

使用Blending方法進行 系集平均場置換對於 EAKF之效能分析

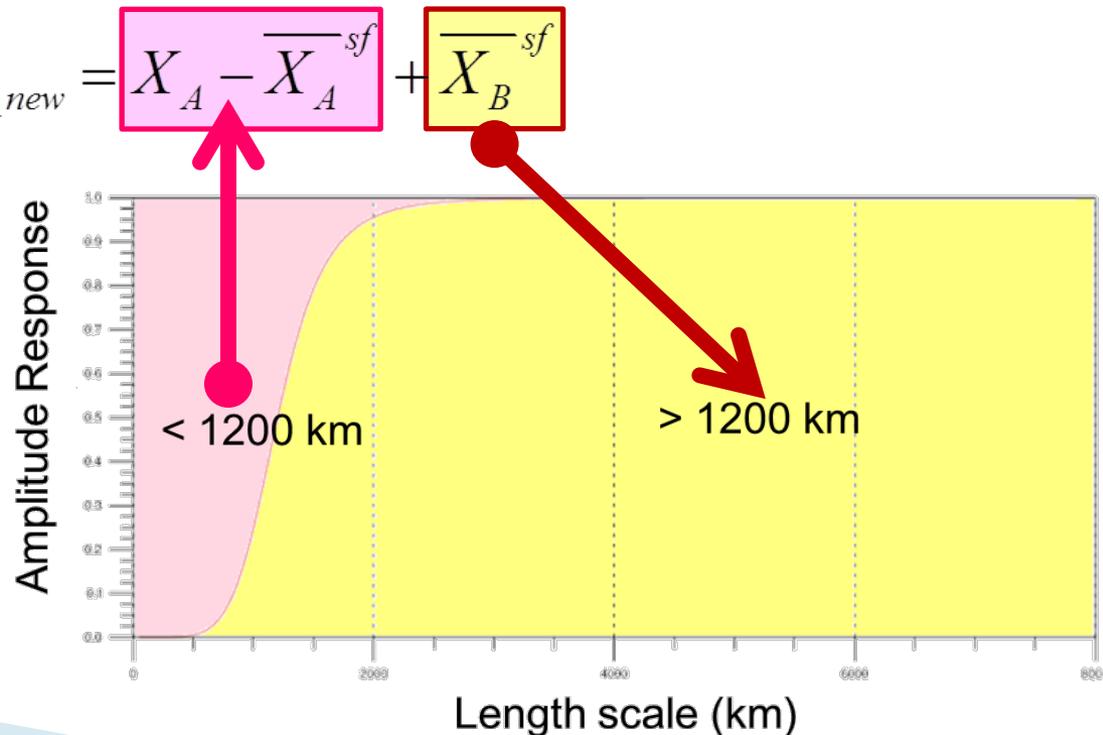
2015/09/17

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Blending方法之基本原理

- ▶ 運用spatial filter方法，將兩種不同模式進行環流尺度分離，並重新結合，得出全新的模式參數場（Yang, 2005），該方法稱為Blending。

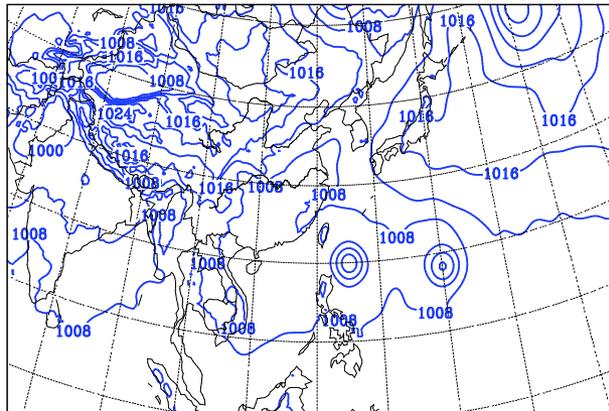
- ▶ 公式：
$$X_{A_new} = X_A - \overline{X_A}^{sf} + \overline{X_B}^{sf}$$



Development of the Blending scheme

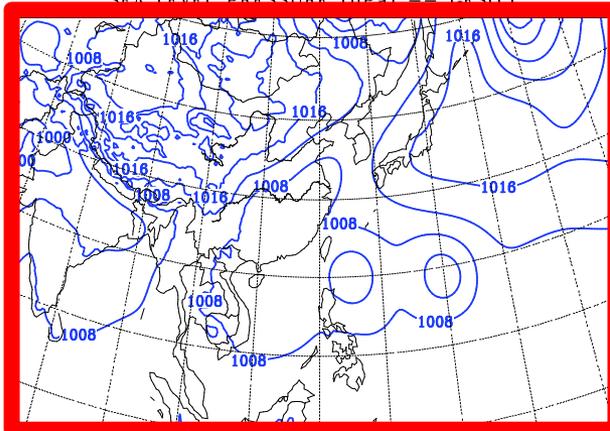
GFS

SEA LEVEL PRESSURE (hPa) -- GFS



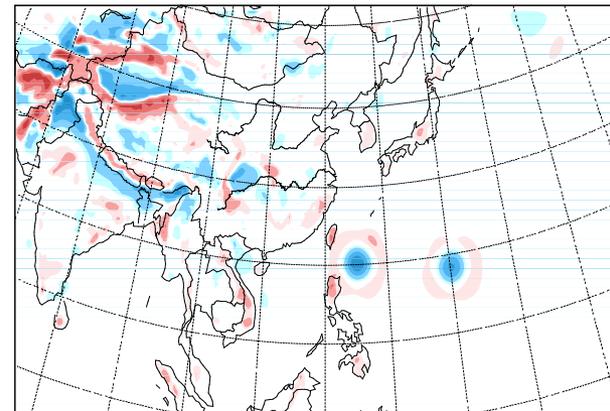
GFS (>1200km)

SEA LEVEL PRESSURE (hPa) -- GFS(L)



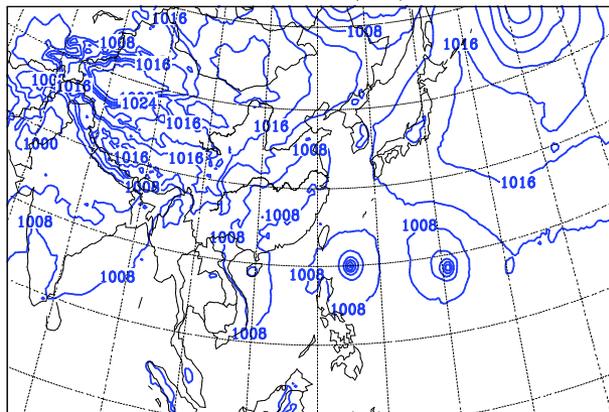
GFS (difference)

SEA LEVEL PRESSURE (hPa) -- GFS(S)



WRF

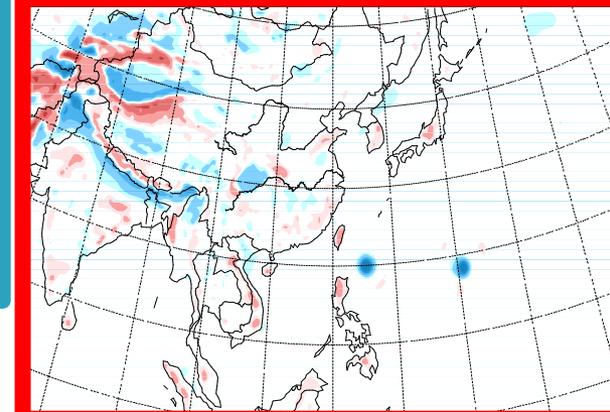
SEA LEVEL PRESSURE (hPa) -- WRF



本研究運用Blending方法，將全球模式之分析場與EAKF系集平均場結合，得到全新的系集平均場。

WRF (difference)

SEA LEVEL PRESSURE (hPa) -- WRF(S)



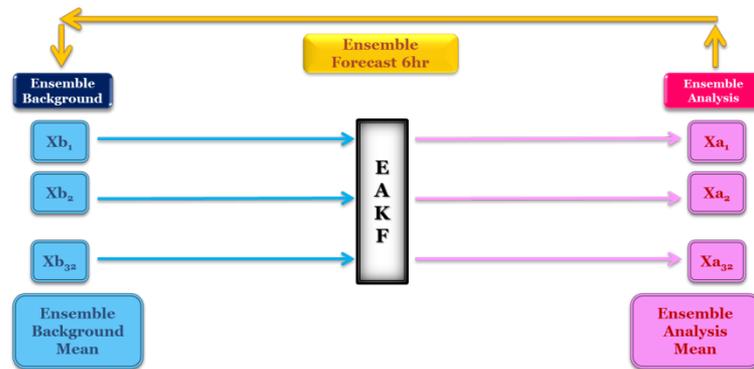
Blending方法於EAKF之目的

▶ EnKF系統需要 **spin-up** 時間

- full cycling 流程。

▶ 模式系統性偏差之問題

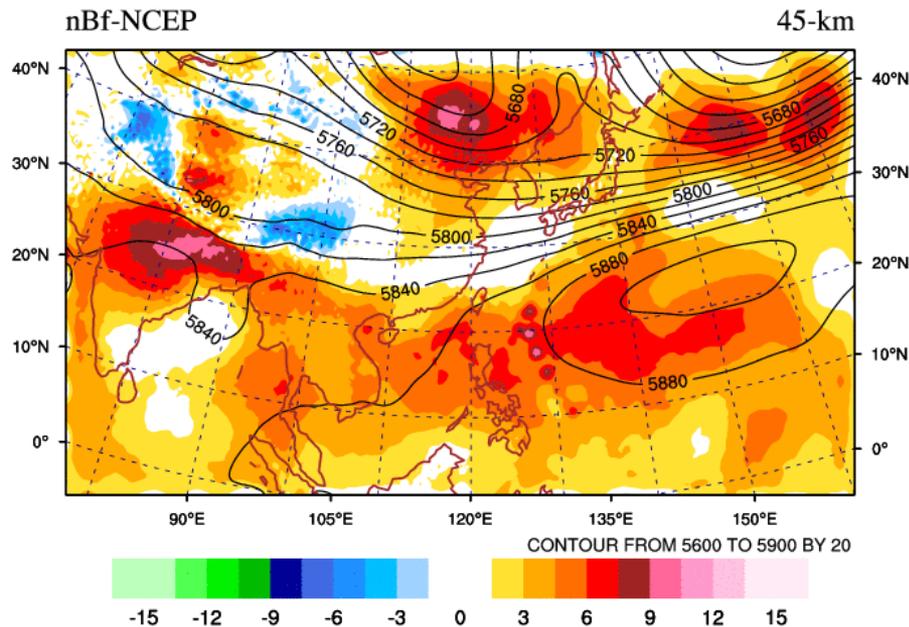
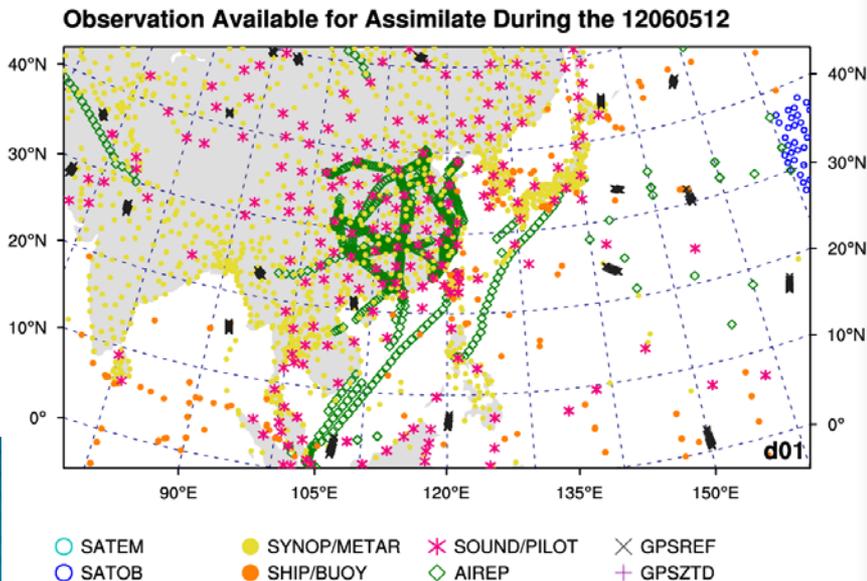
- 模式積分範圍有一半皆為 **海洋**
- 沒有同化衛星觀測



Mean Error

Mean Geopotential Height (m) at 500hPa

(Ensemble 6-hr Forecast Mean @ Valid time: 12060100 to 12063012)

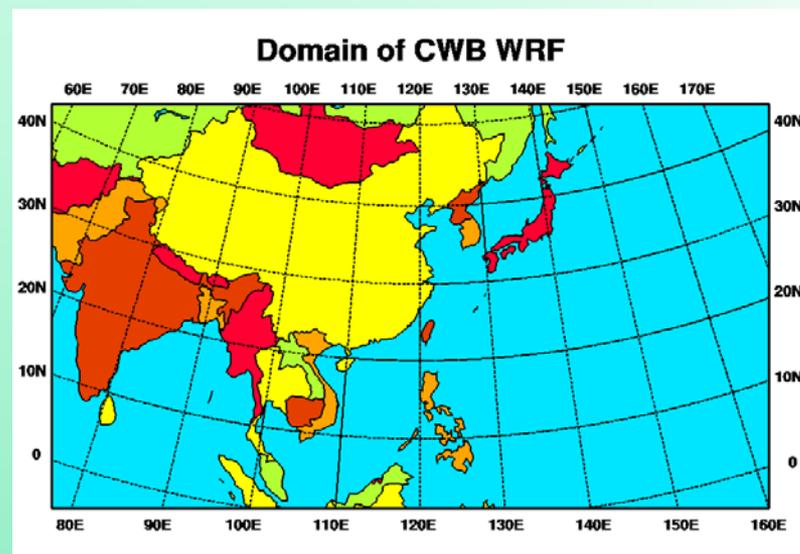


實驗設計

- **w/o** Blending
- **w/** Blending
 - **Background** Blending
 - **Analysis** Blending
- **Blended Cut-off Length Scale (CLS) :**
NCEP GFS 1200 km
- **Blended fields (13)**
 - U, V, T, QVAPOR, PH, P, MU
 - U10, V10, T2, Q2, PSFC, TH2

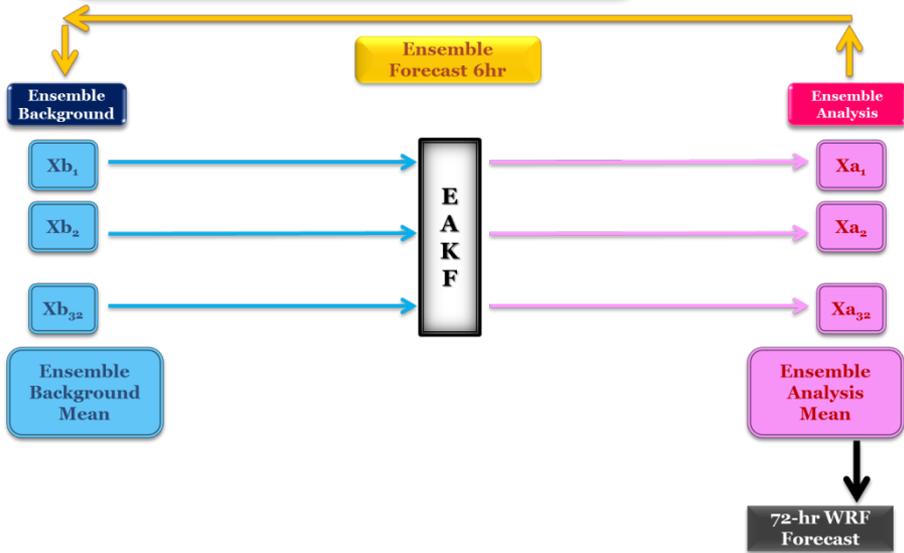
- **預報模式 :** WPS v3.3.1 +
WRF v3.3.1
- **Domain :** CWB WRF domain 1
(45KM)

- **系集成員數 :** 32個
- **更新週期 :** 6小時

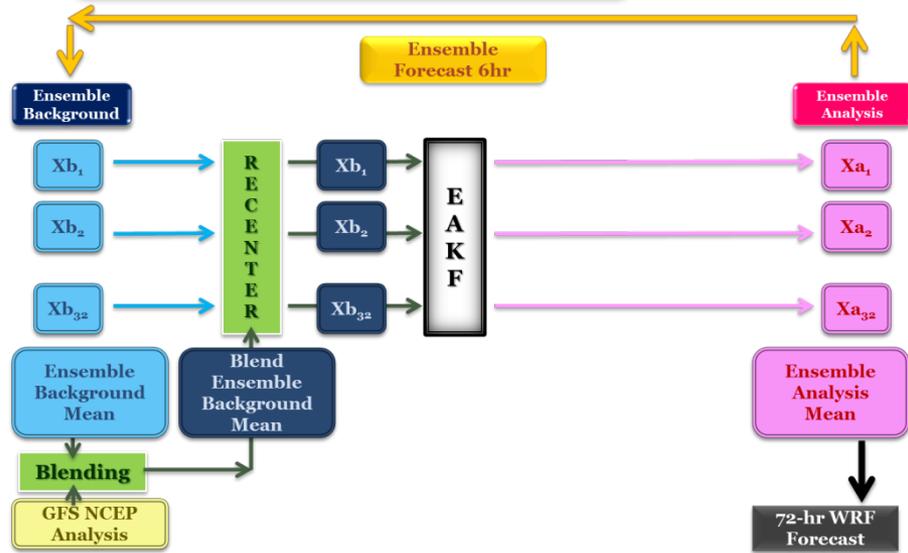


- **時間 :** 2012/05/28 06Z – 2012/05/31 18Z (spin-up)
2012/06/01 00Z – 2012/06/30 12Z

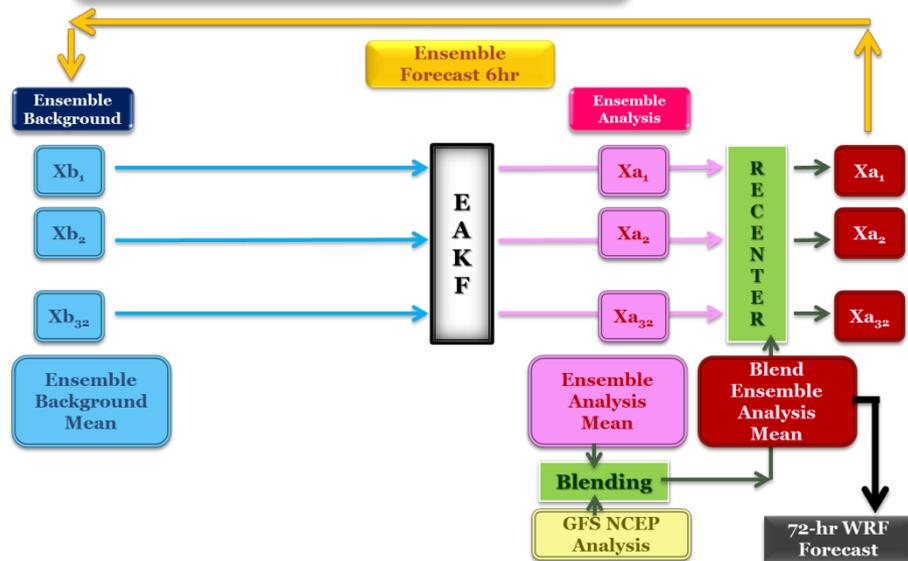
without Blending



Background Blending



Analysis Blending

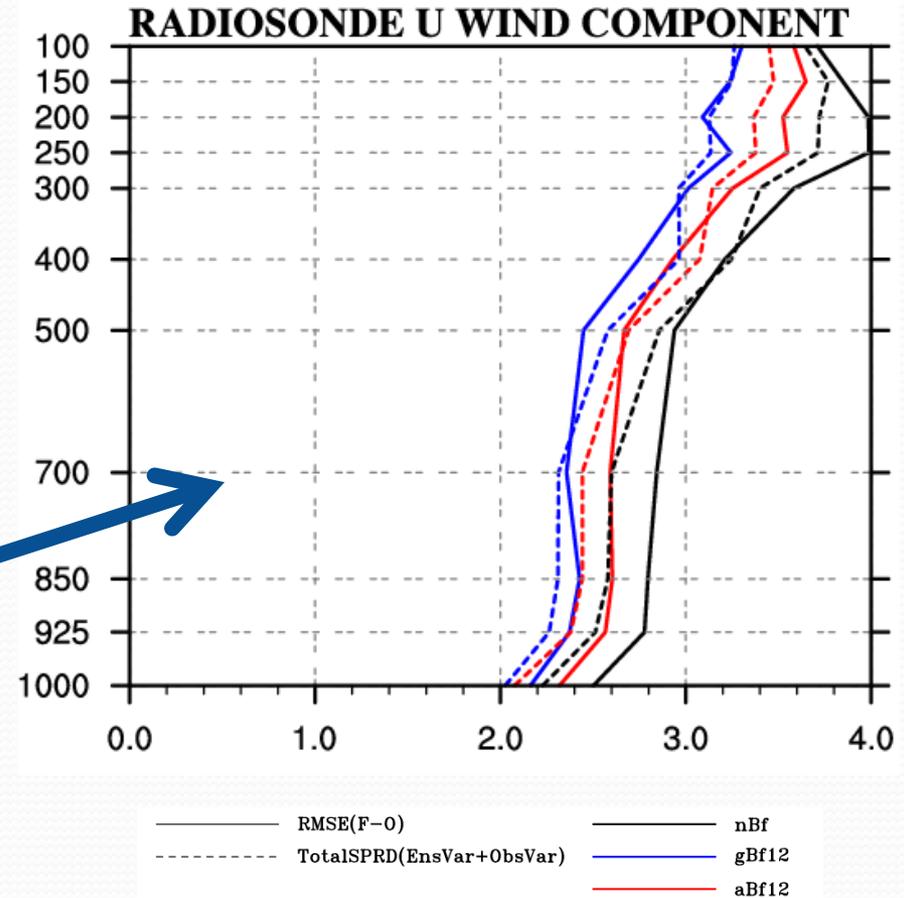
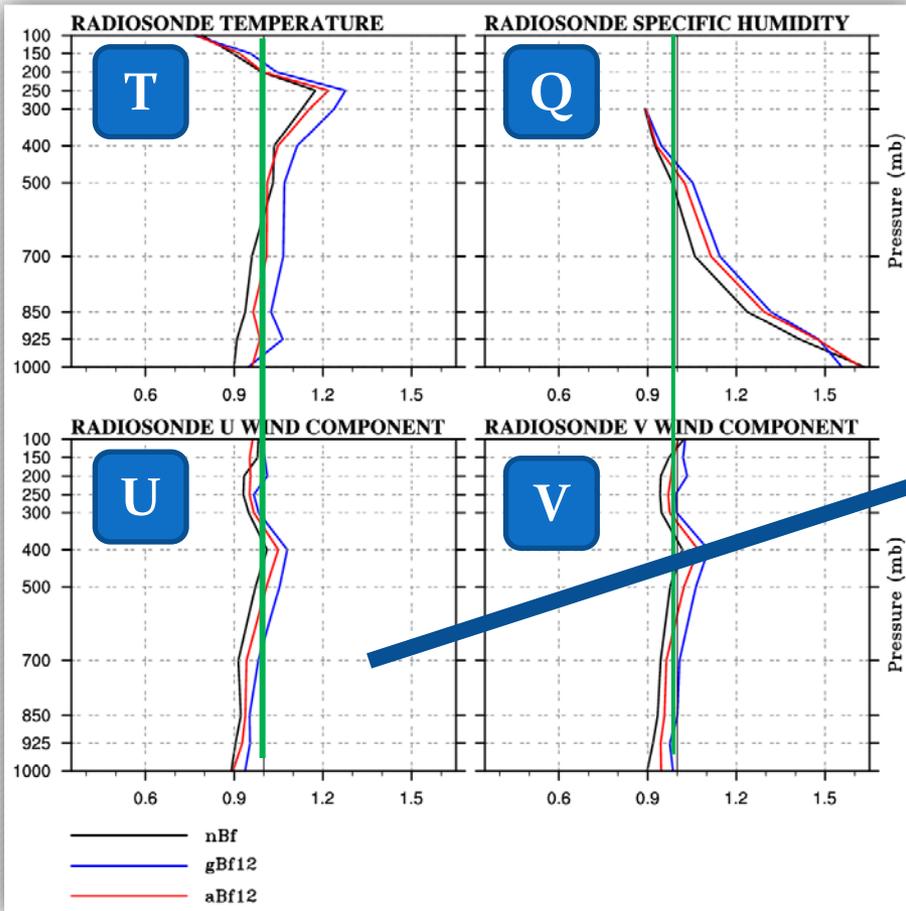


系集離散度診斷

- against 「RADIOSONDE」
- RMSE vs. TotalSPRD
 - 當TotalSPRD與RMSE兩數值相當時，表示系集成員背景場之離散程度表現為最佳狀態。
- 2012/06/01 00Z – 2012/06/30 12Z

— w/o Blending
— Background Blending
— Analysis Blending

RMSE/TotalSPRD



- 系集離散表現變佳。
- 主要是因為Ensemble Background Mean準確度之提升。

U @ 850 mb

against 「NCEP 分析場」

系集6小時預報 @ RMSE

Mean X-wind Component (m/s) at 850hPa

Mean X-wind Component (m/s) at 850hPa

Mean X-wind Component (m/s) at 850hPa

(Ensemble 6-hr Forecast Mean @ Valid time: 12060100 to 12063012)

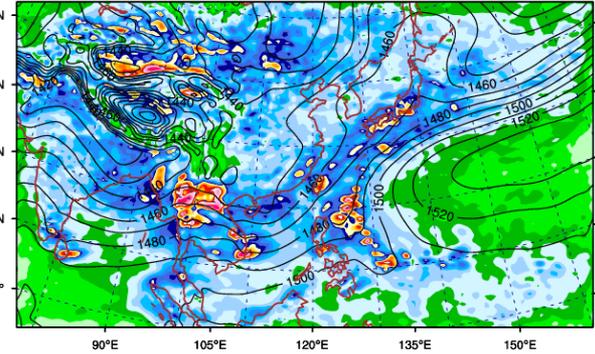
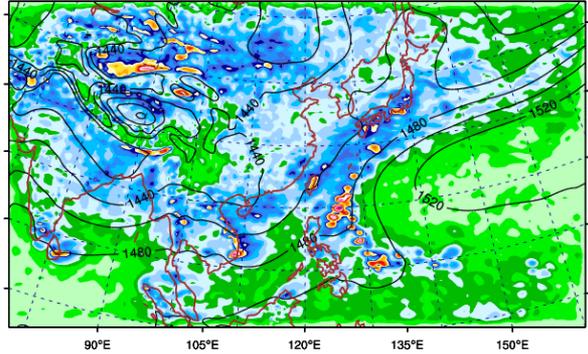
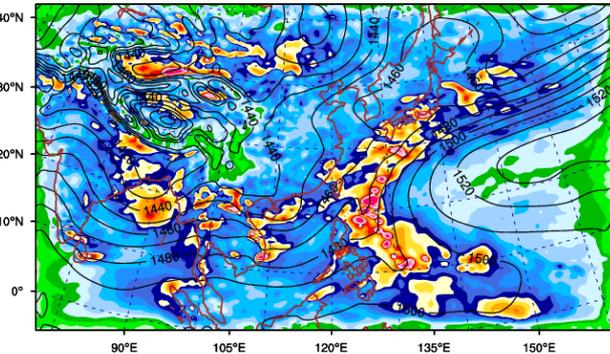
(Ensemble 6-hr Forecast Mean @ Valid time: 12060100 to 12063012)

(Ensemble 6-hr Forecast Mean @ Valid time: 12060100 to 12063012)

nBf-NCEP 45-km

gBf12-NCEP 45-km

aBf12-NCEP 45-km



CONTOUR FROM 1390 TO 1530 BY 10

CONTOUR FROM 1360 TO 1520 BY 20

CONTOUR FROM 1380 TO 1530 BY 10

0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

w/o Blending

Background Blending

Analysis Blending

Mean Ensemble 6-hr Forecast Spread of 850-hPa

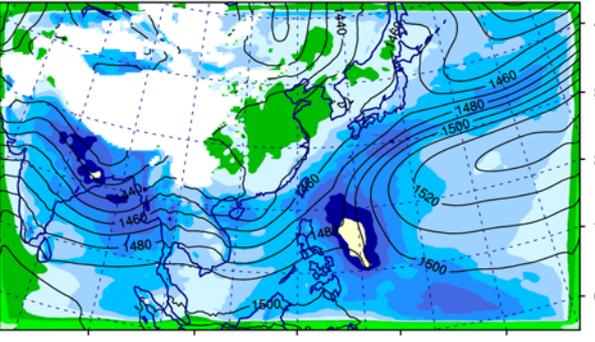
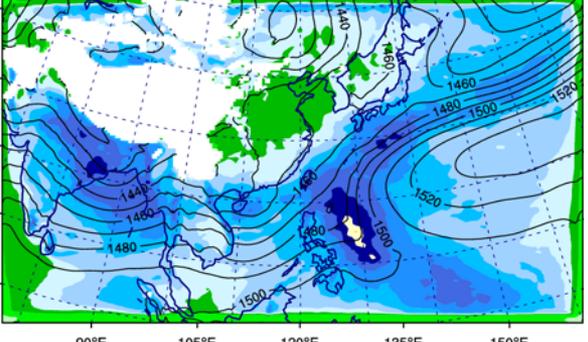
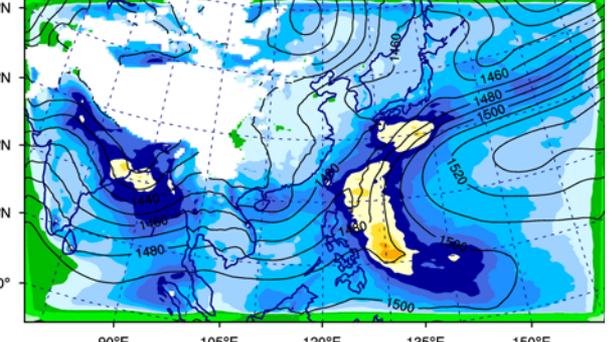
Mean Ensemble 6-hr Forecast Spread of 850-hPa

Mean Ensemble 6-hr Forecast Spread of 850-hPa

Initial from 0000 UTC 01 Jun 2012 to 1200 UTC 30 Jun 2012

Initial from 0000 UTC 01 Jun 2012 to 1200 UTC 30 Jun 2012

Initial from 0000 UTC 01 Jun 2012 to 1200 UTC 30 Jun 2012



CONTOUR FROM 1410 TO 1530 BY 10

CONTOUR FROM 1410 TO 1530 BY 10

CONTOUR FROM 1410 TO 1530 BY 10

0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

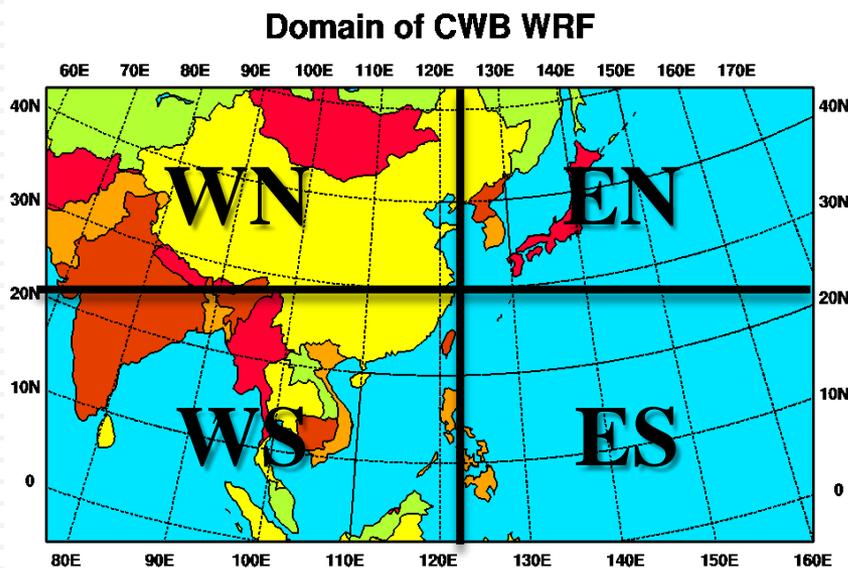
0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

0 0.6 1.2 1.8 2.4 3 3.6 4.2 4.8 5.4 6

系集6小時預報 @ SPRD

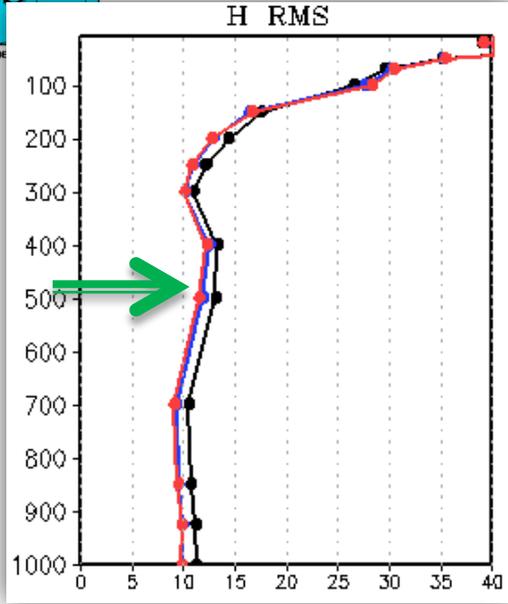
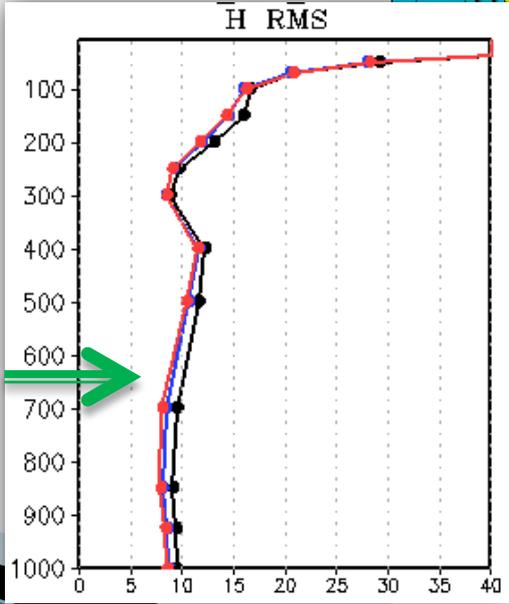
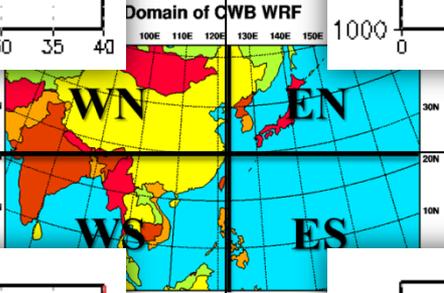
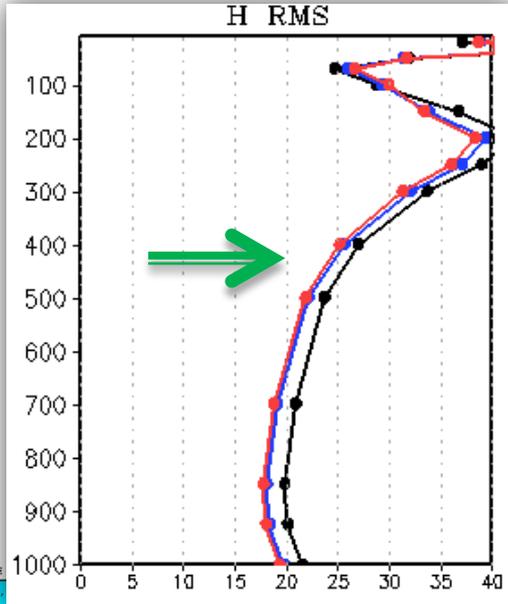
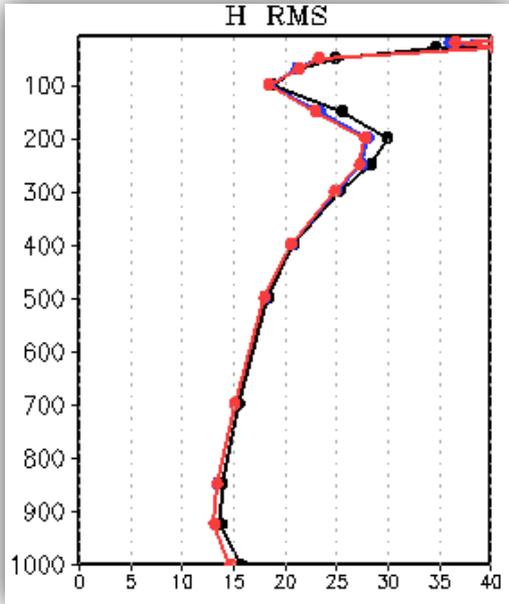
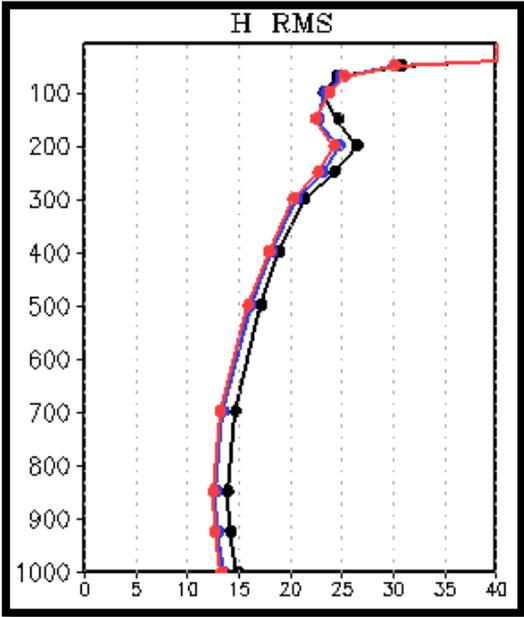
72小時預報得分校驗

- against 「NCEP 分析場」
- 2012/06/01 00Z – 2012/06/30 12Z



H

All Domain

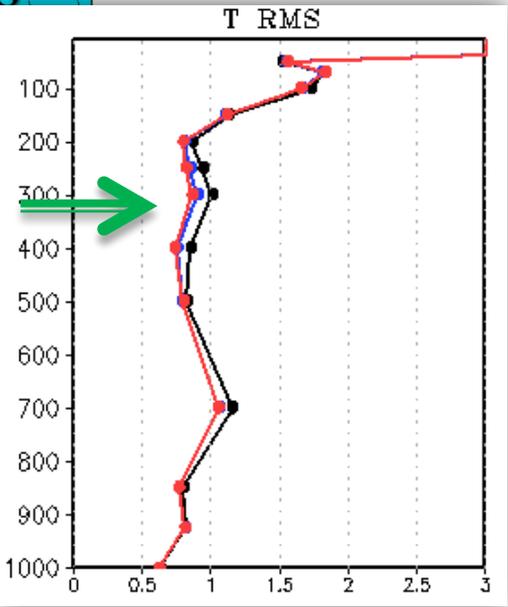
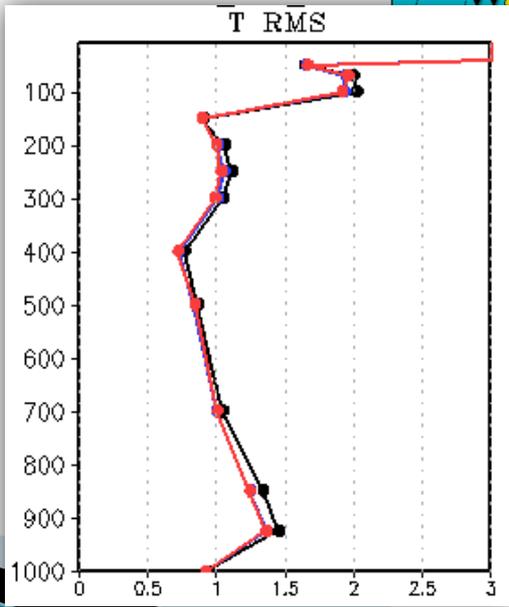
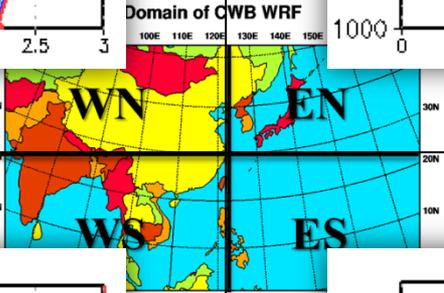
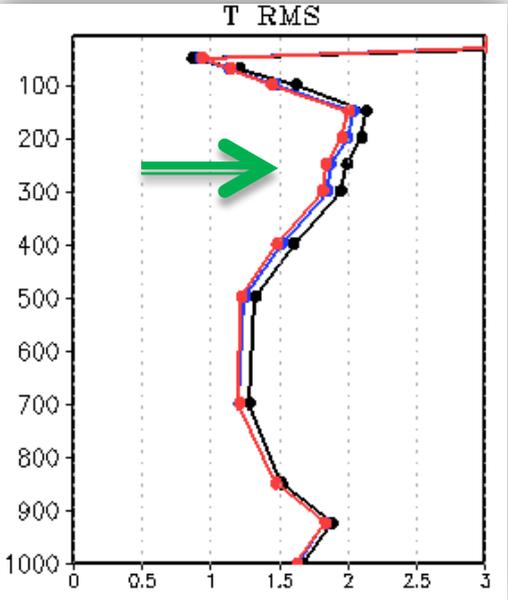
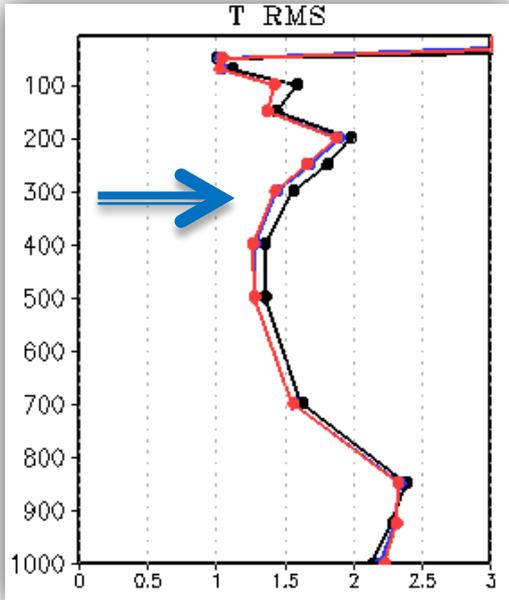
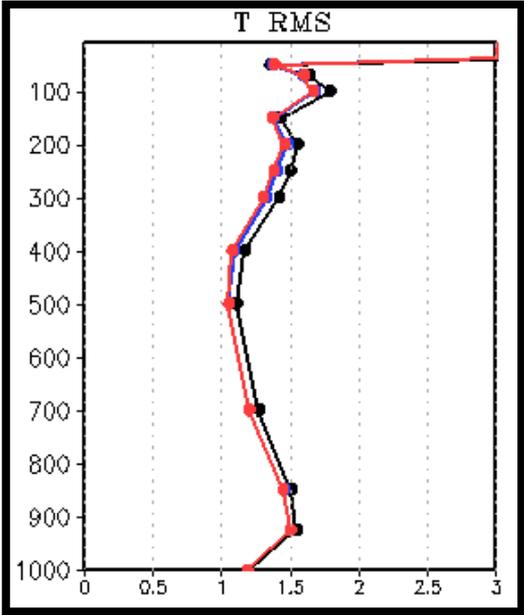


— w/o Blending
— Background Blending
— Analysis Blending

72-hr

T

All Domain

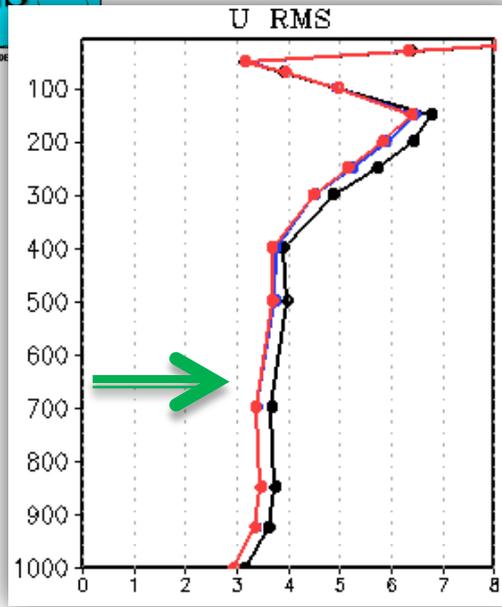
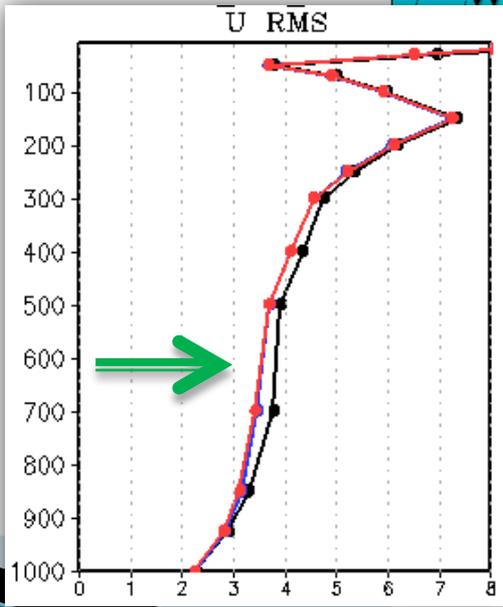
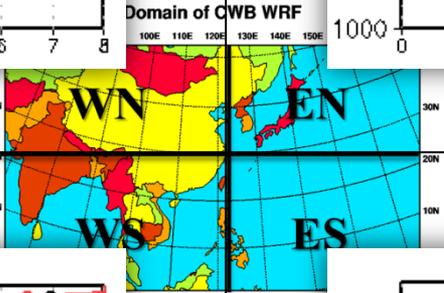
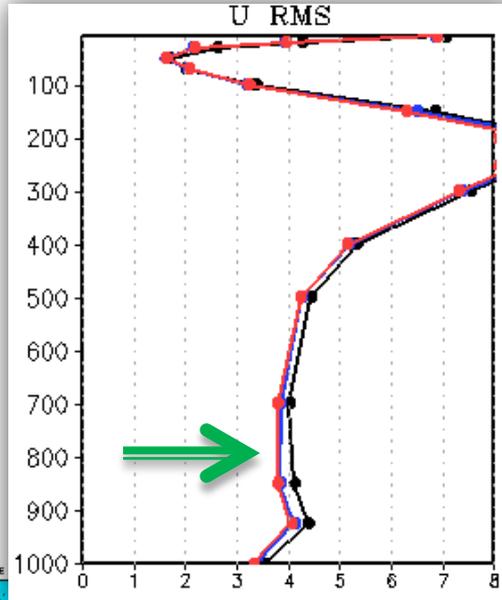
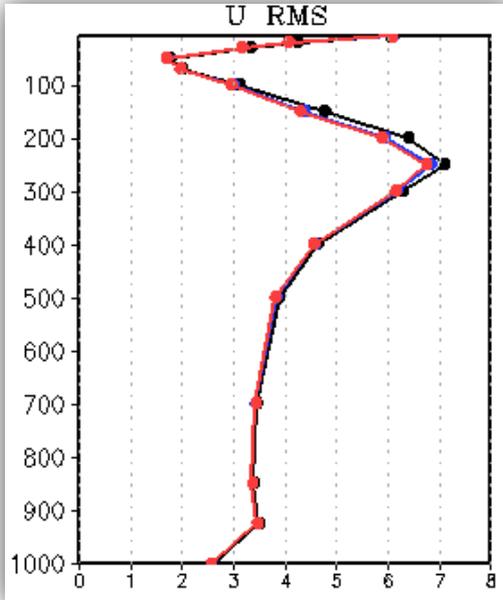
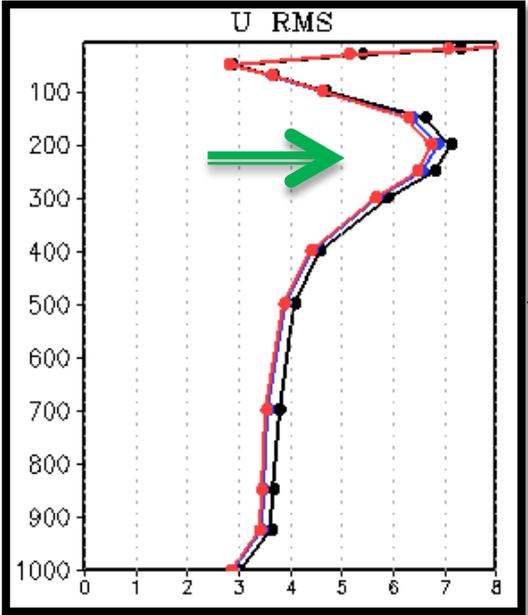


— w/o Blending
— Background Blending
— Analysis Blending

72-hr

U

All Domain

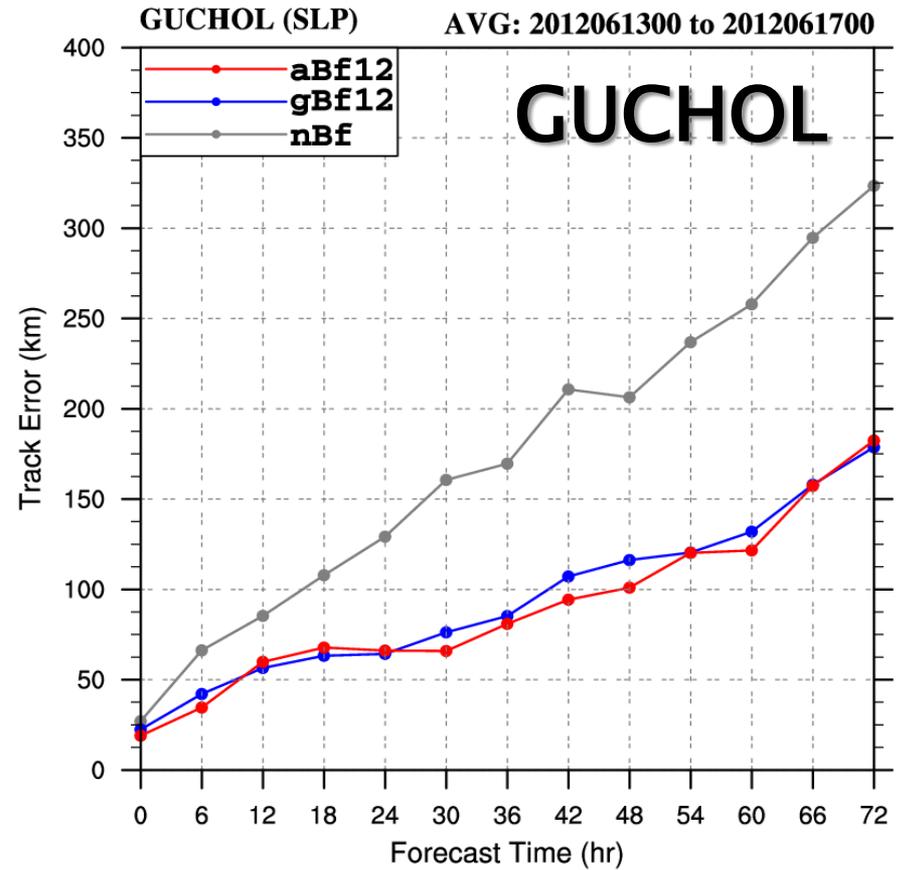
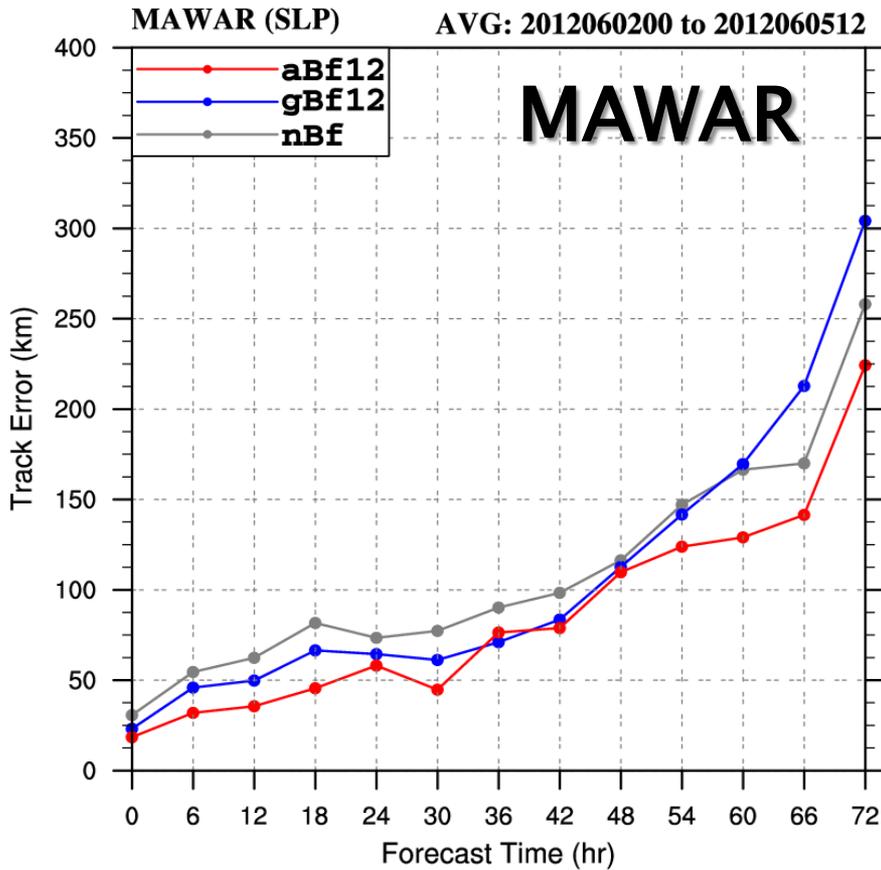


— w/o Blending
— Background Blending
— Analysis Blending

72-hr

颱風路徑預報誤差

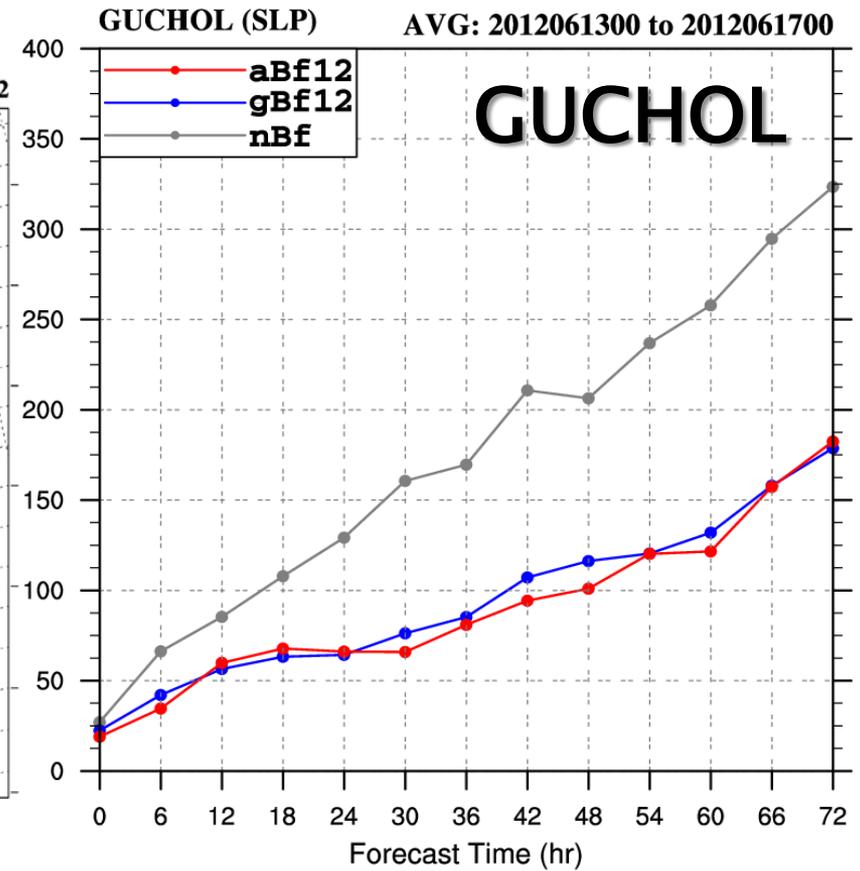
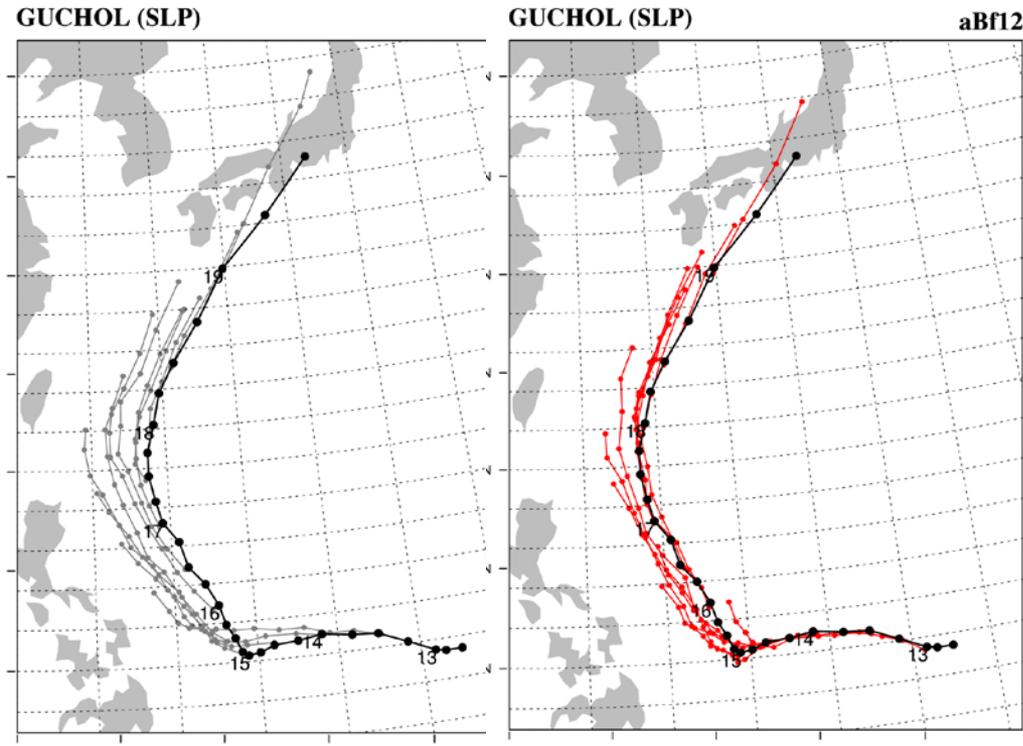
- w/o Blending
- Background Blending
- Analysis Blending



路徑預報誤差表現，Analysis Blending最佳。
w/o Blending的預報誤差表現皆最差。

颱風路徑預報誤差

- w/o Blending
- Background Blending
- Analysis Blending



路徑預報誤差表現，Analysis Blending最佳。w/o Blending的預報誤差表現皆最差。

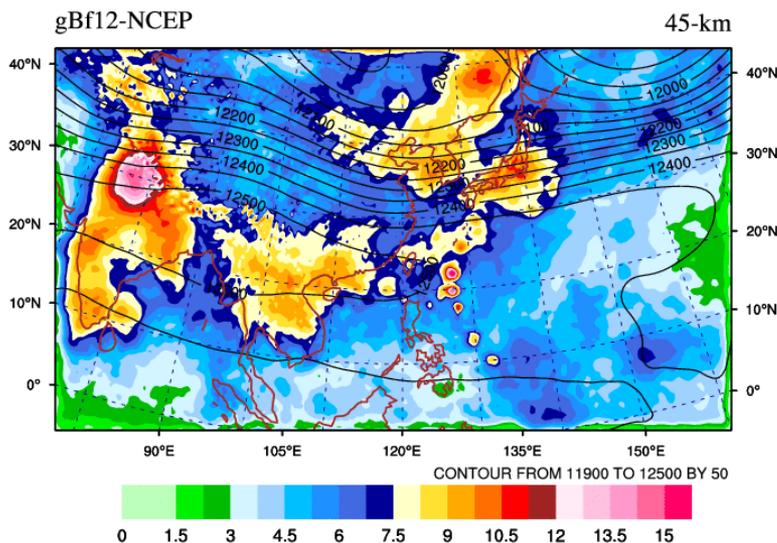
結論

結論

- ▶ 使用 Blending 方法之EAKF的離散度表現與預報表現皆明顯改進許多，然而又以Analysis Blending策略的預報結果最好。
- ▶ Background Blending策略之分析場表現不如Analysis Blending策略 ?? 仍待進一步評估....

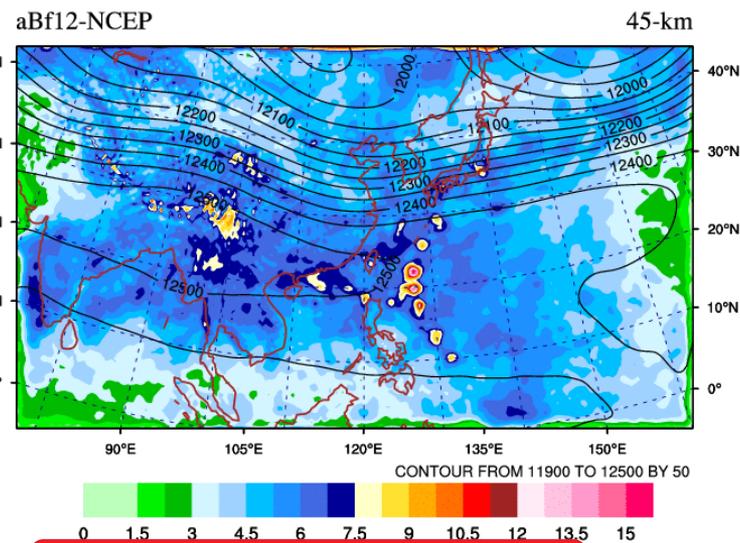
分析場 @ RMSE

Mean Geopotential Height (m) at 200hPa
(Analysis @ Valid time: from 12060100 to 12063012)



Background Blending

Mean Geopotential Height (m) at 200hPa
(Analysis @ Valid time: from 12060100 to 12063012)



Analysis Blending

THE END

Thanks for your attention.