

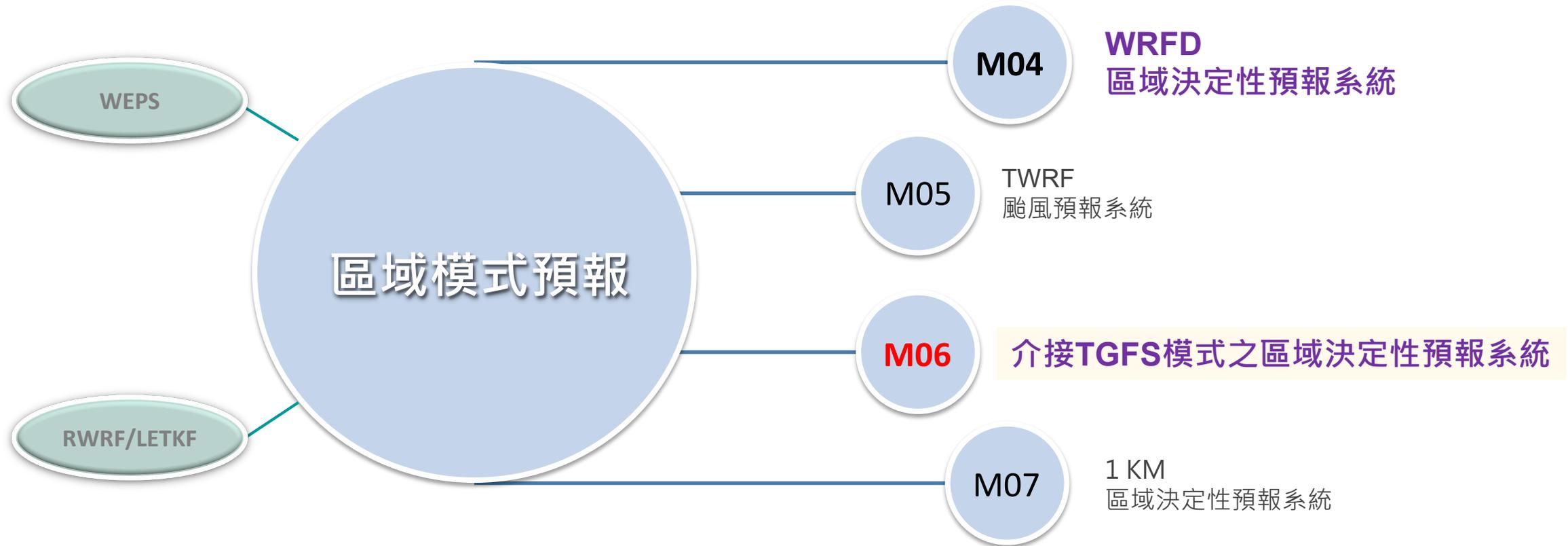
# 中央氣象署區域模式介接TGFS之預報效能評估

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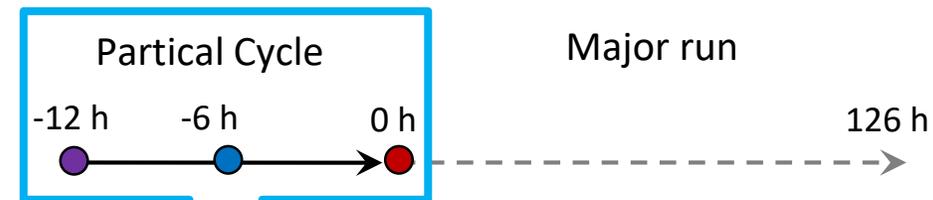
2024/09/04

# 區域模式現況



為強化CWA全球與區域預報模式之連結，進行WRF介接TGFS資料之評估 ( WRF\_M06 )

# 區域決定性預報系統



資料同化系統使用之觀測資料  
 傳統觀測資料量 > 100萬個/天  
 衛星觀測資料量 > 1000億個/天

- ✓ 優化模式的初始場
- ✓ 縮短模式預報氣象場之spin up時間

WRFD Domain



- d01: 661\*385 (15-km)
- d02: 1160\*675 (3-km)
- 52 levels in the vertical (ptop =20 hPa)

物理參數化設定	
積雲參數化法	Kain-Fritsch with new trigger function (used in 15-km domain)
微物理參數化法	Goddard 5-class scheme
邊界層參數化法	Yonsei University scheme
長波/短波輻射參數化法	RRTMG scheme
地表參數化法	Monin-Obukhov scheme
土壤模式	NOAH

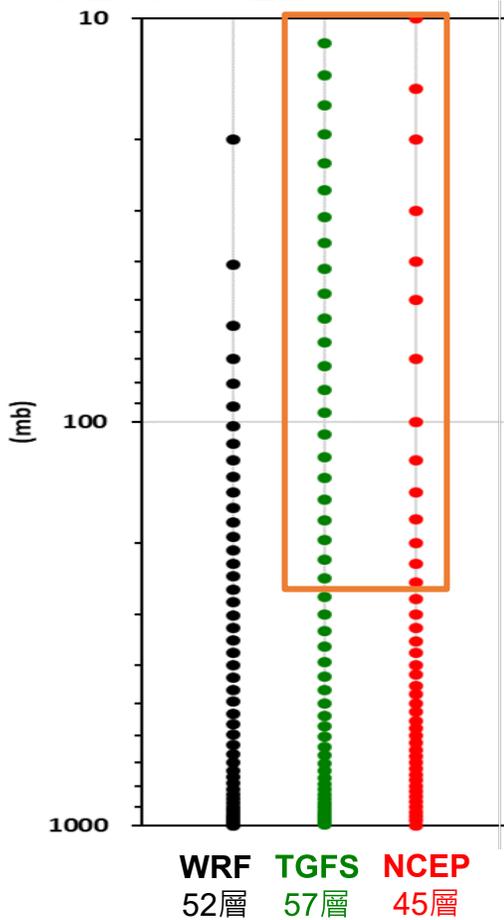
# TGFS\_v1和NCEPGFS\_v15模式設定比較

項目	TGFS_v1	NCEPGFS_v15
決定性預報(解析度)	全球: C384TL64(25公里)以臺灣為中心 巢狀: 4.8公里	C768L64(13公里)
植被覆蓋率	歐洲氣象衛星開發組織(EUMETSAT) 2017至2021年資料	NESDIS/NOAA NOAA-7, 9, 11, 14, 16, 17和18衛星 1982至2005年(24年)資料
植物種類	2010年MODIS地表氣候資料	2002 IGBP MODIS 0.03 degree data sets
土壤種類	2010年MODIS地表氣候資料	2002 IGBP MODIS 0.03 degree data sets
都市水氣傳送及熱傳導	NCEPGFS_v16 NOAH地表模式	NCEPGFS_v15 NOAH地表模式
冰雪覆蓋土壤熱傳導	NCEPGFS_v16 NOAH地表模式	NCEPGFS_v15 NOAH地表模式

# 實驗設計

## 垂直層分布

TGFS垂直層數較密集  
減少上游資料內差至WRF模式層的誤差



模式名稱	全球模式資料	區域模式版本	domain
舊M06	TGFS P level	<b>OP441</b>	<b>15/小3km</b>
<b>M06</b>	<b>TGFS S level</b>	<b>OP50</b>	<b>15/大3km</b>
<b>M04</b>	<b>NCEP GFS</b>	<b>OP50</b>	<b>15/大3km</b>

TGFS垂直層 S 57層  
水氣由相對溼度換為比濕

只有初始及邊界條件差異

M04

NCEP GFS

- 水平內插：波譜→等經緯→區域模式網格
- 垂直內插：sigma→P→sigma

M06

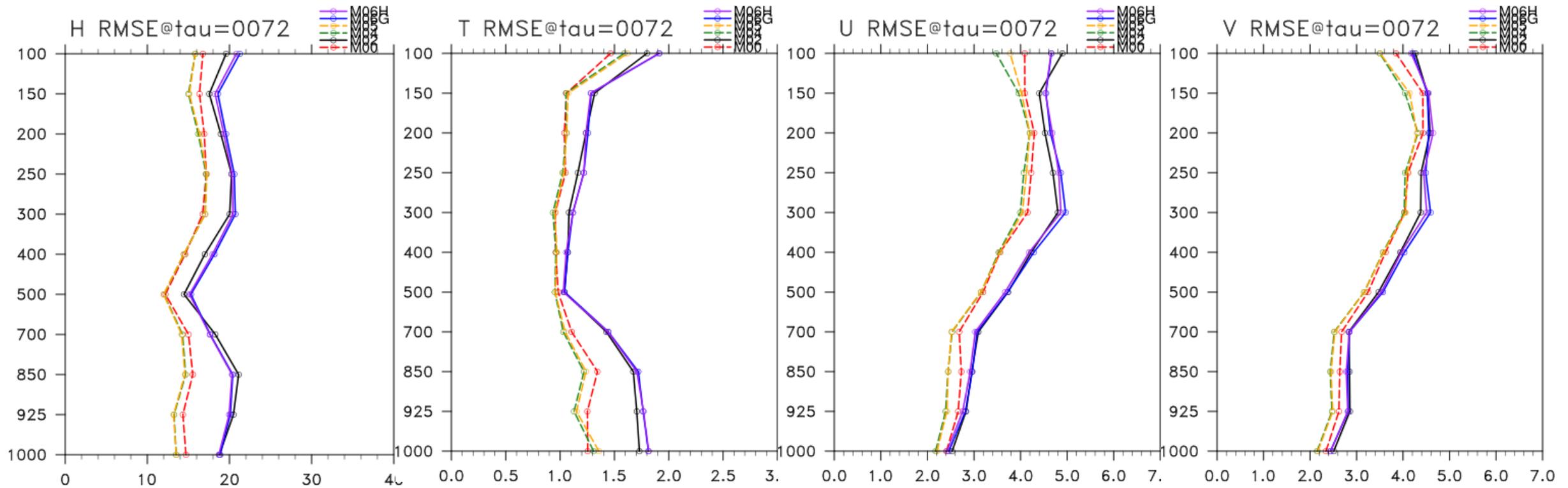
TGFS

- 水平內插：波譜→區域模式網格
- 垂直內插：sigma→sigma  
(垂直層較密)

IC、BC

WPS / WRF

# M04? M06?

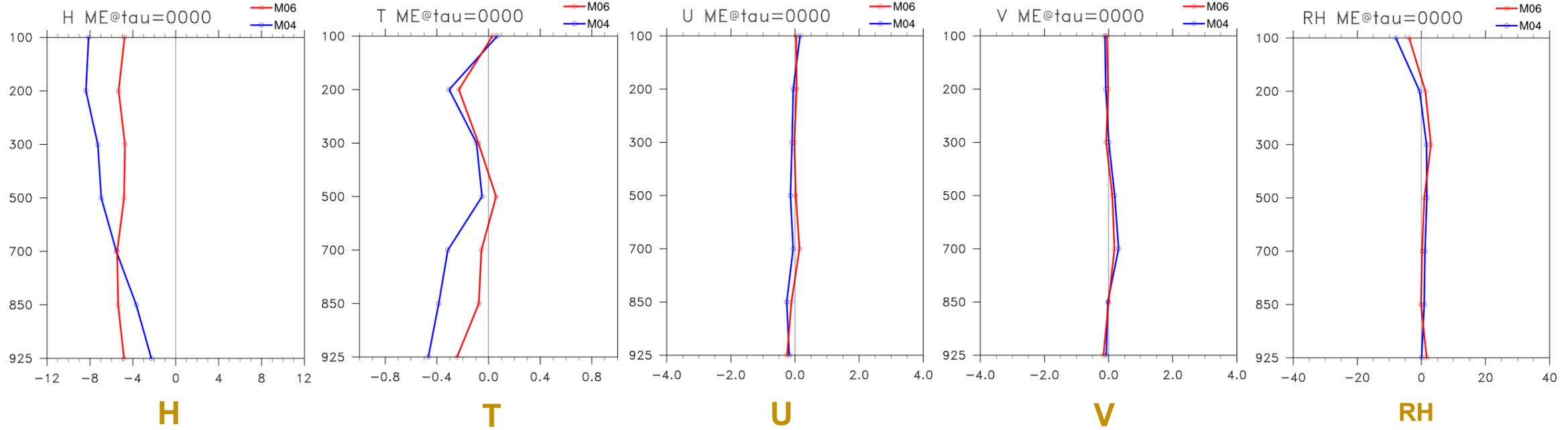


# 15km – 00 h fcst Against EC

- M04 - M06

冬 2024/01/02~01/16  
00 UTC

ME



H

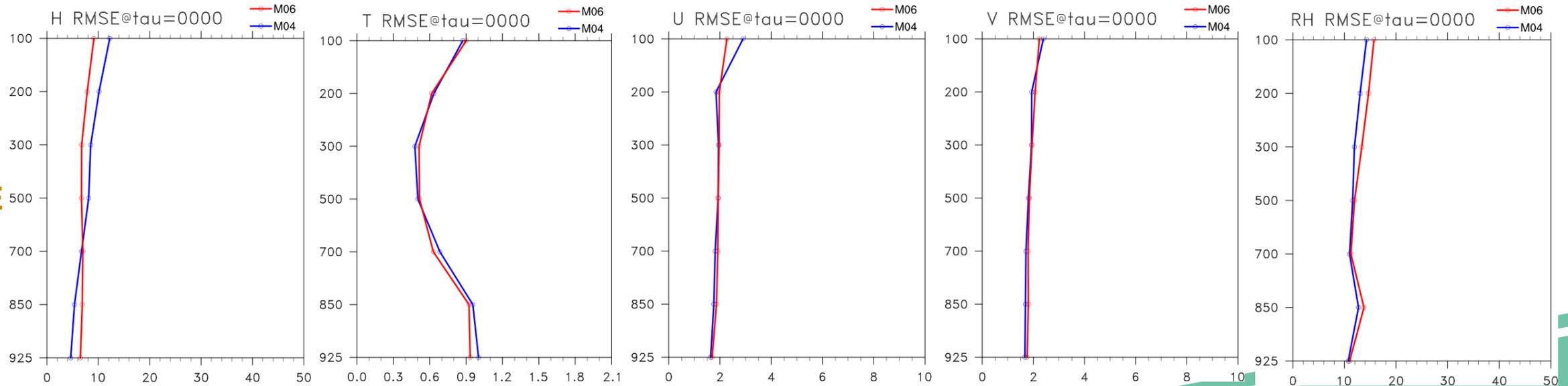
T

U

V

RH

RMSE



H RMSE@tau=0000

T RMSE@tau=0000

U RMSE@tau=0000

V RMSE@tau=0000

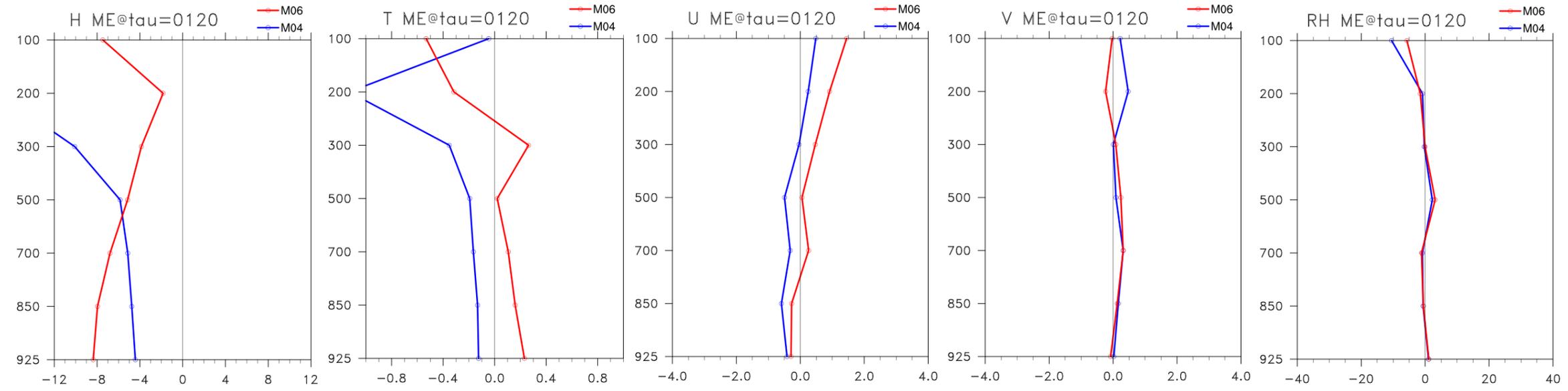
RH RMSE@tau=0000

# 15km – 120 h fcst Against EC

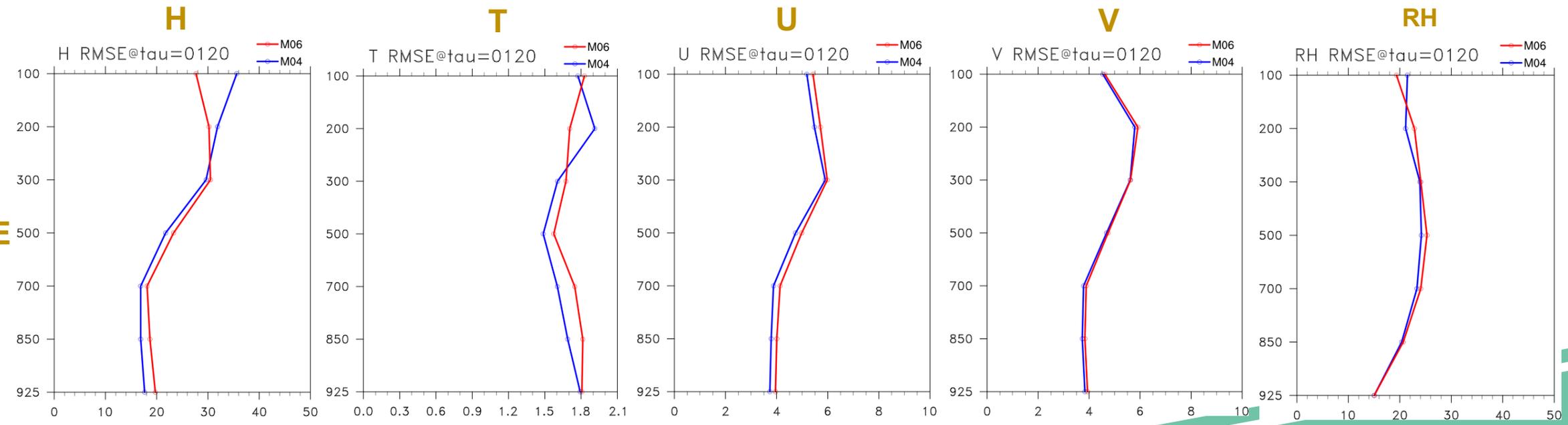
- M04 - M06

冬 2024/01/02~01/16  
00 UTC

ME



RMSE

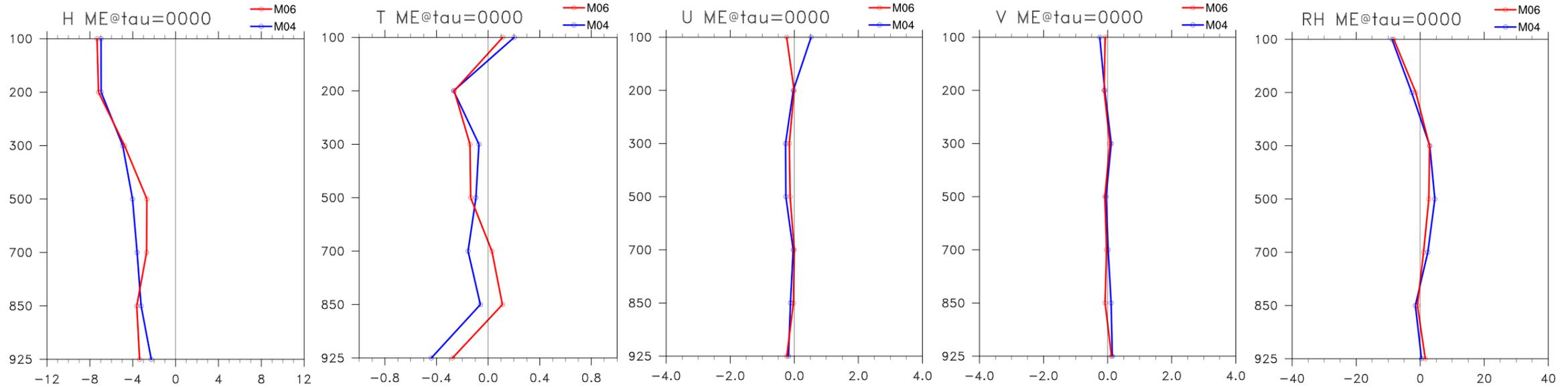


# 15km – 00 h fcst Against EC

- M04 - M06

夏 2023/08/02~08/16  
00 UTC

ME



H

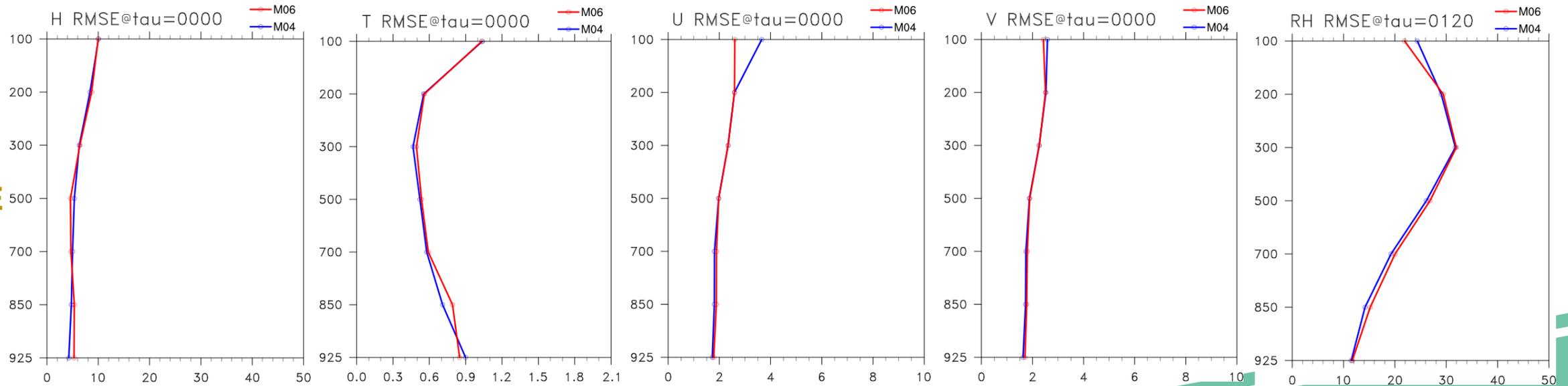
T

U

V

RH

RMSE

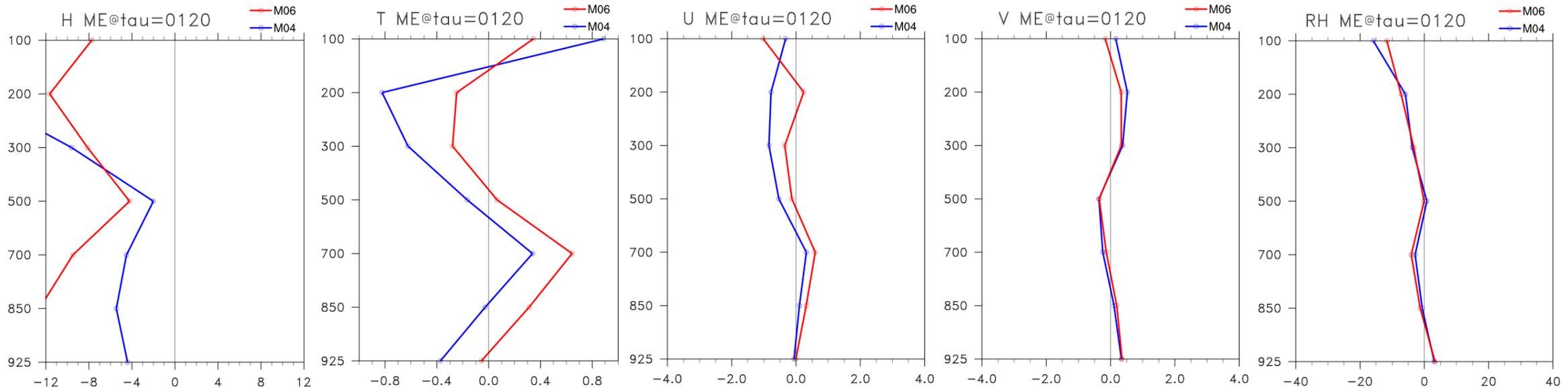


# 15km – 120 h fcst Against EC

- M04 - M06

夏 2023/08/02~08/16  
00 UTC

ME



H

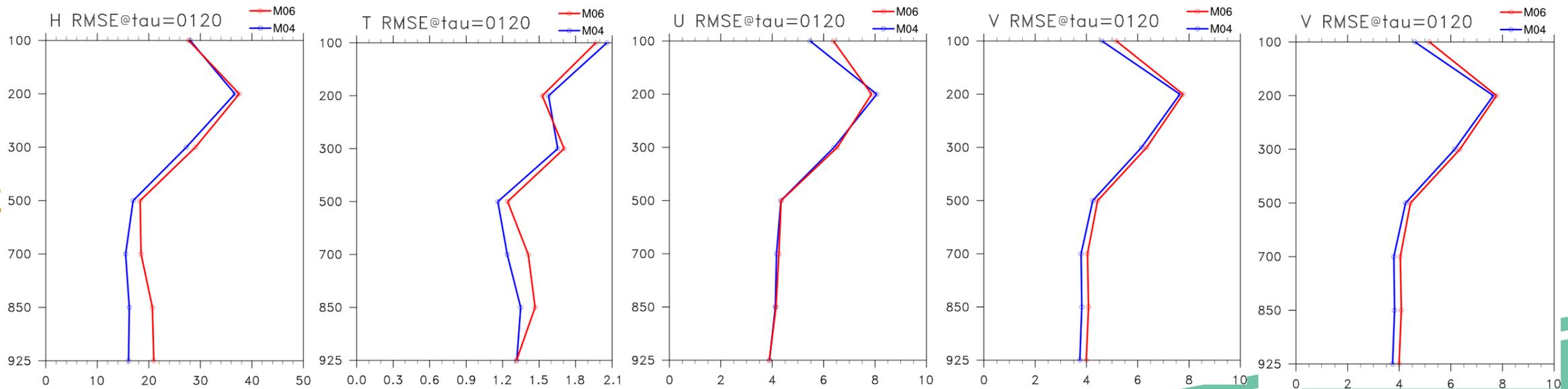
T

U

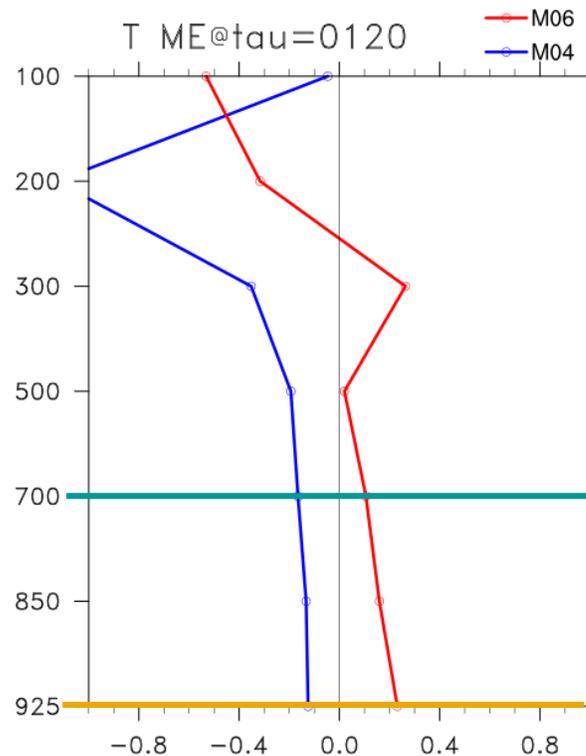
V

RH

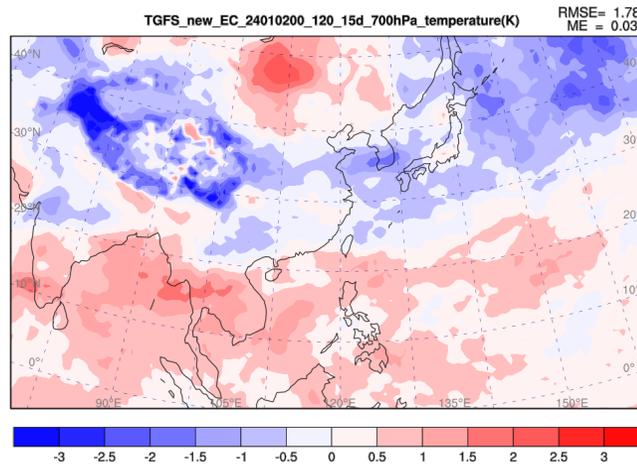
RMSE



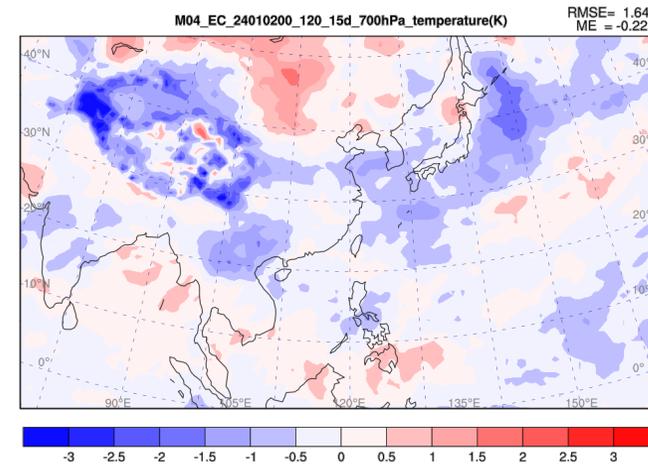
700 hPa



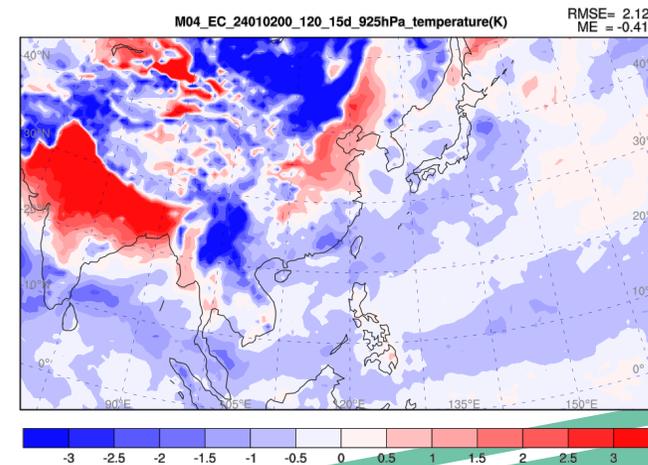
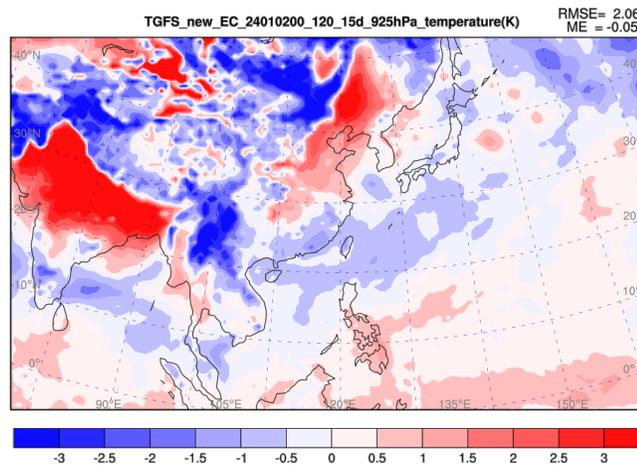
925 hPa



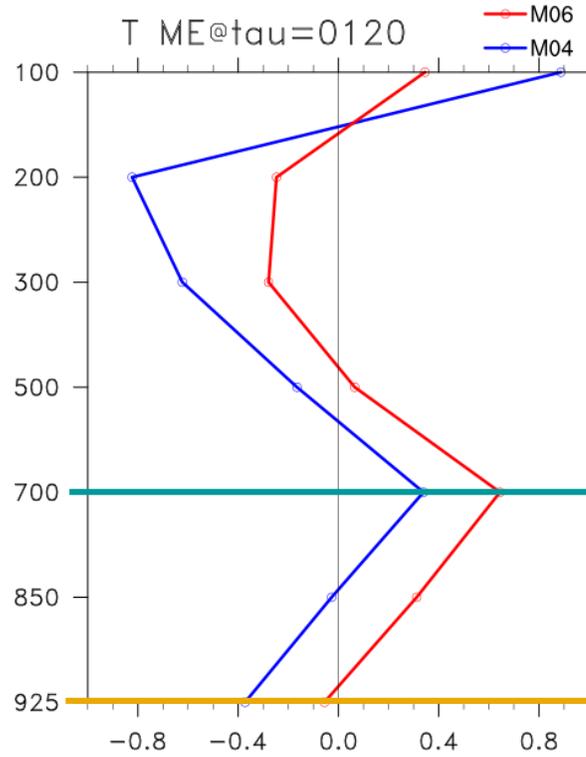
M06 - EC



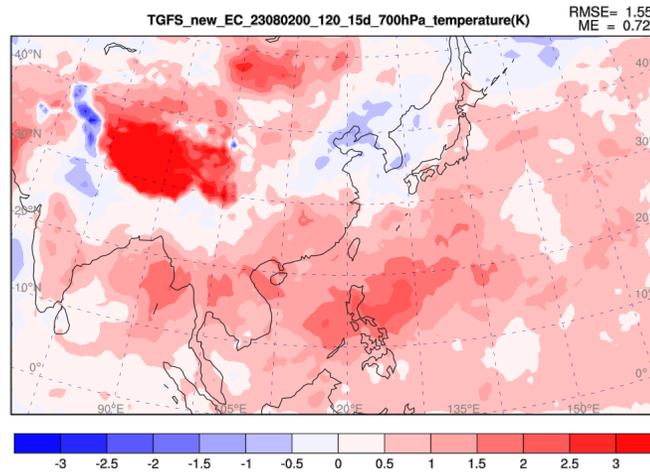
M04 - EC



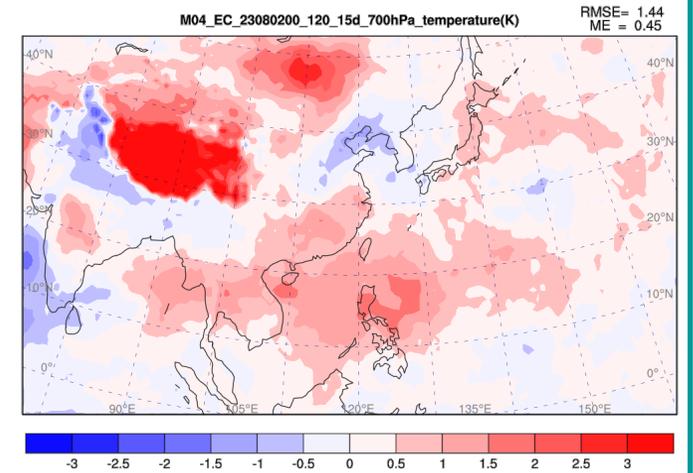
700 hPa



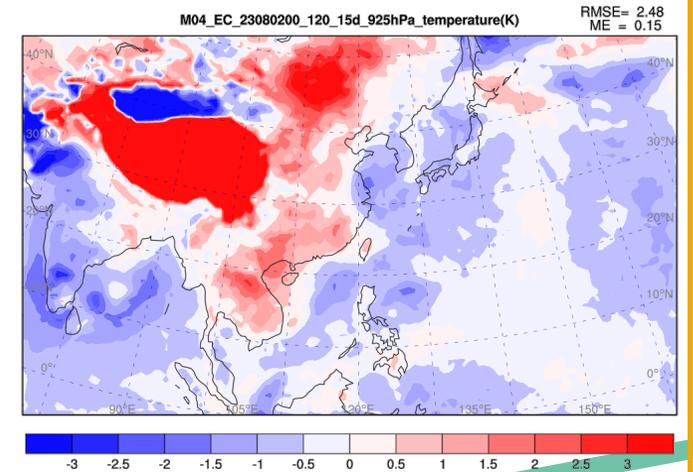
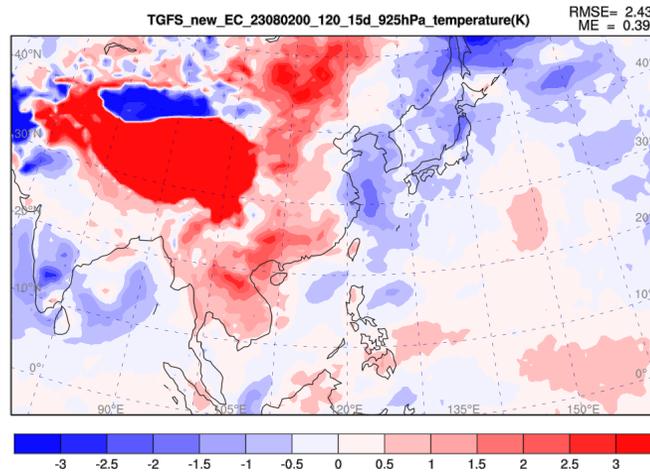
925 hPa



M06 - EC



M04 - EC



2024/01/08 00Z

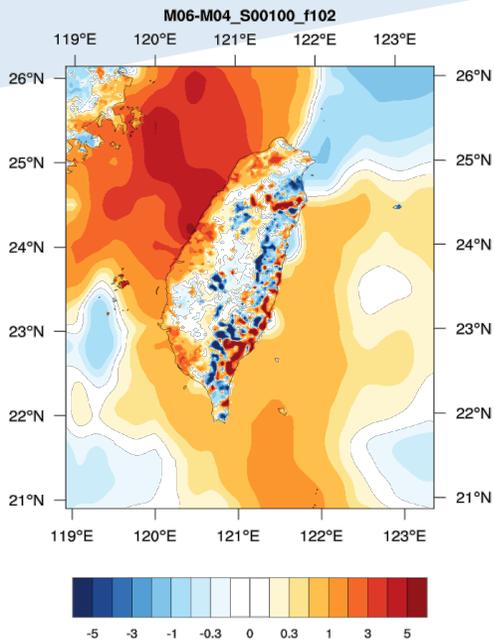
M06 - M04

DAY

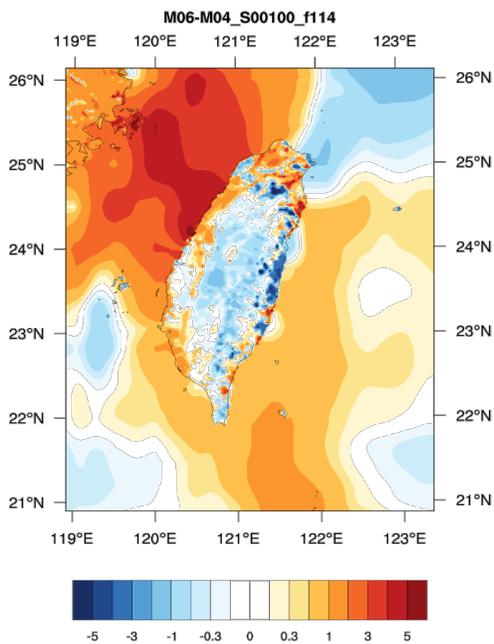
fcst : 102 h

NIGHT

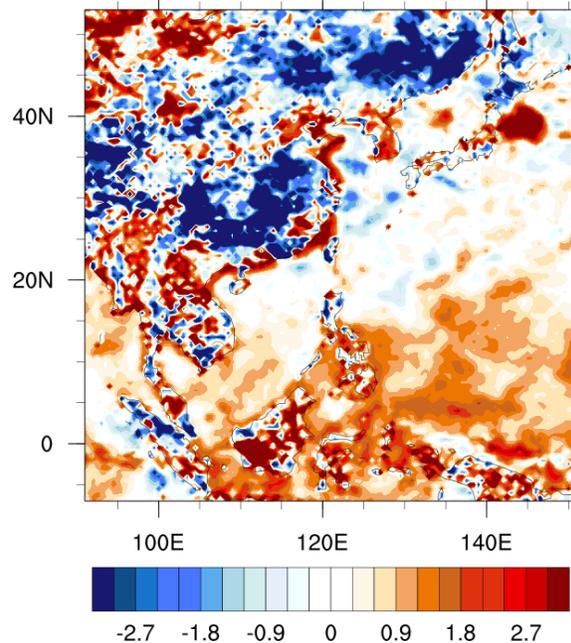
fcst : 114 h



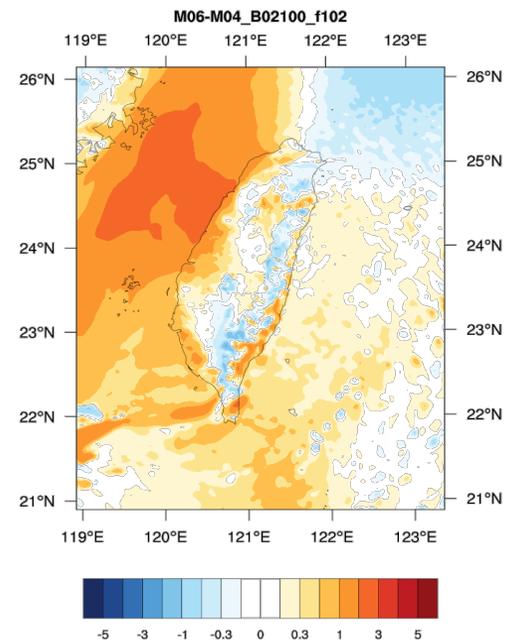
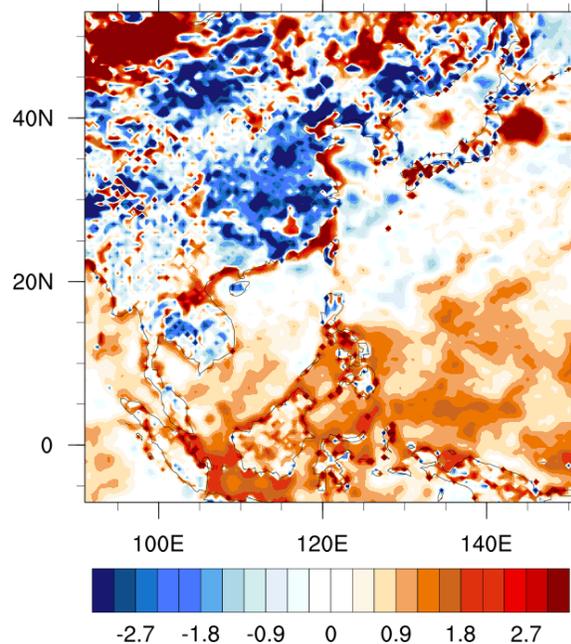
TSK



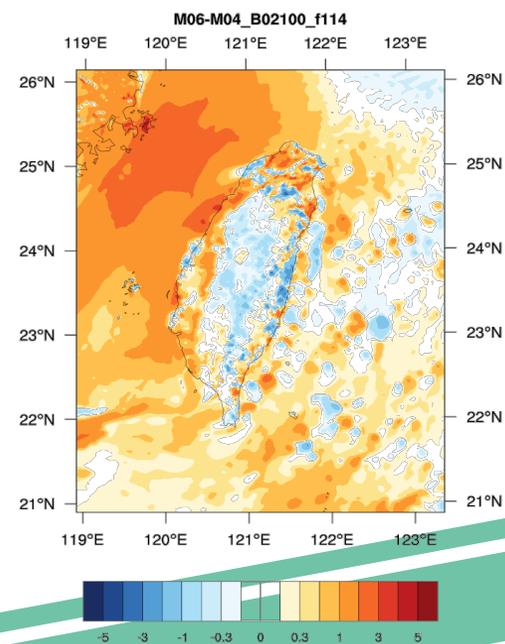
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TGFS-NCEP\_2024010800\_surfaceT\_F114

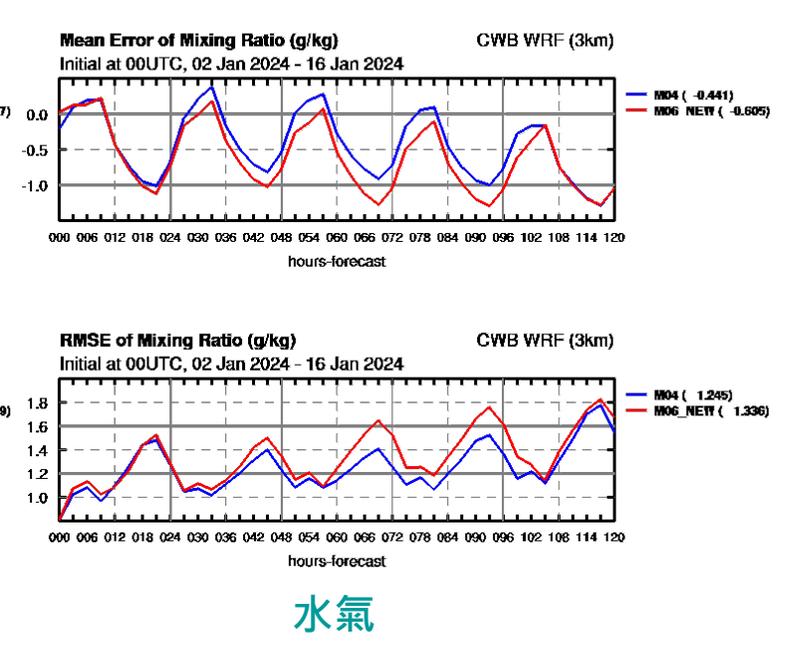
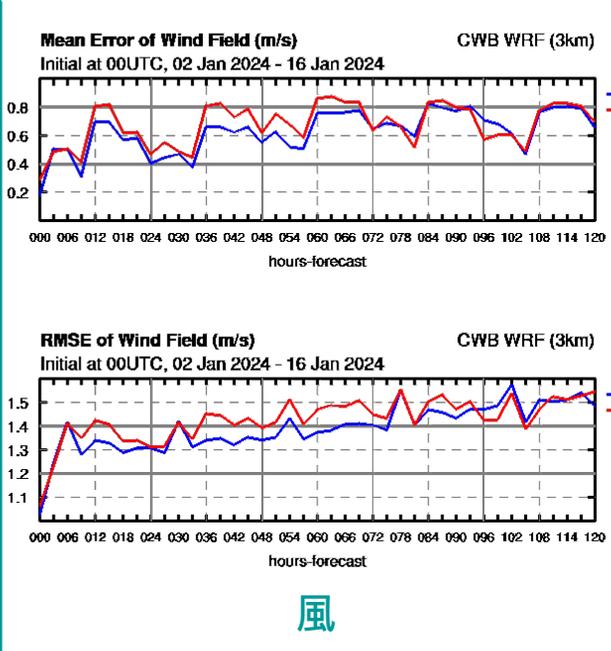
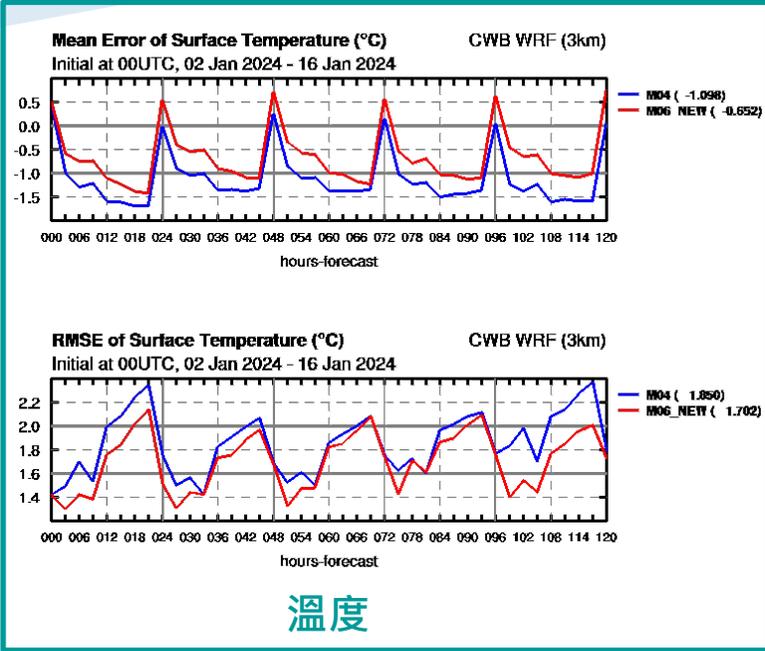


T2m

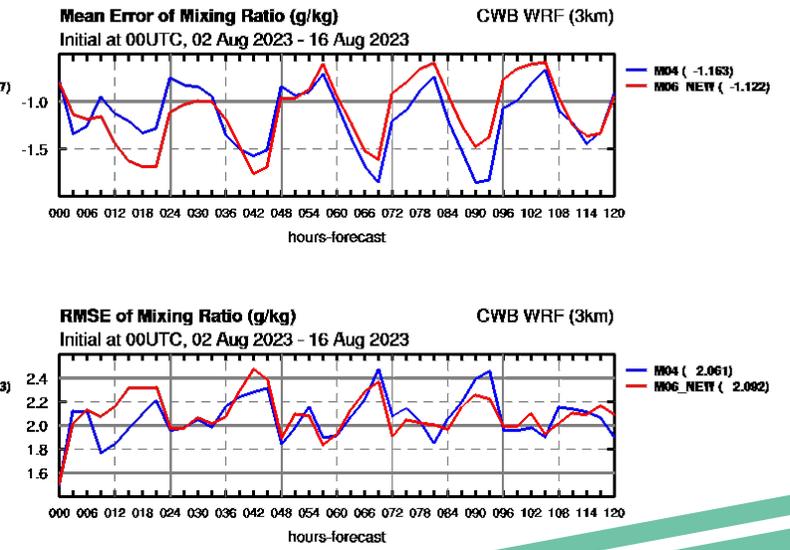
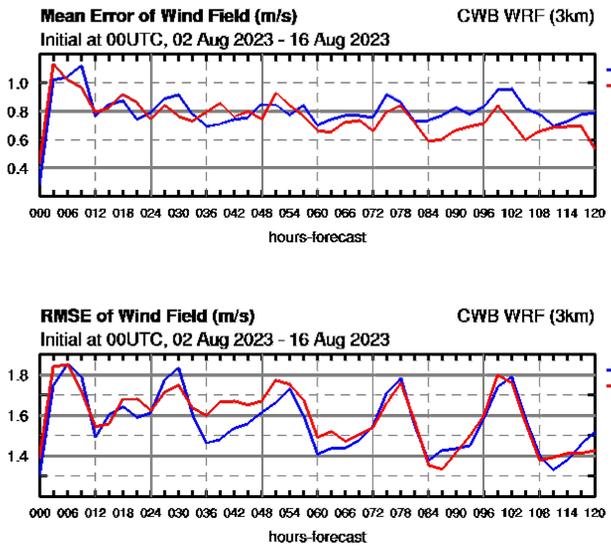
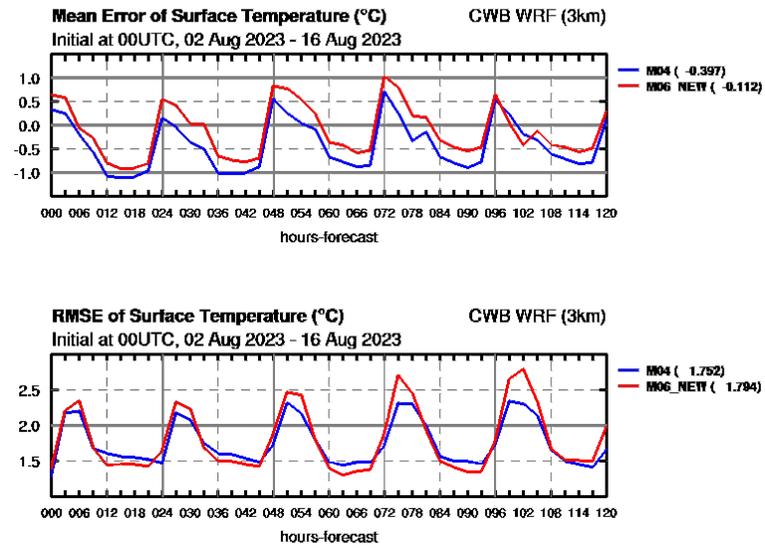


# 3 km Taiwan Against OBS

冬 2024/01/02~01/16 00 UTC



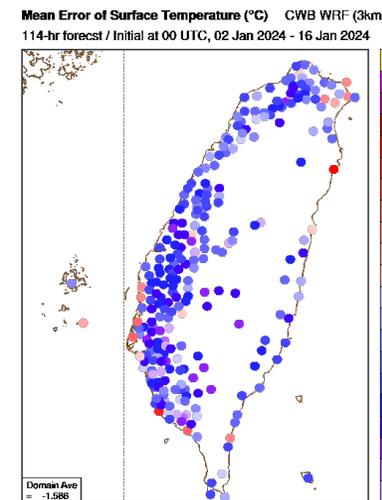
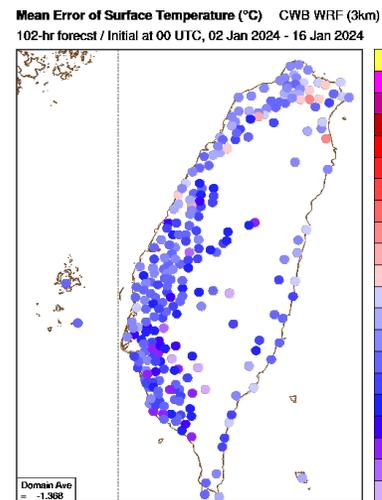
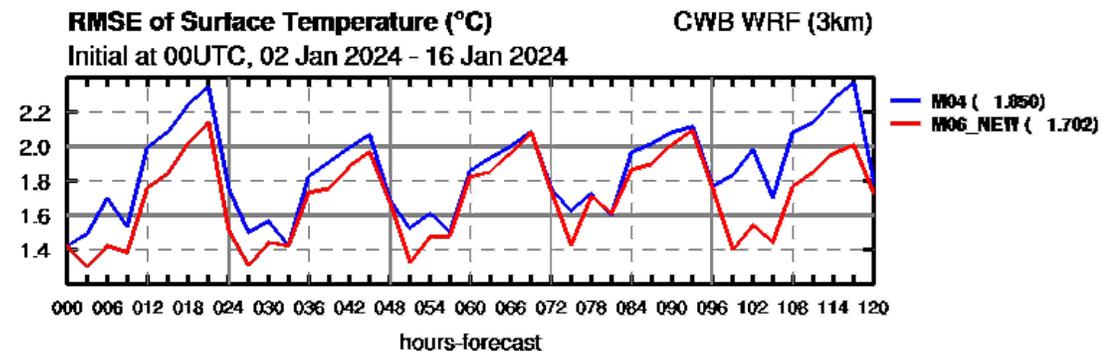
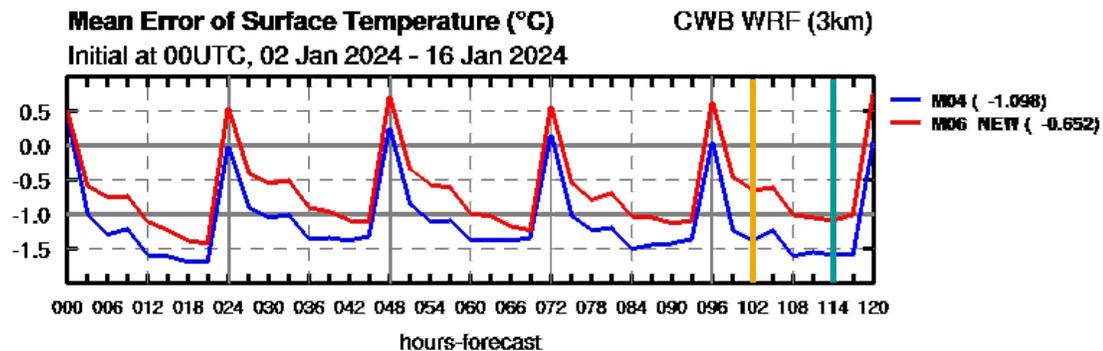
- M04  
- M06



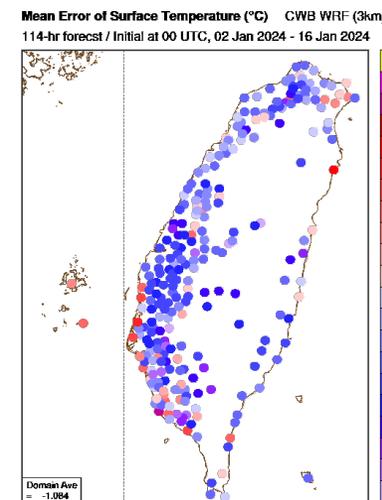
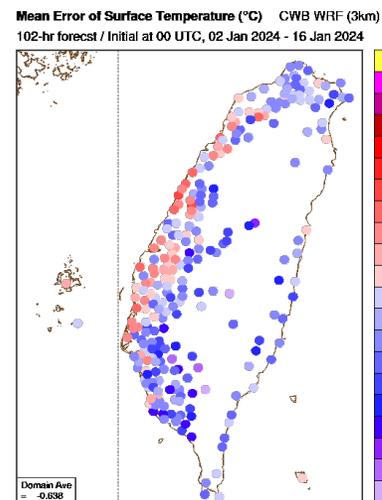
夏 2023/08/02~08/16 00 UTC

# 3 km Taiwan Against OBS

## T2 - mean error



M04



## 結論

### □ 區域模式介接TGFS綜觀預報表現：

- 與M04相比：溫度、高度場預報較差，風場與RH表現相近

### □ 區域模式介接TGFS台灣地區地面預報表現：

- 地面溫度表現比M04好
- 地面風和水氣與M04接近

**CWA所使用的TGFS相較於NCEP，除了水平和垂直解析度優勢外，也更新地表靜態資料，可提供更好的IC、BC給區域模式**

