

中央氣象署數值預報系統對0728 西南氣流豪雨事件之預報表現分析

陳得松、NWP團隊

中央氣象署

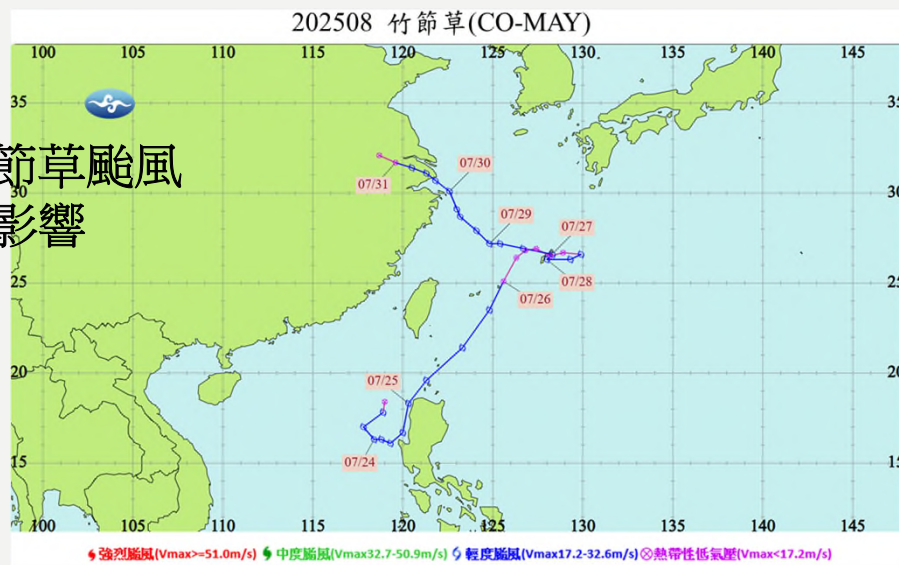
114年第三十九屆天氣分析與預報研討會
2025/09/02

大綱:

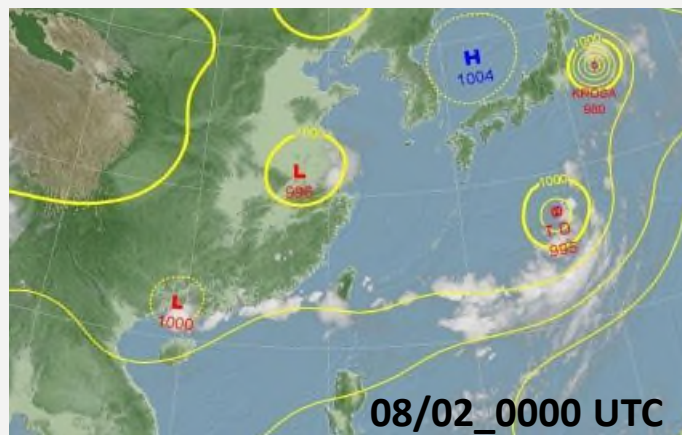
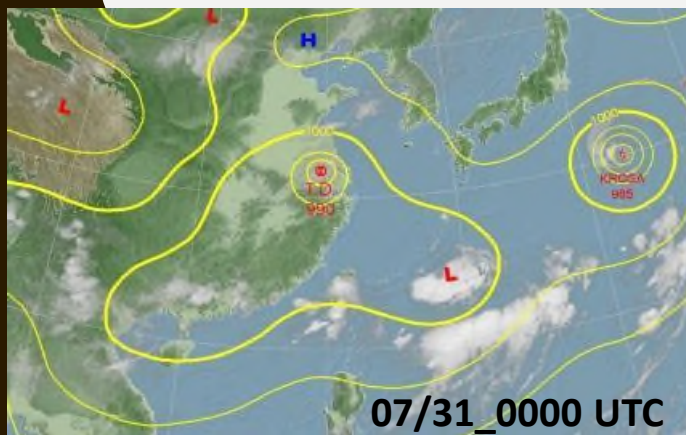
1. CWA NWP作業系統對0728西南氣流豪雨事件之預報表現分析
2. CWA NWP研發中模式對0728西南氣流豪雨事件之預報表現分析
3. 結論

0728豪雨降水事件 (2025/07/28 to 2025/08/03)

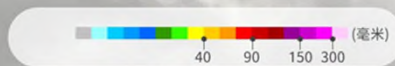
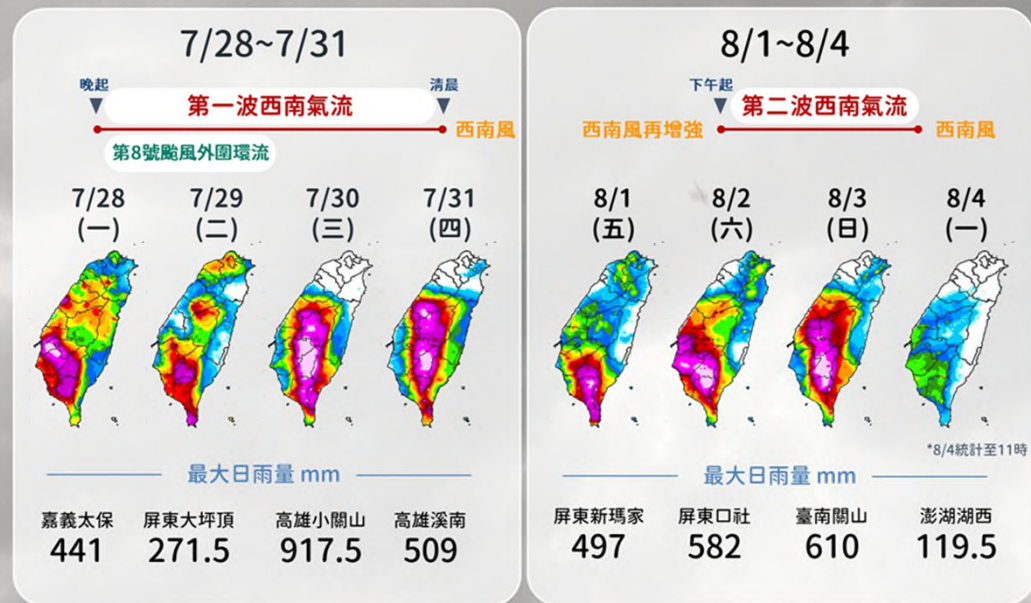
●竹節草颱風環流影響



●颱風環流&大低壓帶西南氣流影響



兩波降雨高峰， 天天有豪雨或以上等級降雨

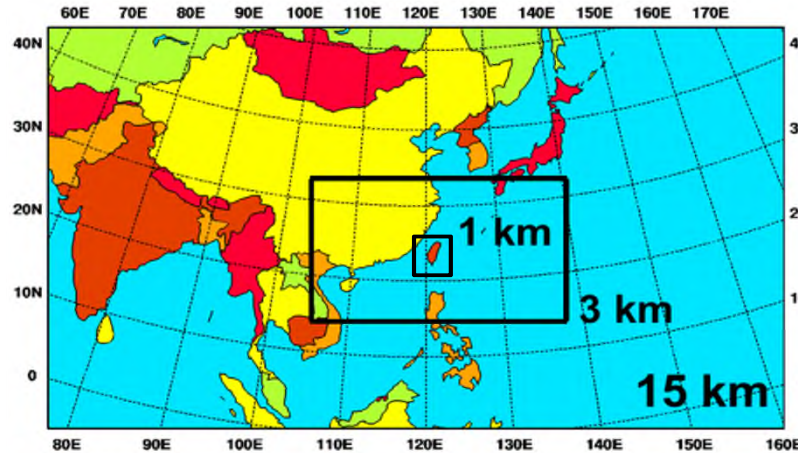


中央氣象署發布 2025.08.04 18:30

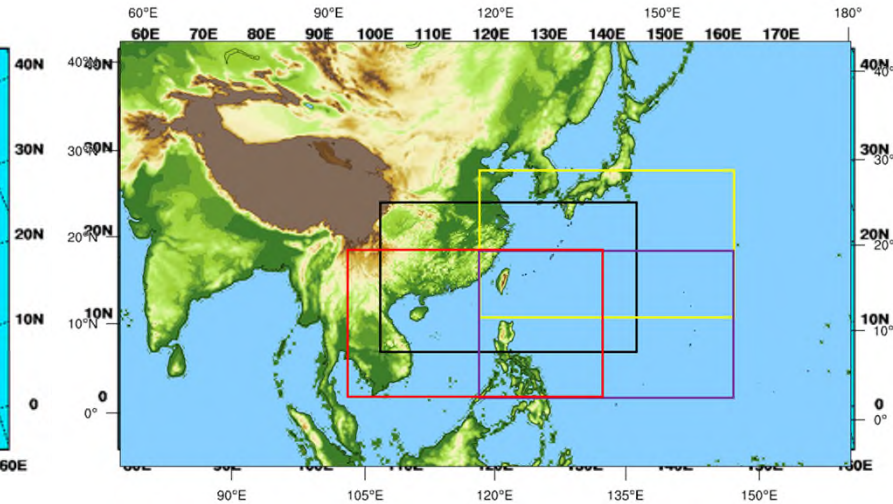
中央氣象署區域數值天氣預報作業系統現況



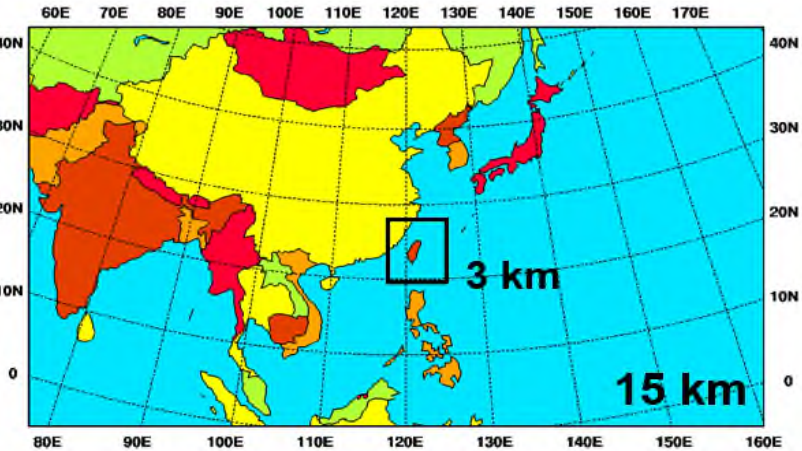
區域作業系統(WRFD/M07)



颱風作業系統(TWRF)



系集作業系統(WEPS)



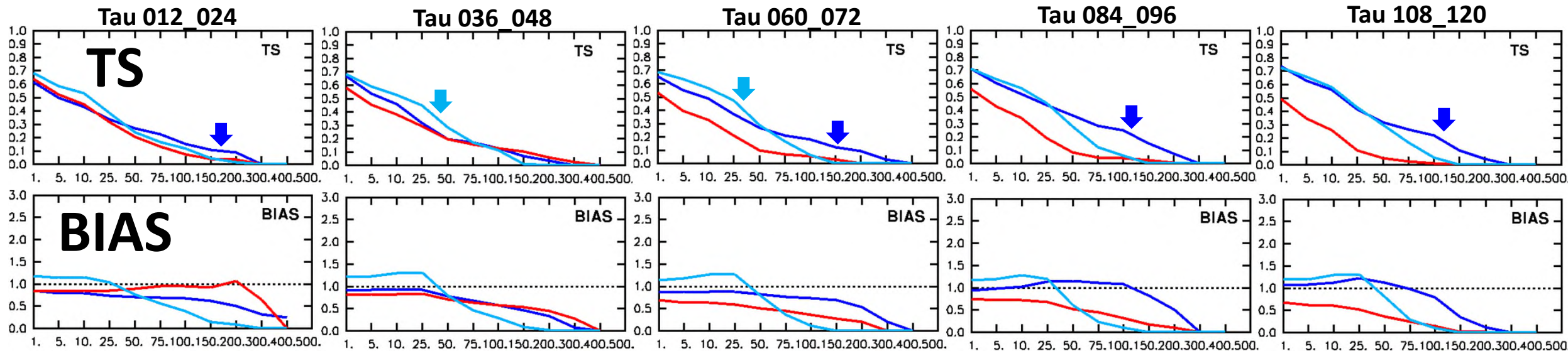
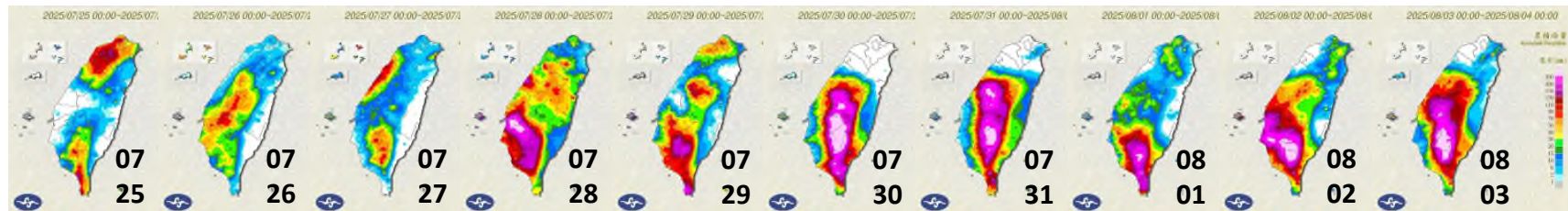
- **WRFD - 96 nodes**
每日4次(00,06,12,18UTC)
預報長度：126小時
網格解析度：15/3公里
- **M07- 48 nodes**
每日4次(00,06,12,18Z)
預報長度：48小時
網格解析度：1公里

- **TWRF - 72 nodes**
每日4次(00,06,12,18UTC)
預報長度：126小時
網格解析度：15/3公里
以颱風位置決定3公里模式範圍(共4種)
以EC預報海溫場為下邊界

- **WEPS - 400 nodes**
每日4次(00,06,12,18UTC)
預報長度：120小時
網格解析度：15/3公里
成員數：20

➤ 0728豪雨降水校驗—WRFD, TWRF, WEPS

cases: 2025/07/25 ~ 08/02
(00 & 12 UTC; 18 cases)



● TS :

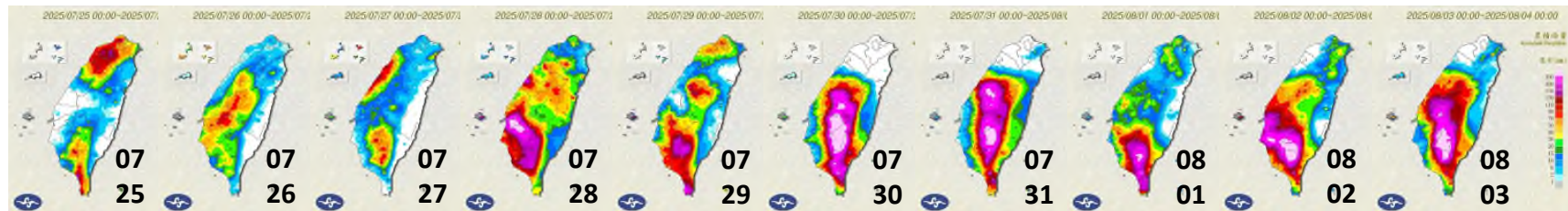
- ✓ WRFD、WEPS、TWRF之大豪雨等級降水預報表現較不佳；
- ✓ WRFD 預報強降水 (>75 mm/12h) 表現稍好；
- ✓ WEPS預報中至弱降水 (<75 mm/12h) 表現稍好。

● BIAS :

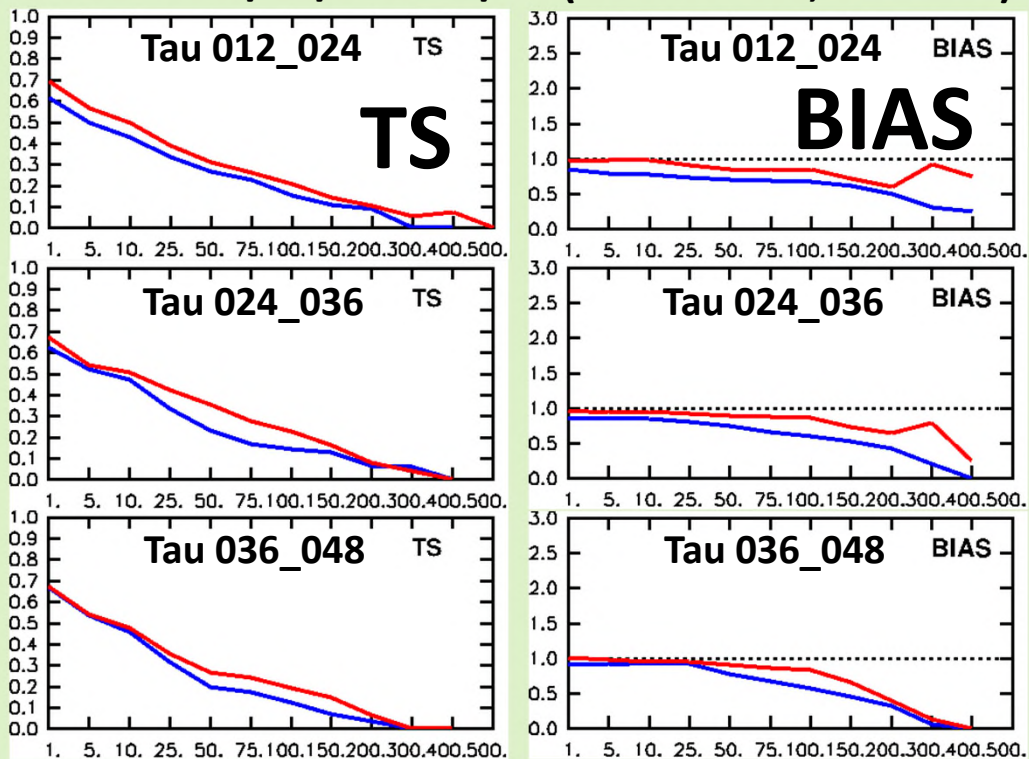
- ✓ 3個預報系統強降水普遍有低估情形，WRFD預報強降水低估情形稍好；
- ✓ TWRF預報降水顯著低估。

—WRFD, —TWRF, —WEPS

➤ 0728豪雨降水校驗—WRFD_3km, M07_1km

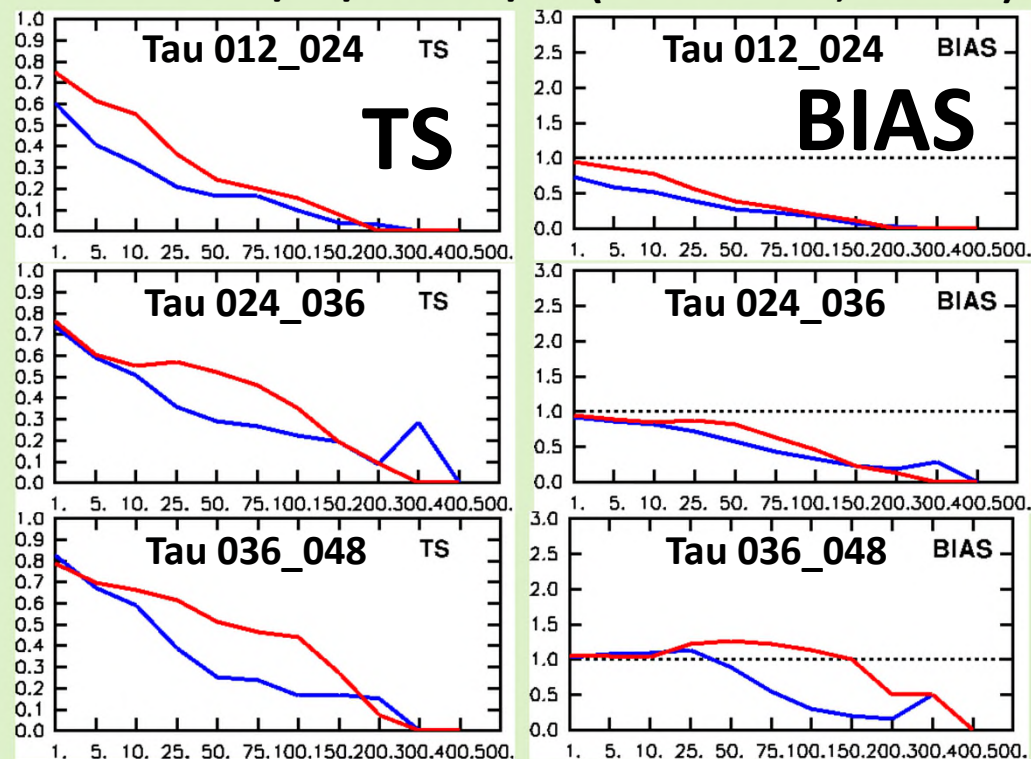


cases: 2025/07/25 ~ 08/02 (00 & 12 UTC; 18 cases)



cases: 2025/08/01 ~ 08/02 (00 & 12 UTC; 4 cases)

第二波



—WRFD_3km, —M07_1km

- M07_1km之降水預報表現較WRFD_3km為佳
- 第二波西南氣流降水，M07_1km之預報表現改善更為顯著，但量值仍低估

QPESUMS

07/30 12 to 24 UTC

25073000
t12 ~ t24

25072912
t24 ~ t36

25072900
t36 ~ t48

25072812
t48 ~ t60

25072800
t60 ~ t72

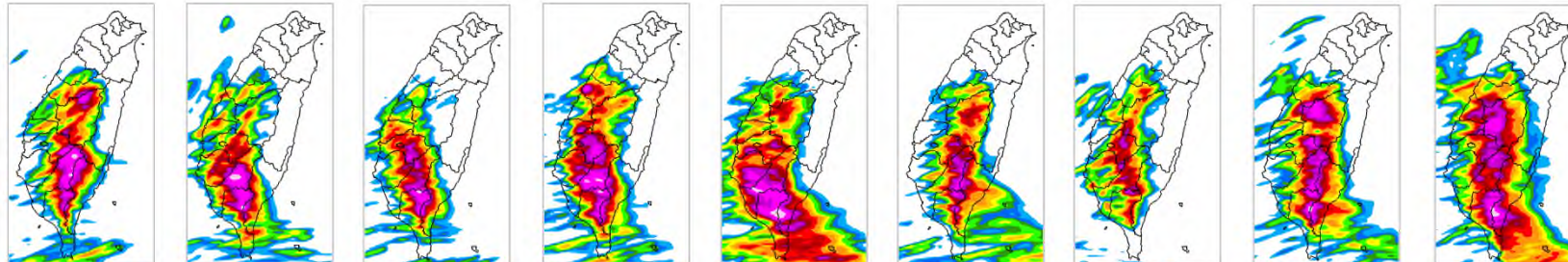
25072712
t72 ~ t84

25072700
t84 ~ t96

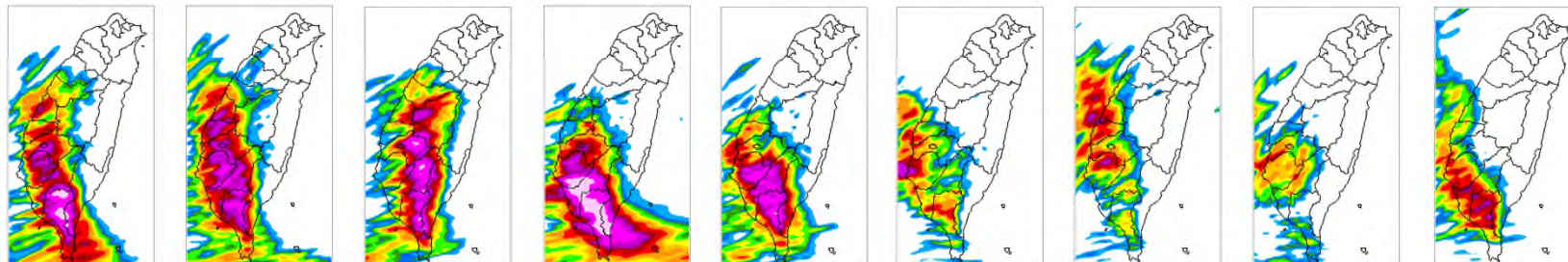
25072612
t96 ~ t108

25072600
t108 ~ t120

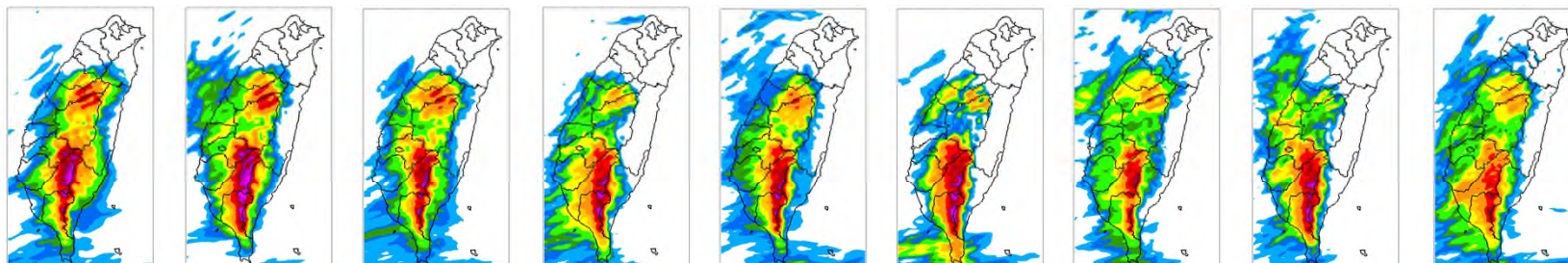
WRFD



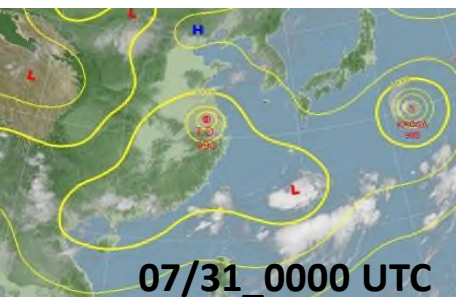
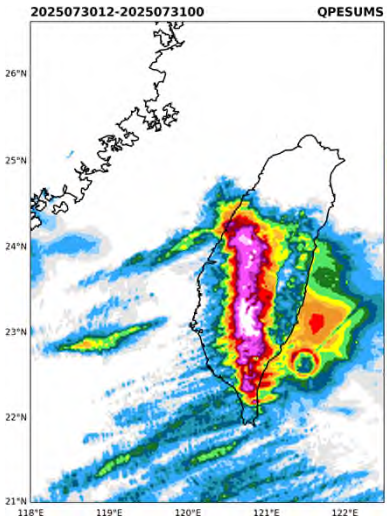
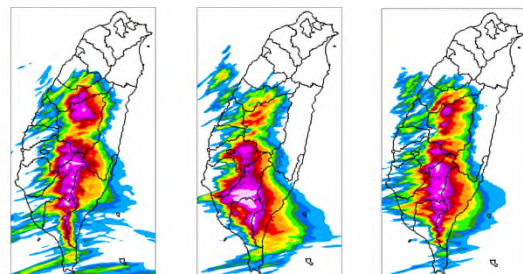
TWRF



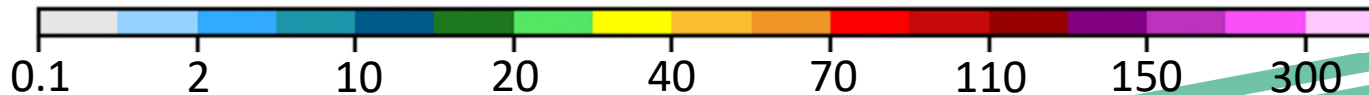
WEPS



M07_1km



- 颱風環流及大低壓帶西南氣流影響：
- **WRFD**於不同預報時間之降水分布較為穩定，**TWRF**低估情形較為顯著。
 - 隨著模式解析度提高，**M07_1km**降水分布掌握最佳

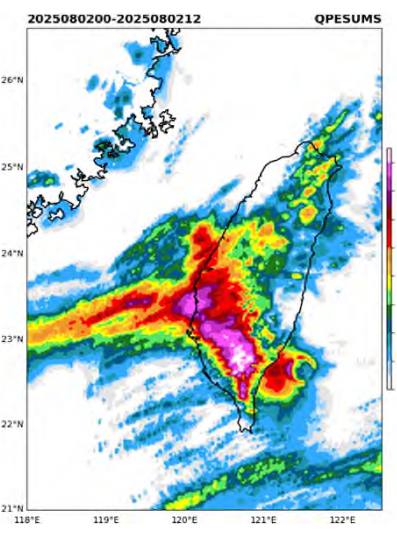


Courtesy: 黃小玲

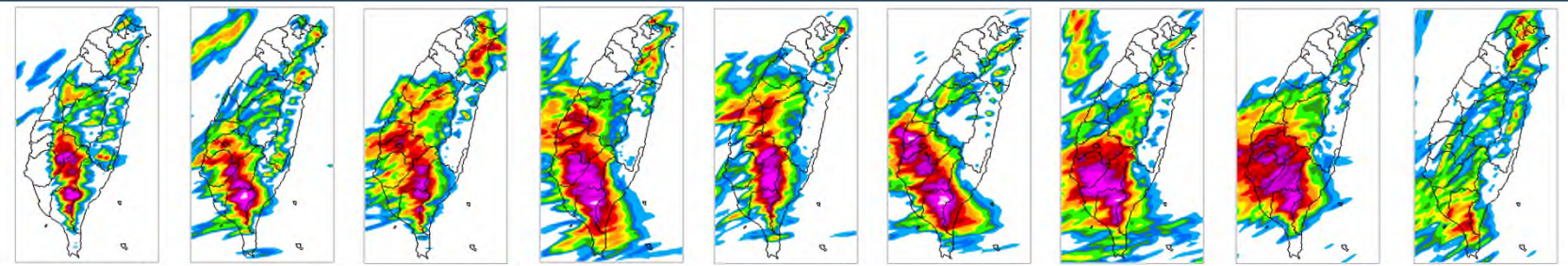
QPESUMS

08/02 00 to 12 UTC

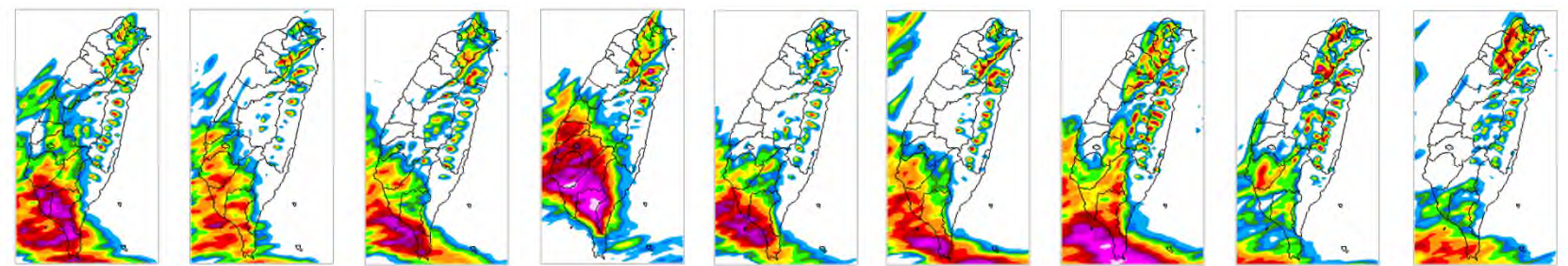
25080112 t12 ~ t24 25080100 t24 ~ t36 25073112 t36 ~ t48 25073100 t48 ~ t60 25073012 t60 ~ t72 25073000 t72 ~ t84 2502912 t84 ~ t96 25072900 t96 ~ t108 25072812 t108 ~ t120



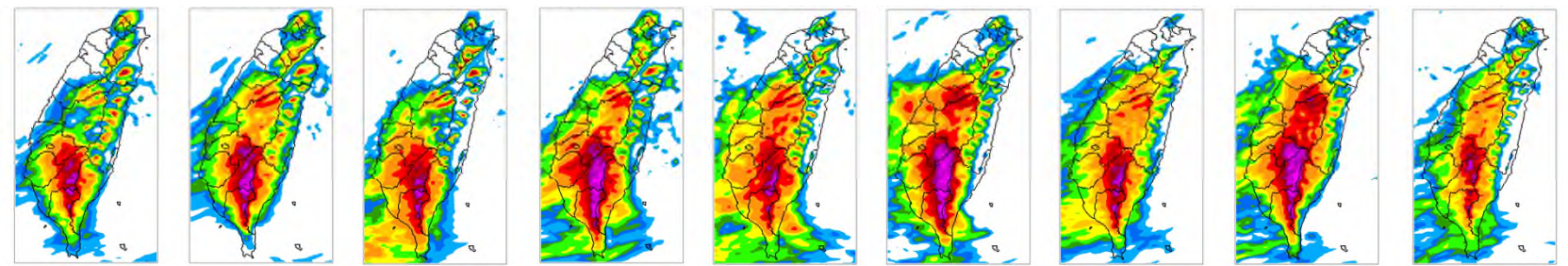
WRFD



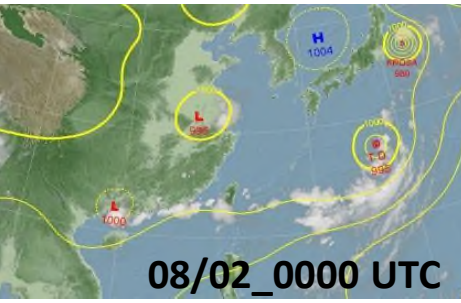
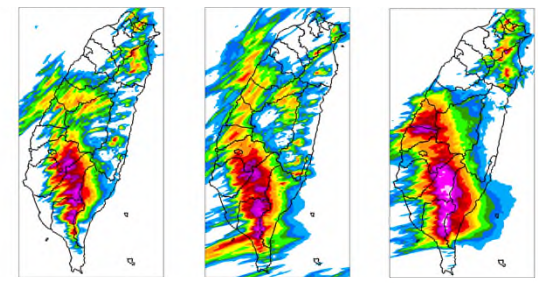
TWRF



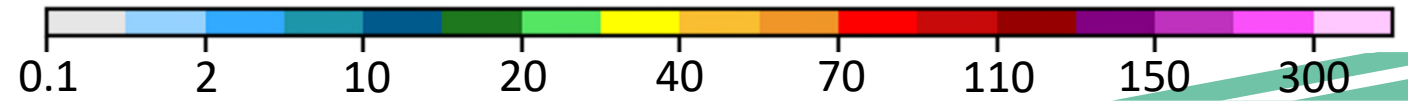
WEPS



M07_1km



- 大低壓帶西南氣流影響：
 - **WRFD**於不同預報時間之降水分布較為穩定，**TWRF**低估情形較為顯著；**WEPS**於平地強降水較為低估。
 - **M07_1km**降水分布掌握最佳



CWA NWP研發中區域模式:

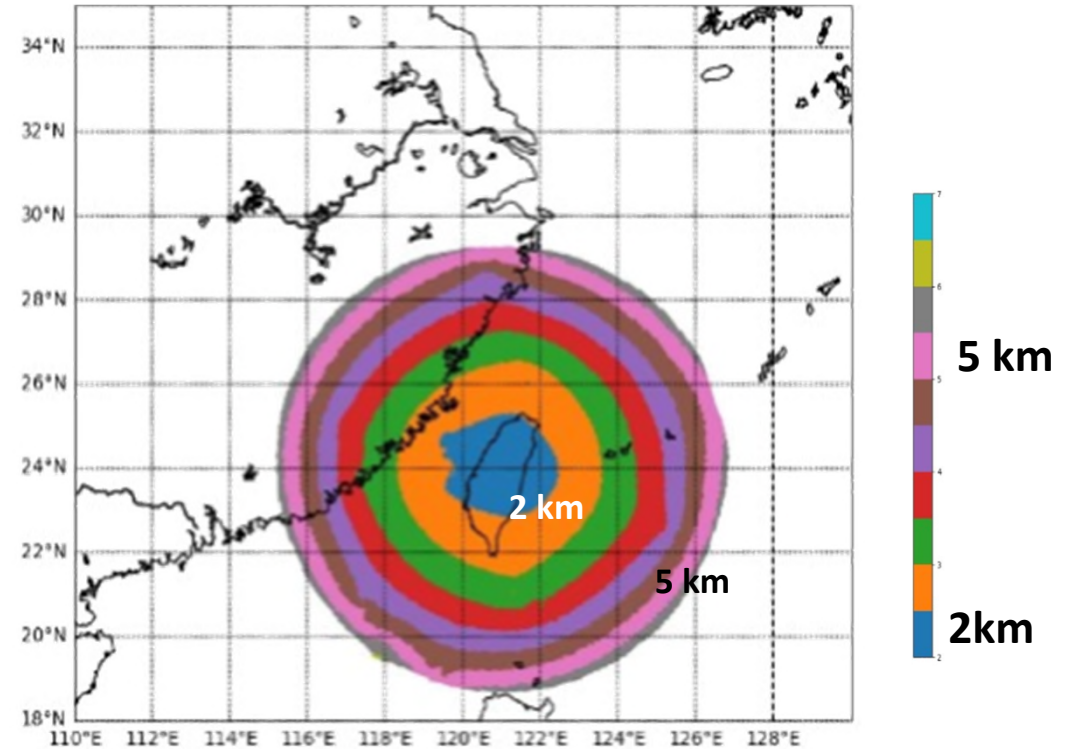
1. MPAS (Model for Prediction Across Scales)

2. TWRF_V3 颱風作業系統，2026 上線作業
(15/3 公里，52 層 → 10/2 公里，64 層)

CWA NWP研發中區域模式 之一 **MPAS**

	MPAS	WRF
I.C & B.C	ECMWF	NCEP
Cumulus scheme	New Tiedtke	Kain-Fritsch
Gravity-wave drag	bl_ysu_gwdo	gwd_opt=3
Microphysics	TCWA1	
Radiation	RRTMG	
PBL	YSU	
Surface layer	Monin-Obukhov	
Veg. frac. source	MODIS	EUMETSET
Vertical coordinate	Height-based	Pressure-based
Model top	30 km	20 hPa
Vertical layers	55	52
Finest grid spacing	2 km	3 km

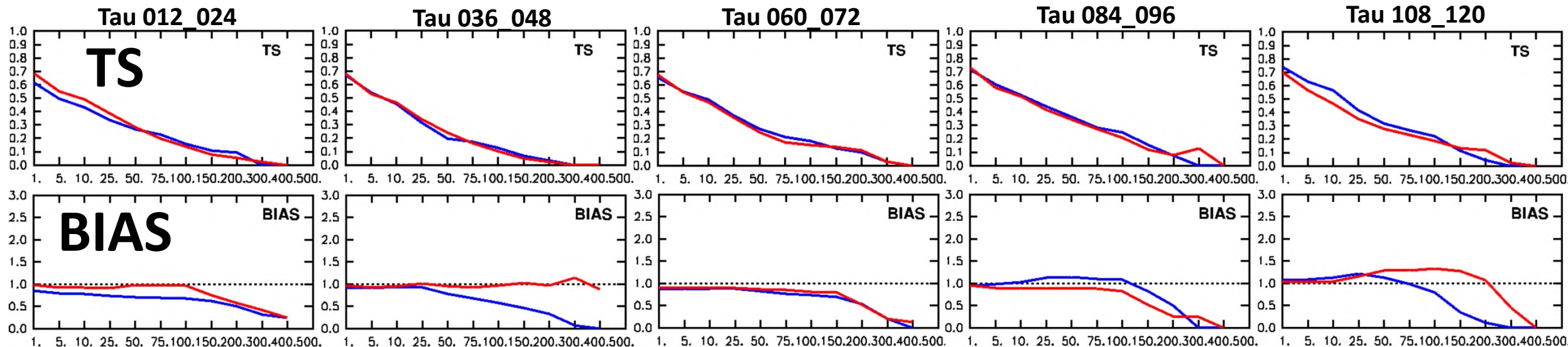
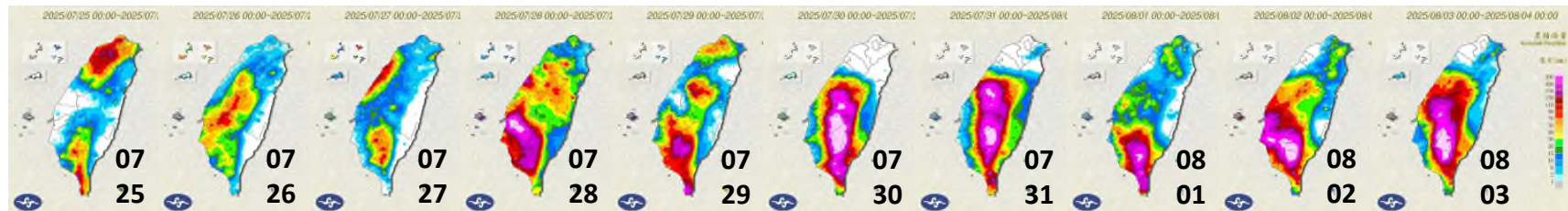
著色區域為**MPAS** 模擬範圍



Courtesy: 吳英璋

➤ 0728豪雨降水校驗—WRFD, MPAS

cases: 2025/07/25 ~ 08/02
(00 & 12 UTC; 18 cases)



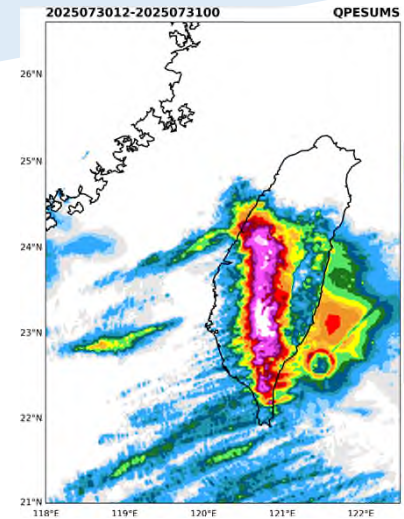
—WRFD, —MPAS

- **BIAS** : **MPAS**之降水低估情形較**WRFD**改善，但仍不足

QPESUMS

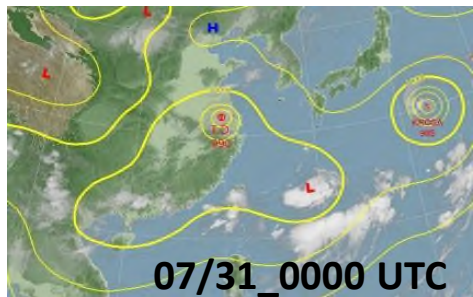
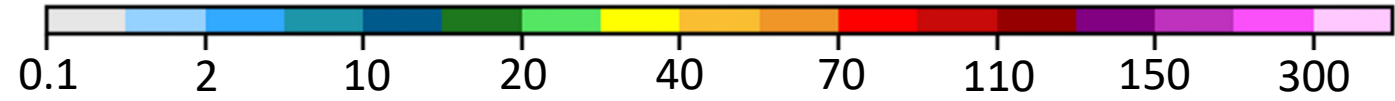
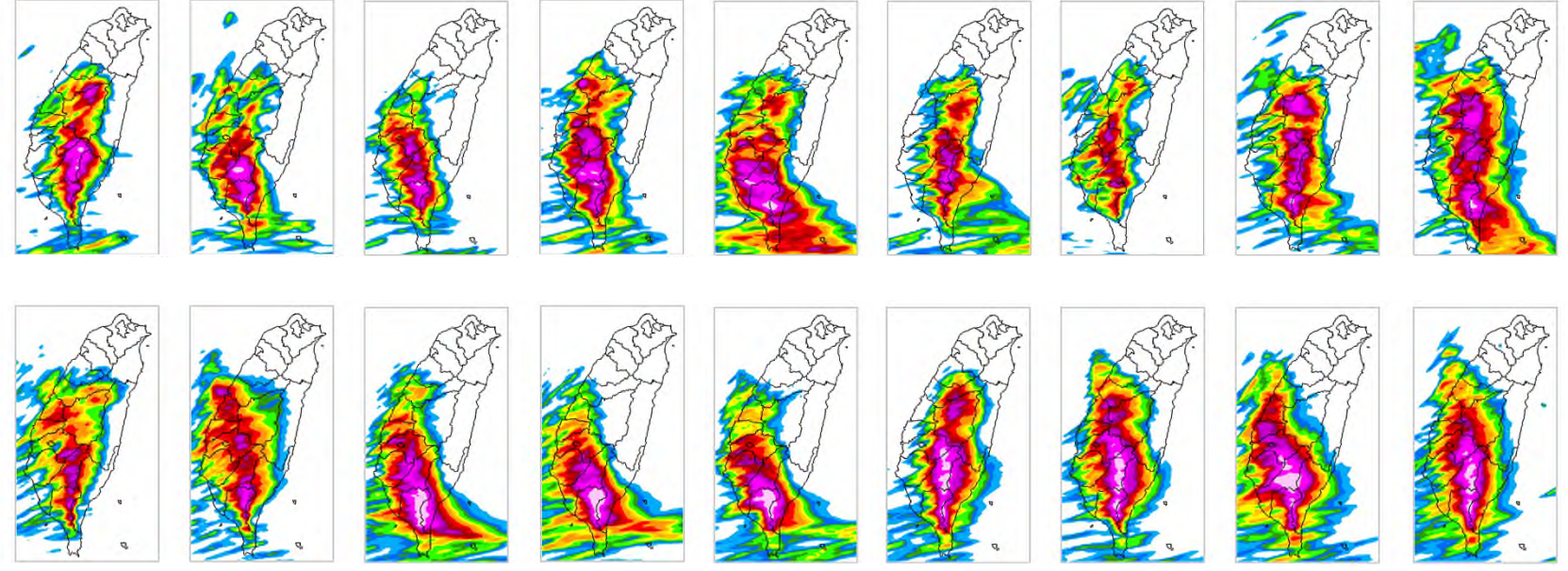
07/30 12 to 24 UTC

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WRFD

MPAS

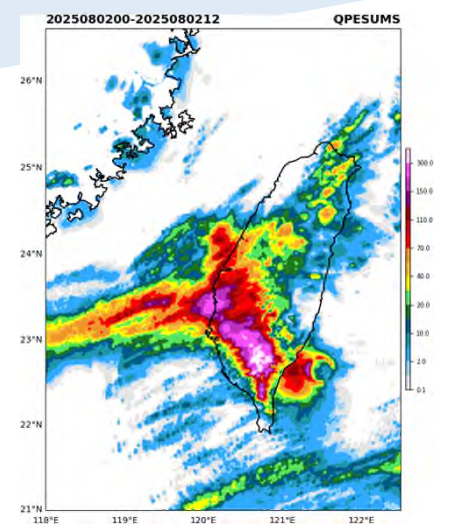


- 颱風環流及大低壓帶西南氣流影響：
 - **MPAS**於中部山區強降水分布掌握較**WRFD**為佳

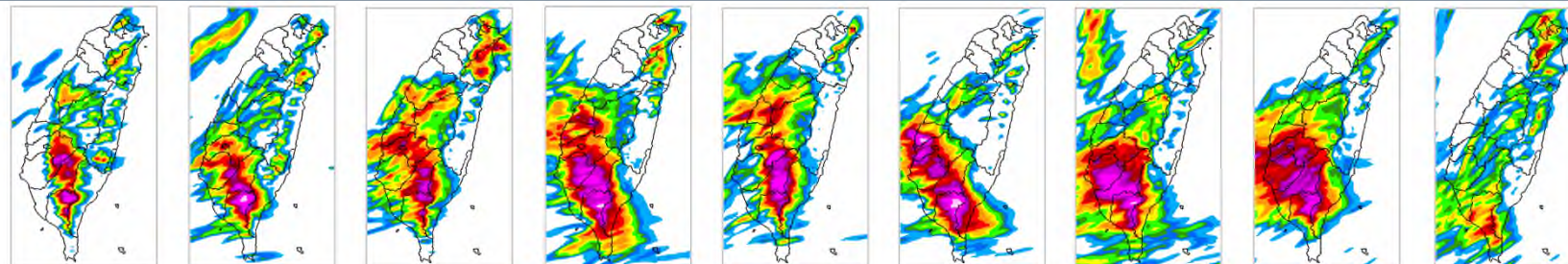
QPESUMS

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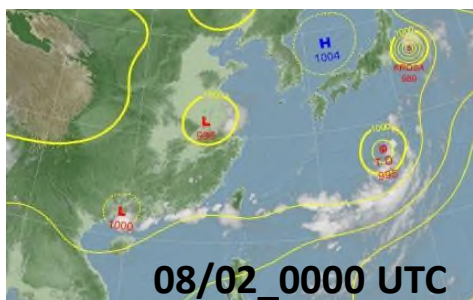
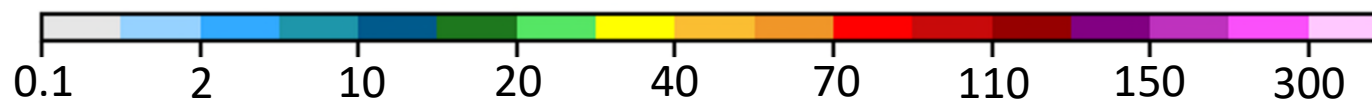
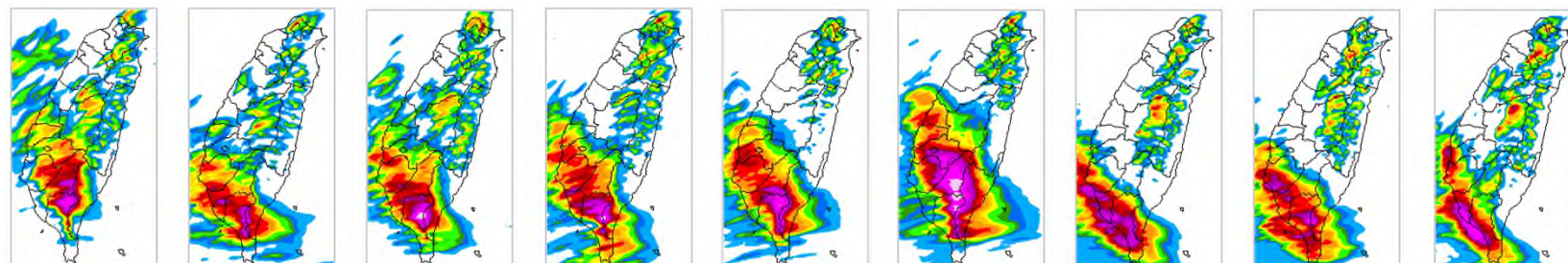
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WRFD



MPAS

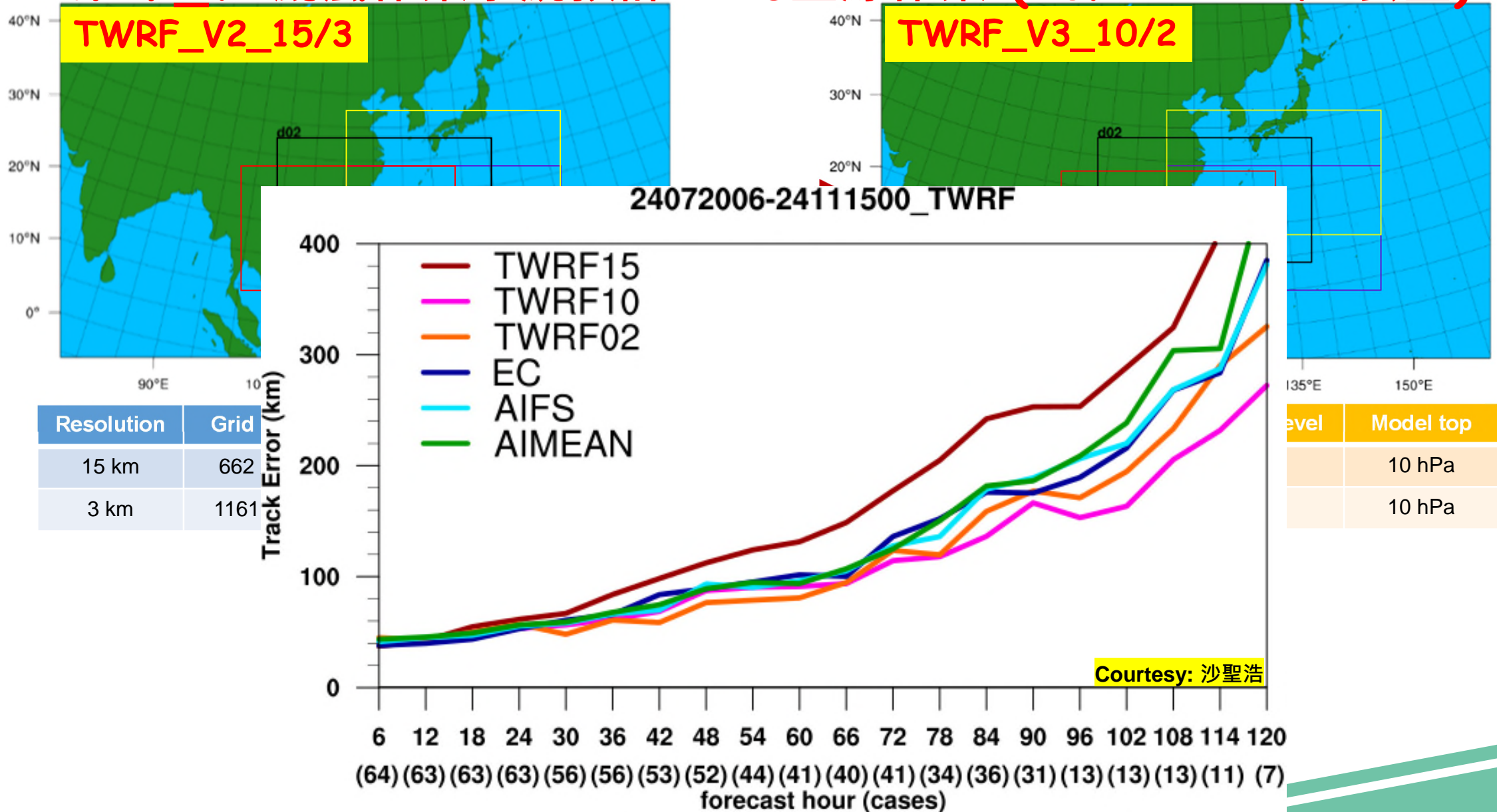


➤ 大低壓帶西南氣流影響：

● **WRFD & MPAS**皆未能掌握到西南部區域強降水量值

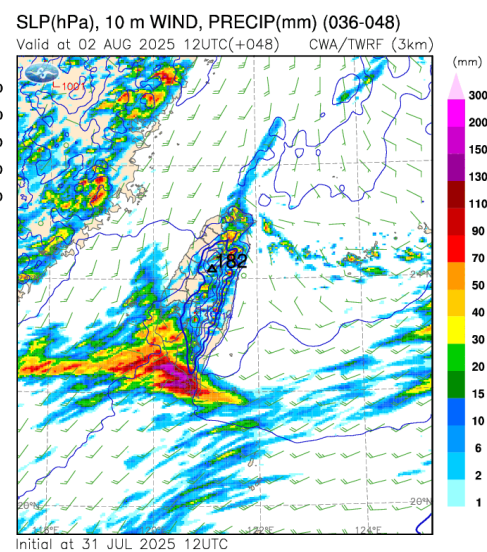
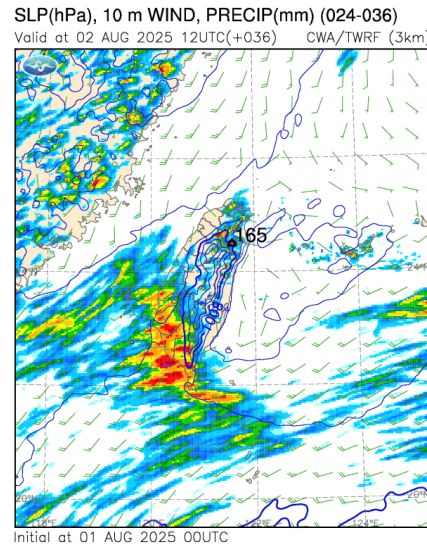
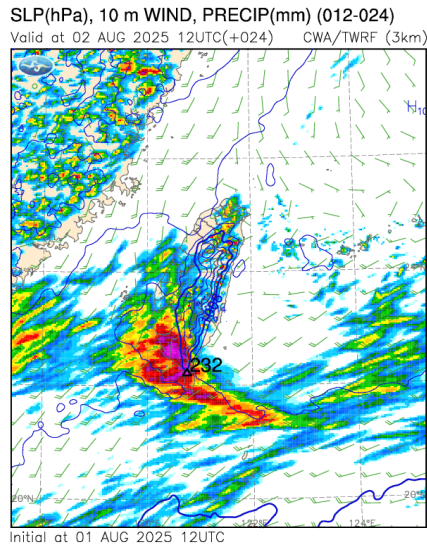
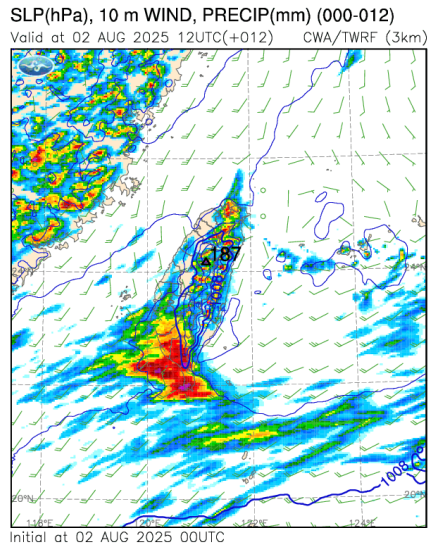
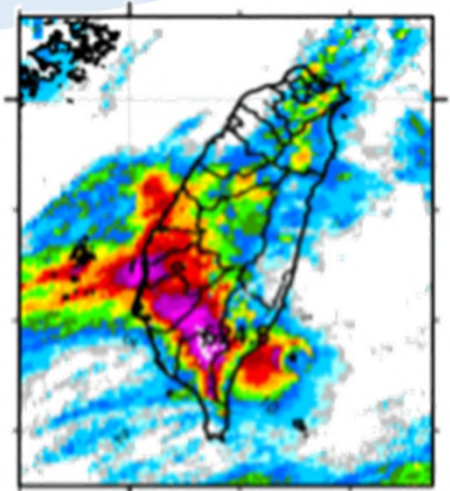
CWA NWP研發中區域模式之二:

TWRF_V3颱風作業系統預計2026上線作業 (15/3 → 10/2公里)

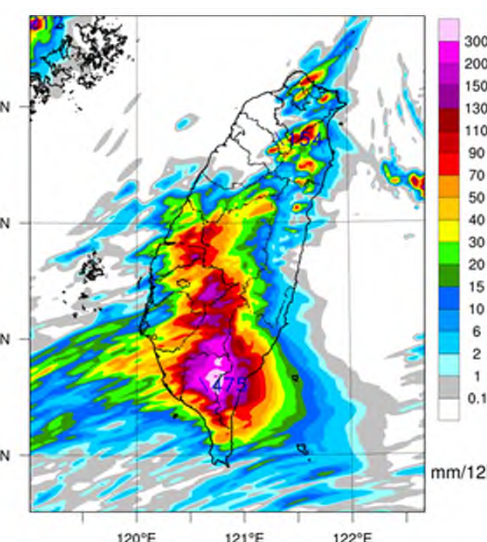
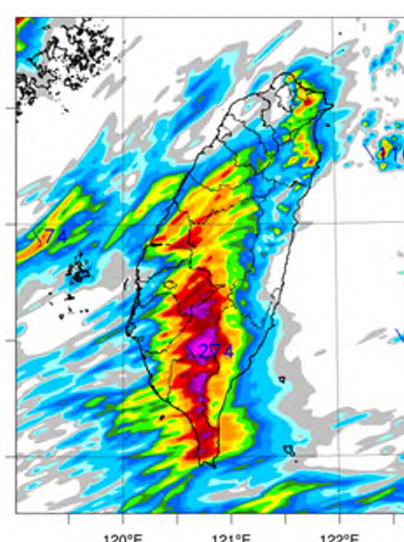
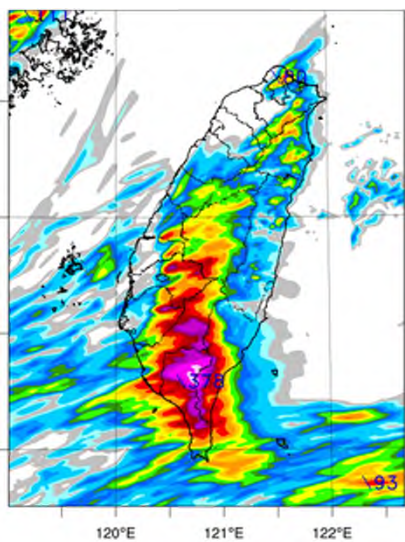
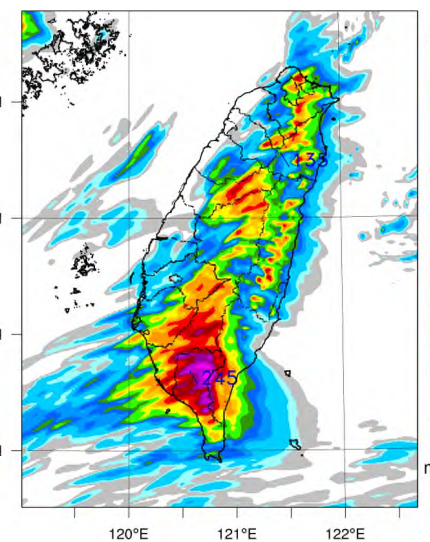
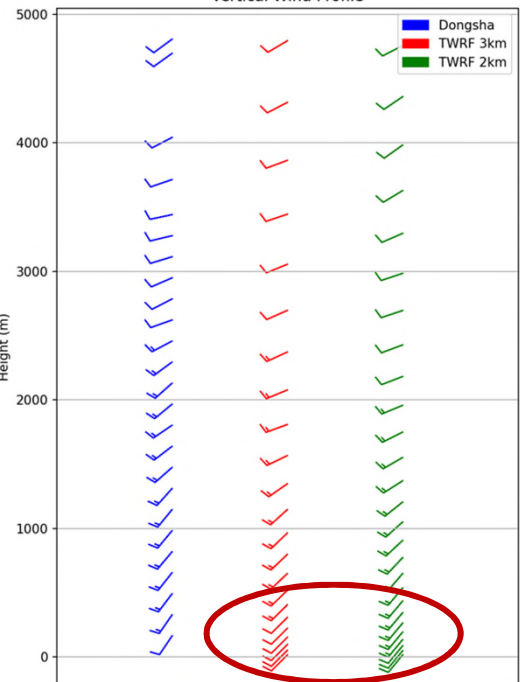


QPESUMS

08/02 00 to 12 UTC



Vertical Wind Profile



➤ TWRF_V3(2km)較V2(3km)明顯改進

TWRF V3(2km)、V2(3km)預報與東沙剖風儀比較

Courtesy: 鄭浚騰、蔡雅婷、徐驊、黃康寧

結論：

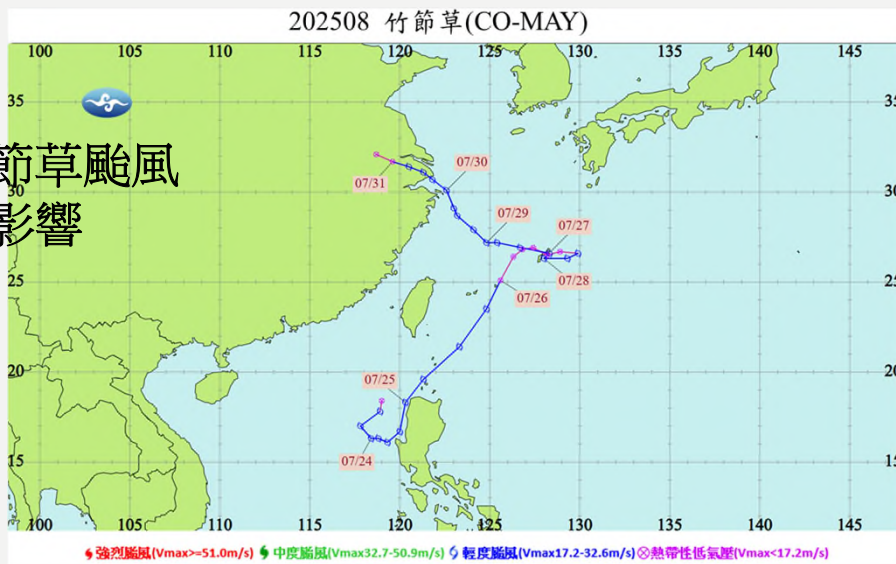
1. 對0728西南氣流歷史級別極端豪雨事件，**WRFD/TWRF/WEPS**對第一波預報尚可，第二波預報表現則不如人意
2. **WRF M07_1km**之降水預報表現較好，特別是第二波，但量值仍低估
3. **CWA NWP**研發中區域模式**MPAS**及**TWRF_V3(2026上線)**較現行作業改善(提升解析度、優化物理過程)



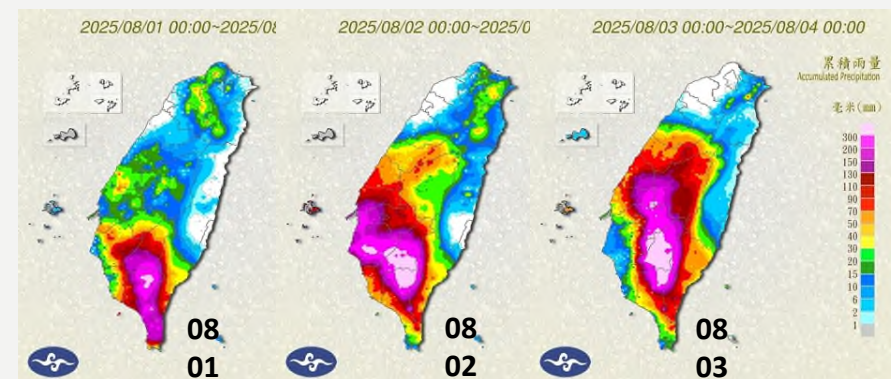
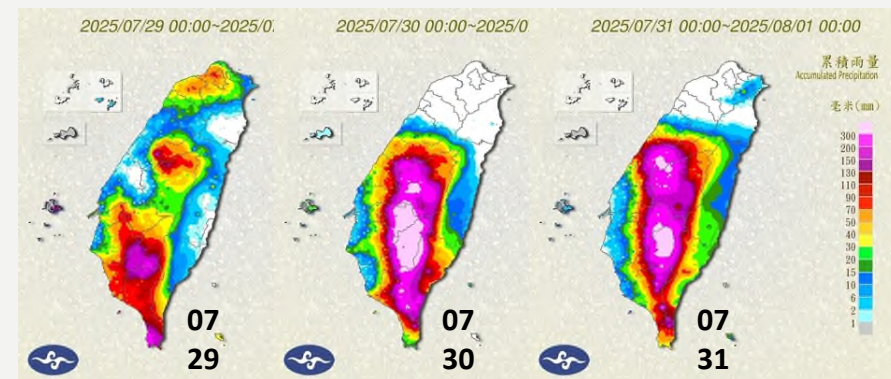
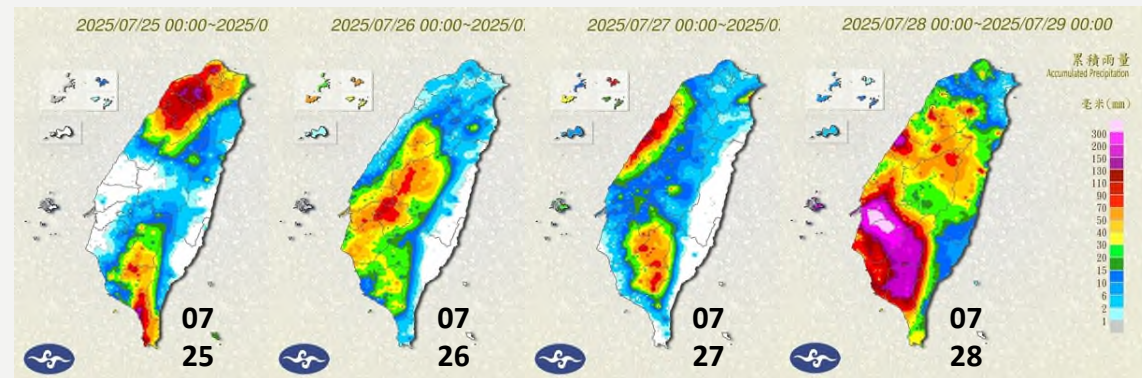
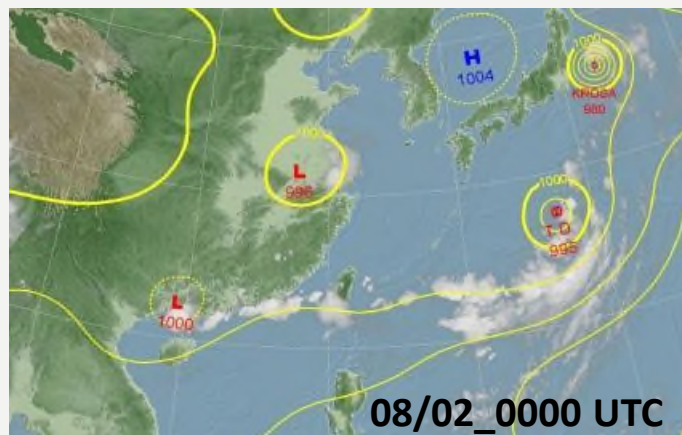
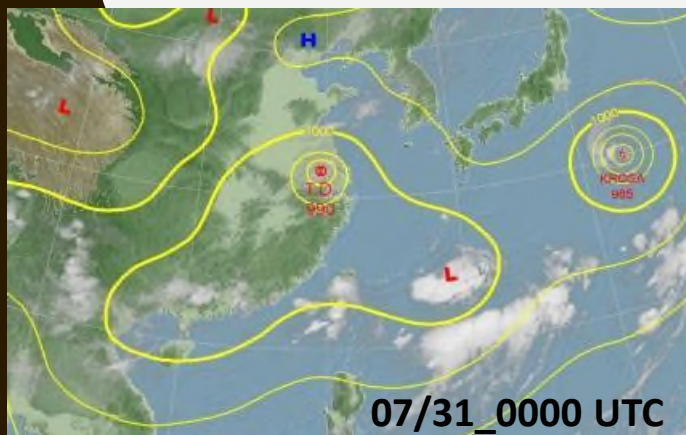
Thank you for your attention and patience!

0728豪雨降水事件 (2025/07/25 to 2025/08/03)

●竹節草颱風環流影響



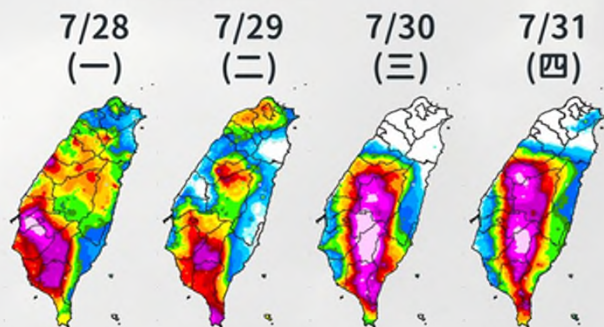
●颱風環流&大低壓帶西南氣流影響



兩波降雨高峰， 天天有豪雨或以上等級降雨

7/28~7/31

晚起
▼ 第一波西南氣流
第8號颱風外圍環流
清晨
▼ 西南風

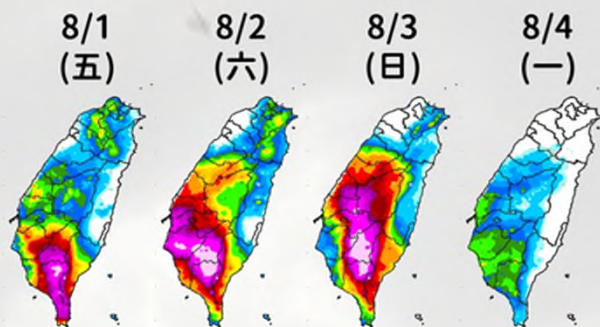


最大日雨量 mm

嘉義太保	屏東大坪頂	高雄小關山	高雄溪南
441	271.5	917.5	509

8/1~8/4

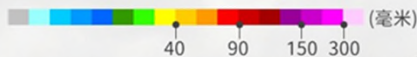
下午起
▼ 第二波西南氣流
西南風再增強
西南風



*8/4統計至11時

最大日雨量 mm

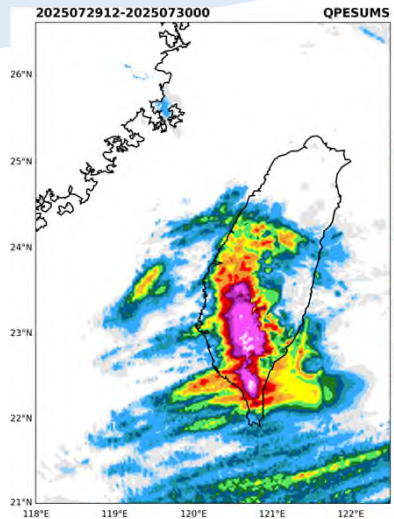
屏東新瑪家	屏東口社	臺南關山	澎湖湖西
497	582	610	119.5



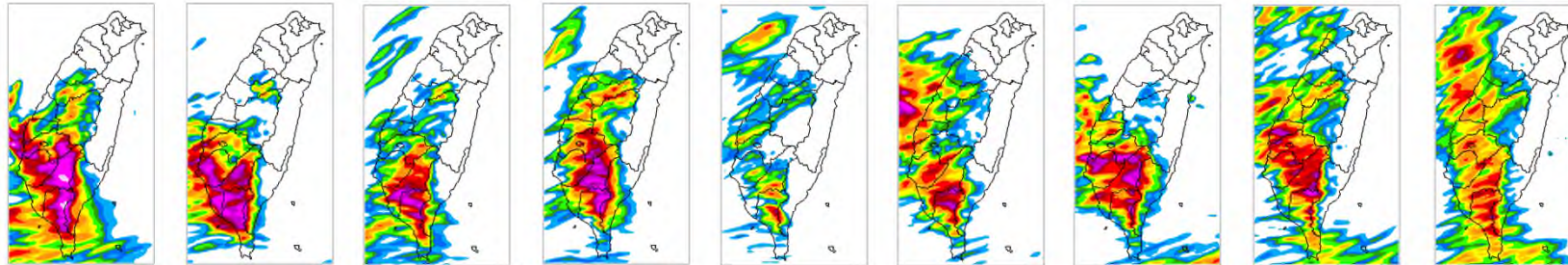
QPESUMS

07/29 12 to 24 UTC

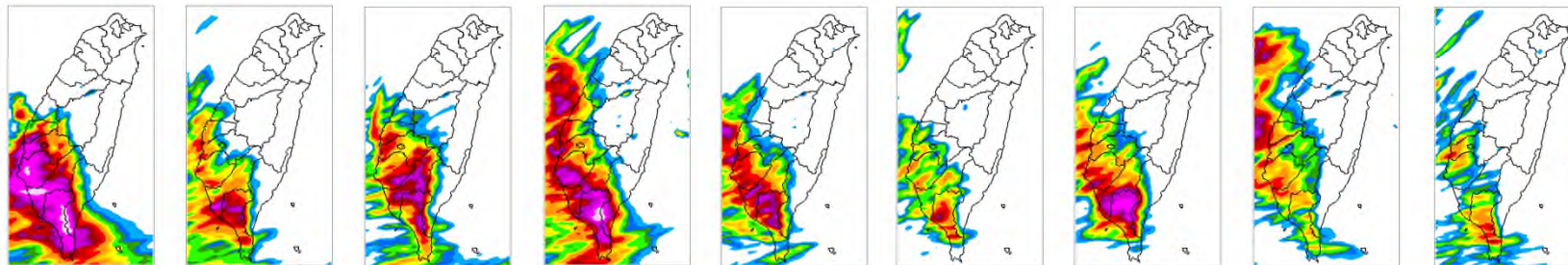
25072900 t12 ~ t24	25072812 t24 ~ t36	25072800 t36 ~ t48	25072712 t48 ~ t60	25072700 t60 ~ t72	25072612 t72 ~ t84	25072600 t84 ~ t96	25072512 t96 ~ t108	25072500 t108 ~ t120
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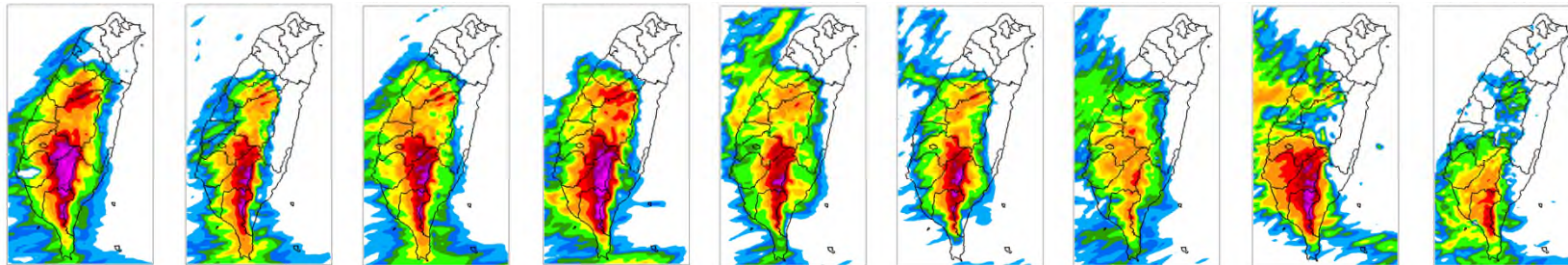
WRFD



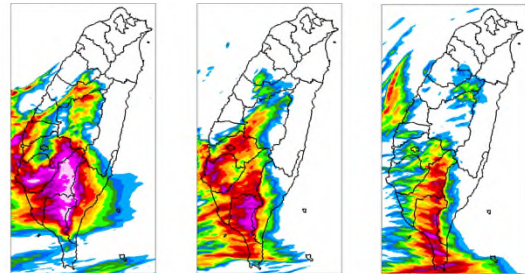
TWRF



WEPS
PM



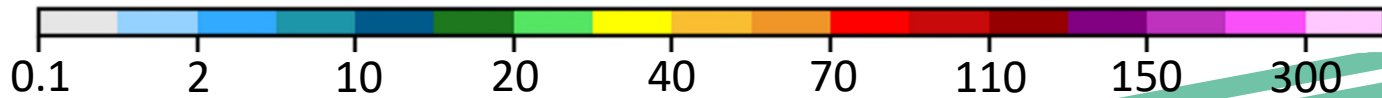
M07_
1-km



202508 竹節草(CO-MAY)



- 竹節草颱風環流影響：
 - TWRF有低估情形；WEPS於地形強降水掌握較佳。
 - 隨著模式解析度提高，M07_1km降水分布掌握最佳

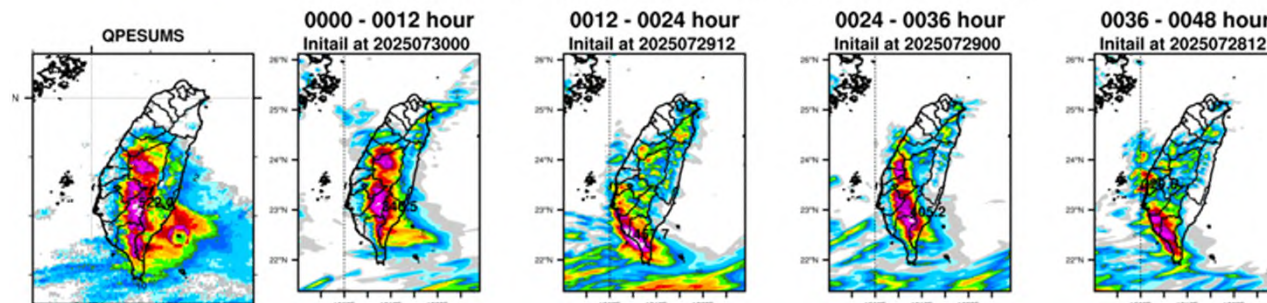


Courtesy: 黃小玲



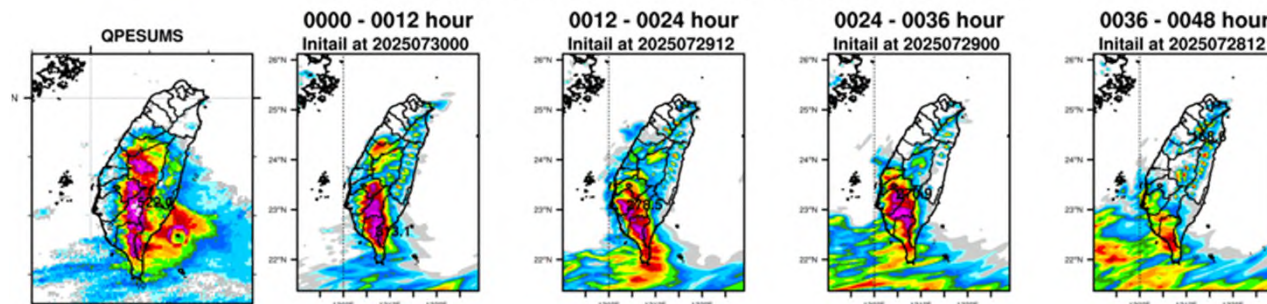
M04 Accumulated rainfall

Valid time at 2025073012 (from 2025073000 - 2025073012)



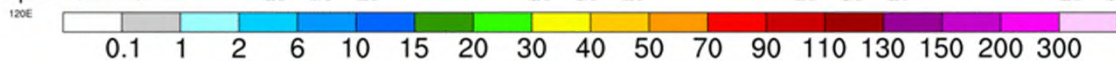
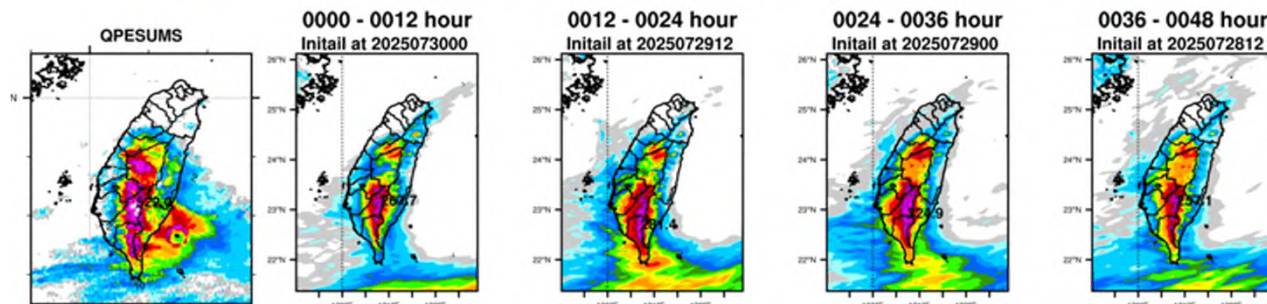
M05 Accumulated rainfall

Valid time at 2025073012 (from 2025073000 - 2025073012)



PM Accumulated rainfall

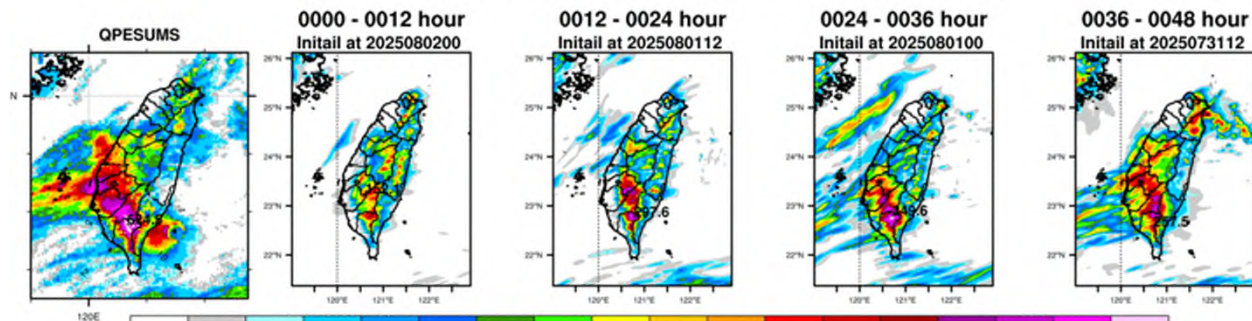
Valid time at 2025073012 (from 2025073000 - 2025073012)





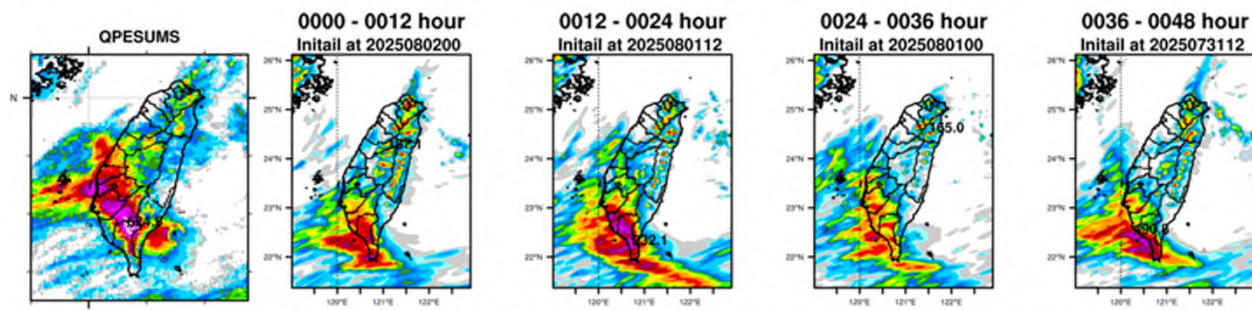
M04 Accumulated rainfall

Valid time at 2025080212 (from 2025080200 - 2025080212)



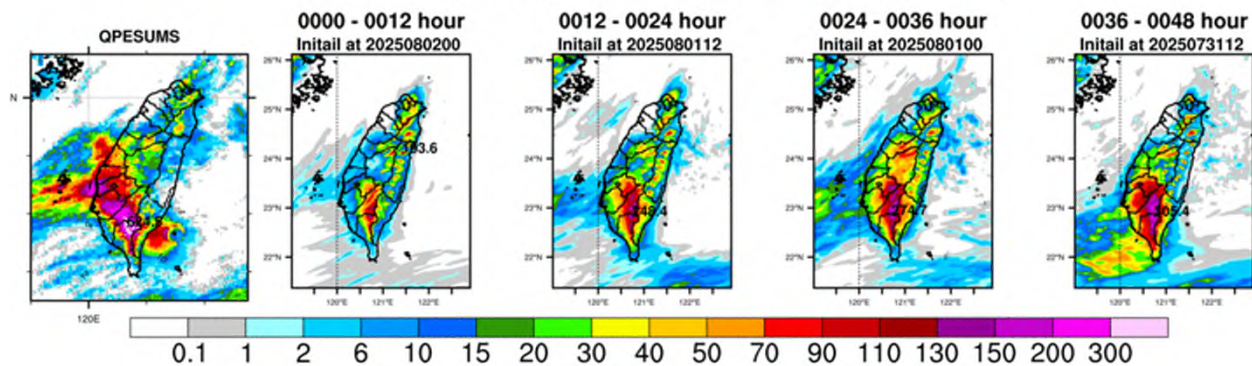
M05 Accumulated rainfall

Valid time at 2025080212 (from 2025080200 - 2025080212)



PM Accumulated rainfall

Valid time at 2025080212 (from 2025080200 - 2025080212)





M07 Accumulated rainfall

Valid time at 2025080212 (from 2025080200 - 2025080212)

