.435	0.412	0.351	0.573	0.356	0.450	0.136	0.365	0.387
48H	0.250	0.000	0.400	0.444	0.469	0.140	0.345	0.562	0.364	0.351	0.180	0.328	0.356
60H	0.231	0.000	0.342	0.375	0.298	0.250	0.246	0.557	0.310	0.292	0.212	0.308	0.285
72H	0.255	0.045	0.275	0.423	0.292	0.172	0.262	0.522	0.271	0.264	0.267	0.229	0.276
84H	0.246	0.000	0.200	0.318	0.204	0.226	0.265	0.500	0.250	0.256	0.125	0.259	0.237
96H	0.347	0.000	0.146	0.370	0.333	0.077	0.267	0.473	0.135	0.196	0.216	0.215	0.241
108H	0.370	0.000	0.163	0.300	0.254	0.023	0.220	0.429	0.152	0.233	0.171	0.197	0.209
120H	0.298	0.000	0.127	0.239	0.222	0.037	0.149	0.359	0.191	0.250	0.158	0.153	0.187
132H	0.170	0.000	0.139	0.310	0.277	0.122	0.141	0.429	0.119	0.211	0.133	0.167	0.185
144H	0.259	0.000	0.113	0.254	0.286	0.093	0.184	0.371	0.207	0.342	0.089	0.111	0.196
156H	0.214	0.000	0.157	0.217	0.197	0.042	0.223	0.287	0.160	0.123	0.143	0.102	0.155
168H	0.236	0.000	0.075	0.095	0.230	0.068	0.217	0.347	0.154	0.132	0.085	0.143	0.150
180H	0.157	0.000	0.175	0.205	0.207	0.020	0.149	0.255	0.191	0.075	0.043	0.073	0.131
192H	0.217	0.034	0.125	0.125	0.174	0.071	0.183	0.226	0.212	0.158	0.083	0.105	0.145
204H	0.235	0.000	0.071	0.075	0.116	0.045	0.112	0.260	0.143	0.127	0.089	0.027	0.108
216H	0.280	0.034	0.064	0.043	0.157	0.074	0.157	0.277	0.169	0.078	0.000	0.176	0.125
228H	0.134	0.000	0.071	0.176	0.257	0.000	0.099	0.221	0.116	0.054	0.057	0.070	0.105
240H	0.111	0.000	0.022	0.200	0.183	0.094	0.171	0.225	0.194	0.140	0.091	0.092	0.130

다) 5mm 이상(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.231	0.000	0.714	0.714	0.650	0.182	0.297	0.434	0.500	0.381	0.000	0.389	0.374
24H	0.214	0.000	0.400	0.593	0.346	0.308	0.441	0.472	0.280	0.500	0.143	0.235	0.378
36H	0.250	0.000	0.353	0.667	0.417	0.000	0.209	0.419	0.526	0.474	0.000	0.263	0.298
48H	0.133	0.000	0.500	0.423	0.333	0.154	0.225	0.444	0.207	0.312	0.333	0.167	0.293
60H	0.273	0.000	0.400	0.333	0.120	0.154	0.111	0.361	0.280	0.167	0.000	0.125	0.194
72H	0.385	0.000	0.067	0.423	0.158	0.000	0.118	0.333	0.125	0.150	0.300	0.000	0.172
84H	0.267	0.000	0.227	0.077	0.156	0.077	0.189	0.306	0.208	0.238	0.000	0.095	0.153
96H	0.381	0.000	0.071	0.267	0.172	0.000	0.176	0.400	0.000	0.105	0.000	0.048	0.135
108H	0.375	0.000	0.250	0.091	0.289	0.000	0.077	0.333	0.000	0.235	0.000	0.125	0.148
120H	0.316	0.000	0.125	0.189	0.043	0.000	0.094	0.306	0.000	0.077	0.125	0.133	0.117
132H	0.105	0.000	0.207	0.195	0.111	0.000	0.075	0.237	0.118	0.148	0.000	0.111	0.109
144H	0.250	0.000	0.053	0.156	0.188	0.000	0.098	0.260	0.000	0.217	0.000	0.000	0.102
156H	0.167	0.000	0.034	0.061	0.125	0.000	0.143	0.117	0.160	0.000	0.000	0.000	0.067
168H	0.188	0.000	0.071	0.031	0.207	0.000	0.127	0.162	0.154	0.208	0.000	0.000	0.096
180H	0.000	0.000	0.091	0.130	0.200	0.000	0.022	0.105	0.050	0.040	0.000	0.000	0.053
192H	0.357	0.000	0.050	0.000	0.031	0.000	0.100	0.039	0.191	0.138	0.000	0.000	0.079
204H	0.375	0.000	0.118	0.000	0.111	0.000	0.068	0.090	0.188	0.069	0.000	0.000	0.085
216H	0.417	0.000	0.067	0.000	0.051	0.000	0.133	0.151	0.176	0.000	0.000	0.100	0.091
228H	0.059	0.000	0.000	0.107	0.263	0.000	0.083	0.038	0.143	0.000	0.000	0.000	0.058
240H	0.130	0.000	0.059	0.194	0.077	0.038	0.000	0.035	0.182	0.111	0.000	0.040	0.072

라) 15mm 이상(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.250	0.444	0.286	0.154	0.182	0.222	0.000	0.000	0.000	0.128
24H	0.250	0.000	0.000	0.231	0.250	0.250	0.529	0.395	0.000	0.333	0.000	0.000	0.187
36H	0.000	0.000	0.333	0.308	0.250	0.000	0.105	0.200	0.300	0.143	0.000	0.000	0.137
48H	0.000	0.000	0.000	0.286	0.167	0.000	0.043	0.289	0.125	0.167	0.000	0.000	0.090
60H	0.000	0.000	0.000	0.000	0.111	0.000	0.000	0.100	0.000	0.250	0.000	0.000	0.038
72H	0.400	0.000	0.000	0.214	0.000	0.000	0.000	0.255	0.250	0.000	0.000	0.000	0.093
84H	0.200	0.000	0.000	0.000	0.154	0.000	0.133	0.158	0.000	0.167	0.000	0.000	0.068
96H	0.375	0.000	0.000	0.091	0.000	0.000	0.138	0.333	0.000	0.167	0.000	0.000	0.092
108H	0.167	0.000	0.000	0.000	0.133	0.000	0.000	0.064	0.000	0.000	0.000	0.000	0.030
120H	0.111	0.000	0.000	0.118	0.000	0.000	0.136	0.174	0.000	0.000	0.000	0.000	0.045
132H	0.000	0.000	0.000	0.053	0.000	0.000	0.059	0.167	0.000	0.000	0.000	0.000	0.023
144H	0.000	0.000	0.000	0.053	0.000	0.000	0.037	0.080	0.000	0.143	0.000	0.000	0.026
156H	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.048	0.000	0.000	0.000	0.000	0.007
168H	0.000	0.000	0.000	0.000	0.200	0.000	0.031	0.089	0.000	0.111	0.000	0.000	0.036
180H	0.000	0.000	0.000	0.000	0.091	0.000	0.048	0.000	0.000	0.100	0.000	0.000	0.020
192H	0.400	0.000	0.000	0.000	0.000	0.000	0.107	0.000	0.000	0.000	0.000	0.000	0.042
204H	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.231	0.000	0.000	0.000	0.030
216H	0.200	0.000	0.000	0.000	0.000	0.000	0.111	0.021	0.000	0.000	0.000	0.000	0.028
228H	0.000	0.000	0.000	0.000	0.062	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
240H	0.000	0.000	0.000	0.077	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027

마) 25mm 이상(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.143	0.000	0.000	0.200	0.133	0.200	0.000	0.000	0.000	0.056
24H	0.000	0.000	0.000	0.000	0.000	0.000	0.461	0.357	0.000	0.333	0.000	0.000	0.096
36H	0.000	0.000	0.000	0.000	0.167	0.000	0.000	0.111	0.200	0.000	0.000	0.000	0.040
48H	0.000	0.000	0.000	0.125	0.000	0.000	0.062	0.212	0.000	0.000	0.000	0.000	0.033
60H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.005
72H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.265	0.000	0.000	0.000	0.000	0.022
84H	0.000	0.000	0.000	0.000	0.200	0.000	0.250	0.174	0.000	0.000	0.000	0.000	0.052
96H	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.310	0.000	0.000	0.000	0.000	0.035
108H	0.000	0.000	0.000	0.000	0.400	0.000	0.000	0.062	0.000	0.000	0.000	0.000	0.039
120H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.193	0.000	0.000	0.000	0.000	0.016
132H	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.111	0.000	0.000	0.000	0.000	0.019
144H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.054	0.000	0.167	0.000	0.000	0.018
156H	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000	0.000	0.000	0.006
168H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000	0.000	0.017
180H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
192H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
204H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.333	0.000	0.000	0.000	0.028
216H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
228H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
240H	0.000	0.000	0.000	0.000	0.333	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028

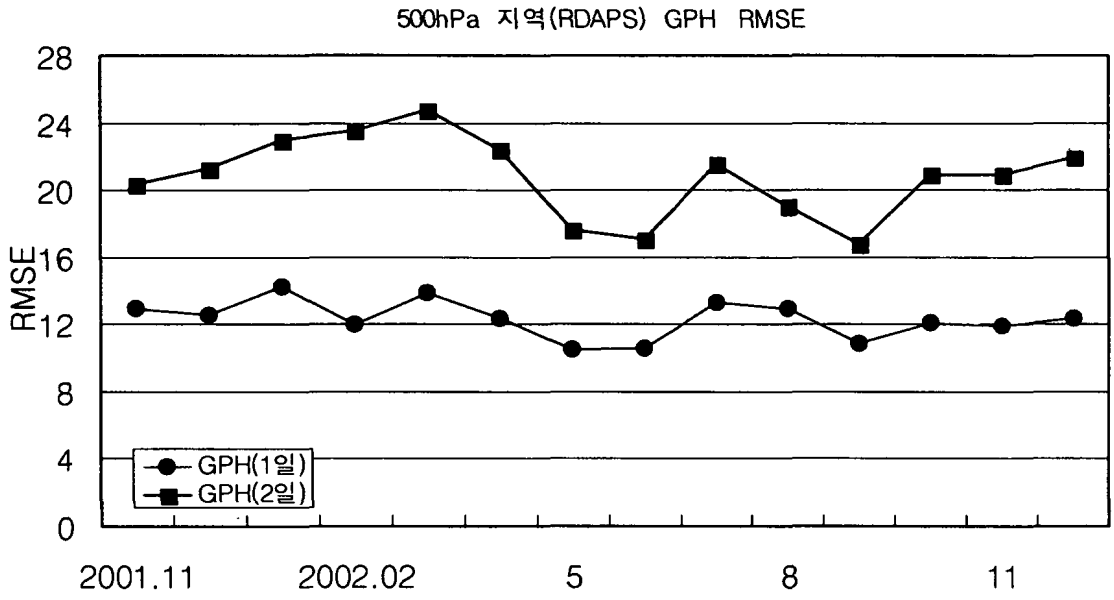
바) 50mm 이상(TS)

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.267	0.000	0.000	0.000	0.000	0.022
36H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48H	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.188	0.000	0.000	0.000	0.000	0.037
60H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.000	0.008
72H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.005
84H	0.000	0.000	0.000	0.000	0.000	0.000	0.167	0.000	0.000	0.000	0.000	0.000	0.014
96H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.176	0.000	0.000	0.000	0.000	0.015
108H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
132H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
144H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
156H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
168H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
192H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
204H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
216H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
228H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
240H	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

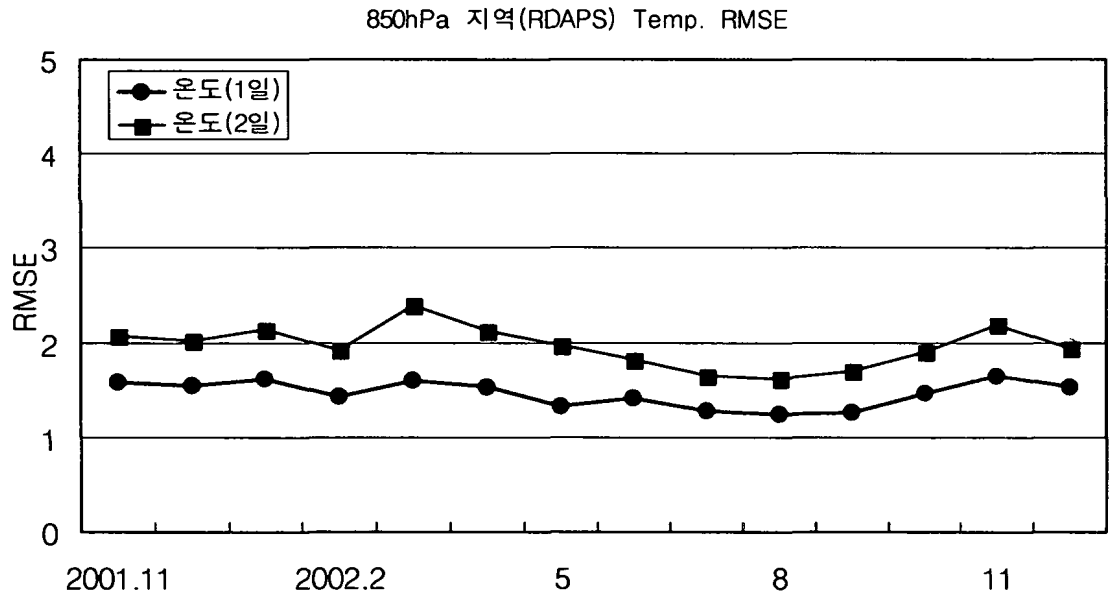
4. 2. 지역예보 모델

4.2.1 성능 변화 추세

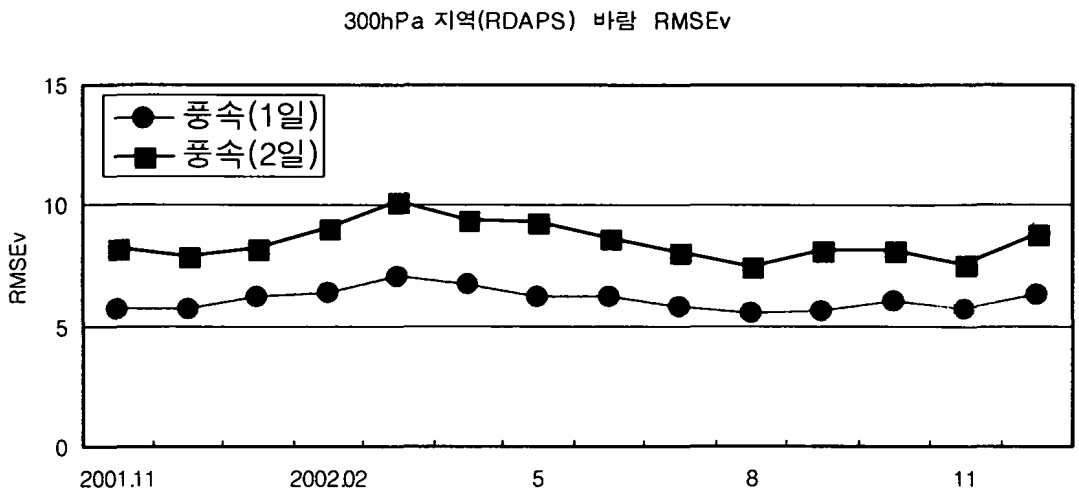
가. 500hPa 고도장의 RMSE



나. 850hPa 기온의 RMSE



다. 250hPa 바람의 RMSEv



4.2.2. 분석 검증

o 검증 변수: MSLP, 고도, 기온, 바람

o 검증 요소: 평균 오차, RMSE, S1 score

o 검증 영역: 동아시아 영역

가. Mean Error

1) GPH

① MSLP

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave
12H	0.59	0.95	1.42	0.99	0.41	0.55	0.38	0.01	0.34	0.45	0.28	0.03	0.53
24H	0.27	0.84	1.53	1.12	0.49	0.59	-0.04	-0.38	0.22	0.18	0.02	-0.31	0.38
36H	-0.10	0.59	1.50	0.99	0.39	0.40	-0.54	-0.79	-0.17	-0.42	-0.35	-0.86	0.05
48H	-0.24	0.47	1.64	1.01	0.54	0.53	-0.53	-0.66	-0.11	-0.77	-0.42	-1.18	0.02

② 850hPa

12H	4.29	4.24	5.66	2.83	1.79	1.77	-1.61	-3.82	1.41	2.41	3.92	2.93	2.15
24H	0.57	1.88	4.70	2.88	1.37	0.92	-5.98	-7.85	-0.19	0.36	0.87	-0.09	0.11
36H	-3.35	-1.37	2.84	0.86	-0.56	-1.86	-10.64	-12.02	-3.87	-5.76	-3.31	-4.77	-3.65
48H	-5.27	-2.90	2.78	0.44	-0.45	-1.31	-11.03	-11.50	3.79	-9.22	-4.88	-7.58	-4.56

③ 500hPa

12H	5.59	5.18	5.25	2.93	0.62	0.64	-1.77	-2.75	1.39	2.97	4.75	4.83	2.47
24H	2.51	1.56	2.76	1.92	-0.01	0.06	-5.94	-5.80	-0.09	1.37	2.59	2.14	0.25
36H	-3.08	-3.86	-2.07	-2.56	-2.39	-2.34	-9.91	-9.30	-3.06	-4.11	-2.48	-3.83	-4.08
48H	-6.43	-7.24	-3.69	-5.09	-1.88	-1.19	-9.74	-8.80	-2.25	-8.05	-5.18	-7.55	-5.59

④ 300hPa

12H	6.76	5.15	5.53	3.58	2.14	2.42	-1.14	0.39	2.23	4.20	5.56	5.13	3.49
24H	5.86	3.01	4.50	2.72	2.49	2.79	-3.66	-0.38	1.99	4.99	6.45	3.67	2.87
36H	-1.66	-4.02	-1.72	-3.49	0.64	1.98	-5.52	-2.13	0.20	1.39	3.33	-2.93	-1.16
48H	-6.01	-9.05	-3.91	-7.92	0.55	4.74	-3.63	-0.56	2.63	-2.01	1.26	-6.63	-2.54

2) 온도

① 850hPa

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	-0.12	-0.24	-0.45	-0.34	-0.22	-0.32	-0.23	-0.12	-0.11	-0.19	-0.26	0.03	-0.21
24H	-0.25	-0.43	-0.81	-0.54	-0.44	-0.49	-0.34	-0.18	-0.20	-0.22	-0.42	-0.02	-0.36
36H	-0.38	-0.59	-1.15	-0.72	-0.68	-0.66	-0.44	-0.28	-0.31	-0.26	-0.60	-0.04	-0.51
48H	-0.50	-0.67	-1.41	-0.86	-0.87	-0.76	-0.52	-0.38	-0.39	-0.33	-0.76	-0.06	-0.63

② 500hPa

12H	0.10	0.03	-0.02	0.06	0.07	0.06	0.09	0.18	0.09	0.06	0.09	0.09	0.07
24H	0.15	0.00	-0.05	0.03	0.10	0.11	0.11	0.28	0.11	0.14	0.21	0.12	0.11
36H	0.00	-0.24	-0.22	-0.12	0.15	0.18	0.20	0.38	0.16	0.16	0.21	-0.02	0.07
48H	-0.09	-0.44	-0.27	-0.26	0.17	0.27	0.28	0.43	0.24	0.15	0.21	-0.12	0.05

③ 300hPa

12H	0.09	0.00	-0.01	0.01	0.05	0.24	0.23	0.34	0.06	0.07	-0.01	-0.05	0.09
24H	0.23	0.10	0.24	0.09	0.18	0.29	0.36	0.47	0.18	0.28	0.17	0.10	0.22
36H	0.11	0.05	0.20	0.05	0.23	0.44	0.51	0.58	0.27	0.49	0.38	0.15	0.29
48H	0.07	0.06	0.15	-0.08	0.16	0.54	0.60	0.63	0.34	0.57	0.45	0.21	0.31

3) 바람

① 850hPa

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	0.36	0.44	0.41	0.35	0.21	0.40	0.32	0.27	0.19	0.26	0.34	0.08	0.30
24H	0.54	0.61	0.65	0.63	0.45	0.46	0.22	0.32	0.34	0.59	0.65	0.20	0.47
36H	0.47	0.57	0.70	0.60	0.49	0.46	0.18	0.40	0.47	0.63	0.63	0.17	0.48
48H	0.43	0.56	0.62	0.57	0.53	0.48	0.15	0.32	0.63	0.75	0.71	0.20	0.50

② 500hPa

12H	0.39	0.45	0.44	0.35	0.08	-0.01	-0.01	-0.14	-0.04	0.17	0.34	0.12	0.18
24H	0.88	0.80	0.87	0.61	0.22	-0.04	-0.26	-0.17	-0.01	0.56	0.86	0.56	0.41
36H	0.78	0.77	0.71	0.56	0.14	-0.44	-0.41	-0.37	-0.15	0.40	0.82	0.49	0.27
48H	0.78	0.62	0.68	0.59	0.05	-0.56	-0.58	-0.47	-0.24	0.57	0.85	0.62	0.24

③ 300hPa

12H	0.06	-0.04	0.13	0.59	0.28	-0.09	-0.10	-0.02	-0.23	0.24	0.06	-0.22	0.06
24H	-0.13	-0.19	0.36	0.64	-0.01	-0.39	-0.14	-0.23	-0.47	0.12	-0.17	-0.45	0.09
36H	-0.43	-0.37	0.47	0.98	0.09	-0.25	-0.26	-0.15	0.40	0.28	0.24	0.32	0.01
48H	-0.70	-0.59	0.27	1.00	-0.08	-0.56	-0.32	-0.18	-0.49	0.21	0.24	-0.20	0.12

나. RMSE

1) GPH

① MSLP

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave
12H	1.72	1.53	1.86	1.60	1.15	1.27	1.49	1.38	1.24	1.38	1.35	1.50	1.46
24H	2.05	1.73	2.18	2.03	1.48	1.55	1.73	1.82	1.57	1.78	1.76	1.90	1.80
36H	2.42	2.10	2.56	2.39	1.73	1.80	2.19	2.37	1.95	2.28	2.23	2.40	2.20
48H	2.81	2.44	3.00	2.77	2.04	2.20	2.61	2.65	2.31	2.76	2.72	2.86	2.60

② 850hPa

12H	9.82	8.07	9.75	8.38	7.47	7.54	9.36	9.61	8.64	8.31	8.40	8.23	8.63
24H	11.90	9.55	11.83	11.81	9.33	9.61	13.31	14.03	11.18	11.16	9.89	10.31	11.16
36H	14.51	12.43	14.35	15.11	11.59	12.74	18.77	19.72	14.61	15.49	13.12	13.69	14.68
48H	17.70	15.28	17.19	18.47	14.20	16.00	22.56	21.68	17.17	19.40	16.77	16.99	17.78

③ 500hPa

12H	11.64	10.31	10.62	9.40	8.58	8.86	9.63	9.39	9.10	9.49	10.27	10.18	9.79
24H	14.25	12.06	13.89	12.44	10.57	10.65	13.31	12.99	10.88	12.10	11.97	12.37	12.29
36H	18.30	17.04	19.12	17.22	13.86	13.73	18.15	17.19	13.82	16.26	15.35	16.97	16.42
48H	23.00	23.56	24.76	22.44	17.68	17.12	21.65	19.09	16.82	21.00	20.91	22.02	20.84

④ 300hPa

12H	15.24	13.61	14.15	12.26	11.01	11.24	10.54	9.80	10.58	12.29	13.48	12.91	12.26
24H	18.98	18.73	19.88	16.91	14.63	14.79	14.38	13.55	14.19	17.00	18.37	16.97	16.53
36H	23.15	25.81	28.83	24.42	20.17	19.34	18.65	17.17	18.38	21.23	22.44	23.58	21.93
48H	29.16	34.66	36.72	32.34	27.58	24.80	22.21	20.25	23.31	26.28	27.97	30.63	27.99

2) 온도

① 850hPa

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	1.29	1.17	1.23	1.22	1.06	1.18	1.08	1.07	1.03	1.21	1.31	1.30	1.18
24H	1.62	1.43	1.60	1.55	1.34	1.41	1.28	1.25	1.26	1.47	1.65	1.54	1.45
36H	1.90	1.70	2.03	1.85	1.65	1.63	1.49	1.44	1.51	1.69	1.93	1.73	1.71
48H	2.14	1.93	2.41	2.13	1.98	1.82	1.65	1.62	1.71	1.91	2.20	1.94	1.95

② 500hPa

12H	0.89	0.81	0.79	0.76	0.70	0.69	0.68	0.65	0.66	0.74	0.88	0.81	0.76
24H	1.15	1.08	1.05	0.96	0.86	0.85	0.87	0.81	0.84	0.94	1.11	1.03	0.96
36H	1.34	1.34	1.34	1.18	1.07	0.99	1.01	0.99	1.03	1.13	1.30	1.25	1.16
48H	1.52	1.63	1.63	1.39	1.29	1.17	1.13	1.12	1.19	1.31	1.45	1.49	1.36

③ 300hPa

12H	1.09	1.03	0.98	0.89	0.80	0.85	0.78	0.83	0.76	0.86	0.96	0.88	0.89
24H	1.51	1.41	1.27	1.15	1.06	1.08	1.03	1.11	1.00	1.15	1.29	1.19	1.19
36H	1.78	1.74	1.50	1.34	1.33	1.32	1.26	1.34	1.25	1.35	1.54	1.44	1.43
48H	2.03	1.96	1.66	1.55	1.58	1.50	1.45	1.51	1.42	1.57	1.75	1.69	1.64

3) 바람

① 850hPa

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	3.98	3.53	3.88	3.90	3.65	0.40	3.98	3.80	3.50	0.26	4.01	3.95	3.24
24H	4.67	4.17	4.68	4.70	4.41	0.46	4.81	4.72	4.29	0.59	4.64	4.58	3.89
36H	5.11	4.69	5.26	5.40	5.00	0.46	5.76	5.78	4.97	0.63	5.03	5.08	4.43
48H	5.57	5.22	5.96	5.99	5.56	0.48	6.67	6.44	5.57	0.75	5.54	5.67	4.95

② 500hPa

12H	4.18	3.88	4.13	3.84	3.65	3.75	3.77	3.46	3.43	3.82	4.01	4.10	3.83
24H	5.40	4.96	5.41	4.98	4.63	4.56	4.63	4.34	4.24	4.87	4.97	5.24	4.85
36H	6.33	5.98	6.36	6.02	5.43	5.28	5.50	5.22	4.98	5.73	5.77	6.26	5.74
48H	7.08	7.07	7.44	6.93	6.24	6.14	6.39	5.84	5.70	6.55	6.45	7.19	6.59

③ 300hPa

12H	4.97	4.76	5.27	5.12	4.68	4.71	4.52	4.34	4.20	4.69	4.44	4.75	4.70
24H	6.23	6.38	7.08	6.76	6.21	6.21	5.79	5.58	5.67	6.05	5.75	6.31	6.17
36H	7.32	7.76	8.77	8.08	7.66	7.60	7.01	6.76	6.94	7.25	6.80	7.56	7.46
48H	8.28	9.08	10.19	9.46	9.36	8.70	8.06	7.53	8.21	8.21	7.59	8.82	8.62

다. S1 score

1) GPH

① MSLP

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave
12H	54.76	56.57	53.23	51.67	56.62	57.78	58.56	60.84	55.10	53.09	53.16	59.23	55.88
24H	57.76	59.58	56.03	55.08	61.64	61.04	62.17	64.69	58.58	57.03	56.89	61.75	59.35
36H	60.44	62.59	59.36	58.16	64.72	64.73	65.99	69.05	61.83	60.47	59.77	63.49	62.55
48H	62.83	65.06	62.94	60.89	67.76	67.91	70.01	71.79	65.34	63.37	62.89	65.65	65.54

② 850hPa

12H	35.64	37.79	36.31	38.56	42.60	44.56	42.62	46.01	45.17	40.74	37.09	41.36	40.70
24H	38.65	41.07	39.55	42.82	47.31	49.90	48.06	51.68	50.62	45.28	39.56	44.01	44.88
36H	40.49	43.96	42.19	46.59	51.42	54.84	53.48	57.86	55.15	49.09	41.74	46.02	48.57
48H	43.25	46.48	45.66	49.64	55.59	59.39	59.05	62.00	59.05	52.09	44.65	48.63	52.12

③ 500hPa

12H	17.67	17.13	18.04	20.84	24.05	29.51	34.32	33.67	27.40	20.48	16.53	17.95	23.13
24H	20.31	19.06	20.68	23.54	26.90	32.89	38.49	37.98	30.32	23.01	18.36	20.19	25.98
36H	22.67	22.03	23.28	26.50	29.93	36.17	42.68	42.37	33.20	25.72	20.21	22.13	28.91
48H	25.01	25.00	26.66	29.49	33.47	40.17	47.37	44.97	36.55	28.22	22.32	24.40	31.97

④ 300hPa

12H	14.94	13.73	15.41	17.24	18.51	22.66	30.15	27.77	21.23	16.13	13.32	14.89	18.83
24H	16.85	15.89	18.17	20.05	21.94	26.65	34.65	31.62	24.30	18.65	15.06	16.80	21.72
36H	18.55	17.95	20.94	22.95	25.03	30.24	39.32	35.17	27.56	20.69	16.39	18.50	24.44
48H	20.31	20.14	23.51	25.91	28.56	33.93	43.56	37.83	30.62	22.46	17.80	20.36	27.08

2) 온도

① 850hPa

FCST	02.1	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	58.58	60.03	58.56	59.48	62.36	68.34	73.67	73.38	67.21	62.73	56.76	56.51	63.13
24H	62.47	63.62	63.72	64.50	68.04	72.68	78.60	77.67	72.74	67.25	60.30	59.87	67.62
36H	64.55	66.44	66.47	67.19	71.38	76.44	81.74	80.45	75.77	69.64	62.48	61.03	70.30
48H	66.29	68.50	69.09	69.47	74.92	78.60	83.96	82.32	77.68	71.09	64.13	62.39	72.37

② 500hPa

12H	42.49	38.57	42.98	48.42	50.23	57.25	66.10	61.78	50.07	44.91	39.22	42.39	48.70
24H	48.11	43.73	48.64	54.65	56.22	63.86	74.14	68.26	56.25	51.25	44.21	47.27	54.71
36H	51.12	47.15	52.26	58.57	59.87	67.62	77.93	72.23	59.51	54.34	46.73	50.09	58.12
48H	53.27	50.32	55.74	60.83	63.03	70.83	80.02	74.15	61.54	56.16	48.42	52.31	60.55

③ 300hPa

12H	46.89	42.79	49.06	54.51	51.76	53.07	60.08	57.63	54.13	47.67	44.73	47.34	50.80
24H	52.96	48.63	56.18	61.83	58.89	59.82	67.48	64.13	61.27	54.08	50.78	53.31	57.45
36H	55.20	51.78	58.73	65.24	62.08	63.96	71.25	67.73	65.04	56.62	52.84	55.67	60.51
48H	57.49	54.25	61.11	67.72	64.67	66.37	74.13	69.41	66.78	58.55	54.59	58.09	62.76

4.2.3. 관측 검증

o 검증 변수: 고도, 기온, 바람

o 검증 요소: 평균 오차, RMSE

o 검증 영역: 동아시아 영역

가. Mean Error

1) GPH

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave
12H	8.50	9.66	10.68	6.05	1.03	-0.40	-2.85	-4.15	1.26	2.96	4.89	6.11	3.65
24H	6.11	8.75	10.63	6.35	0.53	-1.34	-6.85	-7.19	0.36	1.60	3.18	4.55	2.22
36H	2.66	5.74	8.91	4.43	-1.83	-4.15	-11.27	-11.19	-2.92	-2.58	-0.04	0.72	0.96
48H	0.81	3.83	8.77	3.19	-2.27	-4.50	11.86	-10.94	-2.89	4.95	1.12	-1.47	1.95

② 500hPa

12H	5.48	6.60	7.00	3.76	-0.08	-1.66	-3.11	-4.93	-0.71	1.17	2.00	4.64	1.68
24H	4.02	4.87	6.56	4.01	0.80	-0.95	-5.94	-6.63	-1.10	0.90	1.20	3.73	0.96
36H	0.06	0.78	3.22	1.05	-0.55	-2.98	-9.72	-9.94	-3.57	-3.07	-2.46	-1.16	2.36
48H	-2.32	-2.43	1.97	-1.07	-0.24	-1.99	-9.62	-9.53	-3.09	-5.91	-4.21	-4.94	-3.62

③ 300hPa

12H	4.59	4.97	5.54	2.34	-1.16	-2.11	-4.01	-3.83	-2.22	-0.05	0.62	2.57	0.60
24H	4.67	4.57	7.02	2.72	0.89	-0.14	-5.11	-3.42	-1.11	2.21	2.56	3.11	1.50
36H	0.14	0.03	4.01	-0.76	1.23	0.04	-6.89	-4.86	-2.02	0.42	1.52	-1.28	-0.70
48H	-2.02	-3.95	2.82	-3.59	2.92	2.84	-5.19	-2.87	0.16	-1.05	0.80	5.10	-1.19

2) 온도

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	-0.18	-0.21	-0.43	-0.33	-0.13	-0.24	-0.15	-0.17	-0.25	-0.25	-0.29	0.13	-0.21
24H	-0.32	-0.39	-0.69	-0.42	-0.22	-0.32	-0.18	-0.25	-0.40	-0.40	-0.52	0.13	-0.33
36H	-0.45	-0.52	-0.92	-0.55	-0.31	-0.48	-0.26	-0.35	-0.50	-0.49	-0.75	0.13	-0.46
48H	-0.58	-0.59	-1.16	-0.61	-0.42	-0.54	-0.30	-0.46	-0.62	-0.64	-0.91	0.06	-0.56

② 500hPa

12H	-0.05	-0.13	-0.08	0.03	0.05	0.09	0.05	0.15	0.05	0.01	-0.09	-0.04	0.00
24H	-0.03	-0.21	-0.05	-0.01	0.15	0.20	0.16	0.31	0.14	0.09	0.02	-0.04	0.06
36H	-0.09	-0.28	-0.10	-0.07	0.26	0.31	0.26	0.42	0.24	0.14	0.10	-0.11	0.09
48H	-0.09	-0.40	-0.10	-0.14	0.35	0.42	0.36	0.49	0.31	0.17	0.14	-0.22	0.11

③ 300hPa

12H	0.17	0.10	0.12	0.09	0.07	0.17	0.20	0.27	0.07	0.15	0.08	0.05	0.13
24H	0.33	0.26	0.36	0.16	0.17	0.27	0.32	0.38	0.21	0.39	0.26	0.22	0.28
36H	0.31	0.26	0.40	0.13	0.28	0.45	0.45	0.50	0.30	0.61	0.45	0.30	0.37
48H	0.34	0.33	0.42	0.07	0.38	0.58	0.53	0.60	0.41	0.75	0.56	0.36	0.44

3) 바람

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	0.45	0.42	0.41	0.50	0.15	0.41	0.34	0.50	0.39	0.33	0.52	0.25	0.39
24H	0.61	0.60	0.57	0.73	0.37	0.62	0.39	0.61	0.57	0.62	0.71	0.36	0.56
36H	0.54	0.58	0.62	0.78	0.50	0.72	0.53	0.81	0.73	0.66	0.72	0.33	0.63
48H	0.54	0.61	0.65	0.84	0.64	0.85	0.56	0.84	0.93	0.76	0.83	0.42	0.71

② 500hPa

12H	0.06	0.00	0.01	-0.02	-0.36	-0.58	-0.38	-0.48	-0.31	-0.21	-0.02	-0.01	-0.19
24H	0.46	0.28	0.30	0.22	-0.24	-0.56	-0.54	-0.44	-0.21	0.13	0.31	0.21	-0.01
36H	0.29	0.25	0.23	0.14	-0.30	-0.77	-0.63	-0.47	-0.37	0.10	0.33	0.24	-0.08
48H	0.23	0.20	0.18	0.03	-0.34	-0.82	-0.74	-0.51	0.42	0.14	0.17	0.20	-0.14

③ 300hPa

12H	-0.83	-1.03	-0.47	-0.17	-0.36	-0.49	-0.72	-0.57	-0.71	-0.55	-0.62	-0.79	-0.61
24H	-0.99	-1.18	-0.30	-0.12	-0.46	-0.66	-0.72	-0.79	-0.97	-0.66	-0.96	0.95	-0.73
36H	-1.34	-1.47	-0.38	-0.12	-0.41	-0.68	-0.89	-0.81	-1.10	-0.59	-0.92	-0.91	-0.80
48H	-1.61	-1.66	-0.57	-0.33	-0.65	-0.94	-0.92	-0.89	-1.22	-0.72	-0.96	-0.86	-0.94

나. RMSE

1) GPH

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave
12H	14.51	14.01	15.07	12.58	9.80	9.37	10.50	10.66	9.51	10.74	11.10	11.93	11.65
24H	16.29	15.46	17.86	16.25	12.39	11.71	14.06	14.50	12.31	13.50	13.03	13.90	14.27
36H	17.94	16.97	20.00	20.08	14.91	15.28	19.11	18.76	15.16	16.88	15.25	15.79	17.18
48H	20.43	19.53	22.30	24.13	17.44	18.48	21.93	20.19	17.67	19.60	18.55	18.51	19.90

② 500hPa

12H	17.32	16.69	16.71	15.43	13.96	13.29	13.96	14.33	13.27	14.98	14.84	15.54	15.03
24H	20.14	18.45	19.80	18.71	16.41	14.79	16.61	16.73	15.08	17.16	16.82	17.51	17.35
36H	23.41	21.37	23.10	22.54	18.86	17.64	20.51	19.79	17.37	20.17	19.65	20.51	20.41
48H	27.03	25.92	27.76	27.56	21.51	20.59	22.97	21.25	20.05	23.47	24.15	24.92	23.93

③ 300hPa

12H	25.33	24.49	24.98	22.39	20.95	19.96	20.54	20.98	21.26	23.44	23.24	23.53	22.59
24H	28.66	28.08	29.40	26.08	24.08	22.31	23.20	23.08	23.70	26.16	26.21	26.30	25.60
36H	31.99	32.70	35.58	31.60	28.81	26.16	26.85	25.75	26.44	29.63	29.19	30.66	29.61
48H	37.24	38.89	42.50	38.72	33.60	30.83	29.74	28.19	29.97	33.84	33.82	36.65	34.50

2) 온도

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	1.69	1.60	1.72	1.86	1.60	1.64	1.52	1.53	1.54	1.63	1.70	1.84	1.66
24H	1.96	1.83	2.01	2.07	1.82	1.80	1.65	1.63	1.73	1.85	2.00	2.05	1.87
36H	2.25	2.07	2.36	2.38	2.11	2.00	1.86	1.85	1.98	2.10	2.30	2.25	2.13
48H	2.48	2.28	2.74	2.66	2.39	2.21	2.03	2.00	2.19	2.31	2.57	2.46	2.36

② 500hPa

12H	1.32	1.29	1.27	1.28	1.12	1.11	1.09	1.10	1.10	1.17	1.25	1.26	1.20
24H	1.51	1.47	1.44	1.42	1.25	1.23	1.20	1.23	1.24	1.31	1.40	1.43	1.34
36H	1.68	1.64	1.67	1.63	1.45	1.36	1.30	1.37	1.38	1.44	1.56	1.60	1.51
48H	1.87	1.88	1.89	1.86	1.64	1.53	1.44	1.50	1.54	1.64	1.68	1.83	1.69

③ 300hPa

12H	1.79	1.64	1.52	1.39	1.30	1.24	1.28	1.30	1.23	1.37	1.48	1.44	1.42
24H	2.07	1.90	1.70	1.58	1.48	1.40	1.43	1.49	1.40	1.57	1.70	1.66	1.62
36H	2.24	2.12	1.89	1.77	1.68	1.62	1.61	1.67	1.58	1.77	1.89	1.88	1.81
48H	2.45	2.28	2.03	1.98	1.92	1.81	1.79	1.83	1.73	1.98	2.04	2.08	1.99

3) 바람

① 850hPa

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
12H	3.15	2.97	3.34	3.47	2.95	3.18	3.07	3.05	2.83	3.13	3.20	2.99	3.11
24H	3.41	3.26	3.70	3.92	3.25	3.53	3.36	3.33	3.11	3.46	3.39	3.28	3.42
36H	3.60	3.57	4.04	4.20	3.64	3.86	3.77	3.81	3.44	3.75	3.56	3.57	3.73
48H	3.75	3.79	4.30	4.54	4.01	4.26	4.05	4.11	3.81	4.02	3.78	3.74	4.01

② 500hPa

12H	4.23	3.95	4.04	3.91	3.61	3.32	3.14	3.05	3.10	3.57	3.71	3.91	3.63
24H	4.89	4.48	4.45	4.45	4.03	3.69	3.44	3.43	3.47	4.11	4.16	4.53	4.09
36H	5.35	5.01	4.98	5.07	4.52	4.18	3.89	3.87	3.88	4.49	4.60	5.03	4.57
48H	5.81	5.49	5.58	5.58	4.96	4.67	4.31	4.21	4.34	4.82	5.00	5.57	5.03

③ 300hPa

12H	5.85	5.54	5.59	5.20	5.00	4.50	4.49	4.28	4.14	4.87	4.71	5.07	4.94
24H	6.61	6.48	6.47	6.01	5.81	5.33	5.02	4.84	4.97	5.70	5.67	5.91	5.74
36H	7.16	7.33	7.48	6.73	6.73	6.16	5.69	5.44	5.74	6.24	6.15	6.58	6.45
48H	7.91	7.98	8.40	7.54	7.59	6.71	6.27	5.91	6.55	6.75	6.48	7.18	7.11

4.2.4. 강수 검증

o 검증 요소: Threat Score(TS), Bias Score(BS), A.C.C, P.O.D, F.A.R

o 검증 영역: 남한

가. 30km

가) Rain or Not

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.82	0.95	0.92	0.94	0.88	0.85	0.77	0.69	0.83	0.83	0.85	0.85	0.85
12H	0.83	0.93	0.93	0.91	0.88	0.87	0.77	0.74	0.84	0.86	0.83	0.82	0.85
18H	0.81	0.92	0.91	0.92	0.88	0.86	0.77	0.71	0.86	0.84	0.84	0.82	0.85
24H	0.80	0.93	0.92	0.88	0.88	0.84	0.72	0.72	0.81	0.85	0.80	0.81	0.83
30H	0.78	0.90	0.90	0.91	0.87	0.87	0.72	0.72	0.82	0.83	0.79	0.82	0.83
36H	0.80	0.90	0.90	0.88	0.86	0.83	0.72	0.71	0.79	0.83	0.77	0.81	0.82
42H	0.76	0.89	0.89	0.89	0.84	0.87	0.70	0.68	0.83	0.81	0.75	0.80	0.81
48H	0.78	0.90	0.90	0.88	0.84	0.84	0.68	0.67	0.82	0.81	0.75	0.78	0.80

2) BS

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.52	0.00	0.89	0.83	0.75	0.73	1.22	1.03	0.69	1.04	0.60	0.56	0.74
12H	0.62	0.83	0.90	1.15	0.87	0.44	1.03	0.88	0.76	0.83	1.94	0.98	0.94
18H	0.49	1.50	1.22	1.11	0.96	0.54	0.74	0.85	0.88	1.35	0.94	1.60	1.02
24H	0.69	1.10	1.25	1.11	0.96	0.94	0.87	0.71	0.77	1.12	1.50	1.37	1.03
30H	0.71	0.25	1.36	0.94	1.30	0.60	0.89	0.86	0.99	1.15	0.77	1.25	0.92
36H	0.90	0.00	0.93	0.94	1.22	0.88	0.99	0.69	0.79	1.03	1.22	1.08	0.89
42H	0.60	0.00	1.04	0.72	1.57	0.73	1.24	0.83	0.83	1.52	0.66	0.95	0.89
48H	0.65	0.17	0.70	1.00	0.93	0.89	1.27	0.69	0.50	0.69	1.22	0.61	0.78

3) P.O.D

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.09	0.00	0.65	0.58	0.54	0.26	0.52	0.57	0.41	0.35	0.19	0.43	0.38
12H	0.28	0.63	0.57	0.75	0.66	0.26	0.46	0.54	0.44	0.37	0.22	0.39	0.46
18H	0.15	0.50	0.72	0.74	0.64	0.34	0.31	0.50	0.45	0.45	0.23	0.59	0.47
24H	0.28	0.47	0.82	0.71	0.73	0.47	0.36	0.43	0.47	0.53	0.17	0.38	0.49
30H	0.37	0.00	0.70	0.64	0.70	0.36	0.29	0.51	0.50	0.42	0.17	0.56	0.44
36H	0.38	0.00	0.57	0.57	0.79	0.37	0.36	0.43	0.33	0.42	0.17	0.26	0.39
42H	0.12	0.00	0.59	0.39	0.70	0.27	0.29	0.45	0.14	0.40	0.17	0.46	0.33
48H	0.08	0.13	0.51	0.67	0.40	0.36	0.27	0.36	0.13	0.28	0.17	0.20	0.30

4) F.A.R

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.83	0.00	0.27	0.31	0.27	0.65	0.57	0.44	0.40	0.67	0.68	0.24	0.44
12H	0.55	0.24	0.37	0.35	0.24	0.42	0.55	0.39	0.42	0.55	0.89	0.60	0.46
18H	0.69	0.67	0.41	0.34	0.34	0.37	0.59	0.41	0.49	0.66	0.75	0.63	0.53
24H	0.60	0.58	0.35	0.36	0.23	0.50	0.59	0.40	0.39	0.52	0.89	0.72	0.51
30H	0.48	1.00	0.48	0.32	0.46	0.40	0.67	0.41	0.50	0.64	0.78	0.55	0.56
36H	0.58	0.00	0.39	0.39	0.36	0.58	0.64	0.37	0.58	0.59	0.86	0.76	0.51
42H	0.81	0.00	0.43	0.46	0.55	0.64	0.76	0.46	0.83	0.74	0.74	0.51	0.58
48H	0.87	0.20	0.28	0.33	0.57	0.60	0.79	0.47	0.74	0.59	0.86	0.67	0.58

5) TS

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.06	0.00	0.52	0.46	0.45	0.18	0.31	0.39	0.32	0.20	0.14	0.38	0.28
12H	0.21	0.53	0.43	0.53	0.54	0.22	0.29	0.40	0.33	0.26	0.08	0.25	0.34
18H	0.11	0.25	0.48	0.53	0.48	0.28	0.21	0.37	0.31	0.24	0.14	0.29	0.31
24H	0.20	0.29	0.57	0.51	0.60	0.32	0.24	0.33	0.36	0.34	0.07	0.19	0.34
30H	0.28	0.00	0.42	0.50	0.44	0.29	0.18	0.38	0.33	0.24	0.11	0.34	0.29
36H	0.25	0.00	0.42	0.42	0.55	0.25	0.22	0.34	0.23	0.26	0.08	0.14	0.26
42H	0.08	0.00	0.41	0.29	0.38	0.18	0.15	0.33	0.08	0.19	0.11	0.31	0.21
48H	0.05	0.13	0.42	0.51	0.26	0.23	0.13	0.27	0.10	0.20	0.08	0.14	0.21

나) 5mm 이상 - 1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.95	1.00	0.99	0.95	0.97	0.96	0.90	0.86	0.97	0.96	0.99	0.98	0.96
12H	0.96	1.00	0.97	0.96	0.97	0.97	0.91	0.84	0.96	0.95	0.99	0.97	0.95
18H	0.95	1.00	0.98	0.95	0.97	0.97	0.90	0.86	0.97	0.96	0.98	0.96	0.95
24H	0.96	0.99	0.98	0.96	0.97	0.96	0.90	0.84	0.97	0.95	0.99	0.96	0.95
30H	0.96	1.00	0.98	0.95	0.96	0.97	0.89	0.86	0.97	0.96	0.98	0.97	0.95
36H	0.96	0.99	0.97	0.95	0.96	0.96	0.89	0.84	0.95	0.95	0.99	0.96	0.95
42H	0.95	1.00	0.98	0.93	0.94	0.96	0.86	0.85	0.95	0.95	0.99	0.97	0.94
48H	0.95	0.99	0.97	0.96	0.94	0.96	0.85	0.81	0.95	0.95	0.99	0.97	0.94

2) BS

06H	0.52	0.00	0.89	0.83	0.75	0.73	1.22	1.03	0.69	1.04	0.60	0.56	0.74
12H	0.62	0.83	0.90	1.15	0.87	0.44	1.03	0.88	0.76	0.83	1.94	0.98	0.94
18H	0.49	1.50	1.22	1.11	0.96	0.54	0.74	0.85	0.88	1.35	0.94	1.60	1.02
24H	0.69	1.10	1.25	1.11	0.96	0.94	0.87	0.71	0.77	1.12	1.50	1.37	1.03
30H	0.71	0.25	1.36	0.94	1.30	0.60	0.89	0.86	0.99	1.15	0.77	1.25	0.92
36H	0.90	0.00	0.93	0.94	1.22	0.88	0.99	0.69	0.79	1.03	1.22	1.08	0.89
42H	0.60	0.00	1.04	0.72	1.57	0.73	1.24	0.83	0.83	1.52	0.66	0.95	0.89
48H	0.65	0.17	0.70	1.00	0.93	0.89	1.27	0.69	0.50	0.69	1.22	0.61	0.78
Ave.	0.65	0.48	1.04	0.98	1.07	0.72	1.03	0.82	0.78	1.09	1.11	1.05	0.90

3) P.O.D

06H	0.09	0.00	0.65	0.58	0.54	0.26	0.52	0.57	0.41	0.35	0.19	0.43	0.38
12H	0.28	0.63	0.57	0.75	0.66	0.26	0.46	0.54	0.44	0.37	0.22	0.39	0.46
18H	0.15	0.50	0.72	0.74	0.64	0.34	0.31	0.50	0.45	0.45	0.23	0.59	0.47
24H	0.28	0.47	0.82	0.71	0.73	0.47	0.36	0.43	0.47	0.53	0.17	0.38	0.49
30H	0.37	0.00	0.70	0.64	0.70	0.36	0.29	0.51	0.50	0.42	0.17	0.56	0.44
36H	0.38	0.00	0.57	0.57	0.79	0.37	0.36	0.43	0.33	0.42	0.17	0.26	0.39
42H	0.12	0.00	0.59	0.39	0.70	0.27	0.29	0.45	0.14	0.40	0.17	0.46	0.33
48H	0.08	0.13	0.51	0.67	0.40	0.36	0.27	0.36	0.13	0.28	0.17	0.20	0.30

4) F.A.R

06H	0.83	0.00	0.27	0.31	0.27	0.65	0.57	0.44	0.40	0.67	0.68	0.24	0.44
12H	0.55	0.24	0.37	0.35	0.24	0.42	0.55	0.39	0.42	0.55	0.89	0.60	0.46
18H	0.69	0.67	0.41	0.34	0.34	0.37	0.59	0.41	0.49	0.66	0.75	0.63	0.53
24H	0.60	0.58	0.35	0.36	0.23	0.50	0.59	0.40	0.39	0.52	0.89	0.72	0.51
30H	0.48	1.00	0.48	0.32	0.46	0.40	0.67	0.41	0.50	0.64	0.78	0.55	0.56
36H	0.58	0.00	0.39	0.39	0.36	0.58	0.64	0.37	0.58	0.59	0.86	0.76	0.51
42H	0.81	0.00	0.43	0.46	0.55	0.64	0.76	0.46	0.83	0.74	0.74	0.51	0.58
48H	0.87	0.20	0.28	0.33	0.57	0.60	0.79	0.47	0.74	0.59	0.86	0.67	0.58

5) TS

06H	0.06	0.00	0.52	0.46	0.45	0.18	0.31	0.39	0.32	0.20	0.14	0.38	0.28
12H	0.21	0.53	0.43	0.53	0.54	0.22	0.29	0.40	0.33	0.26	0.08	0.25	0.34
18H	0.11	0.25	0.48	0.53	0.48	0.28	0.21	0.37	0.31	0.24	0.14	0.29	0.31
24H	0.20	0.29	0.57	0.51	0.60	0.32	0.24	0.33	0.36	0.34	0.07	0.19	0.34
30H	0.28	0.00	0.42	0.50	0.44	0.29	0.18	0.38	0.33	0.24	0.11	0.34	0.29
36H	0.25	0.00	0.42	0.42	0.55	0.25	0.22	0.34	0.23	0.26	0.08	0.14	0.26
42H	0.08	0.00	0.41	0.29	0.38	0.18	0.15	0.33	0.08	0.19	0.11	0.31	0.21
48H	0.05	0.13	0.42	0.51	0.26	0.23	0.13	0.27	0.10	0.20	0.08	0.14	0.21

다) 15mm 이상 - 1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.99	1.00	0.99	0.97	0.99	0.99	0.96	0.93	0.99	0.99	1.00	0.99	0.98
12H	0.99	1.00	0.99	0.97	0.98	0.99	0.96	0.92	0.99	0.99	1.00	1.00	0.98
18H	0.99	1.00	0.99	0.96	0.99	0.99	0.96	0.93	0.99	0.99	1.00	0.99	0.98
24H	0.99	1.00	0.99	0.97	0.98	0.99	0.95	0.91	0.98	0.99	1.00	1.00	0.98
30H	0.99	1.00	0.99	0.96	0.98	0.99	0.95	0.92	0.98	0.99	1.00	0.99	0.98
36H	0.99	1.00	0.99	0.97	0.98	0.99	0.95	0.91	0.98	0.99	1.00	1.00	0.98
42H	0.99	1.00	1.00	0.97	0.97	0.99	0.93	0.91	0.98	0.99	1.00	0.99	0.98
48H	0.99	1.00	0.99	0.97	0.97	0.98	0.93	0.90	0.98	0.99	1.00	1.00	0.98

2) BS

06H	0.41	0.00	1.25	0.60	0.22	0.24	0.56	0.76	0.45	0.56	0.00	0.00	0.42
12H	0.21	0.00	0.68	1.06	0.79	0.22	0.47	0.71	0.39	0.30	0.50	1.00	0.53
18H	0.09	0.00	0.67	0.85	0.49	0.39	0.20	0.61	0.73	1.04	0.00	0.48	0.46
24H	0.00	0.00	1.48	1.01	1.02	0.30	0.77	0.51	0.69	0.75	0.00	1.71	0.69
30H	0.41	0.00	1.58	0.88	0.94	0.24	0.41	0.61	0.90	0.72	0.00	1.00	0.64
36H	0.00	0.00	1.64	0.40	1.04	0.28	0.82	0.50	0.68	0.32	0.00	0.71	0.53
42H	0.00	0.00	0.12	0.33	1.72	0.47	1.13	0.59	0.80	1.48	0.00	1.12	0.65
48H	0.18	0.00	0.56	1.09	0.69	0.38	1.18	0.56	0.11	0.36	0.00	0.14	0.44

3) P.O.D

06H	0.00	0.00	0.54	0.24	0.15	0.00	0.32	0.46	0.33	0.12	0.00	0.00	0.18
12H	0.00	0.00	0.20	0.51	0.56	0.19	0.24	0.45	0.31	0.11	0.00	0.00	0.21
18H	0.00	0.00	0.12	0.30	0.29	0.21	0.08	0.39	0.49	0.28	0.00	0.16	0.19
24H	0.00	0.00	0.24	0.45	0.59	0.16	0.25	0.31	0.31	0.20	0.00	0.00	0.21
30H	0.23	0.00	0.42	0.29	0.31	0.11	0.14	0.32	0.29	0.36	0.00	0.52	0.25
36H	0.00	0.00	0.36	0.19	0.50	0.20	0.21	0.28	0.26	0.05	0.00	0.00	0.17
42H	0.00	0.00	0.12	0.21	0.48	0.00	0.23	0.27	0.02	0.20	0.00	0.28	0.15
48H	0.00	0.00	0.32	0.62	0.21	0.16	0.23	0.25	0.00	0.11	0.00	0.00	0.16

4) F.A.R

06H	1.00	0.00	0.57	0.60	0.29	1.00	0.42	0.39	0.27	0.79	0.00	0.00	0.44
12H	1.00	0.00	0.71	0.52	0.29	0.14	0.49	0.37	0.21	0.62	1.00	1.00	0.53
18H	1.00	0.00	0.81	0.65	0.41	0.47	0.61	0.37	0.33	0.73	0.00	0.67	0.50
24H	0.00	0.00	0.84	0.55	0.42	0.47	0.68	0.39	0.56	0.73	0.00	1.00	0.47
30H	0.44	0.00	0.74	0.67	0.67	0.56	0.66	0.48	0.68	0.50	0.00	0.48	0.49
36H	0.00	0.00	0.78	0.53	0.51	0.28	0.74	0.44	0.62	0.86	0.00	1.00	0.48
42H	0.00	0.00	0.00	0.38	0.72	1.00	0.80	0.54	0.97	0.86	0.00	0.75	0.50
48H	1.00	0.00	0.43	0.43	0.69	0.58	0.81	0.55	1.00	0.69	0.00	1.00	0.60

5) TS

06H	0.00	0.00	0.32	0.18	0.14	0.00	0.26	0.36	0.29	0.08	0.00	0.00	0.14
12H	0.00	0.00	0.14	0.33	0.46	0.18	0.19	0.36	0.28	0.10	0.00	0.00	0.17
18H	0.00	0.00	0.08	0.19	0.24	0.18	0.07	0.32	0.39	0.16	0.00	0.12	0.15
24H	0.00	0.00	0.11	0.29	0.41	0.14	0.16	0.26	0.22	0.13	0.00	0.00	0.14
30H	0.19	0.00	0.19	0.18	0.19	0.09	0.11	0.25	0.18	0.26	0.00	0.35	0.17
36H	0.00	0.00	0.16	0.16	0.33	0.19	0.13	0.23	0.18	0.04	0.00	0.00	0.12
42H	0.00	0.00	0.12	0.18	0.21	0.00	0.12	0.21	0.01	0.09	0.00	0.15	0.09
48H	0.00	0.00	0.26	0.42	0.14	0.13	0.12	0.19	0.00	0.09	0.00	0.00	0.11

라) 25mm 이상 - 1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	0.99	1.00	1.00	0.98	0.95	0.99	1.00	1.00	1.00	0.99
12H	1.00	1.00	1.00	0.98	0.99	0.99	0.98	0.95	1.00	1.00	1.00	1.00	0.99
18H	1.00	1.00	1.00	0.99	1.00	1.00	0.98	0.95	0.99	1.00	1.00	1.00	0.99
24H	1.00	1.00	1.00	0.98	0.99	0.99	0.98	0.95	0.99	0.99	1.00	1.00	0.99
30H	1.00	1.00	1.00	0.99	1.00	1.00	0.98	0.95	0.99	1.00	1.00	1.00	0.99
36H	1.00	1.00	1.00	0.98	0.99	0.99	0.97	0.94	0.99	1.00	1.00	1.00	0.99
42H	1.00	1.00	1.00	0.99	0.99	0.99	0.96	0.94	0.99	1.00	1.00	1.00	0.99
48H	1.00	1.00	1.00	0.98	0.99	0.99	0.96	0.94	1.00	1.00	1.00	1.00	0.99

2) BS

06H	0.00	0.00	2.33	0.21	0.27	0.19	0.52	0.60	0.24	0.80	0.00	0.00	0.43
12H	0.25	0.00	0.71	0.80	0.71	0.10	0.44	0.67	0.26	0.46	0.00	0.00	0.37
18H	0.00	0.00	0.50	0.13	0.73	0.00	0.14	0.46	0.17	0.40	0.00	0.00	0.21
24H	0.00	0.00	0.14	0.70	0.78	0.10	0.46	0.38	1.21	1.00	0.00	2.00	0.56
30H	0.00	0.00	1.33	0.55	0.09	0.00	0.26	0.33	0.24	1.20	0.00	1.67	0.47
36H	0.00	0.00	1.43	0.17	0.51	0.00	0.85	0.48	1.89	0.00	0.00	0.00	0.44
42H	0.00	0.00	0.00	0.19	2.91	0.69	1.19	0.51	0.59	2.80	0.00	1.00	0.82
48H	0.00	0.00	0.00	0.68	0.10	0.21	1.35	0.54	0.11	0.31	0.00	0.00	0.28

3) P.O.D

06H	0.00	0.00	0.33	0.09	0.09	0.00	0.21	0.36	0.21	0.20	0.00	0.00	0.12
12H	0.00	0.00	0.14	0.18	0.43	0.07	0.06	0.37	0.21	0.15	0.00	0.00	0.13
18H	0.00	0.00	0.00	0.02	0.27	0.00	0.05	0.29	0.10	0.20	0.00	0.00	0.08
24H	0.00	0.00	0.00	0.14	0.33	0.07	0.10	0.25	0.32	0.15	0.00	0.00	0.11
30H	0.00	0.00	0.00	0.11	0.00	0.00	0.10	0.17	0.03	0.20	0.00	0.00	0.05
36H	0.00	0.00	0.14	0.02	0.10	0.00	0.04	0.25	0.32	0.00	0.00	0.00	0.07
42H	0.00	0.00	0.00	0.11	0.55	0.00	0.17	0.21	0.00	0.20	0.00	0.00	0.10
48H	0.00	0.00	0.00	0.20	0.00	0.03	0.21	0.26	0.00	0.08	0.00	0.00	0.07

4) F.A.R

06H	0.00	0.00	0.86	0.60	0.67	1.00	0.60	0.41	0.14	0.75	0.00	0.00	0.42
12H	1.00	0.00	0.80	0.77	0.40	0.33	0.87	0.44	0.20	0.67	0.00	0.00	0.46
18H	0.00	0.00	1.00	0.83	0.62	0.00	0.62	0.36	0.40	0.50	0.00	0.00	0.36
24H	0.00	0.00	1.00	0.80	0.58	0.33	0.79	0.32	0.74	0.85	0.00	1.00	0.53
30H	0.00	0.00	1.00	0.81	1.00	0.00	0.60	0.48	0.86	0.83	0.00	1.00	0.55
36H	0.00	0.00	0.90	0.91	0.80	0.00	0.95	0.47	0.83	0.00	0.00	0.00	0.41
42H	0.00	0.00	0.00	0.44	0.81	1.00	0.86	0.59	1.00	0.93	0.00	1.00	0.55
48H	0.00	0.00	0.00	0.71	1.00	0.83	0.84	0.52	1.00	0.75	0.00	0.00	0.47

5) TS

06H	0.00	0.00	0.11	0.08	0.08	0.00	0.16	0.29	0.20	0.12	0.00	0.00	0.09
12H	0.00	0.00	0.09	0.11	0.33	0.07	0.04	0.29	0.20	0.12	0.00	0.00	0.10
18H	0.00	0.00	0.00	0.02	0.19	0.00	0.05	0.25	0.10	0.17	0.00	0.00	0.07
24H	0.00	0.00	0.00	0.09	0.23	0.07	0.07	0.23	0.17	0.08	0.00	0.00	0.08
30H	0.00	0.00	0.00	0.07	0.00	0.00	0.09	0.15	0.03	0.10	0.00	0.00	0.04
36H	0.00	0.00	0.06	0.01	0.07	0.00	0.02	0.21	0.12	0.00	0.00	0.00	0.04
42H	0.00	0.00	0.00	0.10	0.16	0.00	0.09	0.16	0.00	0.06	0.00	0.00	0.05
48H	0.00	0.00	0.00	0.13	0.00	0.03	0.10	0.20	0.00	0.06	0.00	0.00	0.04

마) 50mm 이상 - 1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00
12H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00
18H	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00
24H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00
30H	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00
36H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	1.00	1.00	1.00	1.00	1.00
42H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00
48H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00

2) BS

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.52	0.00	0.00	0.00	0.00	0.06
12H	0.00	0.00	0.00	0.00	0.00	0.50	0.38	0.67	0.00	1.00	0.00	0.00	0.21
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.03
24H	0.00	0.00	0.00	0.00	0.00	0.50	0.23	0.44	99.99	0.67	0.00	0.00	8.49
30H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.02
36H	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.57	99.99	0.00	0.00	0.00	8.42
42H	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.45	1.12	99.99	0.00	0.00	8.61
48H	0.00	0.00	0.00	0.33	0.00	1.00	2.15	0.70	0.00	0.67	0.00	0.00	0.40

3) P.O.D

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.02
12H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.33	0.00	0.00	0.05
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.02
24H	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.31	0.00	0.33	0.00	0.00	0.06
30H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.01
36H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.01
42H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.02
48H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.03

4) F.A.R

06H	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.56	0.00	0.00	0.00	0.00	0.13
12H	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.59	0.00	0.67	0.00	0.00	0.27
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.03
24H	0.00	0.00	0.00	0.00	0.00	1.00	0.67	0.29	1.00	0.50	0.00	0.00	0.29
30H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.05
36H	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.73	1.00	0.00	0.00	0.00	0.23
42H	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.60	1.00	1.00	0.00	0.00	0.30
48H	0.00	0.00	0.00	1.00	0.00	1.00	1.00	0.48	0.00	1.00	0.00	0.00	0.37

5) TS

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.02
12H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.20	0.00	0.00	0.03
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.02
24H	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.28	0.00	0.25	0.00	0.00	0.05
30H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.01
36H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.01
42H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.01
48H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.02

나. 10km

가) Rain or Not - 1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.81	0.94	0.92	0.94	0.87	0.86	0.74	0.71	0.84	0.82	0.84	0.83	0.84
12H	0.85	0.93	0.92	0.91	0.88	0.86	0.77	0.75	0.85	0.85	0.82	0.84	0.85
18H	0.80	0.93	0.92	0.91	0.87	0.85	0.76	0.73	0.85	0.84	0.83	0.84	0.84
24H	0.82	0.93	0.92	0.89	0.87	0.83	0.72	0.73	0.83	0.85	0.80	0.82	0.83

2) BS

06H	1.62	1.65	1.28	1.25	1.38	1.66	1.61	1.37	1.95	2.32	2.61	2.10	1.73
12H	1.47	2.48	1.40	1.45	1.24	1.34	1.49	1.18	1.79	1.64	2.99	1.93	1.70
18H	1.65	2.40	1.35	1.56	1.38	1.72	1.36	1.21	1.86	2.11	2.72	2.06	1.78
24H	1.66	2.53	1.47	1.51	1.27	1.65	1.42	1.18	1.96	1.66	3.31	2.05	1.81

3) P.O.D

06H	0.78	0.63	0.76	0.89	0.81	0.66	0.76	0.78	0.74	0.74	0.79	0.78	0.76
12H	0.82	0.78	0.84	0.88	0.78	0.57	0.75	0.75	0.71	0.79	0.77	0.77	0.77
18H	0.77	0.78	0.77	0.94	0.81	0.67	0.67	0.72	0.76	0.77	0.83	0.79	0.77
24H	0.84	0.80	0.85	0.82	0.77	0.62	0.62	0.73	0.72	0.79	0.78	0.77	0.76

4) F.A.R

06H	0.51	0.62	0.41	0.29	0.42	0.60	0.53	0.43	0.62	0.68	0.70	0.63	0.54
12H	0.44	0.68	0.40	0.39	0.37	0.57	0.49	0.37	0.60	0.52	0.74	0.60	0.51
18H	0.53	0.67	0.43	0.40	0.41	0.61	0.51	0.40	0.59	0.64	0.69	0.62	0.54
24H	0.49	0.68	0.42	0.45	0.39	0.62	0.57	0.39	0.63	0.52	0.77	0.62	0.55

5) TS

06H	0.43	0.31	0.50	0.66	0.51	0.33	0.41	0.49	0.33	0.29	0.28	0.33	0.41
12H	0.50	0.29	0.54	0.56	0.53	0.32	0.44	0.52	0.34	0.42	0.24	0.36	0.42
18H	0.41	0.30	0.48	0.58	0.52	0.33	0.40	0.48	0.36	0.33	0.29	0.35	0.40
24H	0.46	0.29	0.53	0.49	0.51	0.31	0.34	0.50	0.32	0.42	0.22	0.34	0.39

나) 5mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.95	1.00	0.99	0.95	0.96	0.96	0.89	0.85	0.96	0.96	0.98	0.97	0.95
12H	0.96	1.00	0.97	0.96	0.97	0.96	0.91	0.84	0.96	0.95	0.99	0.97	0.95
18H	0.96	1.00	0.98	0.95	0.96	0.97	0.91	0.87	0.96	0.96	0.98	0.97	0.96
24H	0.96	0.99	0.98	0.95	0.97	0.96	0.90	0.84	0.96	0.96	0.99	0.97	0.95

2) BS

06H	0.54	0.00	0.92	0.84	0.83	0.89	1.23	1.09	0.81	1.11	0.78	0.82	0.82
12H	0.61	0.83	0.96	1.15	0.96	0.61	1.08	0.93	0.82	0.89	2.39	0.96	1.02
18H	0.44	1.75	1.19	1.14	1.08	0.61	0.84	0.97	1.03	1.21	1.08	1.16	1.04
24H	0.76	1.10	1.20	1.19	0.95	1.01	0.86	0.75	0.91	1.05	2.50	1.10	1.12

3) P.O.D

06H	0.12	0.00	0.69	0.59	0.50	0.32	0.55	0.58	0.49	0.37	0.14	0.36	0.39
12H	0.23	0.60	0.63	0.74	0.69	0.26	0.57	0.55	0.43	0.38	0.11	0.39	0.47
18H	0.13	0.25	0.72	0.73	0.64	0.35	0.45	0.56	0.57	0.41	0.20	0.44	0.45
24H	0.35	0.50	0.80	0.71	0.71	0.43	0.40	0.45	0.45	0.51	0.17	0.45	0.49

4) F.A.R

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.77	0.00	0.25	0.29	0.40	0.64	0.56	0.47	0.39	0.67	0.82	0.56	0.49
12H	0.62	0.28	0.35	0.36	0.28	0.58	0.48	0.41	0.48	0.58	0.95	0.59	0.50
18H	0.70	0.86	0.40	0.36	0.41	0.42	0.46	0.42	0.45	0.66	0.82	0.62	0.55
24H	0.55	0.55	0.34	0.40	0.24	0.57	0.53	0.40	0.50	0.51	0.93	0.59	0.51

5) TS

06H	0.09	0.00	0.56	0.48	0.38	0.20	0.32	0.38	0.37	0.21	0.08	0.25	0.28
12H	0.17	0.49	0.47	0.52	0.54	0.19	0.37	0.40	0.31	0.25	0.03	0.25	0.33
18H	0.10	0.10	0.49	0.52	0.44	0.28	0.33	0.40	0.39	0.23	0.10	0.26	0.30
24H	0.24	0.31	0.57	0.48	0.58	0.27	0.28	0.35	0.31	0.33	0.05	0.27	0.34

다) 15mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.99	1.00	0.99	0.97	0.99	0.99	0.95	0.93	0.99	0.99	1.00	0.99	0.98
12H	0.99	1.00	0.99	0.97	0.98	0.99	0.96	0.92	0.98	0.99	1.00	0.99	0.98
18H	0.99	1.00	0.99	0.96	0.99	0.99	0.96	0.93	0.99	0.99	1.00	0.99	0.98
24H	0.99	1.00	0.99	0.96	0.98	0.99	0.95	0.91	0.98	0.99	1.00	0.99	0.98

2) BS

06H	0.14	0.00	1.17	0.73	0.29	0.39	0.87	0.85	0.68	0.68	0.67	0.44	0.58
12H	0.43	0.50	0.76	1.17	0.83	0.22	0.70	0.79	0.48	0.45	0.50	0.50	0.61
18H	0.05	0.00	0.92	0.90	0.42	0.58	0.38	0.75	0.65	1.12	0.67	0.75	0.60
24H	0.18	0.00	1.96	1.23	0.95	0.36	0.56	0.54	1.00	0.91	0.50	0.94	0.76

3) P.O.D

06H	0.00	0.00	0.50	0.26	0.18	0.00	0.38	0.48	0.52	0.04	0.00	0.19	0.21
12H	0.00	0.00	0.12	0.53	0.56	0.20	0.41	0.45	0.20	0.14	0.00	0.17	0.23
18H	0.00	0.00	0.33	0.26	0.33	0.32	0.18	0.46	0.52	0.24	0.00	0.29	0.24
24H	0.07	0.00	0.32	0.53	0.50	0.19	0.23	0.32	0.43	0.23	0.00	0.32	0.26

4) F.A.R

06H	1.00	0.00	0.57	0.65	0.37	1.00	0.57	0.44	0.23	0.94	1.00	0.58	0.61
12H	1.00	1.00	0.84	0.55	0.32	0.07	0.41	0.42	0.58	0.70	1.00	0.67	0.63
18H	1.00	0.00	0.64	0.71	0.21	0.45	0.53	0.38	0.19	0.79	1.00	0.61	0.54
24H	0.60	0.00	0.84	0.57	0.47	0.48	0.58	0.41	0.57	0.75	1.00	0.66	0.58

5) TS

06H	0.00	0.00	0.30	0.17	0.16	0.00	0.25	0.35	0.45	0.02	0.00	0.15	0.15
12H	0.00	0.00	0.07	0.32	0.44	0.20	0.32	0.34	0.16	0.10	0.00	0.12	0.17
18H	0.00	0.00	0.21	0.16	0.31	0.25	0.15	0.36	0.47	0.13	0.00	0.20	0.19
24H	0.06	0.00	0.12	0.31	0.35	0.16	0.18	0.26	0.27	0.14	0.00	0.20	0.17

라) 25mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	0.99	1.00	0.99	0.98	0.95	0.99	1.00	1.00	1.00	0.99
12H	1.00	1.00	1.00	0.98	0.99	0.99	0.98	0.95	1.00	1.00	1.00	1.00	0.99
18H	1.00	1.00	1.00	0.99	1.00	1.00	0.98	0.95	0.99	1.00	1.00	1.00	0.99
24H	1.00	1.00	1.00	0.98	0.99	0.99	0.97	0.95	0.99	0.99	1.00	1.00	0.99

2) BS

06H	0.00	0.00	2.67	0.49	0.17	0.44	0.71	0.61	0.65	1.80	0.00	0.46	0.67
12H	0.50	0.00	1.00	1.17	0.90	0.10	0.66	0.77	0.47	0.92	0.00	0.58	0.59
18H	0.00	0.00	0.33	0.47	0.50	0.31	0.35	0.57	0.54	1.40	0.00	0.35	0.40
24H	0.00	0.00	0.86	1.08	0.88	0.10	0.34	0.50	1.26	1.69	0.00	1.24	0.66

3) P.O.D

06H	0.00	0.00	0.33	0.06	0.08	0.00	0.29	0.35	0.46	0.00	0.00	0.16	0.14
12H	0.00	0.00	0.00	0.29	0.51	0.07	0.29	0.42	0.26	0.15	0.00	0.21	0.18
18H	0.00	0.00	0.00	0.06	0.17	0.00	0.14	0.34	0.38	0.20	0.00	0.11	0.12
24H	0.00	0.00	0.00	0.21	0.39	0.07	0.10	0.30	0.21	0.23	0.00	0.21	0.14

4) F.A.R

06H	0.00	0.00	0.88	0.87	0.50	1.00	0.59	0.42	0.29	1.00	0.00	0.65	0.52
12H	1.00	0.00	1.00	0.75	0.43	0.33	0.56	0.46	0.44	0.83	0.00	0.63	0.54
18H	0.00	0.00	1.00	0.86	0.67	1.00	0.60	0.41	0.29	0.86	0.00	0.69	0.53
24H	0.00	0.00	1.00	0.80	0.56	0.33	0.71	0.40	0.83	0.86	0.00	0.83	0.53

5) TS

06H	0.00	0.00	0.10	0.04	0.08	0.00	0.20	0.28	0.39	0.00	0.00	0.12	0.10
12H	0.00	0.00	0.00	0.15	0.37	0.07	0.21	0.31	0.22	0.09	0.00	0.16	0.13
18H	0.00	0.00	0.00	0.05	0.12	0.00	0.12	0.28	0.33	0.09	0.00	0.09	0.09
24H	0.00	0.00	0.00	0.11	0.26	0.07	0.08	0.25	0.10	0.09	0.00	0.10	0.09

마) 50mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00
12H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00
18H	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00
24H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00

2) BS

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.62	0.38	0.00	0.00	0.62	0.19
12H	0.00	0.00	0.00	0.56	0.25	0.00	0.54	0.62	0.00	0.67	0.00	0.67	0.28
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.40	0.31	0.00	0.00	0.00	0.06
24H	0.00	0.00	0.00	0.56	0.00	0.00	0.15	0.54	0.00	1.00	0.00	1.33	0.30

3) P.O.D

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.27	0.65	0.00	0.00	0.12	0.10
12H	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.27	0.00	0.33	0.00	0.33	0.09
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.64	0.00	0.00	0.00	0.08
24H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	1.00	0.33	0.00	0.33	0.17

4) F.A.R

06H	0.00	0.00	1.00	0.00	0.00	0.00	0.71	0.56	0.22	1.00	0.00	0.80	0.36
12H	0.00	0.00	0.00	1.00	1.00	0.00	0.64	0.57	0.00	0.50	0.00	0.50	0.35
18H	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.35	0.20	0.00	0.00	0.00	0.13
24H	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.37	0.00	0.67	0.00	0.75	0.32

5) TS

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.20	0.22	0.00	0.00	0.08	0.05
12H	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.20	0.00	0.25	0.00	0.25	0.07
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.20	0.00	0.00	0.00	0.04
24H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.20	0.00	0.17	0.06

다. 5km

가) Rain or Not

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.81	0.94	0.92	0.94	0.87	0.90	0.80	0.76	0.89	0.86	0.83	0.83	0.86
12H	0.84	0.92	0.92	0.91	0.88	0.89	0.80	0.76	0.88	0.85	0.82	0.83	0.86
18H	0.79	0.93	0.91	0.92	0.87	0.88	0.79	0.75	0.89	0.85	0.83	0.84	0.85
24H	0.81	0.92	0.92	0.88	0.87	0.87	0.76	0.74	0.87	0.85	0.80	0.83	0.84

2) BS

06H	1.61	1.73	1.25	1.22	1.28	0.93	1.12	0.92	1.28	1.75	2.60	1.80	1.46
12H	1.44	2.60	1.36	1.39	1.17	0.84	1.16	0.93	1.23	1.53	2.98	1.72	1.53
18H	1.67	2.36	1.32	1.46	1.25	1.08	1.08	0.98	1.39	1.87	2.70	1.69	1.57
24H	1.64	2.60	1.43	1.48	1.22	1.16	1.07	0.96	1.34	1.45	3.21	1.79	1.61

3) P.O.D

06H	0.77	0.60	0.73	0.89	0.77	0.48	0.64	0.62	0.64	0.68	0.74	0.83	0.70
12H	0.80	0.78	0.81	0.85	0.75	0.45	0.66	0.64	0.60	0.72	0.73	0.77	0.71
18H	0.75	0.76	0.74	0.92	0.76	0.50	0.60	0.63	0.69	0.69	0.79	0.80	0.72
24H	0.81	0.80	0.84	0.80	0.75	0.54	0.52	0.63	0.59	0.70	0.72	0.80	0.71

4) F.A.R

06H	0.52	0.65	0.41	0.28	0.40	0.48	0.43	0.33	0.50	0.61	0.71	0.54	0.49
12H	0.45	0.70	0.41	0.39	0.36	0.46	0.43	0.31	0.52	0.53	0.75	0.55	0.49
18H	0.55	0.68	0.44	0.37	0.39	0.54	0.44	0.35	0.50	0.63	0.71	0.53	0.51
24H	0.50	0.69	0.42	0.46	0.38	0.54	0.51	0.35	0.56	0.52	0.78	0.55	0.52

5) TS

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.42	0.28	0.48	0.66	0.51	0.33	0.43	0.47	0.39	0.33	0.26	0.42	0.42
12H	0.49	0.28	0.52	0.55	0.53	0.33	0.44	0.50	0.36	0.40	0.23	0.40	0.42
18H	0.39	0.29	0.47	0.60	0.51	0.32	0.41	0.47	0.41	0.32	0.27	0.42	0.41
24H	0.45	0.28	0.52	0.47	0.51	0.33	0.33	0.47	0.34	0.40	0.21	0.40	0.39

나) 5mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.95	1.00	0.99	0.95	0.96	0.97	0.92	0.87	0.97	0.97	0.98	0.98	0.96
12H	0.96	1.00	0.97	0.96	0.96	0.97	0.93	0.85	0.96	0.95	0.98	0.97	0.96
18H	0.96	1.00	0.98	0.94	0.96	0.97	0.91	0.87	0.97	0.96	0.98	0.97	0.96
24H	0.97	0.99	0.98	0.96	0.97	0.96	0.91	0.85	0.96	0.95	0.98	0.96	0.95

2) BS

06H	0.48	0.00	0.90	0.73	0.81	0.52	0.77	0.55	0.67	0.85	0.86	0.62	0.65
12H	0.75	0.70	0.88	1.06	0.92	0.27	0.79	0.65	0.63	1.02	3.83	0.88	1.03
18H	0.46	2.00	1.11	1.06	1.00	0.41	0.65	0.65	0.92	1.20	1.37	1.24	1.01
24H	0.85	1.10	1.19	1.14	0.96	0.80	0.67	0.49	0.80	1.05	3.33	1.36	1.15

3) P.O.D

06H	0.12	0.00	0.65	0.50	0.48	0.25	0.45	0.36	0.51	0.30	0.10	0.36	0.34
12H	0.32	0.53	0.58	0.72	0.65	0.16	0.53	0.42	0.41	0.41	0.33	0.34	0.45
18H	0.15	0.25	0.64	0.66	0.60	0.24	0.38	0.40	0.57	0.39	0.24	0.52	0.42
24H	0.44	0.50	0.82	0.70	0.69	0.38	0.34	0.33	0.48	0.43	0.17	0.35	0.47

4) F.A.R

06H	0.74	0.00	0.28	0.32	0.40	0.52	0.42	0.34	0.23	0.65	0.89	0.41	0.43
12H	0.57	0.24	0.34	0.32	0.29	0.40	0.33	0.35	0.35	0.60	0.91	0.61	0.44
18H	0.67	0.88	0.43	0.38	0.40	0.40	0.42	0.39	0.38	0.68	0.83	0.58	0.54
24H	0.49	0.55	0.31	0.39	0.29	0.53	0.50	0.32	0.39	0.59	0.95	0.74	0.50

5) TS

06H	0.09	0.00	0.52	0.40	0.37	0.20	0.34	0.31	0.44	0.19	0.06	0.29	0.27
12H	0.23	0.46	0.45	0.54	0.51	0.15	0.42	0.34	0.33	0.26	0.07	0.22	0.33
18H	0.11	0.09	0.43	0.47	0.43	0.21	0.29	0.32	0.42	0.21	0.11	0.30	0.28
24H	0.31	0.31	0.60	0.49	0.54	0.27	0.25	0.28	0.37	0.27	0.04	0.17	0.33

다) 15mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.99	1.00	0.99	0.97	0.99	0.99	0.96	0.93	0.99	0.99	1.00	0.99	0.98
12H	0.99	1.00	0.99	0.97	0.98	0.99	0.96	0.91	0.98	0.98	1.00	1.00	0.98
18H	0.99	1.00	0.99	0.96	0.99	0.99	0.96	0.92	0.99	0.99	1.00	0.99	0.98
24H	0.99	1.00	0.99	0.96	0.98	0.98	0.95	0.91	0.98	0.98	1.00	1.00	0.98

2) BS

06H	0.09	0.00	1.25	0.64	0.33	0.29	0.77	0.54	0.71	1.20	1.00	0.20	0.59
12H	0.32	0.00	0.68	1.17	0.82	0.16	0.74	0.68	0.58	1.32	3.50	2.29	1.02
18H	0.32	0.00	0.71	0.82	0.58	0.58	0.44	0.70	0.80	1.24	2.67	1.28	0.85
24H	0.29	0.00	1.72	1.14	0.92	0.48	0.61	0.44	0.92	1.52	2.50	1.29	0.99

3) P.O.D

06H	0.00	0.00	0.46	0.19	0.18	0.00	0.36	0.35	0.52	0.04	0.00	0.04	0.18
12H	0.04	0.00	0.12	0.62	0.54	0.16	0.45	0.39	0.22	0.30	0.00	0.14	0.25
18H	0.05	0.00	0.29	0.26	0.33	0.29	0.19	0.36	0.56	0.32	0.33	0.36	0.28
24H	0.21	0.00	0.32	0.42	0.53	0.16	0.22	0.26	0.29	0.18	0.00	0.00	0.22

4) F.A.R

06H	1.00	0.00	0.63	0.70	0.45	1.00	0.53	0.35	0.26	0.97	1.00	0.80	0.64
12H	0.89	0.00	0.82	0.47	0.34	0.00	0.39	0.43	0.63	0.78	1.00	0.94	0.56
18H	0.86	0.00	0.59	0.68	0.42	0.50	0.56	0.49	0.30	0.74	0.88	0.72	0.56
24H	0.25	0.00	0.81	0.63	0.42	0.68	0.64	0.40	0.68	0.88	1.00	1.00	0.62

5) TS

06H	0.00	0.00	0.26	0.13	0.16	0.00	0.26	0.29	0.44	0.02	0.00	0.03	0.13
12H	0.03	0.00	0.08	0.40	0.43	0.16	0.35	0.30	0.16	0.15	0.00	0.05	0.18
18H	0.04	0.00	0.21	0.17	0.27	0.22	0.15	0.27	0.45	0.17	0.10	0.19	0.19
24H	0.20	0.00	0.13	0.24	0.38	0.12	0.16	0.22	0.18	0.08	0.00	0.00	0.14

라) 25mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	0.99	1.00	0.99	0.98	0.95	0.99	0.99	1.00	1.00	0.99
12H	1.00	1.00	1.00	0.98	0.99	0.99	0.97	0.94	0.99	0.99	1.00	1.00	0.99
18H	1.00	1.00	1.00	0.99	1.00	0.99	0.98	0.94	0.99	1.00	1.00	1.00	0.99
24H	1.00	1.00	1.00	0.97	0.99	0.99	0.97	0.94	0.99	0.99	1.00	1.00	0.99

2) BS

06H	0.00	0.00	2.17	0.38	0.17	0.50	0.63	0.59	0.67	3.80	0.00	0.00	0.74
12H	0.25	0.00	0.57	0.94	0.82	0.07	0.75	0.79	0.47	2.00	0.00	3.00	0.81
18H	0.50	0.00	0.83	0.47	0.50	0.62	0.38	0.77	0.73	2.40	0.00	0.67	0.66
24H	0.50	0.00	0.71	1.17	0.71	0.24	0.48	0.48	1.68	2.46	0.00	1.00	0.79

3) P.O.D

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	0.00	0.00	0.33	0.04	0.08	0.00	0.28	0.34	0.46	0.00	0.00	0.00	0.13
12H	0.00	0.00	0.14	0.29	0.45	0.03	0.27	0.38	0.16	0.31	0.00	0.00	0.17
18H	0.00	0.00	0.17	0.11	0.17	0.12	0.15	0.31	0.44	0.00	0.00	0.00	0.12
24H	0.25	0.00	0.00	0.20	0.35	0.03	0.12	0.25	0.21	0.23	0.00	0.00	0.14

4) F.A.R

06H	0.00	0.00	0.85	0.89	0.50	1.00	0.56	0.43	0.31	1.00	0.00	0.00	0.46
12H	1.00	0.00	0.75	0.69	0.45	0.50	0.64	0.51	0.67	0.85	1.00	1.00	0.67
18H	1.00	0.00	0.80	0.77	0.67	0.80	0.61	0.59	0.39	1.00	0.00	1.00	0.64
24H	0.50	0.00	1.00	0.83	0.51	0.86	0.76	0.48	0.88	0.91	1.00	1.00	0.73

5) TS

06H	0.00	0.00	0.12	0.03	0.08	0.00	0.21	0.27	0.38	0.00	0.00	0.00	0.09
12H	0.00	0.00	0.10	0.17	0.33	0.03	0.18	0.27	0.12	0.11	0.00	0.00	0.11
18H	0.00	0.00	0.10	0.08	0.12	0.08	0.12	0.21	0.34	0.00	0.00	0.00	0.09
24H	0.20	0.00	0.00	0.10	0.25	0.03	0.09	0.21	0.09	0.07	0.00	0.00	0.09

마) 50mm 이상

1) A.C.C

FCST	02.01	2	3	4	5	6	7	8	9	10	11	12	Ave.
06H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.99	1.00	1.00	1.00	1.00
12H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	1.00	1.00	1.00	1.00	1.00
18H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	1.00	1.00	1.00	1.00	1.00
24H	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00

2) BS

06H	0.00	0.00	0.00	0.17	0.00	0.00	0.62	0.57	1.12	0.00	0.00	0.00	0.21
12H	0.00	0.00	0.00	0.67	0.00	0.00	0.54	1.06	0.00	1.33	0.00	0.00	0.30
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.81	0.88	0.00	0.00	0.00	0.17
24H	0.00	0.00	0.00	1.00	0.00	0.00	0.38	0.66	0.00	1.67	0.00	0.00	0.31

3) P.O.D

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.27	0.31	0.00	0.00	0.00	0.06
12H	0.00	0.00	0.00	0.22	0.00	0.00	0.12	0.38	0.00	0.00	0.00	0.00	0.06
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.25	0.31	0.00	0.00	0.00	0.06
24H	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.04

4) F.A.R

06H	0.00	0.00	0.00	1.00	1.00	1.00	0.85	0.53	0.72	1.00	0.00	0.00	0.51
12H	0.00	0.00	0.00	0.67	0.00	0.00	0.79	0.65	0.00	1.00	1.00	0.00	0.34
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.69	0.64	1.00	0.00	0.00	0.25
24H	0.00	0.00	0.00	0.89	0.00	0.00	1.00	0.49	1.00	1.00	0.00	0.00	0.37

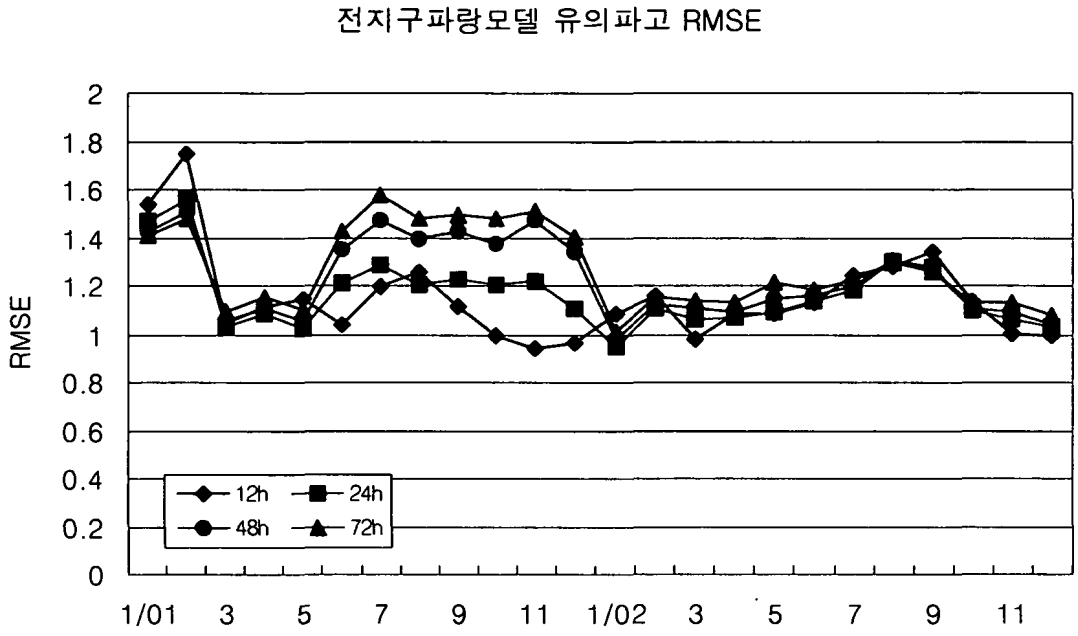
5) TS

06H	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.21	0.17	0.00	0.00	0.00	0.04
12H	0.00	0.00	0.00	0.15	0.00	0.00	0.08	0.22	0.00	0.00	0.00	0.00	0.04
18H	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.16	0.20	0.00	0.00	0.00	0.04
24H	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.03

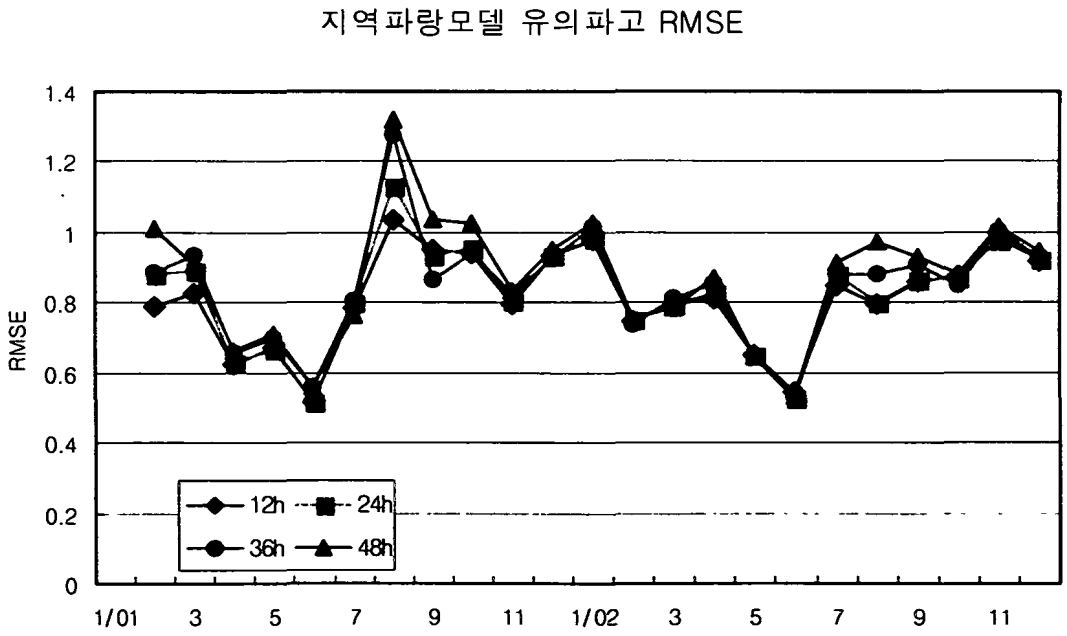
4. 3. 파랑예보 모델

4.3.1 성능 변화 추세(위성검증)

가. 전지구파랑모델 유의파고 RMSE



나. 지역파랑모델 유의파고 RMSE



4.3.2 부이검증

o 검증 요소: 평균 오차, RMSE

가. 전지구파랑모델

1) 전지구

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.58	-0.74	-0.28	-0.22	-0.20	-0.14	-0.09	-0.12	-0.39	-0.36	-0.54	-0.60	-0.35
48H	-0.58	-0.71	-0.27	-0.21	-0.23	-0.15	-0.07	-0.14	-0.40	-0.32	-0.54	-0.61	-0.35
72H	-0.59	-0.68	-0.25	-0.15	-0.22	-0.15	-0.05	-0.14	-0.40	-0.25	-0.48	-0.65	-0.33
96H	-0.54	-0.85	-0.20	-0.13	-0.24	-0.18	0.02	-0.11	-0.40	-0.18	-0.46	-0.50	-0.31
120H	-0.64	-0.74	-0.17	-0.13	-0.27	-0.12	0.05	-0.17	-0.38	-0.15	-0.40	-0.58	-0.31
144H	-0.63	-0.72	-0.24	-0.13	-0.40	-0.08	0.06	-0.17	-0.34	0.05	-0.52	-0.45	-0.30
168H	-0.73	-0.74	-0.24	-0.22	-0.46	-0.02	0.09	-0.15	-0.26	0.09	-0.33	-0.51	-0.29
192H	-0.73	-0.77	-0.18	-0.23	-0.41	-0.02	0.10	-0.13	-0.17	-0.04	-0.39	-0.42	-0.28
216H	-0.77	-0.72	-0.18	-0.17	-0.51	-0.01	0.02	-0.17	-0.16	0.07	-0.28	-0.33	-0.27
240H	-0.78	-0.73	-0.20	-0.27	-0.51	-0.12	0.04	-0.16	-0.05	0.17	-0.29	-0.17	-0.26

② RMSE

24H	1.19	1.24	0.84	0.70	0.70	0.80	0.65	0.48	0.73	0.74	1.06	0.95	0.84
48H	1.24	1.24	0.86	0.74	0.79	0.85	0.67	0.52	0.78	0.72	1.11	1.02	0.88
72H	1.34	1.37	0.92	0.77	0.82	0.87	0.72	0.60	0.83	0.69	1.11	1.11	0.93
96H	1.34	1.60	0.95	0.84	0.97	0.95	0.73	0.68	0.86	0.82	1.21	1.21	1.01
120H	1.45	1.63	1.03	0.88	1.06	0.97	0.78	0.68	0.88	0.90	1.21	1.28	1.06
144H	1.48	1.64	1.06	0.95	1.06	1.10	0.79	0.71	0.93	1.02	1.38	1.38	1.12
168H	1.53	1.76	1.22	1.05	1.09	1.17	0.83	0.70	1.06	1.09	1.51	1.50	1.21
192H	1.64	1.85	1.34	1.15	1.16	1.21	0.92	0.65	1.07	0.99	1.52	1.49	1.25
216H	1.76	1.83	1.33	1.23	1.17	1.17	0.84	0.65	1.05	1.15	1.60	1.56	1.28
240H	1.74	1.64	1.36	1.26	1.29	1.12	0.89	0.71	1.11	1.05	1.64	1.64	1.29

2) 북서 태평양

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.78	-0.79	-0.35	0.18	0.16	0.15	0.10	0.07	-0.34	-0.20	-0.61	-0.72	-0.29
48H	-0.77	-0.75	-0.35	-0.15	0.15	0.16	0.10	0.05	-0.37	-0.15	-0.60	-0.68	-0.28
72H	-0.79	-0.62	-0.35	-0.15	0.12	0.14	0.12	0.05	-0.31	-0.09	-0.57	0.67	-0.26
96H	-0.67	-0.67	-0.38	-0.18	0.15	0.12	0.17	0.08	-0.31	-0.04	-0.56	-0.37	-0.22
120H	-0.72	-0.63	-0.33	-0.15	0.16	0.14	0.19	0.08	-0.31	-0.09	-0.44	-0.57	-0.22
144H	-0.67	-0.51	-0.40	-0.09	0.09	0.18	0.19	0.07	-0.26	-0.07	-0.55	-0.23	-0.19
168H	-0.81	-0.48	-0.56	-0.15	0.02	0.23	0.20	0.10	-0.23	0.03	-0.24	0.43	-0.19
192H	-0.68	-0.45	-0.54	-0.15	0.05	0.27	0.17	0.10	-0.30	0.10	-0.23	-0.41	-0.17
216H	-0.63	-0.40	-0.44	-0.19	-0.03	0.32	0.10	0.07	-0.28	0.18	0.05	-0.25	-0.13
240H	-0.77	-0.38	-0.42	-0.30	-0.03	0.25	0.12	0.13	-0.01	0.24	-0.19	0.07	-0.12

② RMSE

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	1.13	1.19	0.82	0.69	0.61	0.54	0.43	0.47	0.67	0.62	1.14	1.13	0.79
48H	1.19	1.25	0.88	0.72	0.69	0.59	0.44	0.48	0.78	0.60	1.24	1.20	0.84
72H	1.34	1.37	0.96	0.79	0.72	0.60	0.48	0.55	0.78	0.66	1.16	1.24	0.89
96H	1.33	1.50	1.03	0.91	0.85	0.59	0.51	0.61	0.80	0.75	1.39	1.59	0.99
120H	1.34	1.63	1.10	0.90	0.90	0.62	0.49	0.60	0.70	0.90	1.45	1.52	1.01
144H	1.36	1.62	1.18	1.01	0.78	0.83	0.54	0.61	0.91	0.88	1.48	1.67	1.07
168H	1.45	1.59	1.34	1.10	0.79	0.78	0.57	0.58	1.13	0.97	1.69	1.62	1.14
192H	1.50	1.63	1.46	1.30	0.81	0.82	0.59	0.58	1.11	1.05	1.76	1.63	1.19
216H	1.69	1.65	1.44	1.25	0.88	0.83	0.54	0.58	1.05	1.18	1.90	1.79	1.23
240H	1.67	1.33	1.31	1.35	0.93	0.78	0.64	0.65	1.17	1.13	1.70	1.75	1.20

3) 북동 대서양

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.41	-0.53	-0.15	-0.12	-0.23	-0.20	-0.12	-0.12	0.43	-0.27	-0.38	0.52	-0.29
48H	-0.41	-0.51	-0.23	-0.11	-0.27	-0.20	-0.07	-0.16	-0.41	-0.24	-0.39	-0.62	-0.30
72H	-0.40	-0.44	-0.16	-0.12	0.28	-0.19	-0.05	0.20	-0.41	-0.17	0.43	-0.75	-0.30
96H	-0.38	-0.58	-0.14	-0.06	0.30	0.20	0.00	0.20	-0.33	-0.22	0.48	-0.69	-0.30
120H	-0.43	-0.46	-0.16	-0.08	-0.34	-0.07	0.03	-0.22	-0.25	-0.22	-0.37	-0.77	-0.28
144H	-0.25	-0.45	-0.17	-0.13	-0.40	0.08	0.09	-0.17	0.32	-0.13	0.29	-0.59	-0.23
168H	-0.37	-0.49	-0.12	-0.09	-0.44	0.25	0.12	-0.15	-0.29	-0.04	-0.20	-0.66	-0.21
192H	-0.19	-0.42	-0.02	-0.08	-0.37	0.28	0.08	-0.11	-0.32	0.00	-0.18	-0.60	-0.16
216H	-0.04	-0.38	0.01	-0.02	-0.39	0.23	-0.06	-0.15	-0.39	0.02	-0.34	-0.58	-0.18
240H	-0.18	-0.49	-0.11	-0.06	-0.25	0.06	-0.04	-0.10	-0.26	0.04	-0.43	0.42	-0.19

② RMSE

24H	0.66	0.90	0.55	0.45	0.57	0.42	0.32	0.33	0.73	0.58	0.80	0.84	0.60
48H	0.75	0.86	0.63	0.47	0.68	0.45	0.36	0.39	0.80	0.55	0.83	0.96	0.65
72H	0.82	1.06	0.63	0.53	0.74	0.44	0.37	0.45	0.88	0.48	0.94	1.16	0.71
96H	0.83	1.21	0.62	0.58	0.92	0.47	0.36	0.47	0.91	0.55	1.05	1.14	0.76
120H	0.91	1.23	0.67	0.69	1.01	0.50	0.36	0.50	0.93	0.65	1.06	1.30	0.82
144H	0.91	1.22	0.65	0.68	0.93	0.71	0.39	0.57	0.97	0.67	1.01	1.26	0.83
168H	1.02	1.19	0.73	0.66	0.89	0.78	0.55	0.56	1.17	0.76	0.99	1.32	0.89
192H	0.99	1.31	0.77	0.72	0.95	0.78	0.69	0.51	1.09	0.71	1.17	1.32	0.92
216H	1.03	1.28	0.76	0.74	1.07	0.68	0.49	0.48	1.05	0.74	1.17	1.39	0.91
240H	0.95	1.33	0.70	0.76	1.19	0.61	0.50	0.45	1.04	0.67	1.12	1.46	0.90

4) 북서 대서양

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
24H	-0.55	-0.89	-0.34	-0.38	-0.52	-0.37	-0.25	-0.32	-0.41	-0.60	-0.64	-0.55	-0.48
48H	-0.56	-0.86	-0.23	-0.35	-0.57	-0.42	-0.24	-0.32	-0.43	-0.58	-0.62	-0.53	-0.48
72H	-0.58	-0.98	-0.25	-0.18	-0.50	-0.42	-0.22	-0.28	-0.48	-0.48	-0.45	-0.52	-0.45
96H	-0.58	-1.29	-0.08	-0.15	-0.57	-0.47	-0.11	-0.21	-0.56	-0.30	-0.33	-0.43	-0.42
120H	-0.78	-1.13	-0.01	-0.18	-0.63	-0.44	-0.07	-0.36	-0.56	-0.14	-0.40	-0.39	-0.42
144H	-0.97	-1.20	-0.14	-0.17	-0.88	-0.49	-0.11	-0.41	-0.44	0.35	-0.71	-0.53	-0.48
168H	-1.01	-1.24	-0.04	-0.43	-0.96	-0.55	-0.04	-0.39	-0.25	0.29	-0.55	-0.44	-0.47
192H	-1.32	-1.44	0.02	-0.45	-0.93	-0.60	0.05	-0.36	0.12	-0.23	-0.75	-0.26	-0.51
216H	-1.62	-1.39	-0.09	-0.31	-1.10	-0.58	0.02	-0.42	0.18	0.00	-0.55	-0.16	-0.50
240H	-1.39	-1.32	-0.07	-0.46	-1.25	-0.68	0.05	-0.51	0.11	0.23	-0.24	-0.01	-0.46

② RMSE

24H	1.76	1.62	1.14	0.96	0.92	1.44	1.19	0.62	0.80	1.02	1.23	0.88	1.13
48H	1.76	1.60	1.06	1.02	1.01	1.50	1.22	0.68	0.77	1.02	1.25	0.90	1.15
72H	1.84	1.67	1.16	0.98	1.00	1.55	1.31	0.80	0.81	0.93	1.24	0.93	1.18
96H	1.87	2.07	1.21	1.01	1.14	1.79	1.32	0.96	0.87	1.14	1.20	0.89	1.29
120H	2.09	2.01	1.31	1.05	1.27	1.79	1.47	0.95	1.00	1.13	1.11	1.01	1.35
144H	2.16	2.07	1.36	1.15	1.46	1.76	1.43	0.95	0.90	1.50	1.64	1.19	1.46
168H	2.13	2.50	1.59	1.38	1.57	1.93	1.38	0.96	0.86	1.53	1.84	1.55	1.60
192H	2.45	2.62	1.79	1.42	1.72	2.04	1.48	0.85	1.00	1.22	1.62	1.53	1.65
216H	2.56	2.54	1.79	1.71	1.57	2.01	1.50	0.88	1.05	1.52	1.74	1.50	1.70
240H	2.60	2.25	2.07	1.67	1.74	1.98	1.55	1.04	1.13	1.34	2.12	1.71	1.77

나. 지역파랑모델

① Mean Error

FCST	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	0.50	0.30	0.02	0.69	0.45	0.21	0.20	0.30	0.17	0.32
24H	0.52	0.32	0.01	0.72	0.41	0.21	0.23	0.34	0.23	0.33
36H	0.54	0.35	0.02	0.74	0.38	0.24	0.25	0.41	0.25	0.35
48H	0.55	0.37	0.03	0.71	0.37	0.29	0.31	0.45	0.25	0.37

② RMSE

12H	0.71	0.38	0.99	1.21	0.75	0.55	0.47	0.49	0.46	0.67
24H	0.75	0.42	1.04	1.26	0.69	0.53	0.54	0.55	0.50	0.69
36H	0.77	0.45	1.08	1.23	0.69	0.56	0.58	0.63	0.52	0.72
48H	0.79	0.49	1.13	1.16	0.70	0.63	0.63	0.64	0.55	0.75

4.3.3 위성검증

o 검증 요소: 평균 오차, RMSE

가. 전지구파랑모델

1) 해상풍 검증

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	-1.36	-1.31	-1.30	-1.33	-1.40	-1.42	-1.61	-1.61	-1.80	-1.56	-1.47	-1.50	-1.47
24H	-1.32	-1.26	-1.31	-1.33	-1.37	-1.51	-1.48	-1.61	-1.59	-1.45	-1.45	-1.45	-1.43
36H	-1.28	-1.28	-1.22	-1.30	-1.29	-1.41	-1.47	-1.56	-1.68	-1.43	-1.43	-1.45	-1.40
48H	-1.27	-1.24	-1.30	-1.32	-1.29	-1.45	-1.37	-1.55	-1.50	-1.36	-1.36	-1.41	-1.37
60H	-1.22	-1.26	-1.19	-1.24	-1.13	-1.35	-1.37	-1.45	-1.57	-1.34	-1.37	-1.40	-1.32
72H	-1.24	-1.24	-1.29	-1.29	-1.17	-1.43	-1.29	-1.48	-1.45	-1.24	-1.27	-1.33	-1.31
84H	-1.26	-1.33	-1.25	-1.25	-1.12	-1.35	-1.37	-1.44	-1.52	-1.26	-1.32	-1.36	-1.32
96H	-1.28	-1.25	-1.31	-1.26	-1.15	-1.34	-1.23	-1.43	-1.39	-1.16	-1.23	-1.26	-1.27
108H	-1.20	-1.34	-1.26	-1.25	-1.12	-1.24	-1.24	-1.42	-1.44	-1.16	-1.31	-1.31	-1.27
120H	-1.26	-1.25	-1.32	-1.19	-1.17	-1.27	-1.11	-1.33	-1.30	-1.10	-1.24	-1.22	-1.23
132H	-1.17	-1.32	-1.34	-1.23	-1.13	-1.20	-1.14	-1.33	-1.29	-1.11	-1.34	-1.27	-1.24
144H	-1.24	-1.22	-1.34	-1.19	-1.17	-1.24	-1.08	-1.32	-1.21	-1.01	-1.24	-1.22	-1.20
156H	-1.14	-1.31	-1.27	-1.19	-1.07	-1.18	-1.12	-1.29	-1.20	-1.10	-1.31	-1.22	-1.20
168H	-1.18	-1.23	-1.33	-1.17	-1.07	-1.23	-1.12	-1.31	-1.17	-1.02	-1.20	-1.20	-1.19
180H	-1.13	-1.32	-1.24	-1.21	-0.99	-1.16	-1.17	-1.26	-1.24	-1.12	-1.25	-1.20	-1.19
192H	-1.23	-1.20	-1.24	-1.17	-0.99	-1.23	-1.10	-1.29	-1.18	-1.00	-1.15	-1.14	-1.16
204H	-1.11	-1.34	-1.23	-1.26	-0.89	-1.21	-1.18	-1.34	-1.24	-1.16	-1.19	-1.16	-1.19
216H	-1.20	-1.18	-1.25	-1.11	0.93	1.21	-1.09	-1.34	-1.17	-0.94	1.15	-1.07	-1.13
228H	-1.10	-1.28	-1.17	-1.19	-0.96	-1.25	-1.16	-1.30	-1.23	-1.03	-1.23	1.14	1.17
240H	-1.22	-1.13	-1.17	-1.09	-0.95	-1.31	-1.13	-1.33	-1.21	-0.88	-1.19	-1.05	1.14

② RMSE

12H	3.41	3.38	3.41	3.29	3.58	3.58	3.66	3.55	3.72	3.61	3.39	3.28	3.49
24H	3.30	3.33	3.45	3.27	3.57	3.67	3.53	3.55	3.66	3.60	3.42	3.30	3.47
36H	3.54	3.60	3.63	3.45	3.77	3.78	3.77	3.72	3.82	3.70	3.59	3.44	3.65
48H	3.50	3.58	3.74	3.49	3.82	3.88	3.77	3.75	3.84	3.80	3.62	3.49	3.69
60H	3.73	3.85	3.83	3.65	3.96	3.99	3.96	3.79	3.99	3.83	3.77	3.64	3.83
72H	3.75	3.83	3.98	3.72	4.03	4.06	3.97	3.93	4.02	3.93	3.81	3.67	3.89
84H	3.89	4.06	4.07	3.85	4.19	4.15	4.15	4.00	4.13	4.00	3.94	3.83	4.02
96H	3.95	4.02	4.18	3.94	4.19	4.20	4.13	4.05	4.17	4.09	3.98	3.87	4.06
108H	3.97	4.20	4.26	4.01	4.25	4.23	4.24	4.13	4.25	4.15	4.13	4.04	4.15
120H	4.12	4.21	4.35	4.11	4.36	4.30	4.20	4.14	4.34	4.24	4.21	4.04	4.22
132H	4.06	4.38	4.43	4.20	4.41	4.28	4.31	4.23	4.34	4.31	4.27	4.13	4.28
144H	4.20	4.32	4.50	4.20	4.48	4.42	4.30	4.26	4.40	4.35	4.32	4.15	4.32
156H	4.17	4.45	4.53	4.26	4.52	4.36	4.36	4.26	4.39	4.38	4.40	4.26	4.36
168H	4.30	4.39	4.67	4.31	4.54	4.51	4.38	4.36	4.46	4.46	4.43	4.31	4.42
180H	4.23	4.52	4.60	4.43	4.55	4.45	4.46	4.42	4.45	4.47	4.46	4.34	4.45
192H	4.32	4.43	4.67	4.38	4.57	4.51	4.46	4.46	4.47	4.51	4.44	4.31	4.46
204H	4.30	4.51	4.61	4.44	4.60	4.47	4.47	4.52	4.56	4.53	4.49	4.42	4.49
216H	4.45	4.45	4.73	4.42	4.59	4.53	4.46	4.48	4.55	4.56	4.49	4.43	4.51
228H	4.38	4.64	4.67	4.54	4.62	4.52	4.46	4.48	4.55	4.61	4.54	4.49	4.54
240H	4.48	4.56	4.67	4.44	4.59	4.63	4.56	4.56	4.62	4.57	4.52	4.51	4.56

2) 유의파고 검증

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	-0.27	-0.48	-0.35	-0.38	-0.41	-0.46	-0.55	-0.64	-0.63	-0.41	-0.32	-0.35	-0.44
24H	-0.15	-0.29	-0.37	-0.47	-0.33	-0.42	-0.51	-0.62	-0.58	-0.35	-0.40	-0.40	-0.41
36H	-0.26	-0.44	-0.34	-0.37	-0.40	-0.46	-0.52	-0.60	-0.58	-0.40	-0.30	-0.34	-0.42
48H	-0.13	-0.28	-0.36	-0.46	-0.30	-0.39	-0.49	-0.59	-0.55	-0.35	-0.39	-0.38	-0.39
60H	-0.27	-0.38	-0.31	-0.35	-0.38	-0.45	-0.49	-0.55	-0.53	-0.39	-0.26	-0.33	-0.39
72H	-0.10	-0.25	-0.34	-0.44	-0.27	-0.36	-0.47	-0.55	-0.50	-0.33	-0.36	-0.36	-0.36
84H	-0.27	-0.38	-0.30	-0.33	-0.36	-0.42	-0.45	-0.50	-0.49	-0.35	-0.23	-0.31	-0.37
96H	-0.08	-0.23	-0.33	-0.41	-0.25	-0.37	-0.41	-0.51	-0.45	-0.28	-0.34	-0.32	-0.33
108H	-0.27	-0.35	-0.28	-0.36	-0.34	-0.39	-0.43	-0.47	-0.43	-0.31	-0.22	-0.30	-0.34
120H	-0.06	-0.21	-0.32	-0.39	-0.25	-0.34	-0.38	-0.47	-0.41	-0.27	-0.33	-0.30	-0.31
132H	-0.30	-0.33	-0.26	-0.36	-0.34	-0.35	-0.39	-0.44	-0.36	-0.25	-0.25	-0.27	-0.32
144H	-0.03	-0.22	-0.30	-0.36	-0.24	-0.30	-0.35	-0.43	-0.35	-0.25	-0.31	-0.27	-0.28
156H	-0.29	-0.34	-0.21	-0.36	-0.27	-0.31	-0.36	-0.42	-0.32	-0.25	-0.25	-0.25	-0.30
168H	-0.02	-0.22	-0.26	-0.33	-0.24	-0.26	-0.34	-0.40	-0.29	-0.23	-0.28	-0.23	-0.26
180H	-0.31	-0.32	-0.19	-0.33	-0.22	-0.29	-0.34	-0.38	-0.27	-0.24	-0.20	-0.23	-0.28
192H	-0.03	-0.22	-0.21	-0.33	-0.20	-0.26	-0.32	-0.35	-0.23	-0.20	-0.27	-0.20	-0.23
204H	-0.31	-0.31	-0.16	-0.33	-0.18	-0.27	-0.32	-0.37	-0.23	-0.29	-0.18	-0.18	-0.26
216H	-0.01	-0.25	-0.15	-0.22	-0.18	-0.27	-0.28	-0.36	-0.17	-0.18	-0.24	-0.14	-0.20
228H	-0.31	-0.27	-0.11	-0.28	-0.15	-0.25	-0.28	-0.34	-0.21	-0.28	-0.16	-0.17	-0.23
240H	0.01	-0.23	-0.14	-0.20	-0.17	-0.23	-0.28	-0.38	-0.14	-0.16	-0.23	-0.10	-0.19

② RMSE

12H	1.09	1.17	0.98	1.09	1.09	1.13	1.24	1.29	1.34	1.14	1.01	1.00	1.13
24H	0.95	1.11	1.07	1.07	1.10	1.14	1.19	1.30	1.29	1.11	1.06	1.03	1.12
36H	1.09	1.16	1.00	1.11	1.11	1.16	1.25	1.26	1.31	1.14	1.02	1.01	1.13
48H	0.98	1.13	1.11	1.10	1.15	1.16	1.20	1.30	1.27	1.11	1.10	1.04	1.14
60H	1.12	1.17	1.03	1.12	1.15	1.20	1.26	1.23	1.31	1.14	1.04	1.03	1.15
72H	1.01	1.16	1.14	1.13	1.21	1.19	1.22	1.30	1.26	1.13	1.13	1.08	1.16
84H	1.18	1.23	1.08	1.14	1.21	1.23	1.27	1.23	1.29	1.12	1.07	1.06	1.18
96H	1.03	1.19	1.18	1.16	1.24	1.20	1.23	1.30	1.25	1.21	1.18	1.13	1.19
108H	1.21	1.25	1.13	1.18	1.22	1.29	1.31	1.24	1.31	1.19	1.08	1.09	1.21
120H	1.09	1.21	1.24	1.21	1.24	1.22	1.26	1.34	1.28	1.17	1.24	1.16	1.22
132H	1.25	1.29	1.19	1.25	1.24	1.25	1.31	1.26	1.32	1.23	1.15	1.09	1.24
144H	1.09	1.23	1.24	1.25	1.27	1.19	1.25	1.34	1.26	1.24	1.30	1.15	1.23
156H	1.29	1.34	1.22	1.26	1.26	1.26	1.29	1.30	1.28	1.25	1.24	1.14	1.26
168H	1.12	1.26	1.31	1.26	1.33	1.21	1.27	1.32	1.25	1.27	1.39	1.20	1.26
180H	1.35	1.34	1.26	1.29	1.31	1.27	1.30	1.29	1.31	1.25	1.31	1.17	1.29
192H	1.10	1.28	1.37	1.24	1.34	1.27	1.28	1.34	1.24	1.28	1.42	1.23	1.28
204H	1.38	1.33	1.27	1.31	1.30	1.27	1.29	1.30	1.32	1.28	1.31	1.19	1.29
216H	1.15	1.30	1.40	1.27	1.35	1.26	1.29	1.36	1.28	1.31	1.43	1.26	1.30
228H	1.43	1.32	1.29	1.34	1.32	1.30	1.29	1.32	1.33	1.29	1.29	1.22	1.31
240H	1.17	1.33	1.39	1.25	1.34	1.26	1.31	1.37	1.30	1.32	1.43	1.29	1.31

나. 지역파랑모델

1) 해상풍 검증

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	-1.08	-1.11	-0.80	-0.50	-0.36	-0.35	-0.07	-0.40	-0.85	-1.18	-1.24	-1.44	-0.78
24H	-0.90	-1.05	-0.66	-0.41	-0.09	-0.19	-0.07	-0.35	-0.74	-0.98	-1.07	-1.34	-0.65
36H	-0.85	-0.94	-0.62	-0.42	-0.03	-0.22	-0.12	-0.20	-0.56	-0.95	-1.05	-1.31	-0.61
48H	-0.85	-0.92	-0.67	-0.38	0.15	-0.13	-0.12	-0.10	-0.45	-0.86	-0.98	-1.33	-0.55

② RMSE

12H	2.84	2.78	2.83	2.94	2.70	2.76	2.62	2.47	2.61	2.84	2.90	3.00	2.77
24H	2.88	2.85	2.92	3.02	2.75	2.82	2.85	2.63	2.71	2.91	2.98	3.10	2.87
36H	3.06	2.92	2.99	3.13	2.82	3.01	3.07	2.88	2.84	3.05	3.11	3.21	3.01
48H	3.20	3.08	3.19	3.32	2.99	3.14	3.43	3.24	2.99	3.22	3.27	3.42	3.21

2) 유의파고 검증

① Mean Error

FCST	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
12H	-0.59	-0.54	-0.45	-0.55	-0.33	-0.24	-0.43	-0.32	0.52	-0.51	-0.66	-0.63	-0.48
24H	-0.55	-0.53	-0.43	-0.54	-0.30	-0.24	-0.44	-0.32	-0.54	-0.52	-0.62	-0.58	-0.47
36H	-0.51	-0.50	-0.39	-0.53	-0.27	-0.23	-0.40	-0.26	0.53	0.48	0.56	0.54	0.43
48H	-0.52	-0.46	-0.39	-0.52	-0.25	-0.23	-0.37	-0.24	-0.52	-0.44	-0.57	-0.52	-0.42

② RMSE

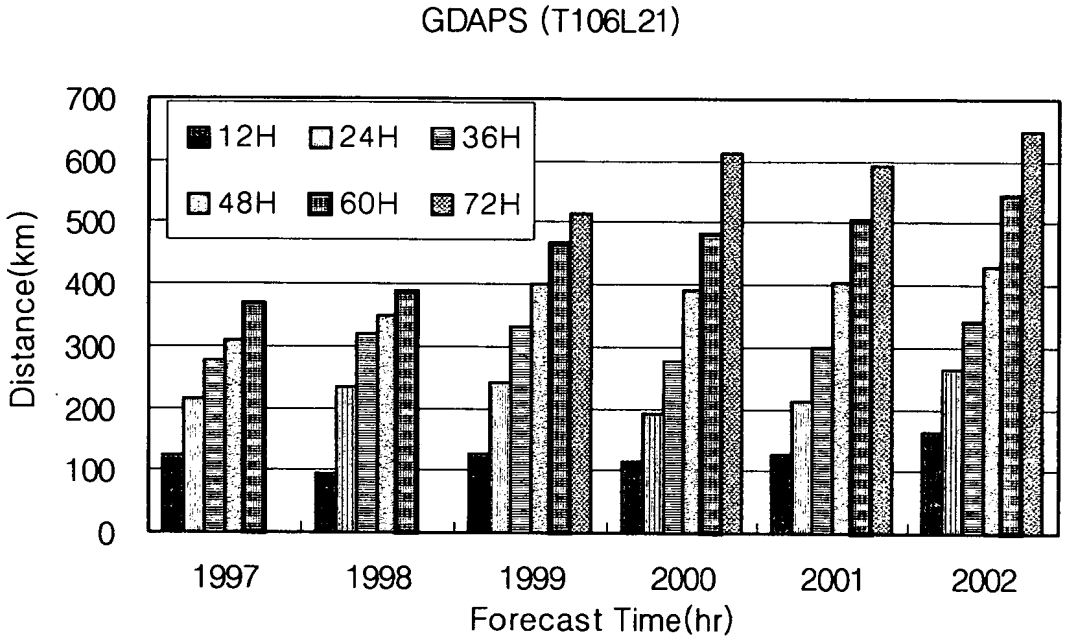
12H	0.98	0.75	0.79	0.81	0.65	0.55	0.85	0.79	0.86	0.88	1.00	0.92	0.82
24H	0.98	0.75	0.80	0.83	0.65	0.53	0.88	0.80	0.87	0.87	0.98	0.92	0.82
36H	1.01	0.74	0.81	0.86	0.64	0.53	0.88	0.88	0.91	0.85	1.01	0.93	0.84
48H	1.03	0.75	0.79	0.87	0.65	0.54	0.92	0.97	0.93	0.88	1.01	0.94	0.86

4. 4. 태풍 모델

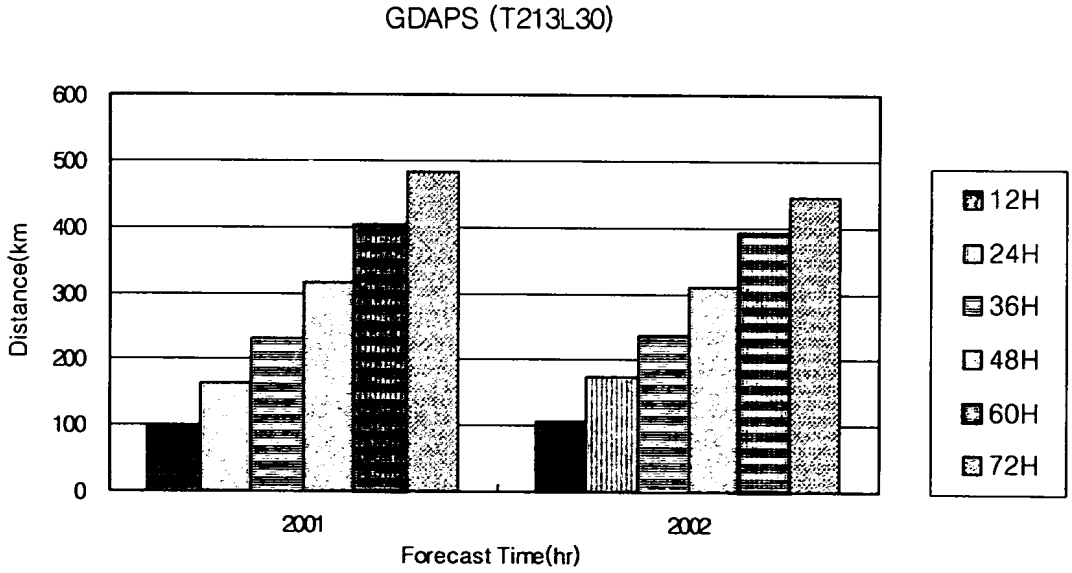
4.4.1 성능 변화 추세

가. 태풍진로오차

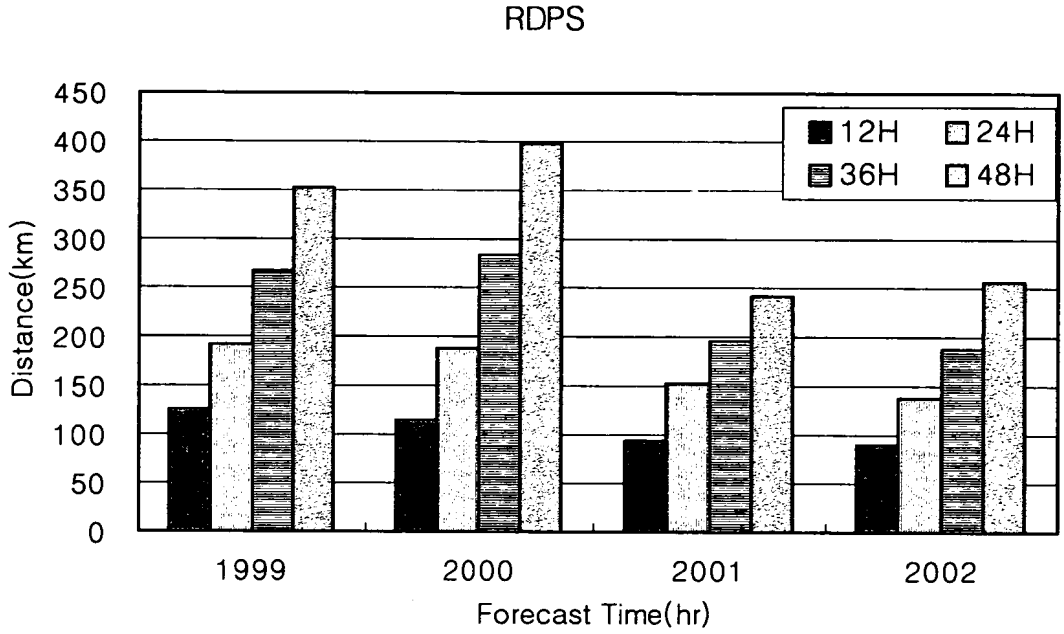
① GDAPS(T106L21)



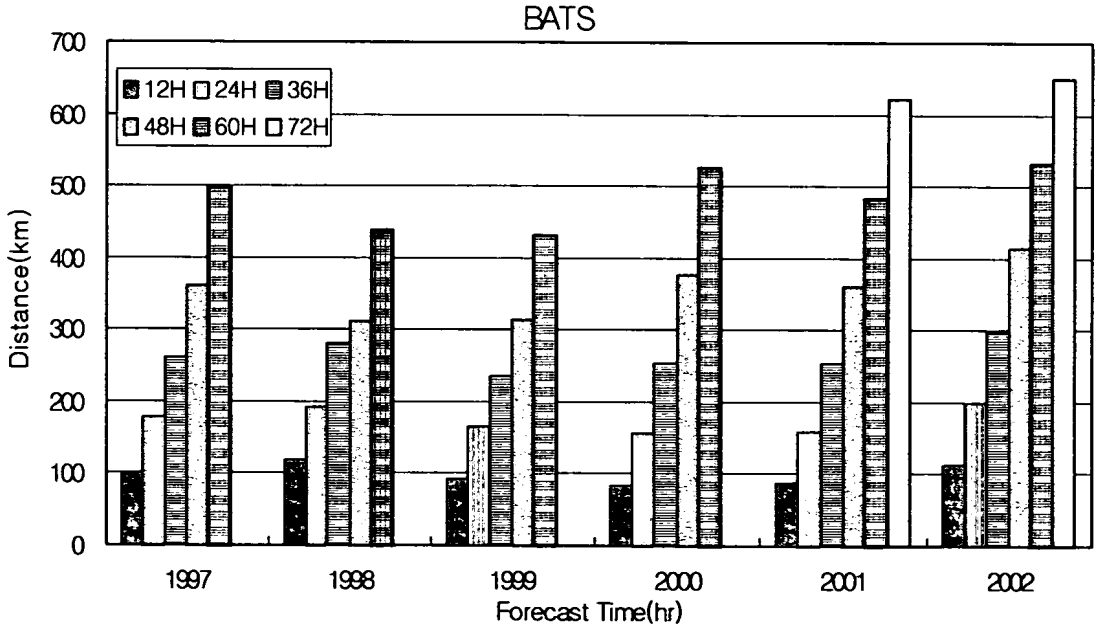
② GDAPS(T213L30)



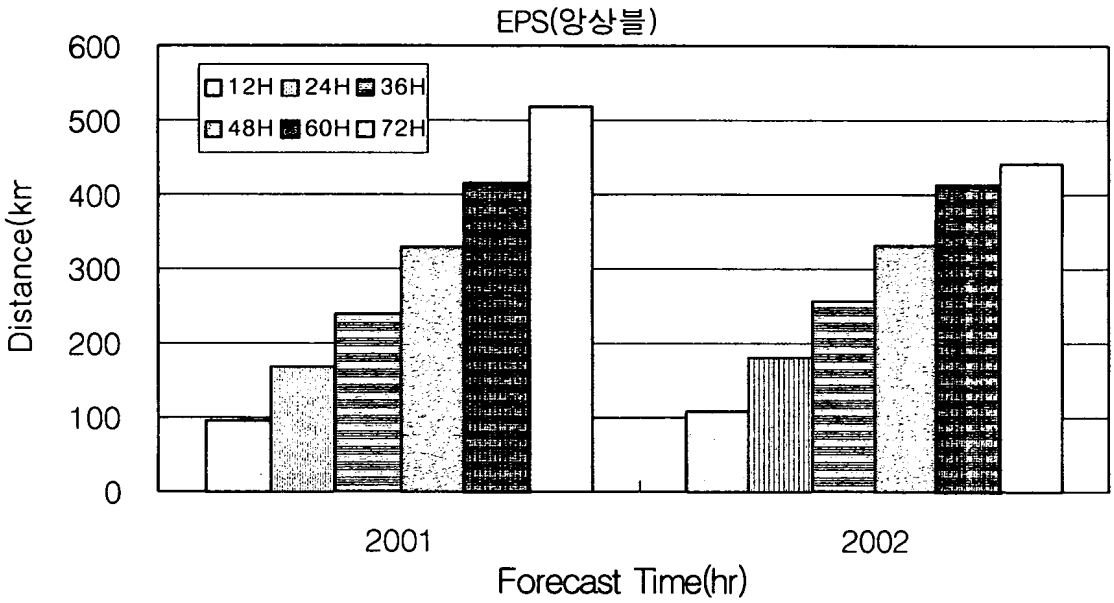
③ RDAPS



④ BATS



⑤ EPS



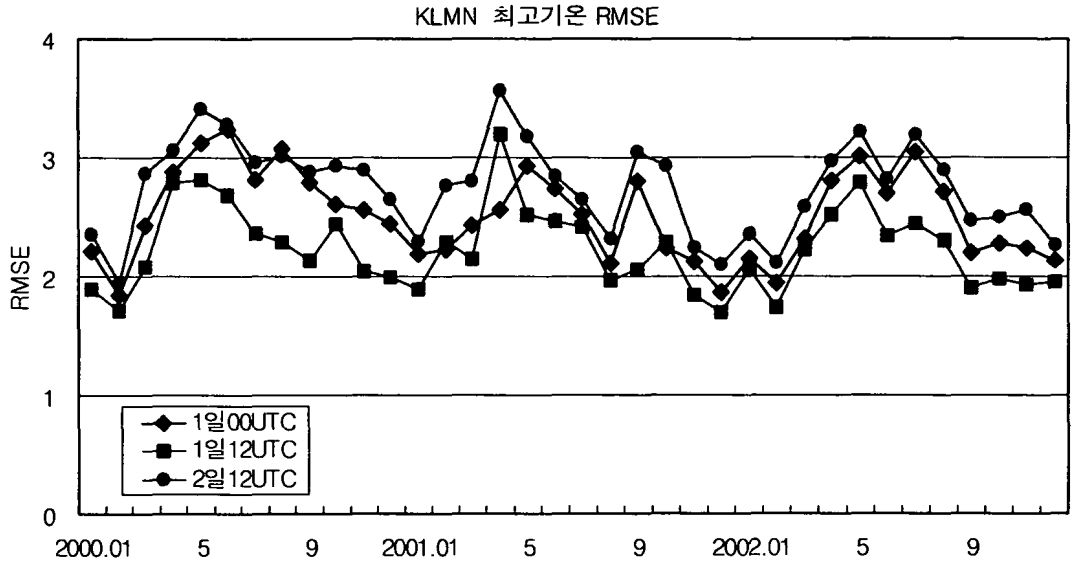
4.4.2. 태풍진로오차(2002년)

FCST	GDAPS (T106L21)	GDAPS (T213L30)	BATS	RDPS	EPS
12H	162.94	107.19	111.81	90.26	109.01
24H	262.46	173.63	199.59	137.87	182.23
36H	340.59	235.42	298.88	187.35	257.19
48H	430.62	308.70	415.66	256.81	331.12
60H	545.23	389.87	530.89		412.58
72H	648.62	445.25	651.47		442.15

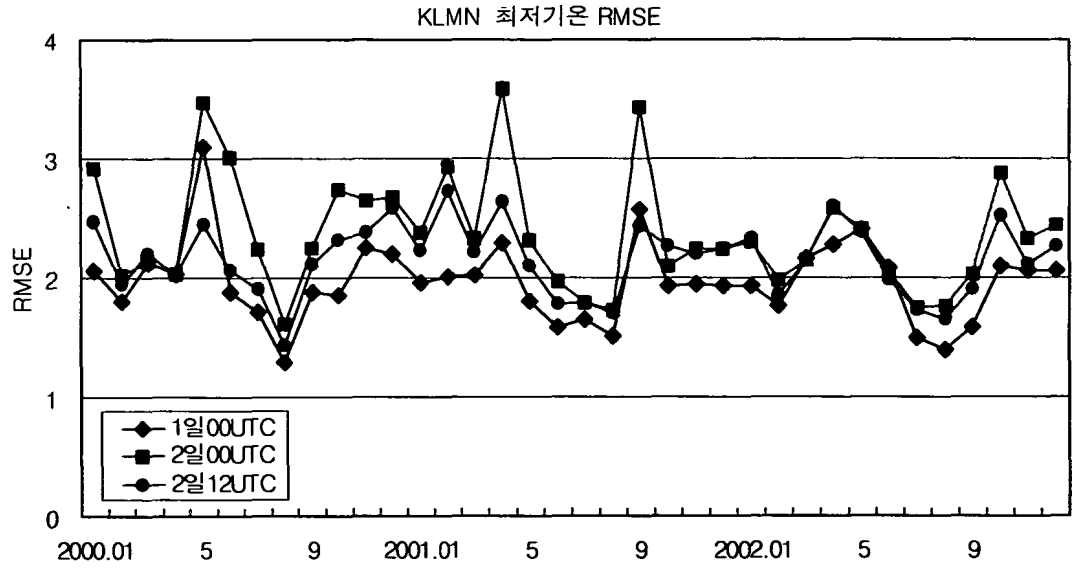
4. 5. 칼만 모델

4.5.1. 성능 변화 추세

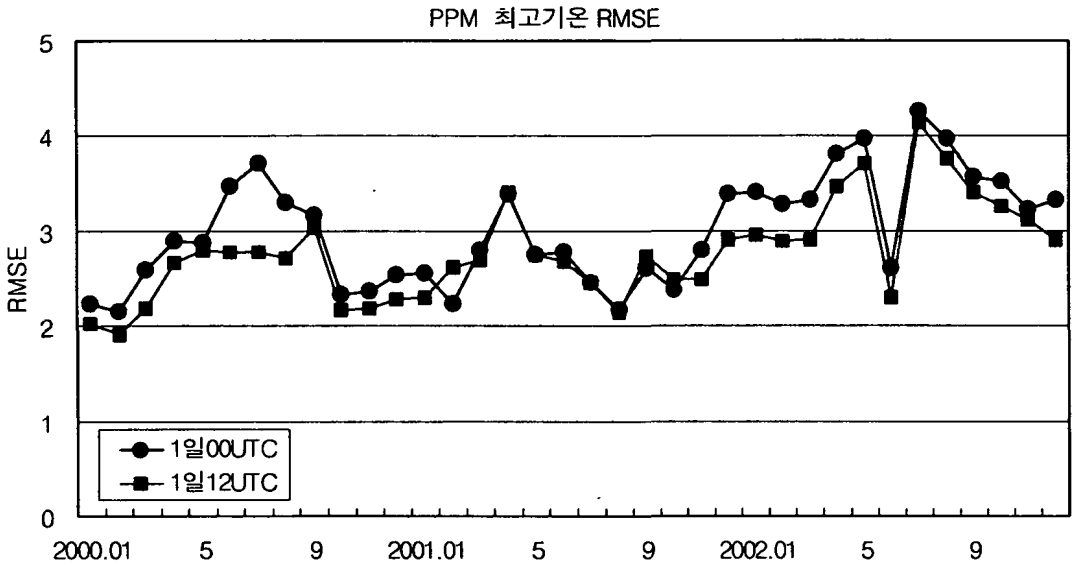
가. KLMN 최고기온



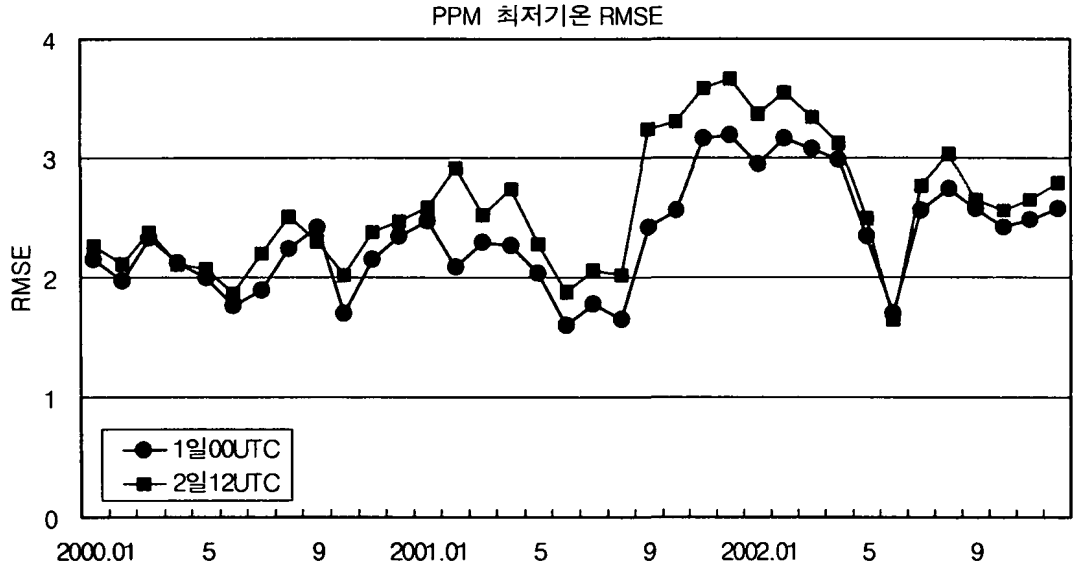
나. KLMN 최저기온



다. PPM 최고기온



라. PPM 최저기온



4.5.2. 최고, 최저기온 예보 검증

o 검증 요소: 평균 오차, RMSE, MAE, P(Priestly skill score)
o 검증 영역: 전지구, 남한

가. Mean Error

최고기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	0.47	-1.05	-1.22	-1.77	-1.59	-0.81	-2.16	-1.44	-1.61	-0.24	0.95	1.10	-0.78
	1일12H	0.45	-0.63	-0.52	-1.33	-1.37	-0.48	-2.23	-1.71	-1.53	-0.40	0.76	0.66	-0.69
KLMN	1일00H	0.39	-0.49	-0.11	0.32	-0.12	-0.06	0.00	0.20	-0.14	0.30	0.16	0.38	0.07
	1일12H	0.29	-0.33	-0.05	0.09	-0.06	0.02	0.01	0.12	-0.10	0.13	0.19	0.20	0.04
	2일12H	0.50	-0.69	-0.14	0.37	-0.24	0.00	-0.07	0.23	-0.04	0.41	0.23	0.50	0.09
GDLM	1일						1.55	1.67	0.83	0.71	0.56	0.06	-0.13	0.75
	2일						1.48	1.64	0.98	0.82	0.61	0.17	-0.16	0.79
	3일						1.48	1.53	1.09	0.87	0.81	0.02	-0.17	0.80
	4일						1.44	1.11	1.26	1.03	0.84	0.26	-0.40	0.79
	5일						1.45	1.01	1.34	1.14	0.90	0.39	-0.49	0.82
	6일						1.66	0.85	1.08	1.11	1.02	0.76	-0.42	0.87
	7일						1.95	0.40	1.28	1.08	1.04	1.19	-0.74	0.89
	8일						2.28	0.17	1.30	0.98	1.03	1.51	-0.33	0.99
	9일						2.20	0.09	1.40	0.72	1.13	1.63	0.07	1.01
	10일						2.17	0.15	1.41	0.79	1.37	1.14	-0.45	0.94
최저기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	-0.53	-0.72	-1.08	-0.78	-0.71	0.02	-1.33	-1.55	-0.82	0.19	0.92	0.37	0.53
	2일12H	-0.58	-0.91	-1.27	-1.01	-0.72	-0.14	-1.48	-1.78	-0.86	0.20	1.15	0.55	-0.60
KLMN	1일00H	-0.06	0.00	-0.08	-0.08	-0.17	-0.02	-0.09	0.03	0.10	0.14	0.10	-0.01	-0.01
	2일00H	-0.16	-0.21	-0.26	0.00	-0.20	-0.01	-0.27	0.04	0.30	0.65	0.31	0.10	0.02
	2일12H	-0.07	-0.20	-0.29	-0.03	-0.21	0.05	-0.22	0.04	0.27	0.51	0.23	0.00	0.01
GDLM	1일						1.29	1.29	1.18	1.11	0.01	0.21	0.27	0.63
	2일						1.12	1.19	1.24	1.34	-0.10	-0.16	-0.43	0.60
	3일						1.10	1.15	1.39	1.47	0.05	0.03	-0.49	0.66
	4일						1.06	1.03	1.47	1.58	0.10	0.07	0.85	0.64
	5일						0.83	0.74	1.45	1.76	0.20	-0.08	0.90	0.57
	6일						0.87	0.57	1.48	1.93	0.37	0.13	1.10	0.61
	7일						1.03	0.17	1.38	1.84	0.60	0.40	-1.05	0.62
	8일						1.10	0.08	1.35	1.99	0.56	1.21	0.95	0.74
	9일						0.79	-0.20	1.23	1.99	0.68	1.83	-0.71	0.80
	10일						0.64	-0.33	1.37	2.30	1.02	0.96	0.66	0.76

나. RMSE

최고기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	3.42	3.29	3.34	3.81	3.98	2.61	4.27	3.97	3.57	3.52	3.23	3.34	3.53
	1일12H	2.97	2.90	2.91	3.47	3.71	2.30	4.15	3.76	3.42	3.27	3.12	2.91	3.24
KLMN	1일00H	2.16	1.95	2.32	2.81	3.01	2.71	3.05	2.72	2.20	2.28	2.25	2.14	2.47
	1일12H	2.06	1.75	2.23	2.53	2.79	2.35	2.45	2.31	1.91	1.99	1.93	1.96	2.19
	2일12H	2.36	2.12	2.59	2.97	3.22	2.82	3.19	2.90	2.47	2.50	2.57	2.27	2.67
GDLM	1일						3.37	3.64	3.15	2.73	2.25	1.84	1.67	2.66
	2일						3.47	3.68	3.33	2.98	2.46	2.01	1.89	2.83
	3일						3.45	3.73	3.50	3.03	2.41	2.18	1.92	2.89
	4일						3.59	3.67	3.57	3.10	2.43	2.41	2.38	3.02
	5일						3.65	3.70	3.72	3.12	2.80	2.64	3.31	3.28
	6일						3.82	3.71	3.79	3.12	2.95	3.12	3.61	3.45
	7일						3.98	3.71	3.80	3.29	3.36	3.42	3.84	3.63
	8일						4.33	3.81	3.98	3.37	3.59	3.74	3.96	3.83
	9일						4.43	3.79	4.36	3.40	3.82	3.97	4.40	4.02
	10일						4.72	3.81	4.37	3.39	3.65	4.18	4.87	4.14
최저기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	2.95	3.17	3.08	2.99	2.35	1.71	2.57	2.74	2.58	2.42	2.49	2.58	2.64
	2일12H	3.37	3.55	3.34	3.13	2.50	1.65	2.77	3.04	2.65	2.57	2.65	2.80	2.84
KLMN	1일00H	1.94	1.77	2.17	2.28	2.41	2.09	1.50	1.40	1.59	2.10	2.07	2.06	1.95
	2일00H	2.31	1.99	2.15	2.59	2.41	2.05	1.76	1.77	2.04	2.88	2.33	2.45	2.23
	2일12H	2.33	1.86	2.15	2.60	2.38	1.99	1.73	1.66	1.91	2.52	2.12	2.27	2.13
GDLM	1일						2.52	2.27	2.19	2.17	1.91	1.83	2.14	2.15
	2일						2.51	2.29	2.36	2.46	2.00	1.58	2.43	2.23
	3일						2.50	2.40	2.50	2.54	2.25	2.02	2.44	2.38
	4일						2.45	2.50	2.62	2.58	2.28	2.07	2.96	2.49
	5일						2.55	2.51	2.72	2.80	2.11	2.56	3.92	2.74
	6일						2.78	2.59	2.94	2.73	2.27	2.83	4.58	2.96
	7일						2.94	2.66	3.02	2.57	2.79	3.50	4.65	3.16
	8일						3.22	2.58	3.15	2.82	2.83	3.75	4.57	3.27
	9일						3.41	2.61	3.24	2.85	3.30	3.51	4.89	3.40
	10일						3.48	2.59	3.38	3.10	3.52	3.86	5.29	3.60

다. MAE

최고기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	2.91	2.72	2.79	3.03	3.42	2.11	3.78	3.52	3.19	3.01	2.75	2.79	3.00
	1일12H	2.46	2.35	2.40	2.75	3.20	1.85	3.70	3.35	3.04	2.80	2.65	2.40	2.75
KLMN	1일00H	1.70	1.57	1.81	2.12	2.44	2.12	2.49	2.11	1.75	1.83	1.76	1.68	1.95
	1일12H	1.60	1.39	1.68	1.89	2.24	1.87	1.98	1.76	1.50	1.59	1.49	1.50	1.71
	2일12H	1.84	1.71	2.02	2.29	2.60	2.18	2.61	2.25	1.93	2.05	2.05	1.79	2.11
GDLM	1일						2.65	3.09	2.65	2.31	1.77	1.31	1.32	2.16
	2일						2.82	3.15	2.85	2.44	1.93	1.49	1.49	2.31
	3일						2.86	3.17	3.02	2.49	1.95	1.65	1.46	2.37
	4일						2.94	3.18	3.01	2.57	1.97	1.85	1.81	2.48
	5일						2.96	3.11	3.11	2.52	2.28	2.08	2.54	2.66
	6일						3.09	3.09	3.22	2.57	2.37	2.55	2.82	2.82
	7일						3.20	3.08	3.15	2.73	2.78	2.86	3.09	2.98
	8일						3.50	3.12	3.27	2.85	2.96	3.21	3.13	3.15
	9일						3.67	3.15	3.65	2.78	3.04	3.32	3.57	3.31
	10일						3.86	3.23	3.67	2.81	2.90	3.46	4.05	3.43
최저기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	2.44	2.63	2.53	2.38	1.94	1.35	2.31	2.47	2.23	1.97	2.07	2.08	2.20
	2일12H	2.81	3.03	2.83	2.50	2.10	1.31	2.48	2.70	2.28	2.11	2.19	2.25	2.38
KLMN	1일00H	1.55	1.42	1.79	1.82	1.87	1.63	1.21	1.11	1.27	1.65	1.65	1.67	1.55
	2일00H	1.80	1.58	1.75	2.11	1.90	1.61	1.39	1.42	1.65	2.32	1.89	1.94	1.78
	2일12H	1.81	1.50	1.75	2.12	1.88	1.57	1.35	1.34	1.55	2.02	1.70	1.80	1.70
GDLM	1일						2.11	1.96	1.89	1.80	1.54	1.46	1.61	1.77
	2일						2.04	1.94	2.07	2.05	1.62	1.19	1.90	1.83
	3일						2.05	2.02	2.15	2.14	1.83	1.58	1.99	1.97
	4일						1.99	2.08	2.22	2.13	1.88	1.70	2.22	2.03
	5일						2.10	2.05	2.26	2.35	1.71	2.05	2.95	2.21
	6일						2.25	2.15	2.42	2.31	1.84	2.28	3.73	2.43
	7일						2.46	2.16	2.46	2.13	2.20	2.72	3.80	2.56
	8일						2.61	2.11	2.55	2.32	2.24	2.94	3.75	2.65
	9일						2.69	2.12	2.56	2.31	2.68	2.72	4.04	2.73
	10일						2.75	2.11	2.73	2.63	2.89	3.12	4.44	2.95

2.95

라. P

최고기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	0.26	-0.56	0.10	-0.23	-1.48	0.28	-5.11	-3.38	-3.54	-0.26	-0.02	0.38	-1.13
	1일12H	0.48	-0.09	0.34	-0.02	-1.39	0.43	-5.05	-3.28	-3.44	-0.20	0.03	0.51	-0.97
KLMN	1일00H	0.74	0.61	0.63	0.35	0.34	0.26	0.00	0.18	0.34	0.77	0.63	0.78	0.47
	1일12H	0.77	0.69	0.66	0.48	0.41	0.42	0.37	0.40	0.53	0.84	0.73	0.81	0.59
	2일12H	0.69	0.54	0.55	0.30	0.26	0.19	-0.07	0.07	0.19	0.73	0.51	0.75	0.39
GDLM	1일						-0.67	-0.76	-0.42	-0.22	0.67	0.73	0.84	0.02
	2일						-0.74	-0.76	-0.49	-0.56	0.61	0.66	0.80	-0.07
	3일						-0.65	-0.80	-0.57	-0.60	0.63	0.63	0.80	-0.08
	4일						-0.68	-0.70	-0.63	-0.63	0.62	0.56	0.71	-0.11
	5일						-0.74	-0.66	-0.58	-0.56	0.52	0.45	0.44	-0.16
	6일						-0.97	-0.71	-0.53	-0.58	0.47	0.27	0.34	-0.24
	7일						-1.09	-0.72	-0.44	-0.73	0.34	0.12	0.25	-0.32
	8일						-1.42	-0.77	-0.64	-0.76	0.24	-0.05	0.20	-0.46
	9일						-1.41	-0.71	-1.05	-0.70	0.13	-0.19	0.01	-0.56
	10일						-1.66	-0.74	-0.91	-0.70	0.21	-0.34	-0.21	-0.62
최저기온		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
PPM	1일00H	0.46	-0.72	-0.40	0.33	-0.51	0.43	-7.24	-5.47	-0.78	0.63	0.51	0.67	-1.01
	2일12H	0.24	-1.36	-0.77	0.20	-0.62	0.46	-7.42	-5.70	-0.83	0.60	0.44	0.62	-1.18
KLMN	1일00H	0.83	0.66	0.60	0.66	-0.14	0.15	0.36	0.56	0.67	0.81	0.67	0.81	0.55
	2일00H	0.75	0.58	0.61	0.54	-0.12	0.20	0.12	0.30	0.46	0.63	0.57	0.73	0.45
	2일12H	0.75	0.63	0.61	0.54	-0.09	0.24	0.14	0.38	0.51	0.71	0.64	0.77	0.49
GDLM	1일						-0.78	-1.11	-0.89	-0.42	0.79	0.67	0.74	-0.20
	2일						-0.82	-1.00	-1.01	-0.79	0.77	0.76	0.67	-0.14
	3일						-0.87	-1.13	-1.17	-0.89	0.70	0.60	0.68	-0.30
	4일						-0.74	-1.18	-1.33	-0.95	0.69	0.58	0.53	-0.34
	5일						-0.74	-1.12	-1.42	-1.15	0.74	0.37	0.19	-0.45
	6일						-1.07	-1.19	-1.86	-1.11	0.70	0.25	-0.11	-0.63
	7일						-1.21	-1.29	-1.94	-0.98	0.56	-0.15	-0.13	-0.73
	8일						-1.75	-1.17	-2.04	-1.21	0.55	-0.32	-0.09	-0.86
	9일						-1.88	-1.18	-2.31	-1.32	0.39	-0.15	-0.24	-0.96
	10일						-1.89	-1.14	-2.44	-1.71	0.31	-0.42	-0.47	-1.11

4. 6. 앙상블 모델

o 검증 요소 : Reliability diagram, ROC Curve, Economic Value

4.6.1. Reliability diagram

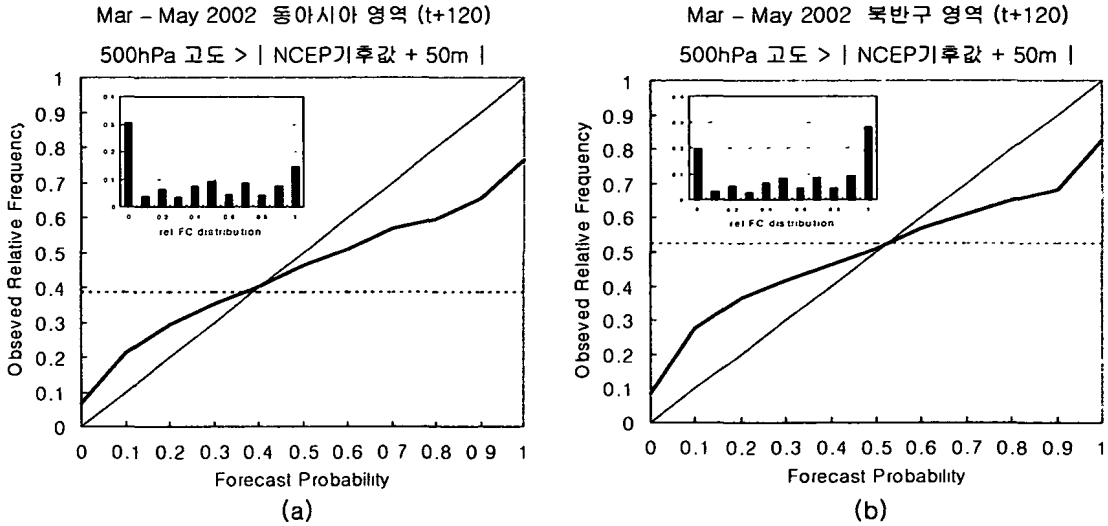


그림 4.1 2002년 봄 500hPa 고도의 Reliability Diagram(검증 대상은 아노말리가 50m 이상 차이날 현상에 대한 120시간 앙상블 확률예보이고 검증 영역은 동아시아 영역(a), 북반구영역(b). 실선은 reliability를, 막대그래프는 각 확률의 상대예보 빈도인 resolution을 나타내며 점선은 실황의 빈도로 sample climate이라고도 한다).

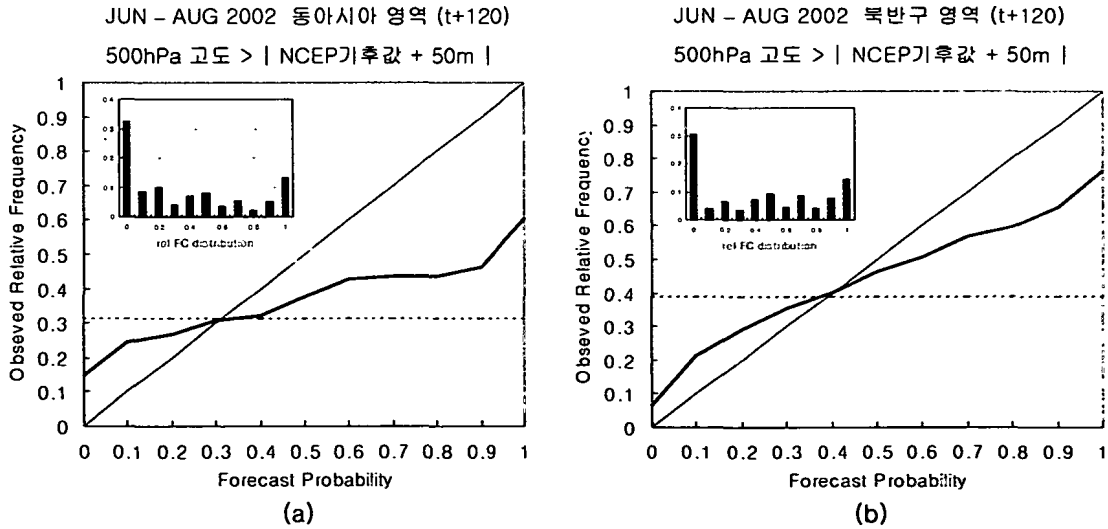


그림 4.2 2002년 여름 500hPa 고도의 Reliability Diagram : 2002년 여름인 것만 다르고 이하 그림 4.1과 같다.

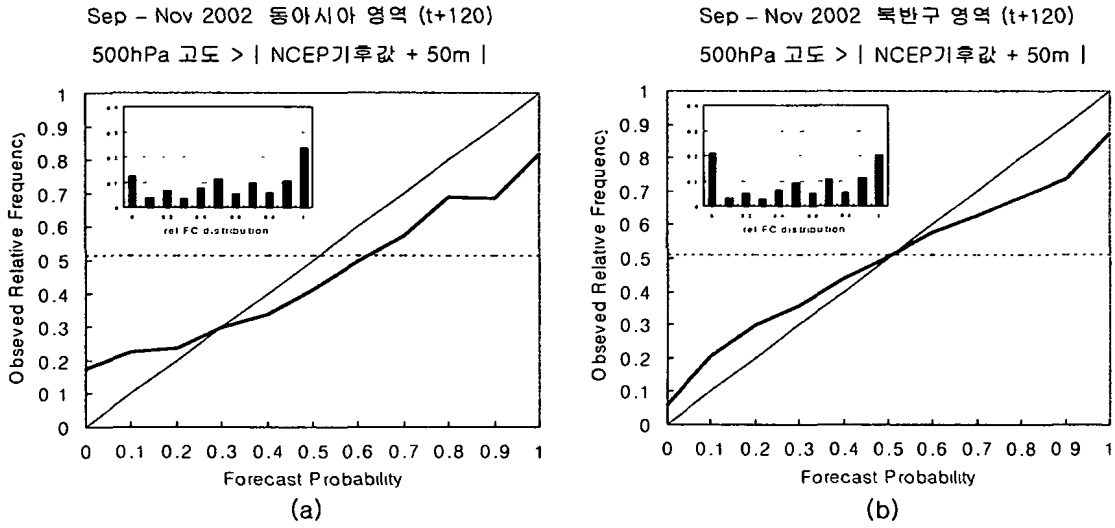


그림 4.3 2002년 가을 500hPa 고도의 Reliability Diagram : 2002년 가을인 것만 다르고 이하 그림 4.1과 같다.

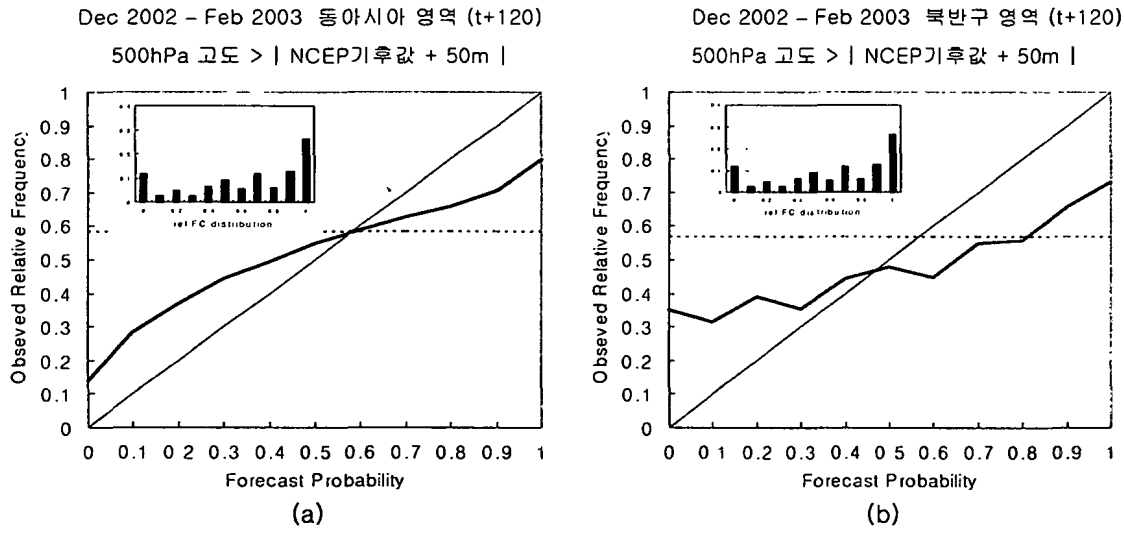


그림 4.4 2002-2003년 겨울 500hPa 고도의 reliability diagram (2002 ~ 2003년 겨울인 것만 다르고 이하 그림 4.1과 같다.

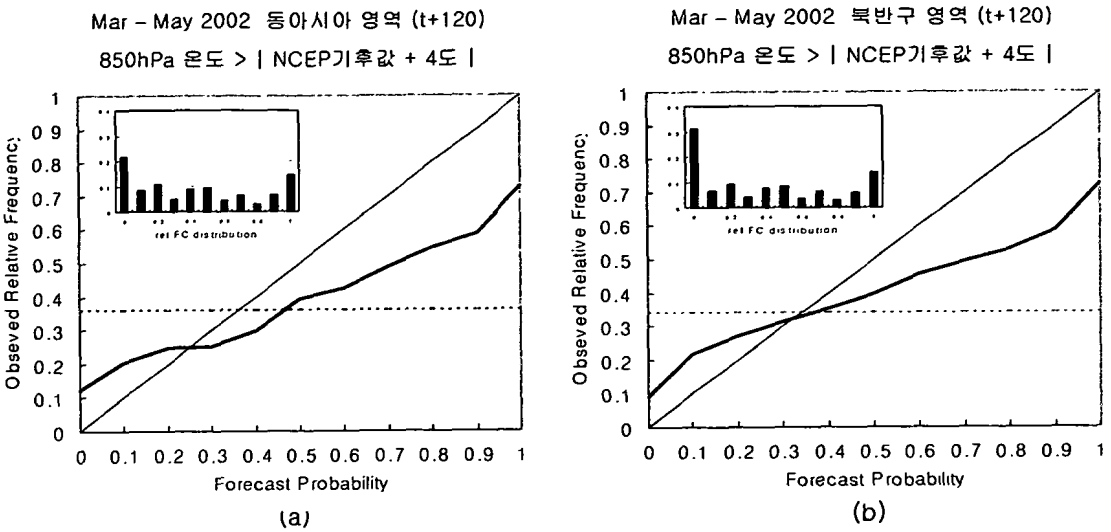


그림 4.5 2002년 봄 850hPa 온도의 Reliability Diagram(검증 대상은 아노말리가 4도 이상 차이나는 현상에 대한 120시간 앙상블 확률예보이고 검증 영역은 동아시아 영역(a), 북반구 영역(b). 실선은 reliability를 나타내고 막대그래프는 각 확률의 상대 예보빈도인 resolution을 나타내며 점선은 실황의 빈도로 sample climate이라고도 한다).

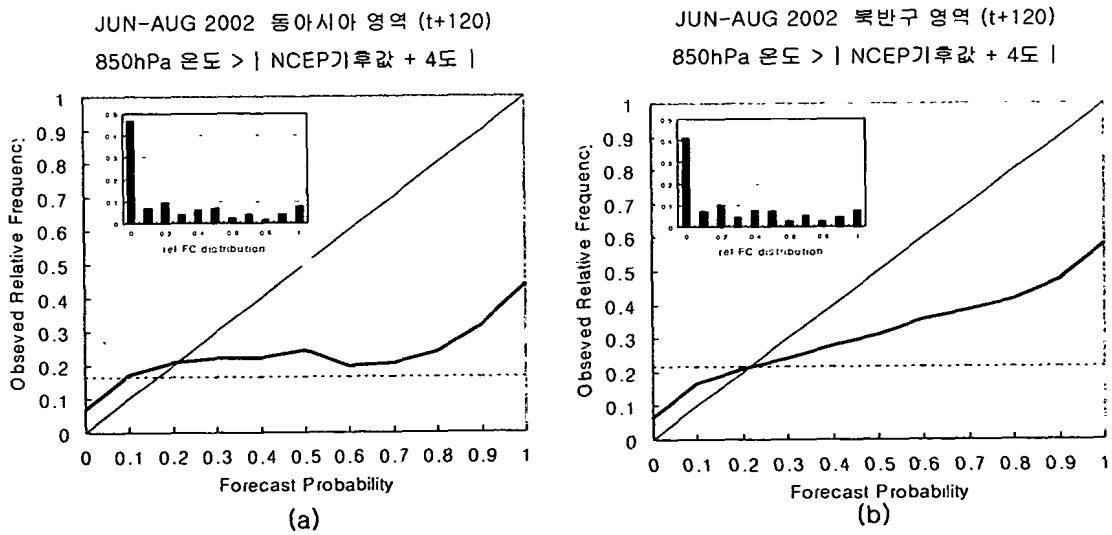


그림 4.6. 2002년 여름 850hPa 온도의 Reliability Diagram : 2002년 여름인 것만 다르고 이하 그림 4.5와 같다.

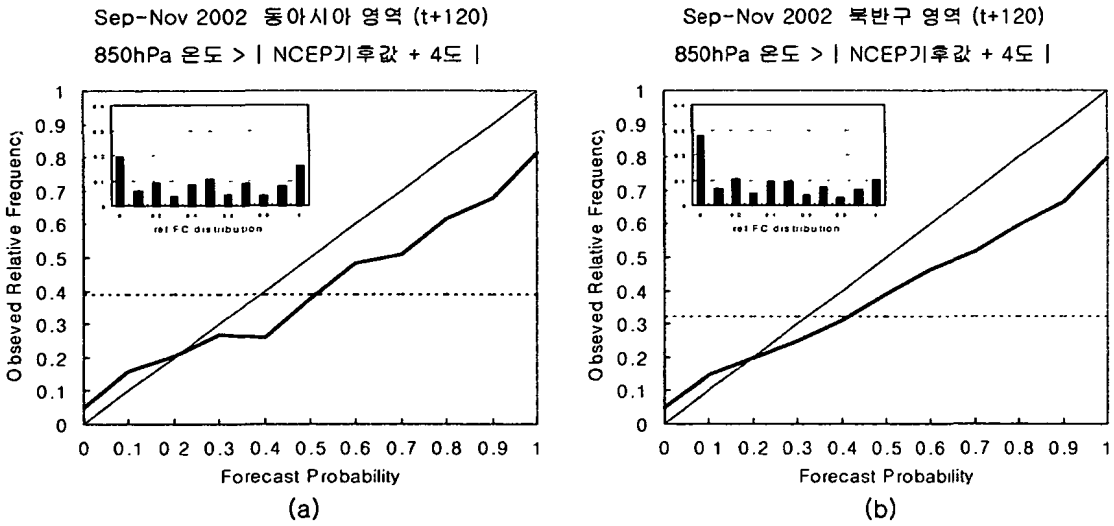


그림 4.7 2002년 가을 850hPa 온도의 Reliability Diagram : 2002년 가을인 것만 다르고 이하 그림 4.5와 같다.

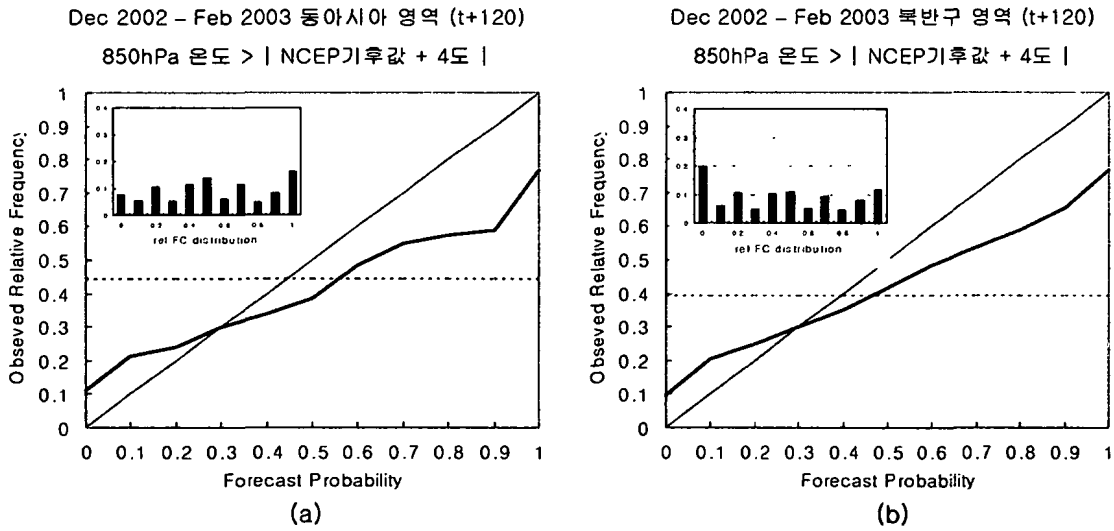


그림 4.8 2002 ~ 2003년 겨울 850hPa 온도의 Reliability Diagram : 2002~2003년 겨울인 것만 다르고 이하 그림 4.5와 같다.

4.6.2. ROC Curve를 이용한 검증

가. 500hPa 고도

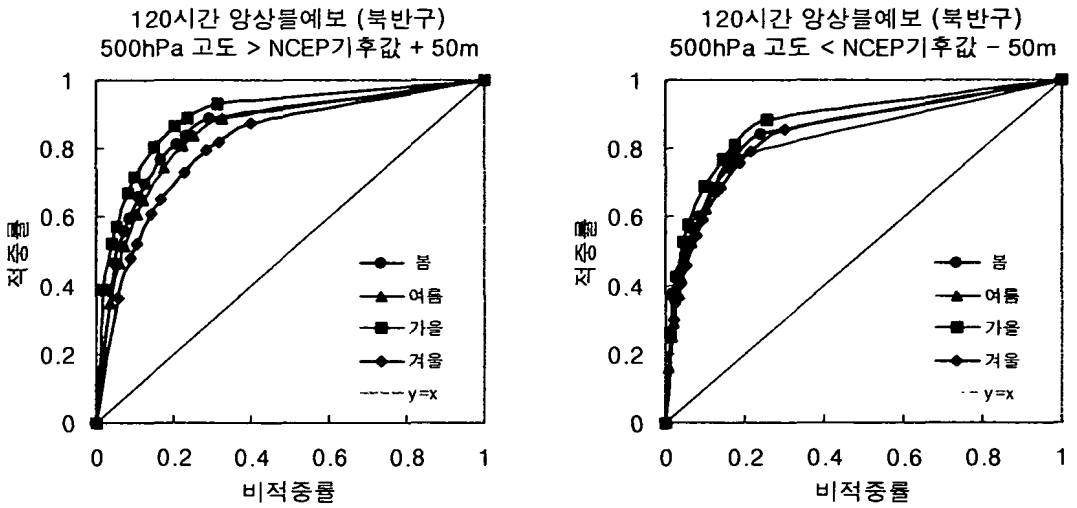


그림 4.9 2002년 계절별 500hPa 고도의 120시간 앙상블예보 ROC 곡선(검증 영역은 북반구 영역이고 검증 대상은 500hPa 고도가 기후값에 비해 +50m보다 높은 현상에 대한 앙상블 확률예보의 ROC 곡선이 좌측이고 우측은 -50m보다 낮은 현상에 대한 앙상블 확률예보의 ROC 곡선이다.

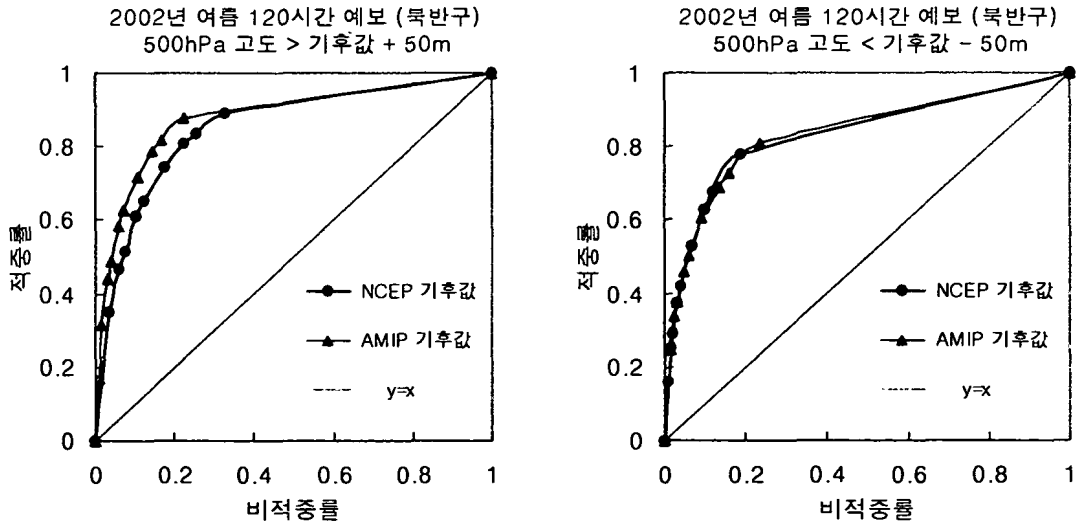


그림 4.10 기후값을 다르게 사용했을 때 500hPa 고도의 ROC Curve 비교(검증 기간은 2002년 여름, 검증영역은 북반구 영역, 검증 대상은 120 시간 앙상블 예보에 있어서 좌측은 500hPa 고도가 기후값에 비해 +50m이상 높게 예보한 앙상블 확률예보의 ROC 곡선이고 우측은 -50m보다 낮게 예보한 앙상블 확률예보의 ROC 곡선이다(동그라미 표시는 NCEP 기후값, 세모 표시는 AMIP 기후값)).

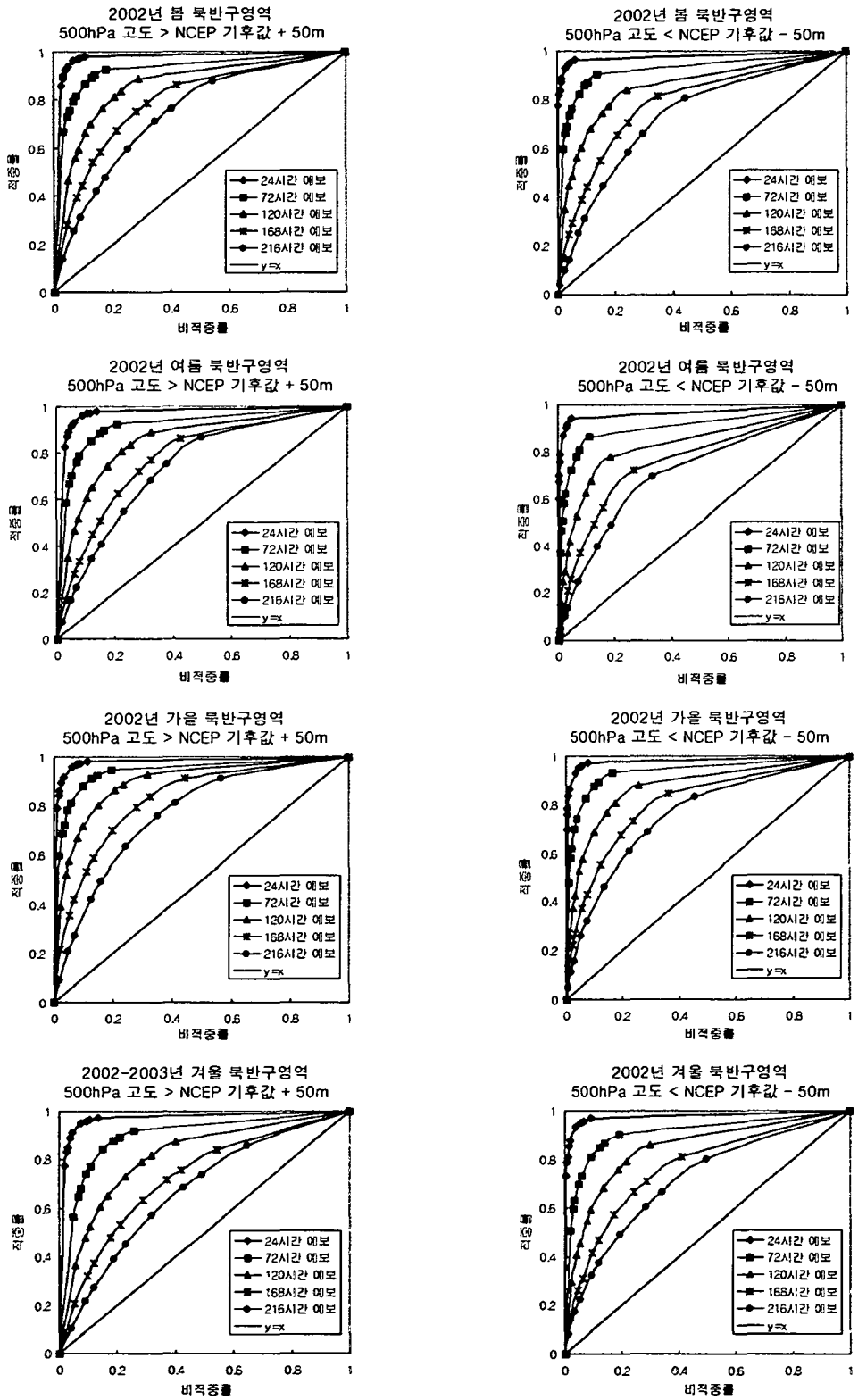


그림 4.11 2002년 봄, 여름, 가을, 겨울 500hPa 고도의 ROC Curve(검증 영역은 북반구 영역, 검증 대상은 500hPa 고도, 좌측은 기후값에 비해 +50m 보다 높은 현상, 우측은 기후값에 비해 -50m보다 낮은 현상).

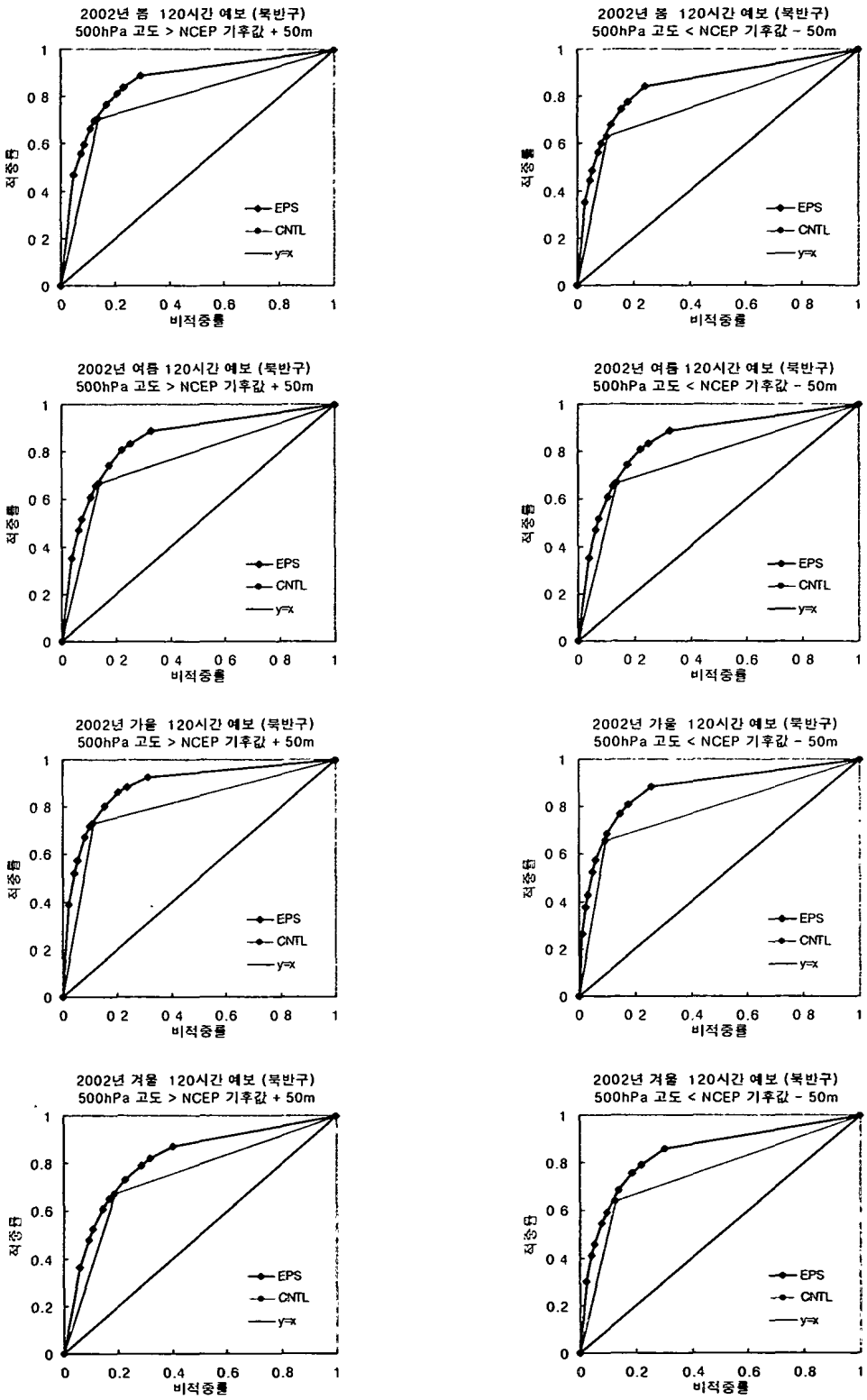


그림 4.12 2002년 계절별 500hPa 고도에 대한 120시간 앙상블 확률예보(EPS)와 컨트롤 예보(CNTL)의 ROC Curve 비교(검증 영역은 북반구 영역. 검증 대상은 500hPa 고도, 좌측은 기후값에 비해 +50m보다 높은 현상, 우측은 기후값에 비해 50m보다 낮은 현상).

나. 850hPa 온도

표 4.1 기후값을 다르게 사용할 때 예보빈도와 관측빈도의 비교(상단은 850hPa 온도의 아노말리가 +4도 이상인 현상의 빈도이고, 하단은 850hPa 온도의 아노말리가 -4도 이하인 현상의 빈도이다.)

2002년 여름 120시간 예보	850hPa 온도 아노말리 > +4도			
	NCEP 기후값		모델 기후값	
	예보 빈도	관측 빈도	예보 빈도	관측 빈도
TOTAL	278208	34447	278208	25662
10%이상	143102	29077	109926	19259
20%이상	103576	23562	71274	15350
30%이상	86717	20647	58354	13703
40%이상	58114	15238	39149	10687
50%이상	36766	10819	26019	7955
60%이상	28256	8717	20916	6693
70%이상	15324	5233	12851	4565
80%이상	10518	3738	9705	3655
90%이상	3525	1335	4713	1987

2002년 여름 120시간 예보	850hPa 온도 아노말리 < -4도			
	NCEP 기후값		모델 기후값	
	예보 빈도	관측 빈도	예보 빈도	관측 빈도
TOTAL	278208	26743	278208	54750
10%이상	58473	12082	107228	40465
20%이상	24179	6400	66441	30400
30%이상	16168	4670	53248	26311
40%이상	7506	2445	34259	19113
50%이상	3801	1344	21553	13248
60%이상	2781	1018	17056	10844
70%이상	1552	594	10253	6985
80%이상	1045	387	7553	5339
90%이상	427	144	3514	2640

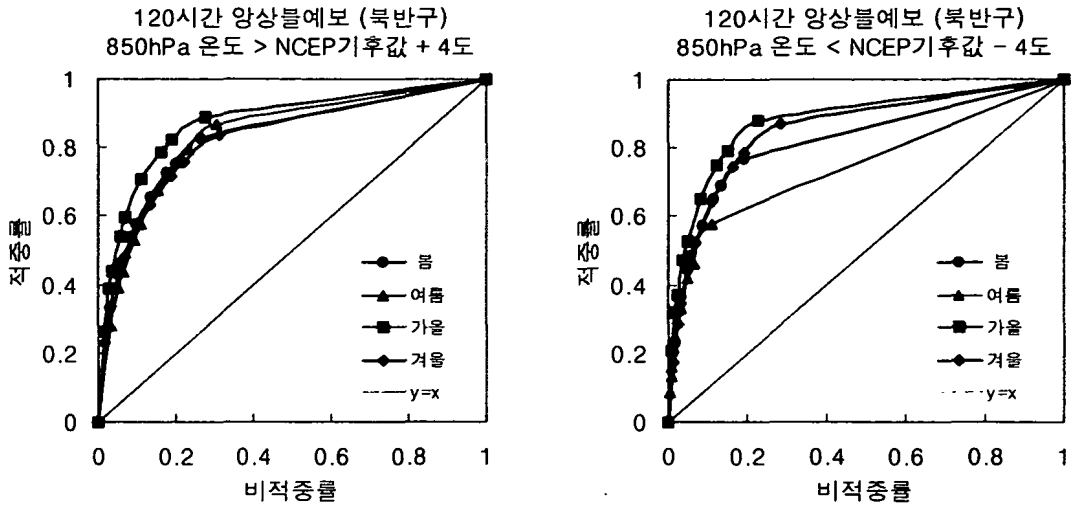


그림 4.13 2002년 계절별 500hPa 고도의 120시간 앙상블예보 ROC 곡선(검증 영역은 북반구 영역, 검증 대상은 850hPa 온도, 좌측은 기후값에 비해 +4도보다 높은 현상에 대한 앙상블 확률예보의 ROC 곡선, 우측은 -4도보다 낮은 현상에 대한 앙상블 확률예보의 ROC 곡선).

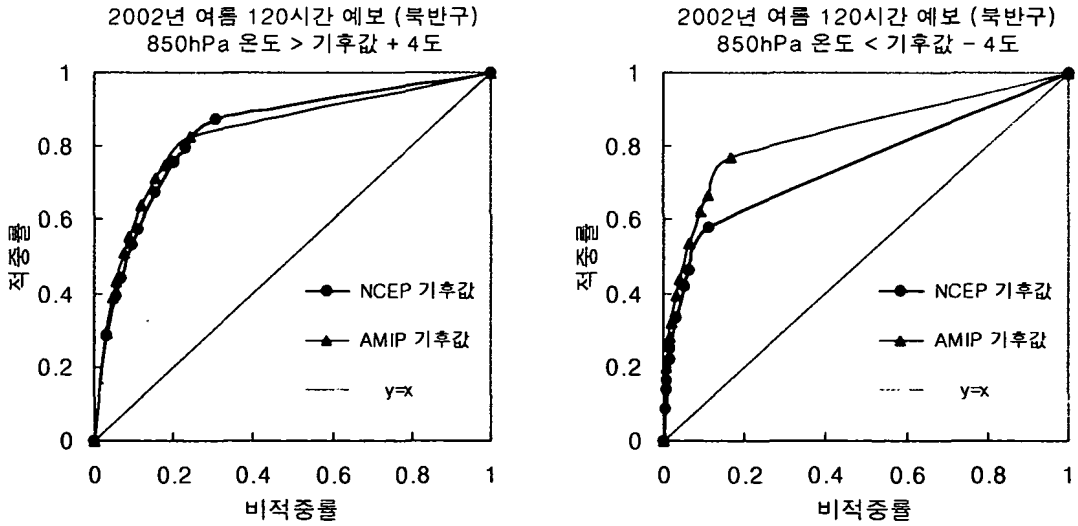


그림 4.14 기후값을 다르게 사용했을 때 500hPa 고도의 ROC Curve(검증 기간은 2002년 여름, 검증영역은 북반구 영역, 검증 대상은 120시간 앙상블 예보에 있어서 좌측은 850hPa 온도가 기후값에 비해 +4도 이상 높게 예보한 앙상블 확률예보의 ROC 곡선, 우측은 -4도보다 낮게 예보한 앙상블 확률예보의 ROC 곡선, 동그라미 표시는 NCEP 기후값, 세모 표시는 AMIP 기후값).

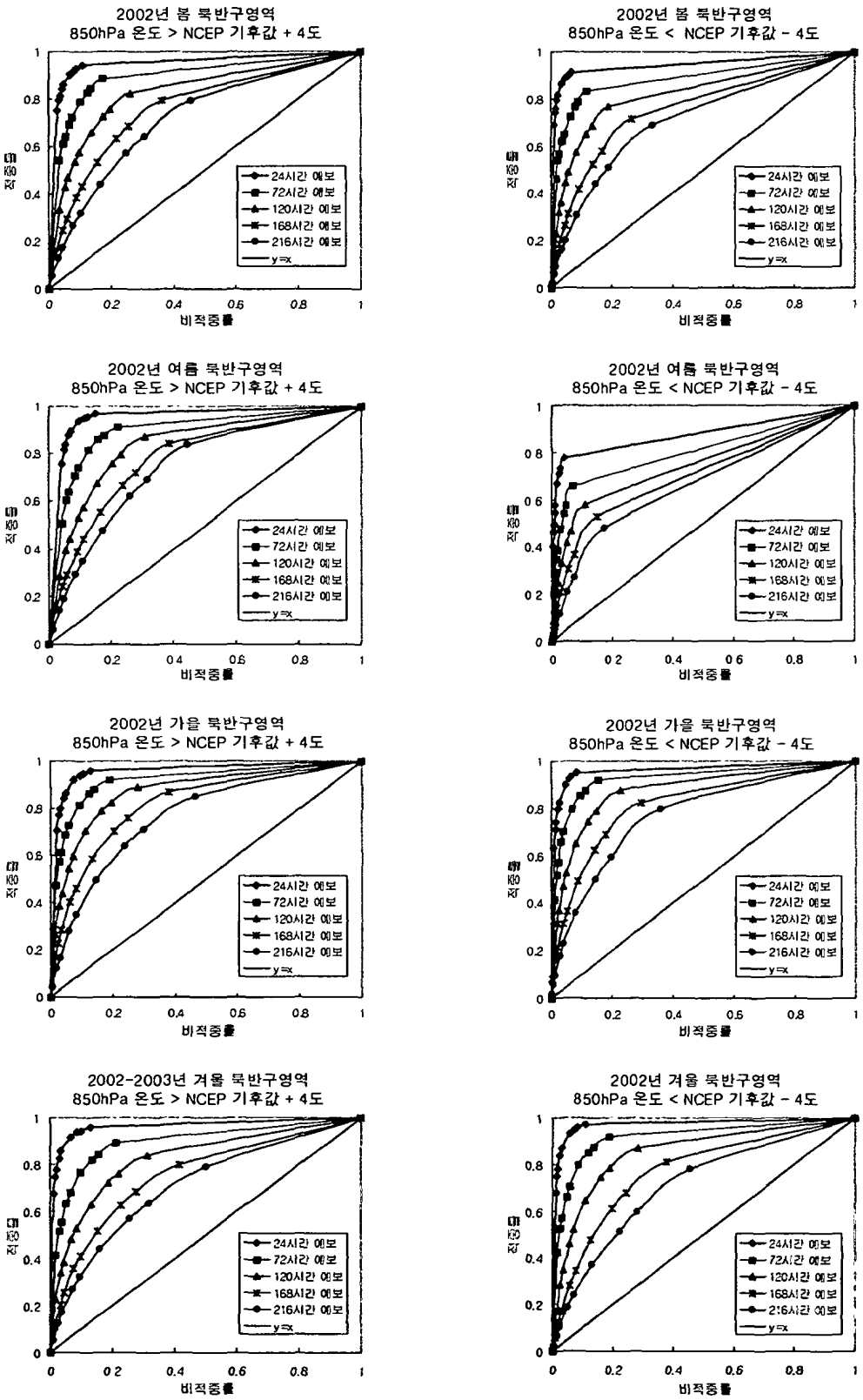


그림 4.15 2002년 봄, 여름, 가을, 겨울 850hPa 온도의 ROC Curve(검증 영역은 북반구 영역, 검증 대상은 850hPa 온도, 좌측은 기후값에 비해 +4도보다 높은 현상, 우측은 -4도보다 낮은 현상).

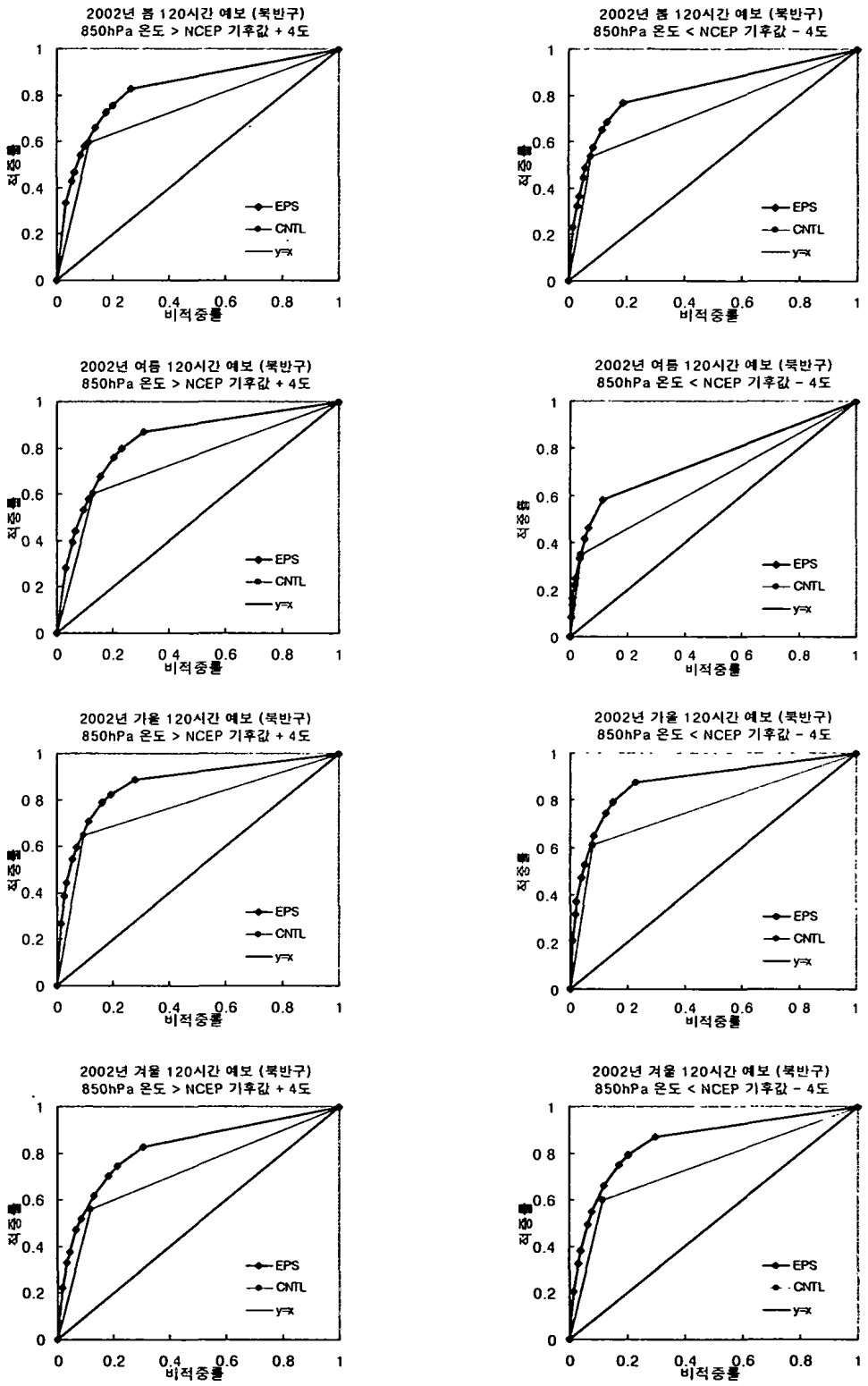


그림 4.16 2002년 계절별 850hPa 온도에 대한 120시간 앙상블 확률예보(EPS)와 컨트롤 예보(CNTL)의 ROC Curve(검증 영역은 북반구 영역, 검증 대상은 850hPa 온도, 좌측은 기후값에 비해 +4도보다 높은 현상, 우측은 -4도보다 낮은 현상).

4.6.3 Economic Value

가. 결정론적 예보 Economic Value (2002년 여름 사례)

표 4.2 앙상블 컨트롤예보의 이벤트에 따른 skill 비교

event	2002년 여름 북반구 영역		
	FAR	HR	$\bar{o}$
H500 anomaly > +50	0.1402	0.6713	0.2399
H500 anomaly < -50	0.0660	0.5042	0.1523
T850 anomaly > +4	0.1314	0.6056	0.1238
T850 anomaly < -4	0.0352	0.3492	0.0961

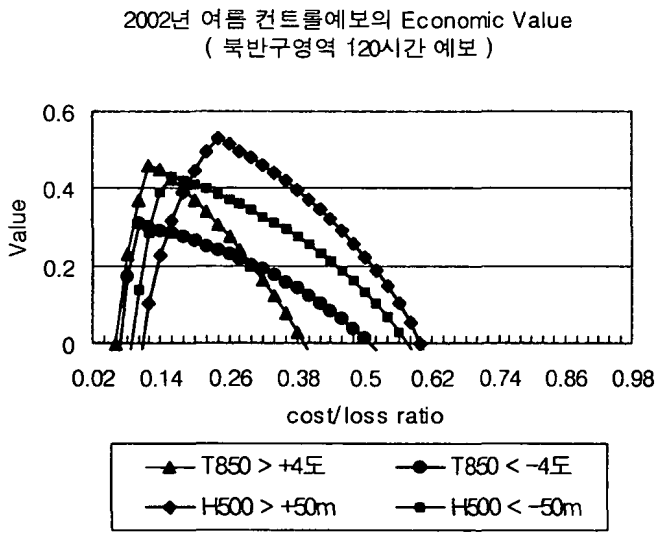


그림 4.17 2002년 여름 컨트롤 예보의 이벤트에 대한 EV(검증 영역은 북반구, 세모 표시는 850hPa 온도의 아노말리가 +4도 이상인 현상, 동그라미 표시는 -4도 이하인 현상, 다이아몬드 표시는 500hPa 고도의 아노말리가 +50m 이상, 네모 표시는 -50m 이하일 경우).

나. 앙상블 확률예보의 Economic Value

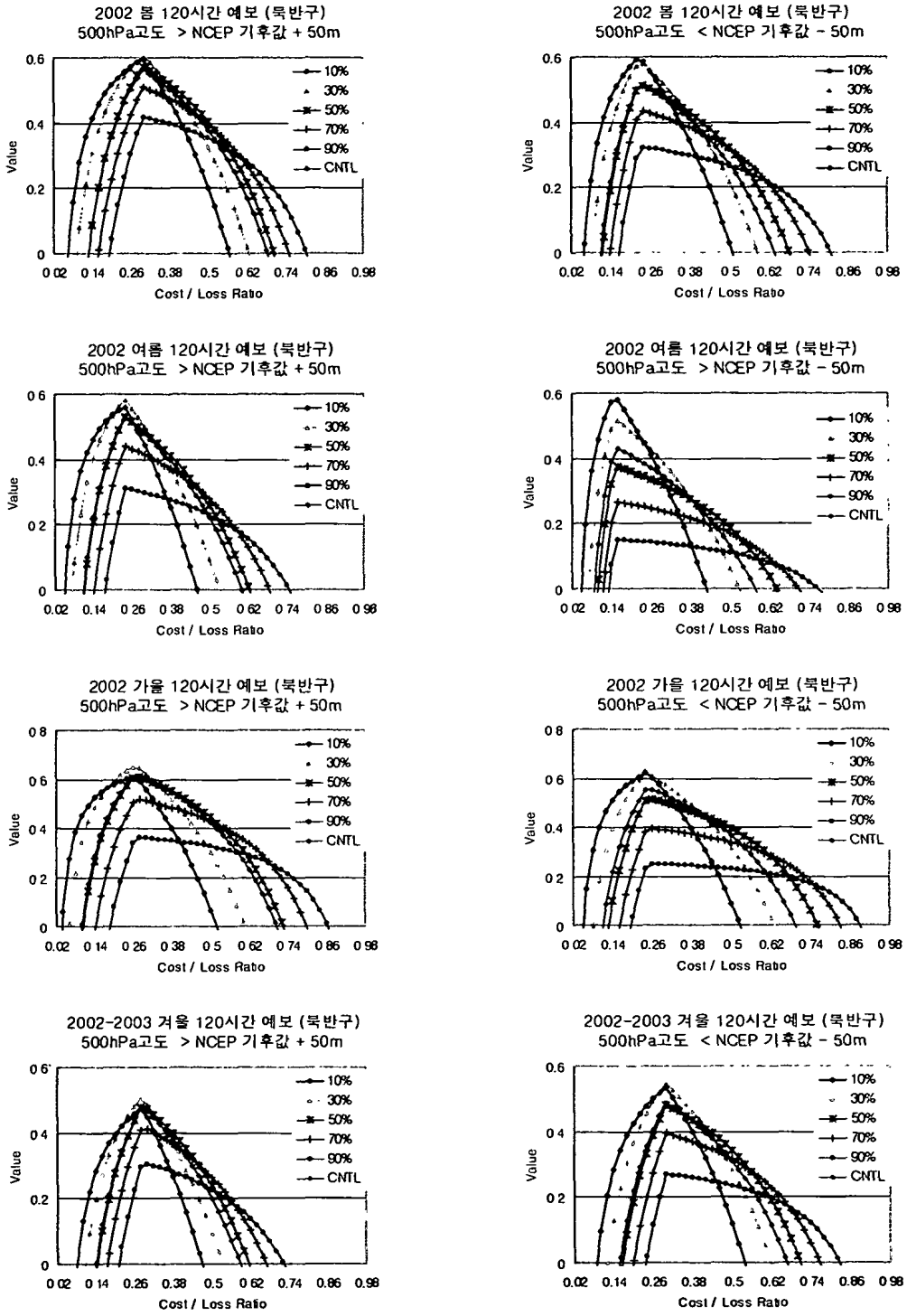


그림 4.18 2002년 봄, 여름, 가을, 겨울 500hPa 고도의 Economic Value(검증 영역은 북반구 영역, 검증 대상은 500hPa 고도, 좌측은 120시간예보에서 기후값에 비해 +50m보다 높게 예보한 앙상블 확률예보 10, 30, 50, 70, 90%와 컨트롤 단일 예보(CNTL)의 EV 곡선, 우측은 -50m 보다 낮게 예보한 경우의 EV 곡선).

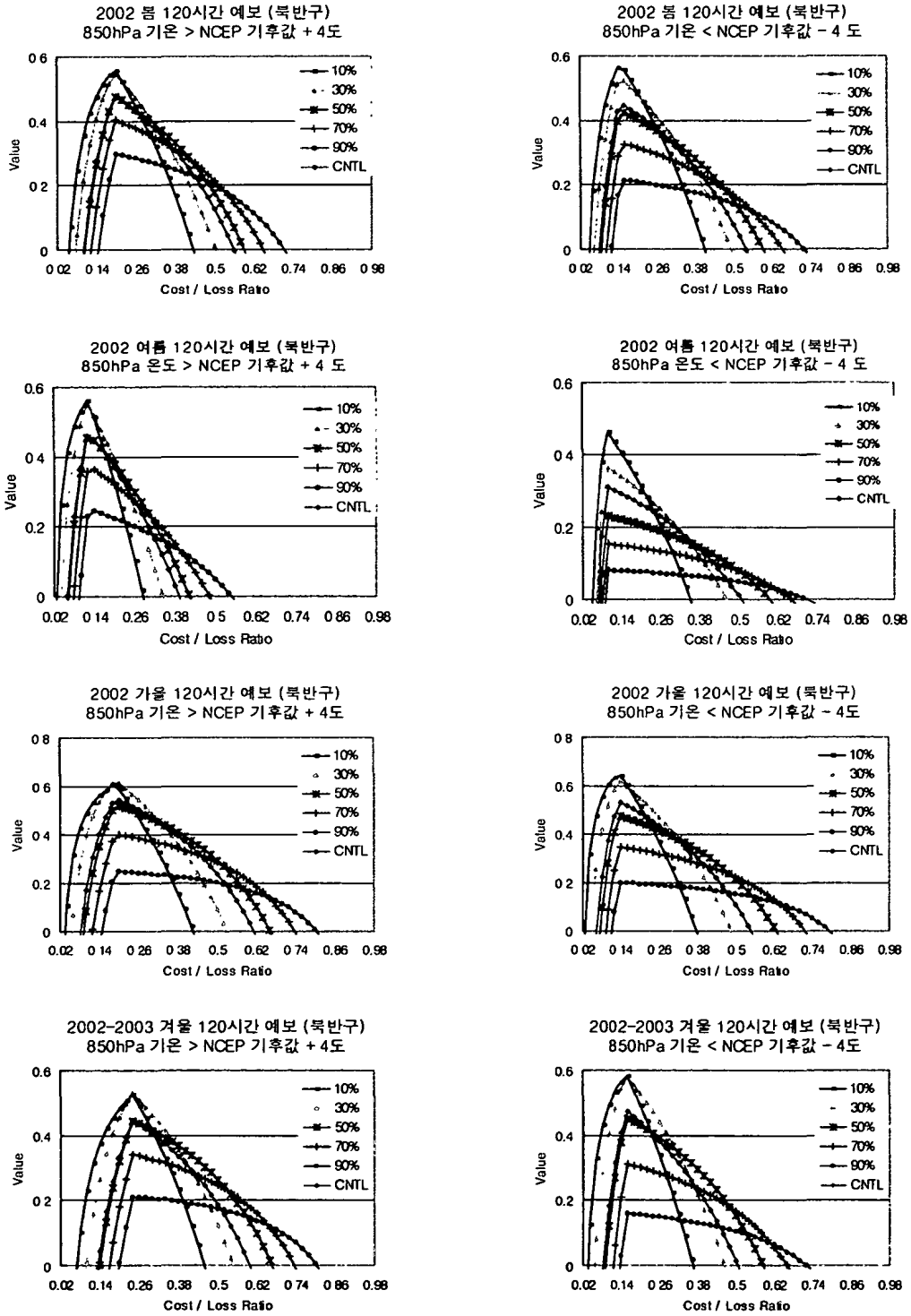


그림 4.19 2002년 봄, 여름, 가을, 겨울 850hPa 온도의 Economic Value(검증 영역은 북반구 영역, 검증 대상은 850hPa 온도, 좌측이 120시간예보에서 기후값에 비해 +4도보다 높게 예보한 앙상블 확률예보 10, 30, 50, 70 90%와 컨트롤 단일 예보(CNTL)의 EV 곡선, 우측이 -4도 보다 낮게 예보한 경우의 EV 곡선).

5. 년도별 기술보고서 내역

년 도	보 고 서 명	비 고
1992	CRAY에서 F-LAM의 처리과정(*)	기술노트 92-1
	극동아시아 수치예보모델(F-LAM)의 개선사항 및 예보과정	기술보고서 92-1
1993	국지예보모델(K-LAM)의 구성 및 수행과정	기술노트 93-1
	F-LAM의 비선형 정상형 초기화	기술노트 93-2
	통계적 방법을 이용한 최고/최저기온 예보법	기술보고서 93-1
1994	단변수 최적내삽법을 이용한 F-LAM의 객관분석	기술노트 94-1
	태풍모델(KTM)의 구성과 수행과정	기술노트 94-2
	전구모델(GSM)의 구성과 수행 과정	기술노트 94-3
	극동아시아모델과 PPM 최고최저기온 예보검증	기술보고서 94-1
	Workshop on the Application of Numerical weather prediction outputs	기술보고서 94-2
1995	해양모델	기술노트 95-1
	94년 기상청 운영 수치모델의 예보 검증	기술보고서 95-1
	기상청의 수치예보(*)	기술보고서 95-2
	전구모형의 예보성능 : 예비적 고찰	기술보고서 95-3
	통계적 방법에 의한 강수확률 예보	기술보고서 95-4
	전구모형(GSM) 수행과정 및 운영방법을 중심으로	기술노트 95 2
1996	'95년 기상청 운영 수치모델의 예보 검증	기술보고서 96-1
	기상청의 새로운 수치예보시스템	기술보고서 96-2
	지역예보시스템과 예보평가	기술보고서 96-3
1997	96년의 기상청의 수치예보 검증	기술보고서 97 1
	예보기술의 발전방향과 슈퍼컴퓨터 도입	기술보고서 97 2
	전지구(GDAPS)예보시스템과 예보평가	기술보고서 97-3
1998	태풍예보시스템과 예보평가	기술보고서 98-1
	기상병렬기술 보고서	기술보고서 98-2
	1997 수치예보모델 검증결과 보고서	기술보고서 98-3
	칼만필터를 이용한 최고/최저기온 예보	기술보고서 98 4
1999	98수치예보모델 검증결과 보고서	기술보고서 99 1
2000	국지일기도와 대기선도	기술보고서 2000 1
	기상청 파랑 수치예보 시스템	기술보고서 2000 2
	1999년 지역예보시스템 구성	기술보고서 2000-3
	1999년 지역예보모델의 검증과 민감도 연구	기술보고서 2000-4
	1999년 고분해능 모델의 성능과 평가	기술보고서 2000 5
	전지구예보시스템의 검증 보고서(1999)	기술보고서 2000 6

년 도	보 고 서 명	비 고
2001	지역예보모델의 개선사항	기술보고서 2001-1
	수치예보시스템의 검증보고서	기술보고서 2001-2
	전지구예보시스템의 검증보고서	기술보고서 2001-3
2002	1차원변분법 프로그램 메뉴얼	기술노트 2002-1
	2001년 전지구예보시스템의 개선사항	기술보고서 2002-1
	중기앙상블예보시스템	기술보고서 2002-2
	2001년 지역예보시스템 개선	기술보고서 2002-3
	지역모델용 3차원 변분자료동화 체계	기술보고서 2002-4
	전지구예보시스템의 모조태풍 작성과정 분석 및 2001년 태풍예보 검증	기술보고서 2002-5
	전지구모델 결과를 이용한 중기기온 통계예보모델 개발과 전지구 파랑모델 검증 보고서	기술보고서 2002-6
	2001수치예보시스템의 검증	기술보고서 2002-7