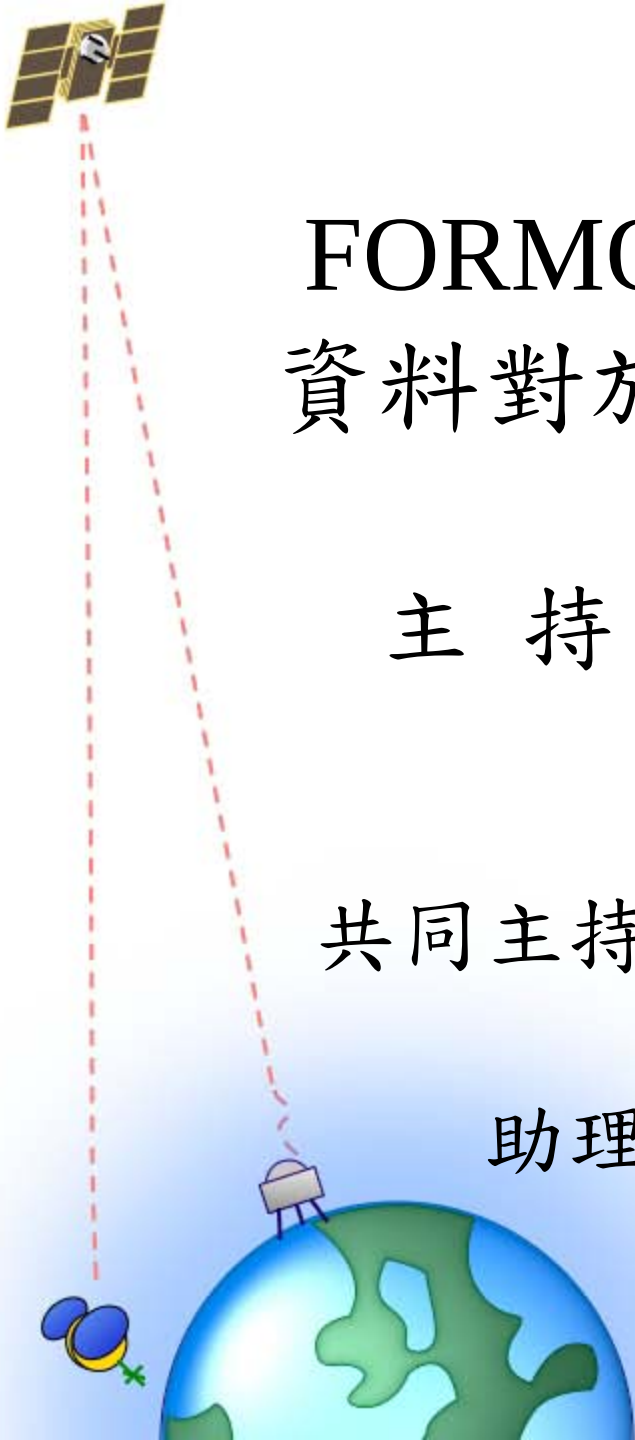




FORMOSAT-3 GPS掩星觀測 資料對於全球模式之影響研究

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助理：陳御群 中央氣象局科技中心

沈彥志 中央氣象局科技中心

GPS Scientific Application Research Center



任務目標

2010年計畫的主要任務目標為：

- (1) 引進美國NCEP/GSI三維變分資料同化系統
- (2) 將GPS掩星資料中的bending angle資料，同化納入中央氣象局的全球模式預報系統。





目前進度報告

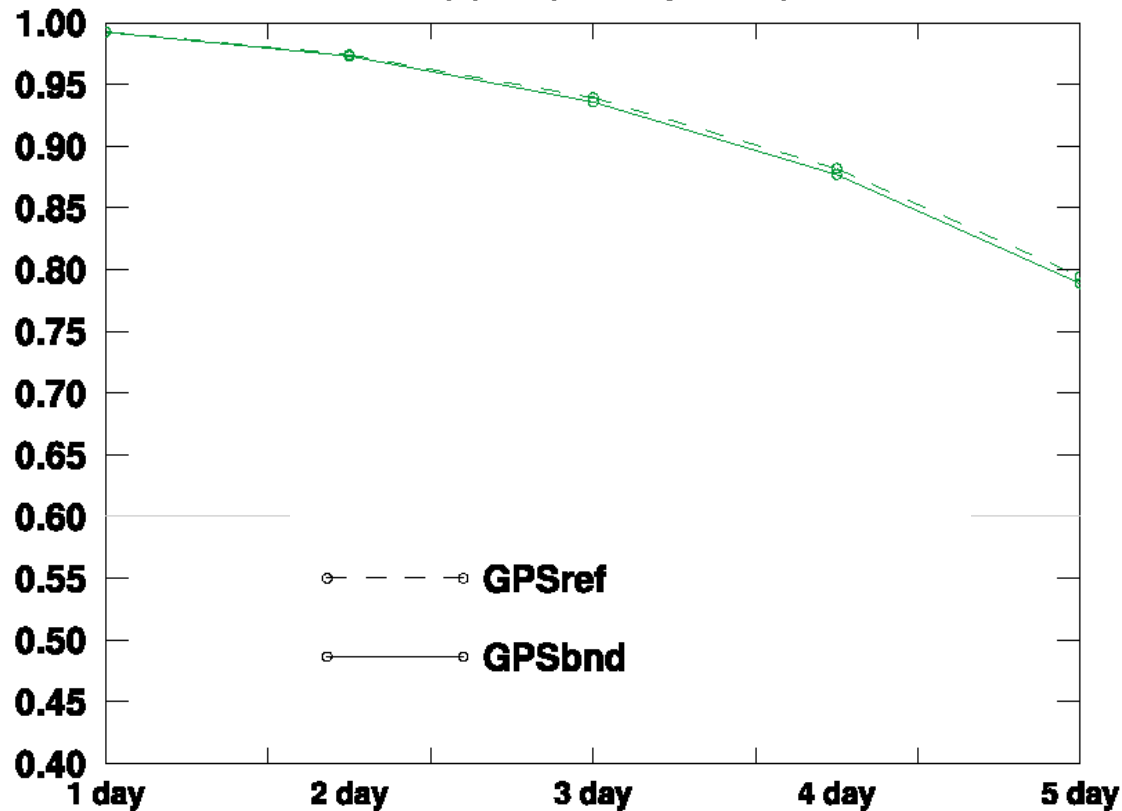
1. 完成GSI系統的偏折角(bending angle)資料1D operator的初步同化測試，並與局地折射率(local refractivity) 資料同化結果進行比較。
2. 就GPS RO資料對於颱風個案路徑影響，進行深入研究探討。





2009/09 500-hPa AC score of H @ NH

mean ach score

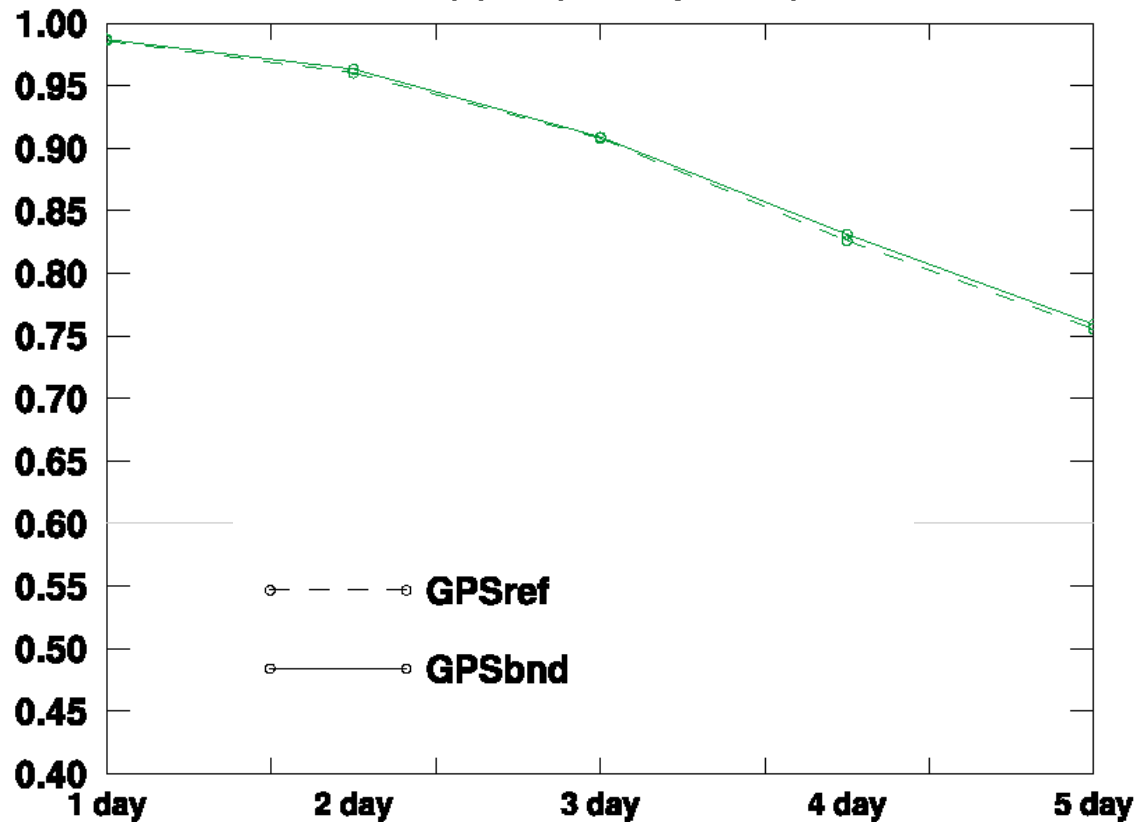


→ In the Northern Hemisphere, similar or slightly worse performance in the bending-angle assimilation is found for the 500-hPa height compared to the local refractivity assimilation.



2009/09 Sea-Level AC score of H @ SH

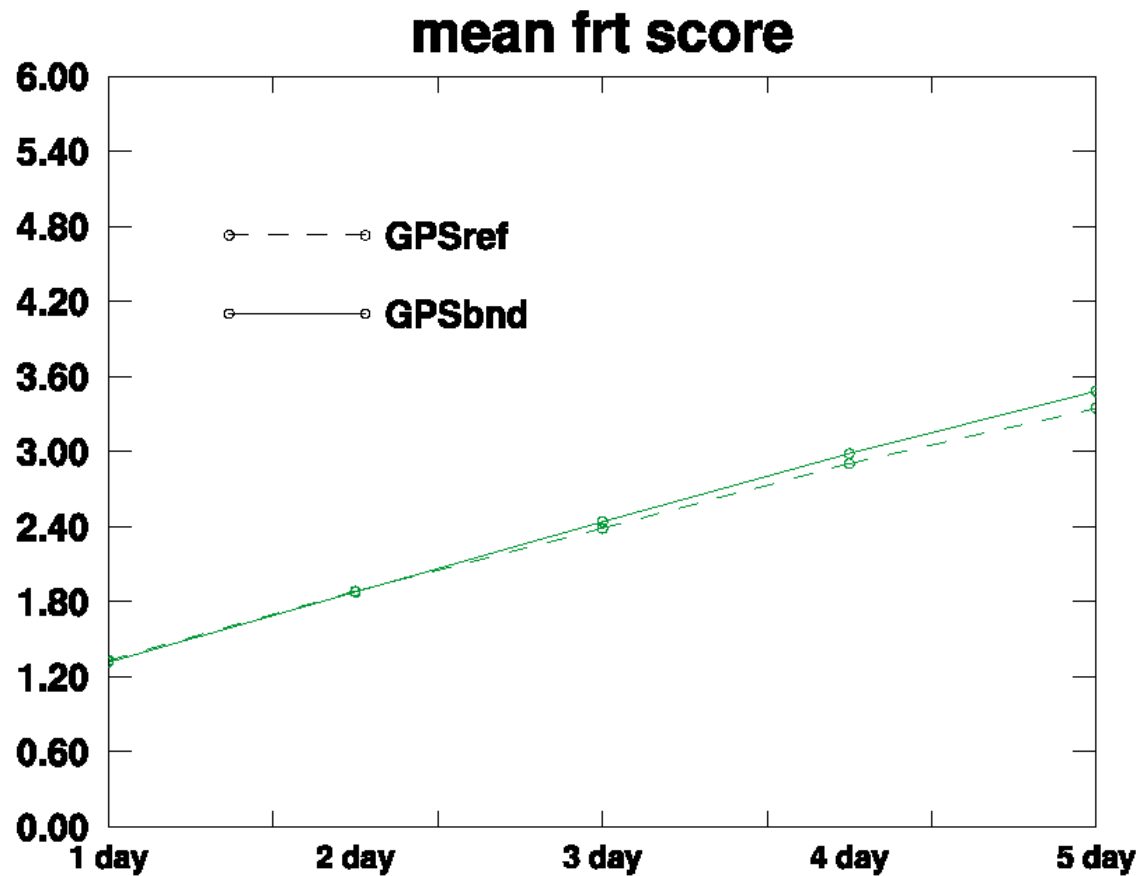
mean ach score



→ In the Southern Hemisphere, similar or slightly better performance in the bending-angle assimilation is found for the sea-level height compared to the local refractivity assimilation.



2009/09 850-hPa RMSE of T @ SH



→ In the Southern Hemisphere, similar or slightly worse performance in the bending-angle assimilation is found for the 850-hPa temperature compared to the local refractivity assimilation.



RO 資料對颱風路徑預報的影響分析

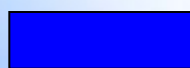
- 11 typhoon cases which affected Taiwan during 2008 to 2010 are investigated
- Cooperation work with the CWB GPS team leaded by Dr. Fong (馮欽賜副主任)





Summary of RO Data Impact

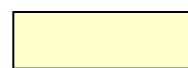
颱風	期間	強度	移動方向	RO資料的影響
卡玫基	08071506-08071806	中度	北行	
鳳凰	08072506-08072806	中度	轉彎	
如麗	08081800-08082112	中度	西行	
辛樂克	08090818-08091918	強烈	轉彎	
哈格比	08091912-08092406	中度	西行	
薔蜜	08092412-08092800	強烈	轉彎	
莫拉克	09080318-09080912	中度	轉彎	
芭瑪	09092900-09101012	中度	西行	
米勒	09092912-09100800	強烈	轉彎	
凡那比	10091512-10092000	中度	轉彎	
梅姬	10101312-10102212	中度	轉彎	



Negative



Positive

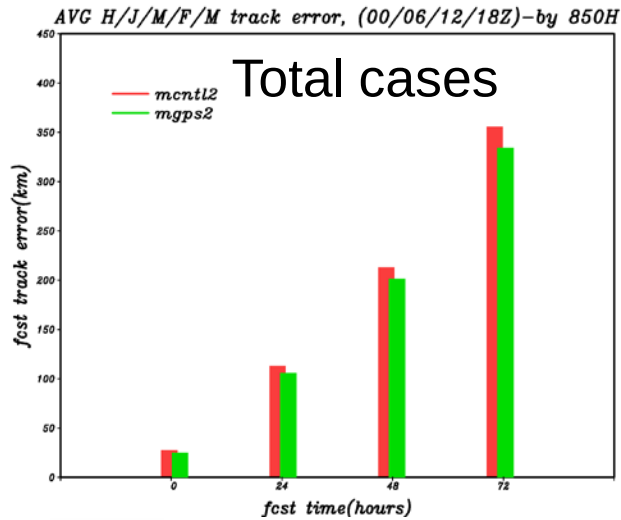


Neutral

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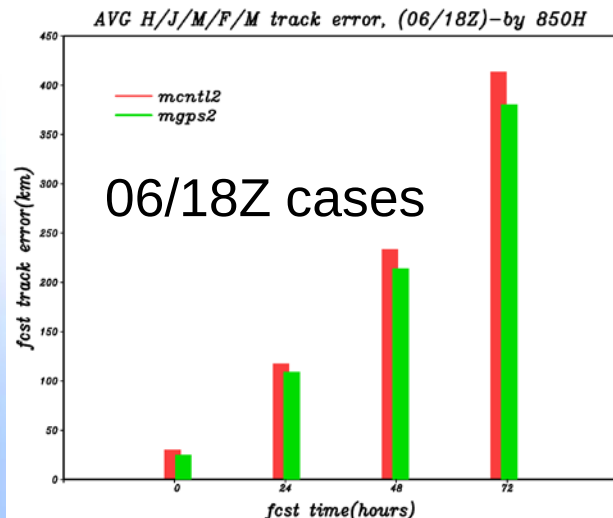
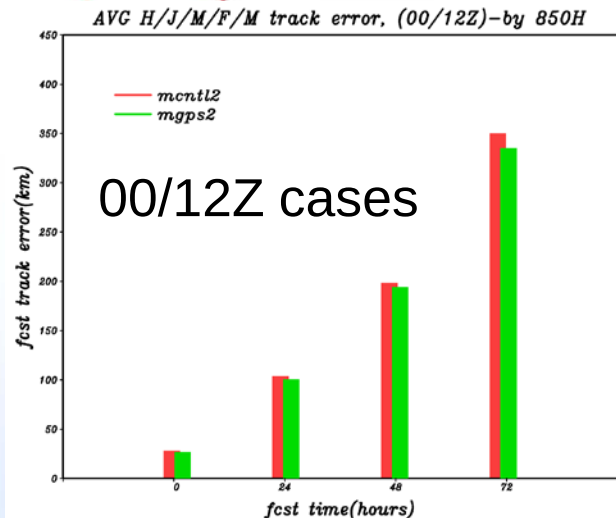
Data Impact Differences Between 00/12Z and 06/18Z



- Choose 5 positive cases to analyze the data impact on track forecasts with initial fields at 00/12Z and 06/18Z respectively.
- 06/18Z results appear more positive than 00/12Z.

可能原因：

在00/12Z，傳統資料觀測量大，RO資料與探空等常規資料競爭下，對預報的影響不易展現，反之06/18Z常規觀測少，RO資料的效應較能突顯





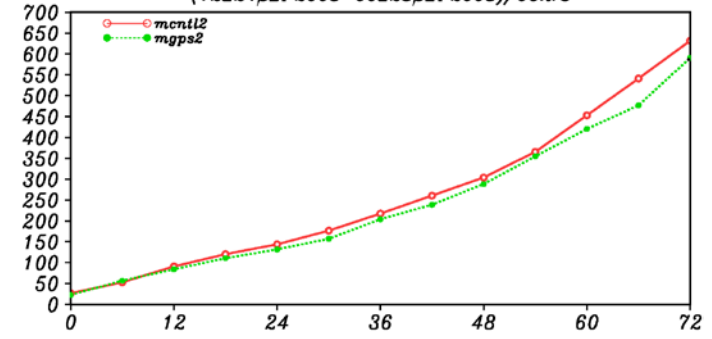
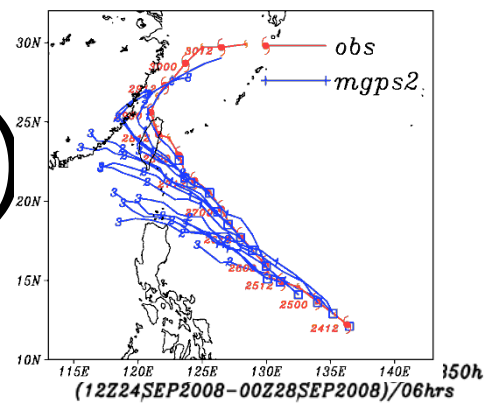
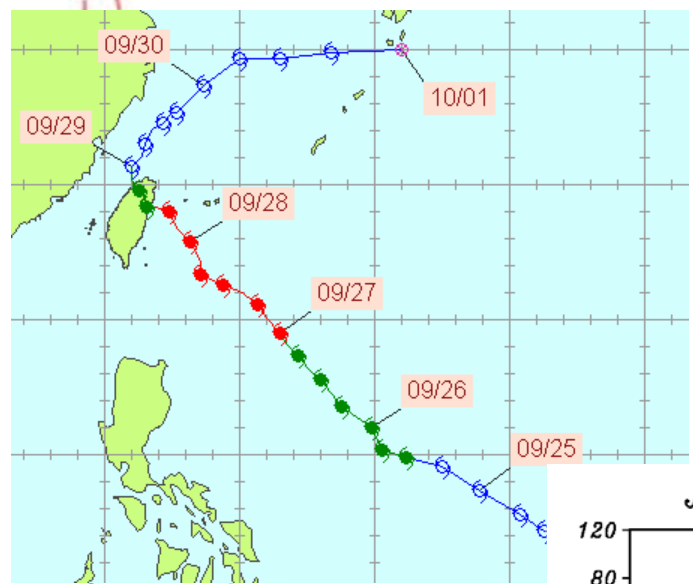
Relation between data impact and curved typhoon tracks

- 發現較大的資料正面效應密集落在含有路徑轉彎的預報時段上，其中薔蜜(2008)、莫拉克(2009)與梅姬(2010)颱風是明顯的例子。

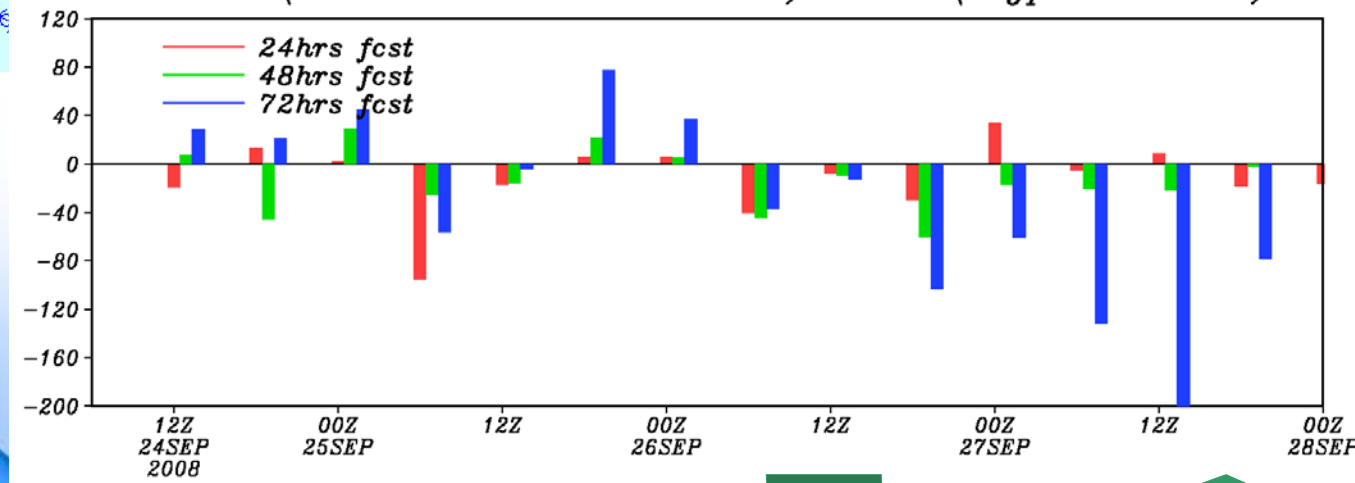


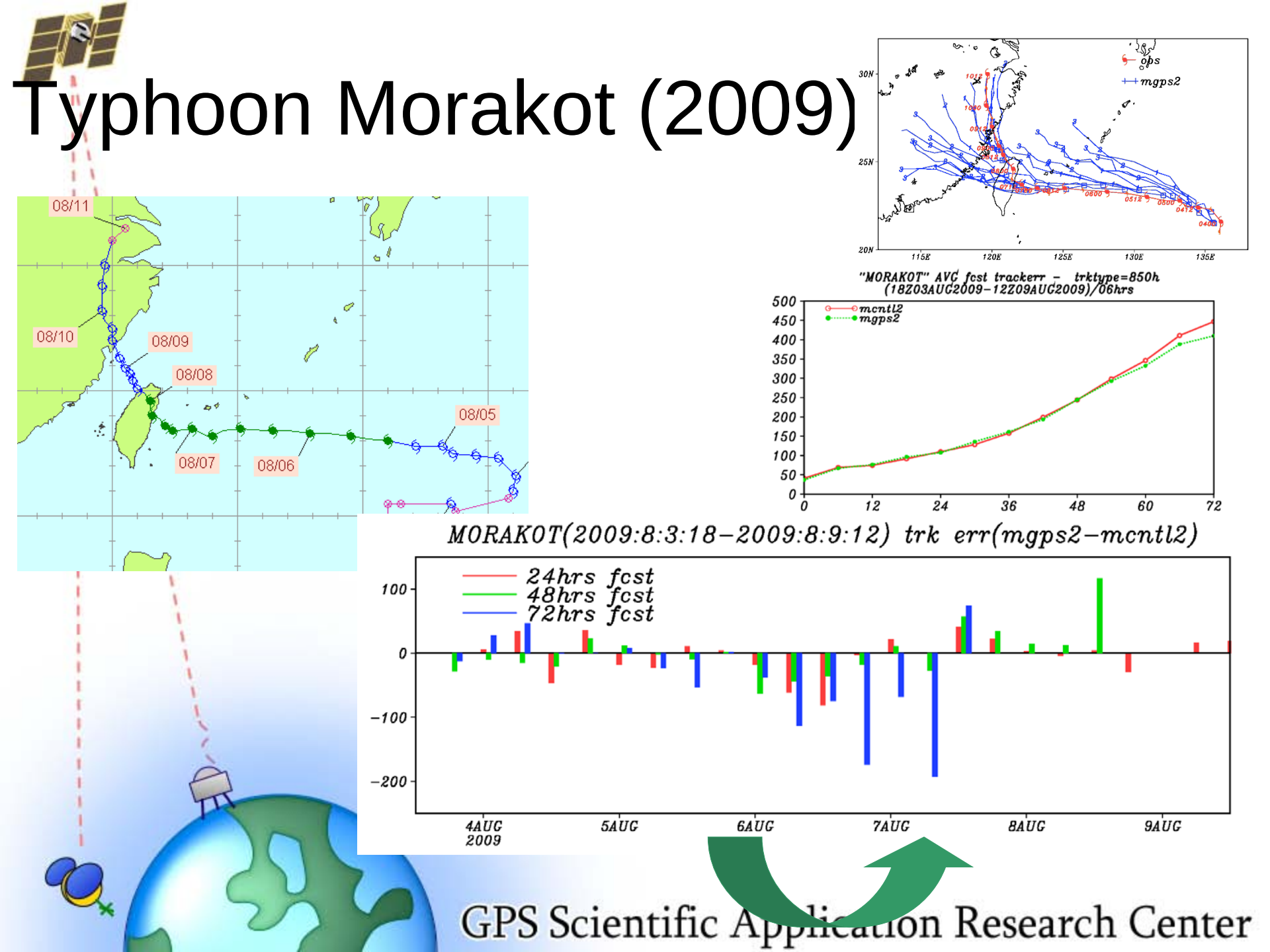


Typhoon Jangmi (2008)



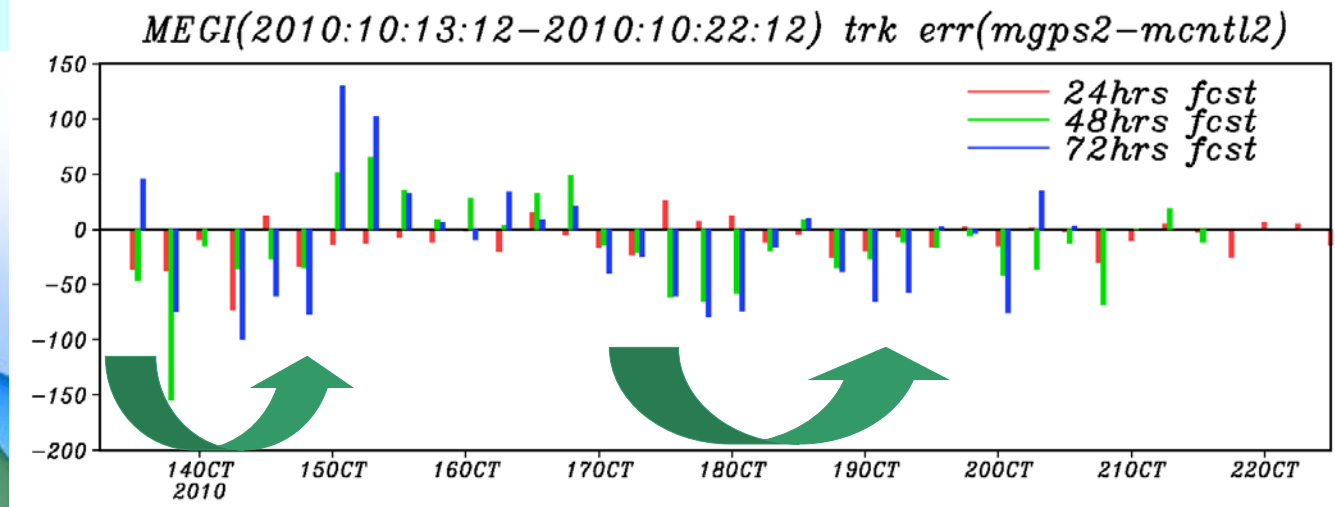
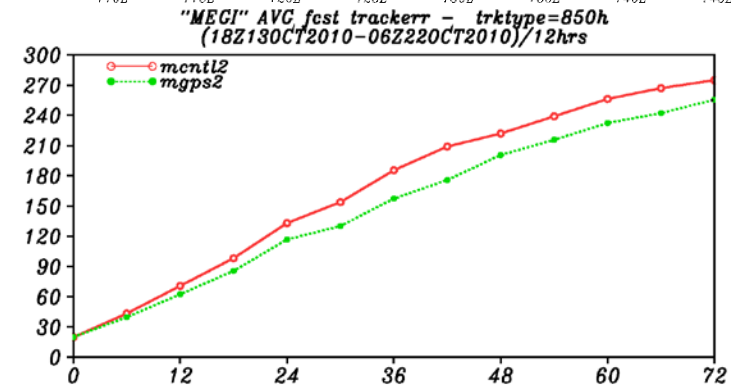
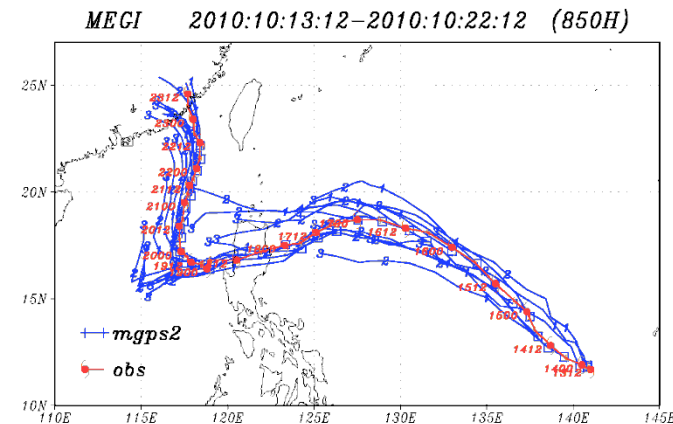
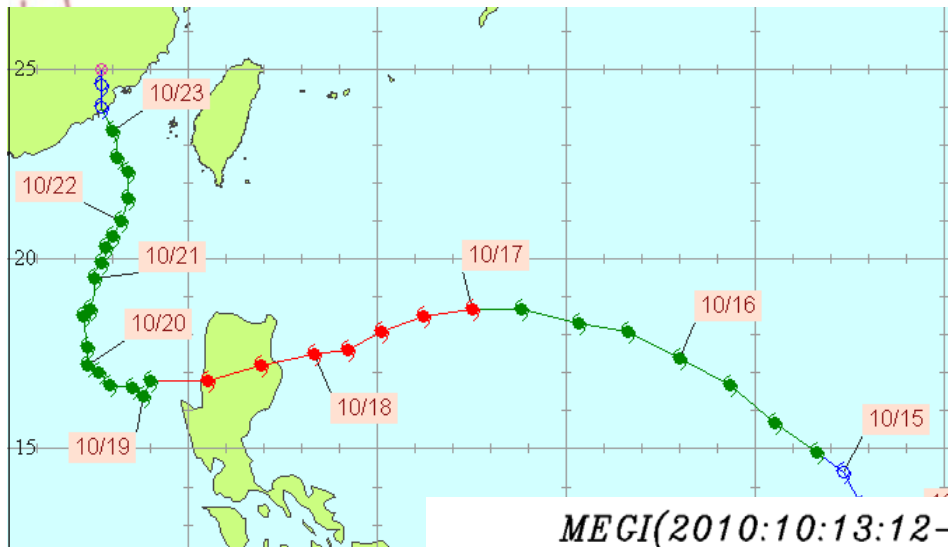
JANGMI(2008:9:24:12-2008:9:28:0) trk err(mgps2-mcntl2)







Typhoon Megi (2010)

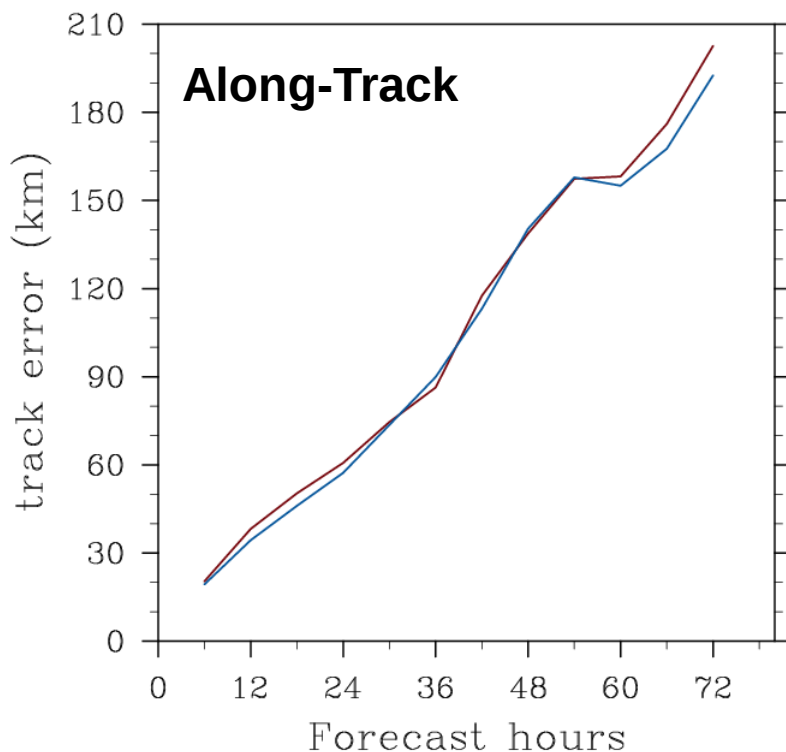




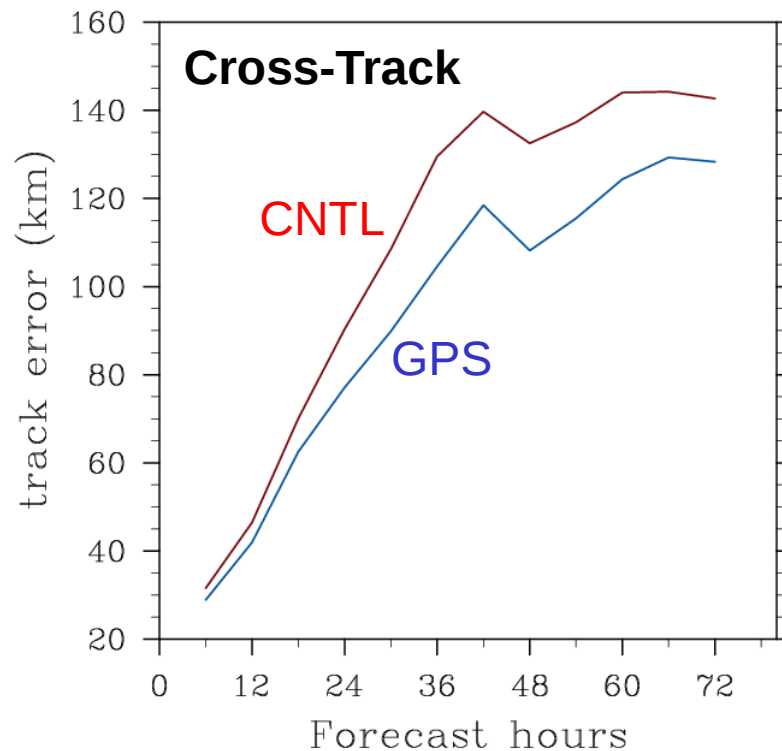
Typhoon Megi (2010)

(10/13/12Z ~ 10/23/12Z)

Typhoon MEGI along track error



Typhoon MEGI cross track error





可能原因：

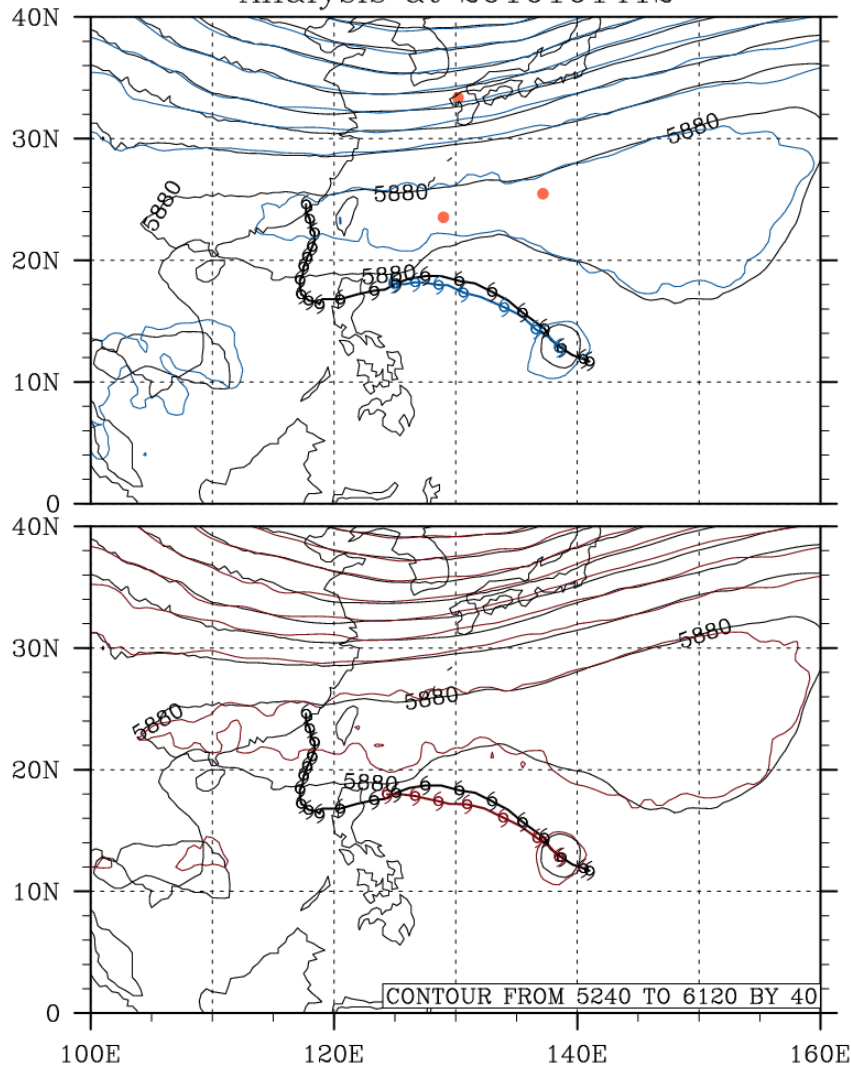
由於導致路徑變化的過程有時來自太平洋高壓強度的變化或者中緯度天氣系統的牽引，因為RO資料的分布有較大的機會是藉由改善大尺度的初始場，進而改善綜觀天氣系統的預報，產生路徑預報的影響，因此我們推測路徑轉彎時期，對綜觀天氣系統的因素較敏感，此時資料可能較易反應出較大的正面影響。





Large-Scale Analysis

Typhoon MEGI, 500 mb Height
Analysis at 2010101412



Blue: GPS

Red: CNTL

Black: NCEP

Black track: Best Track

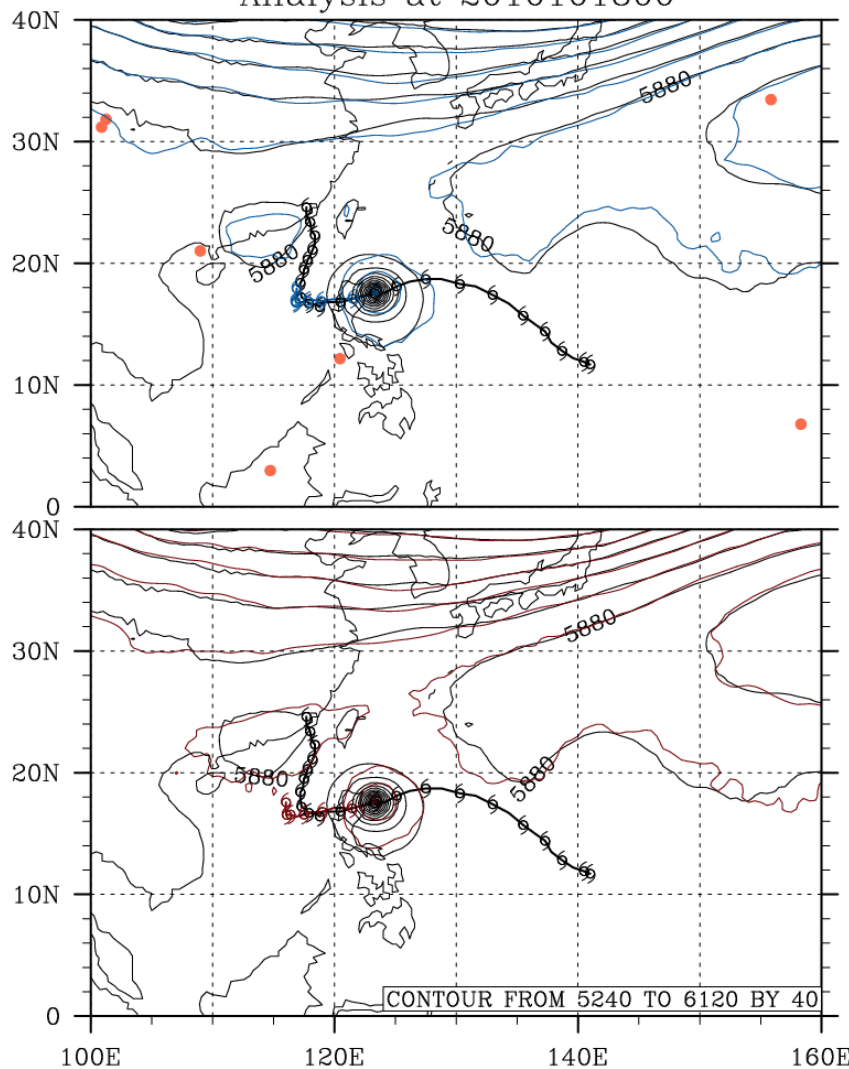
Orange: GPSRO soundings

- Upper: **GPS** and NCEP
- Lower: **CNTL** and NCEP
- Each TY symbol: 12 hrs



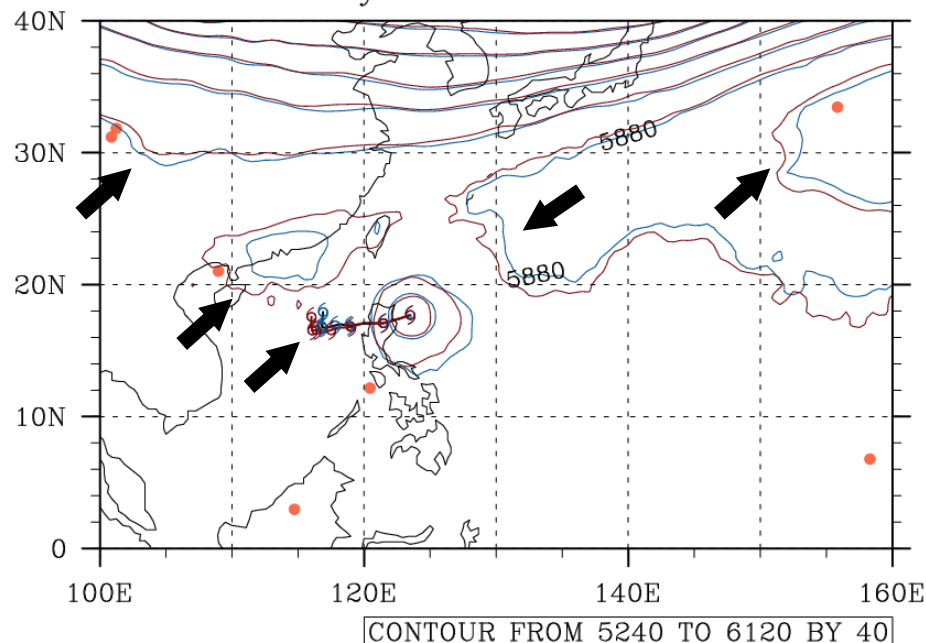
Positive Case: 2010101800

Typhoon MEGI, 500 mb Height
Analysis at 2010101800



Blue: GPS
Red: CNTL
Black: NCEP
Orange: GPSRO soundings

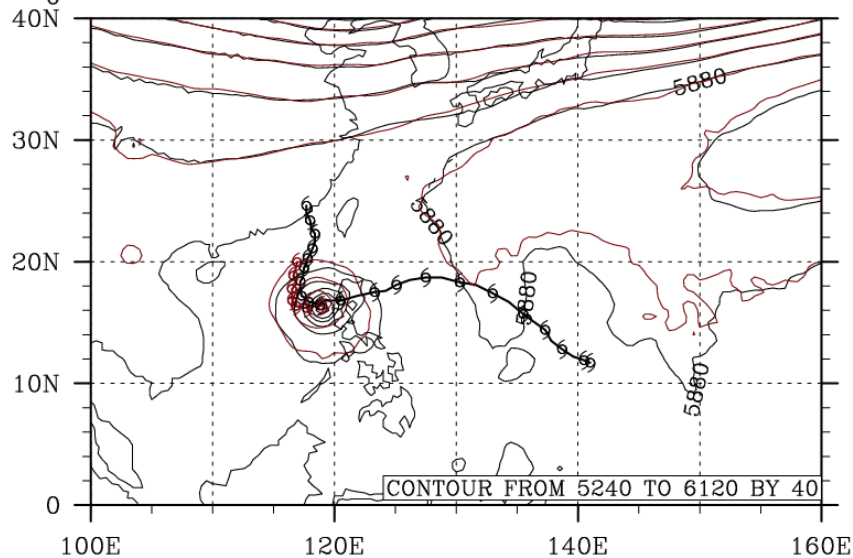
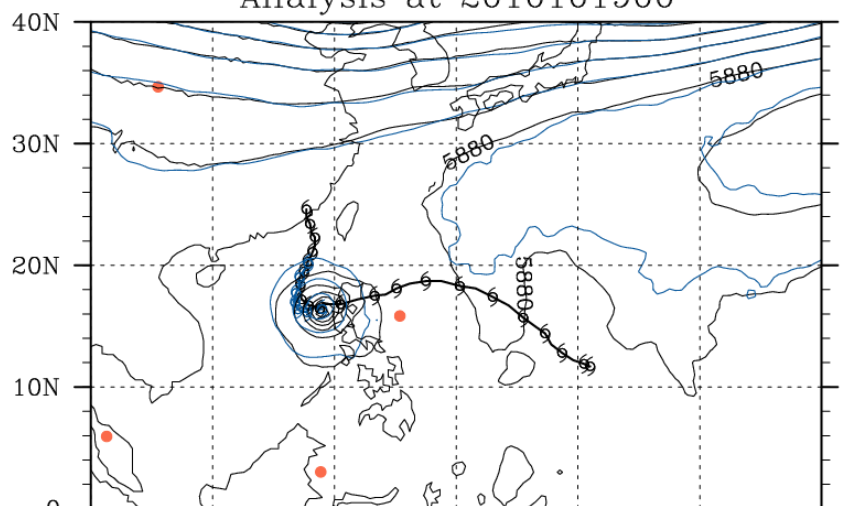
Typhoon MEGI, 500 mb Height
Analysis at 2010101800





Positive Case: 2010101900

Typhoon MEGI, 500 mb Height
Analysis at 2010101900



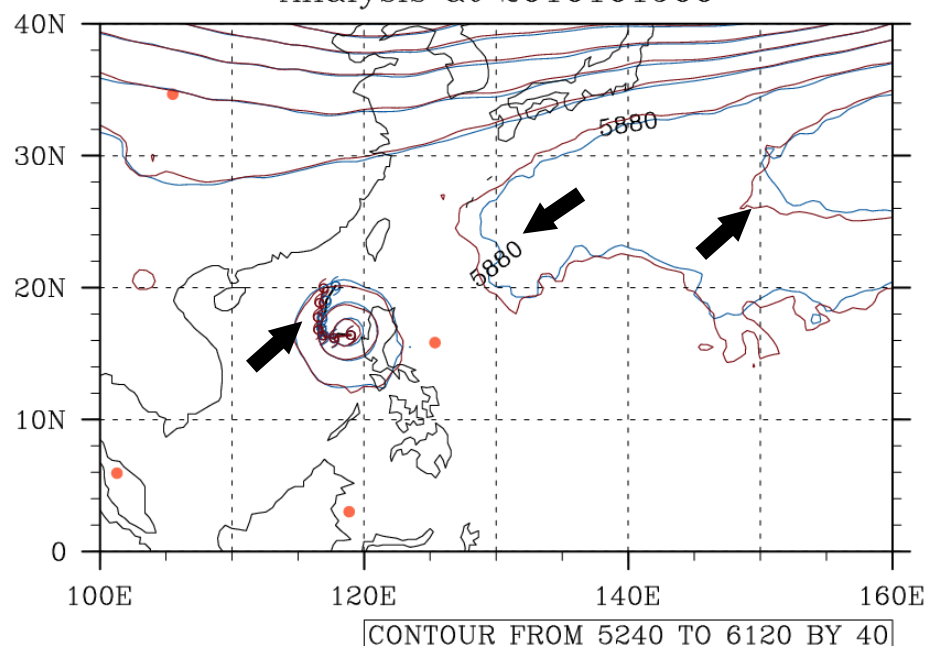
Blue: GPS

Red: CNTL

Black: NCEP

Orange: GPSRO soundings

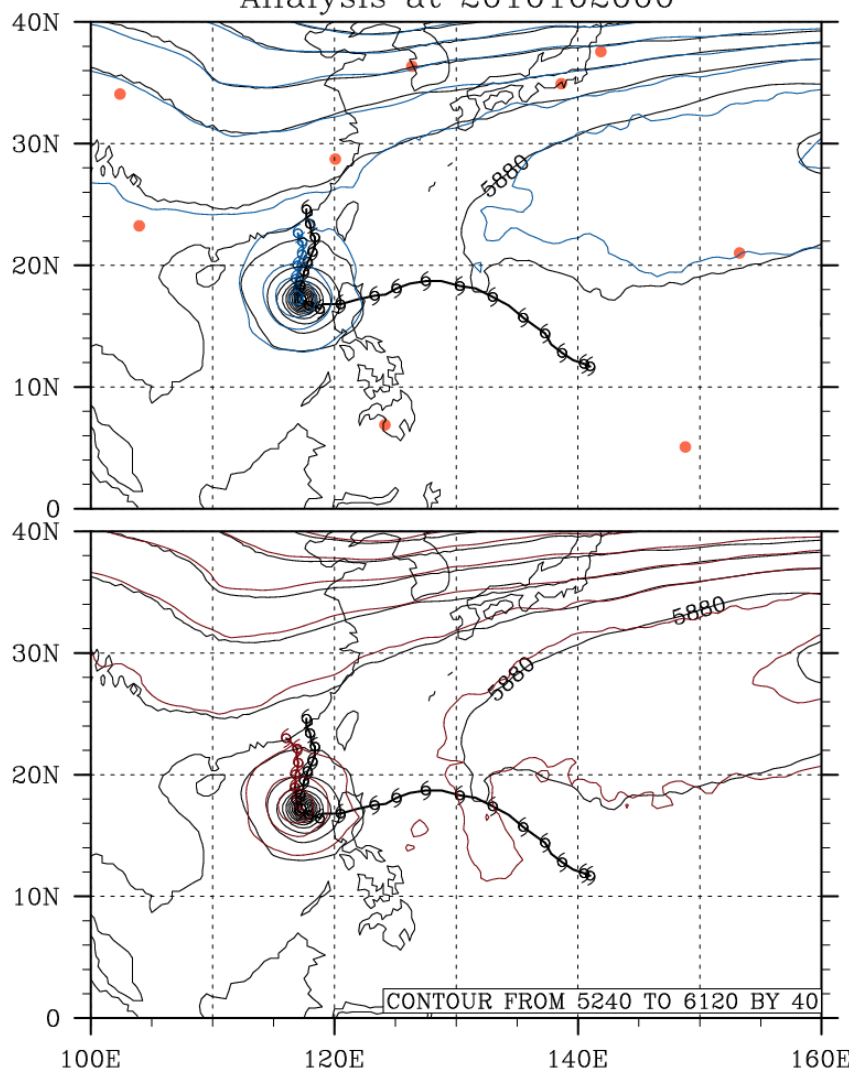
Typhoon MEGI, 500 mb Height
Analysis at 2010101900





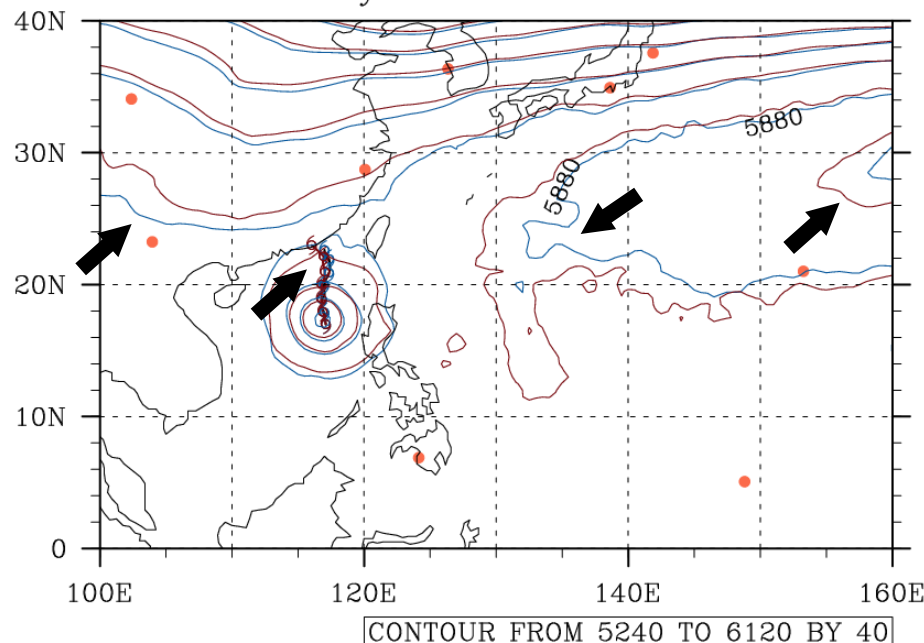
Positive Case: 2010102000

Typhoon MEGI, 500 mb Height
Analysis at 2010102000



Blue: GPS
Red: CNTL
Black: NCEP
Orange: GPSRO soundings

Typhoon MEGI, 500 mb Height
Analysis at 2010102000





9-12月執行進度

甘梯圖內容	完成進度(%)	說明
引進GSI同化系統	100 %	已完成GSI系統的平行化作業測試，成效良好，於2010/07/28 正式於CWB上線作業。
同化bending angle資料	100%	已完成GSI系統同化bending angle之1D operator同化測試。