

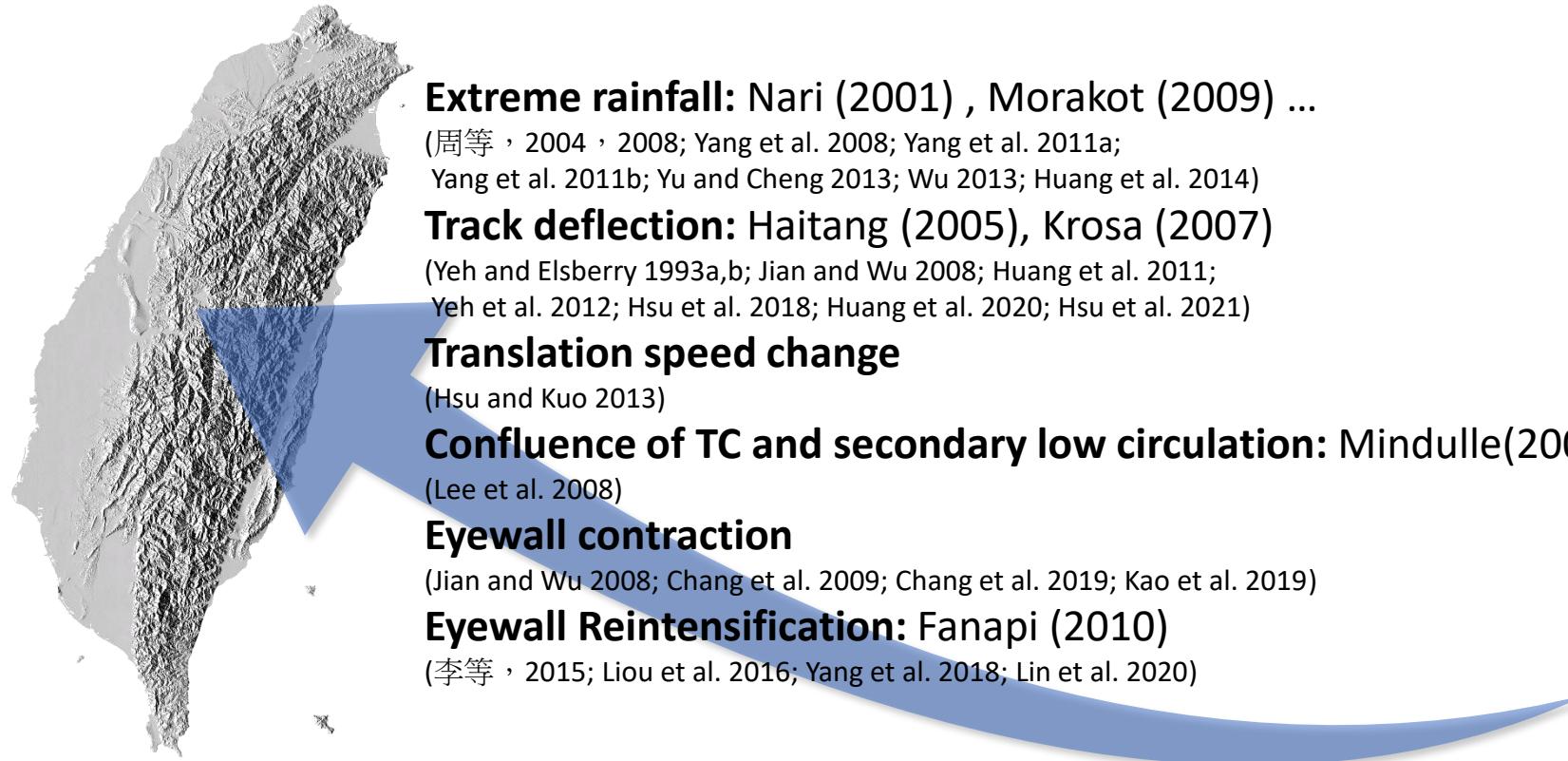
凱米颱風之風雨結構雷達觀測分析

方偉庭 張保亮
中央氣象署

2024.09.03

天氣分析與預報研討會@CWA

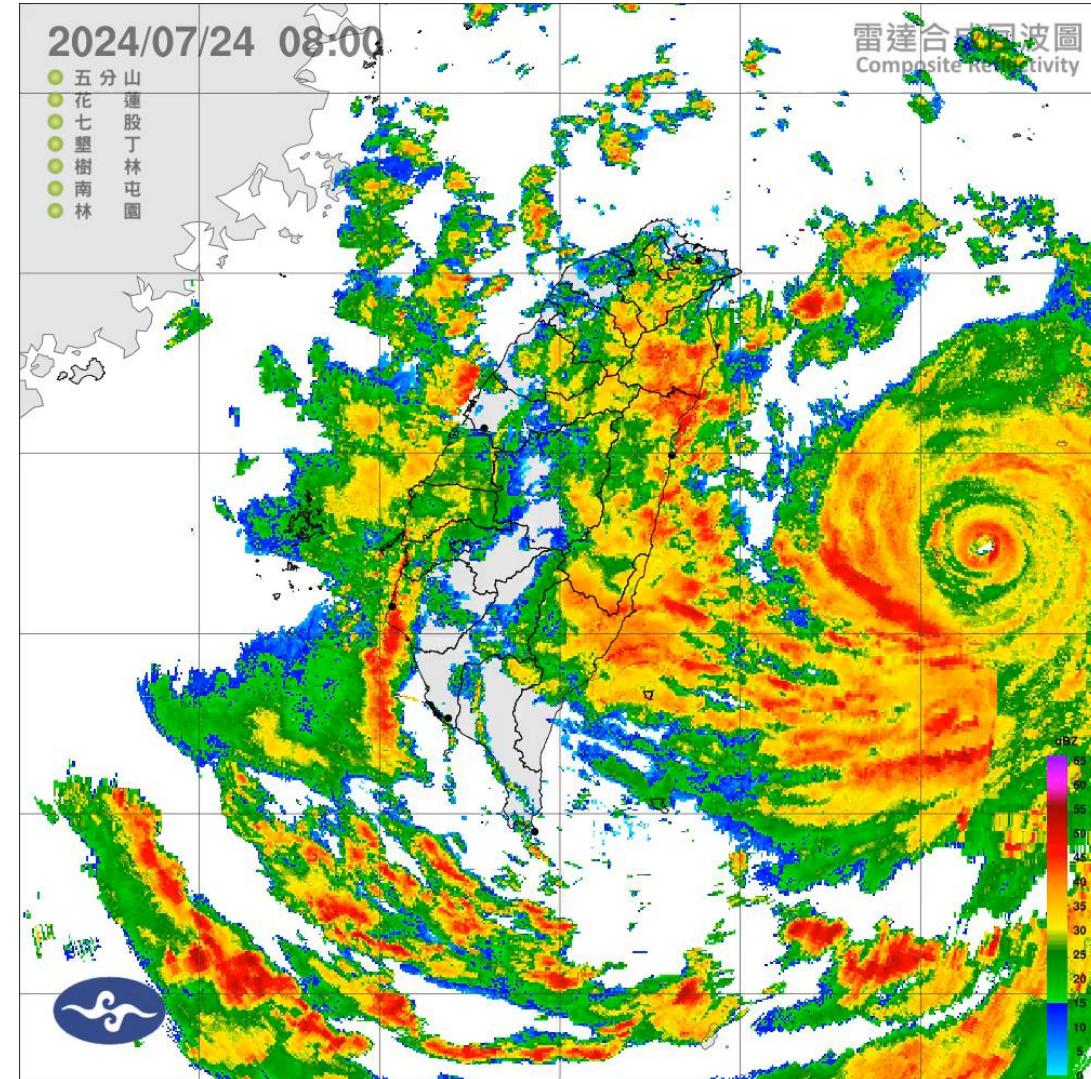
地形引發之特殊現象



Taiwan terrain

大綱

- 路徑與平均流場分析
- 軸對稱風場特徵與降雨配置



Looping Track Typhoon GAEMI

➤ Historical looping track typhoons of Taiwan

- 7 typhoon cases

1960 Shirley	1992 Polly	2008 Sinlaku
1965 Mary	2005 Haitang	
1989 Sarah	2007 Krosa	

- Key features

approached northern Taiwan (north to 24°N).

relatively slow translation speeds (~4 m/s).

intense typhoon.

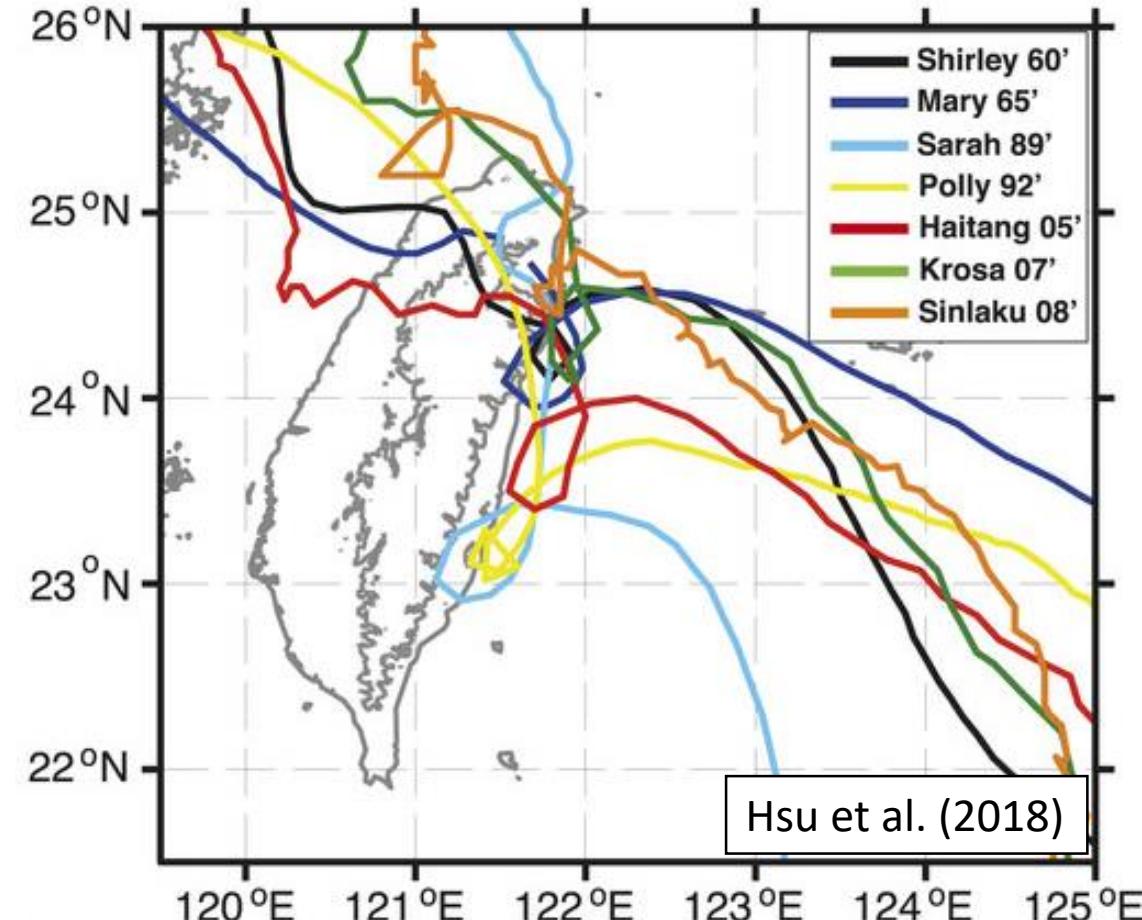
(Hsu et al. 2018 ; Huang et al. 2011)

→ Prolong the duration time and lead to extreme rainfall

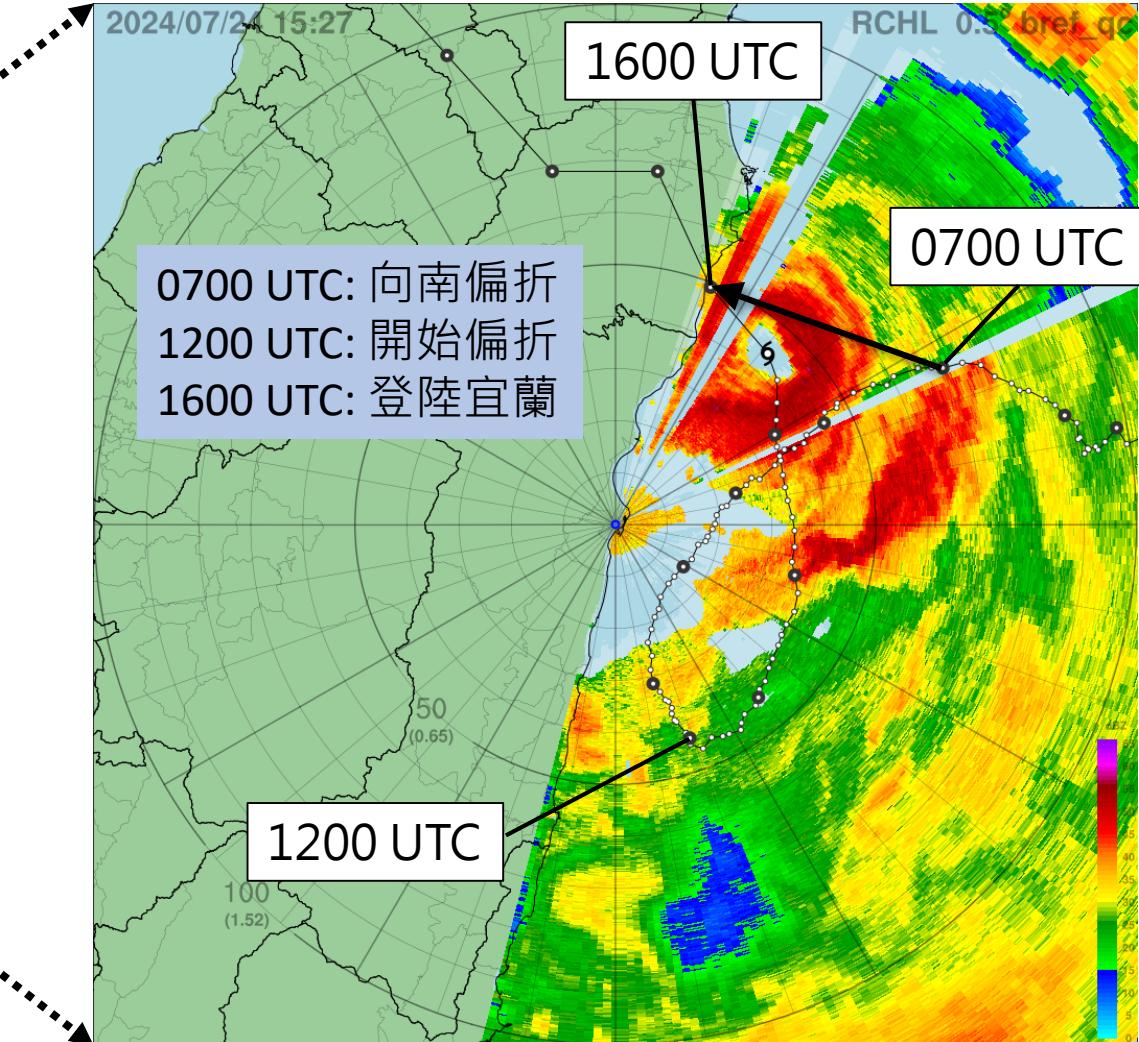
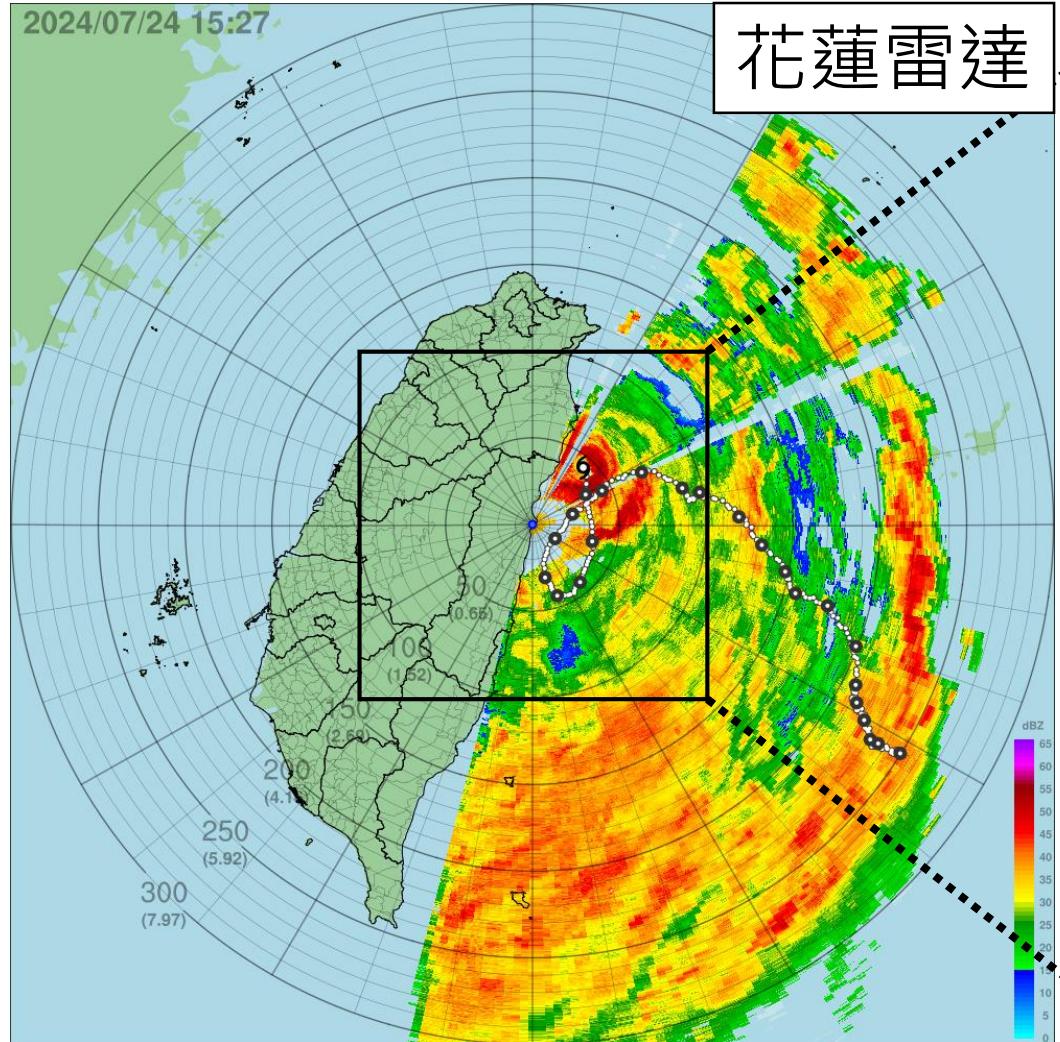
➤ Typhoon GAEMI (2403)

- Approached northern Taiwan.
- Translation speeds ~5.6 m/s.
- Category 4 typhoon (peak intensity prior to landfall).
- Significant inner core structure and intensity change.

→ By using high resolution RCHL data, the detail inner core structure evolution features of GAEMI is documented.

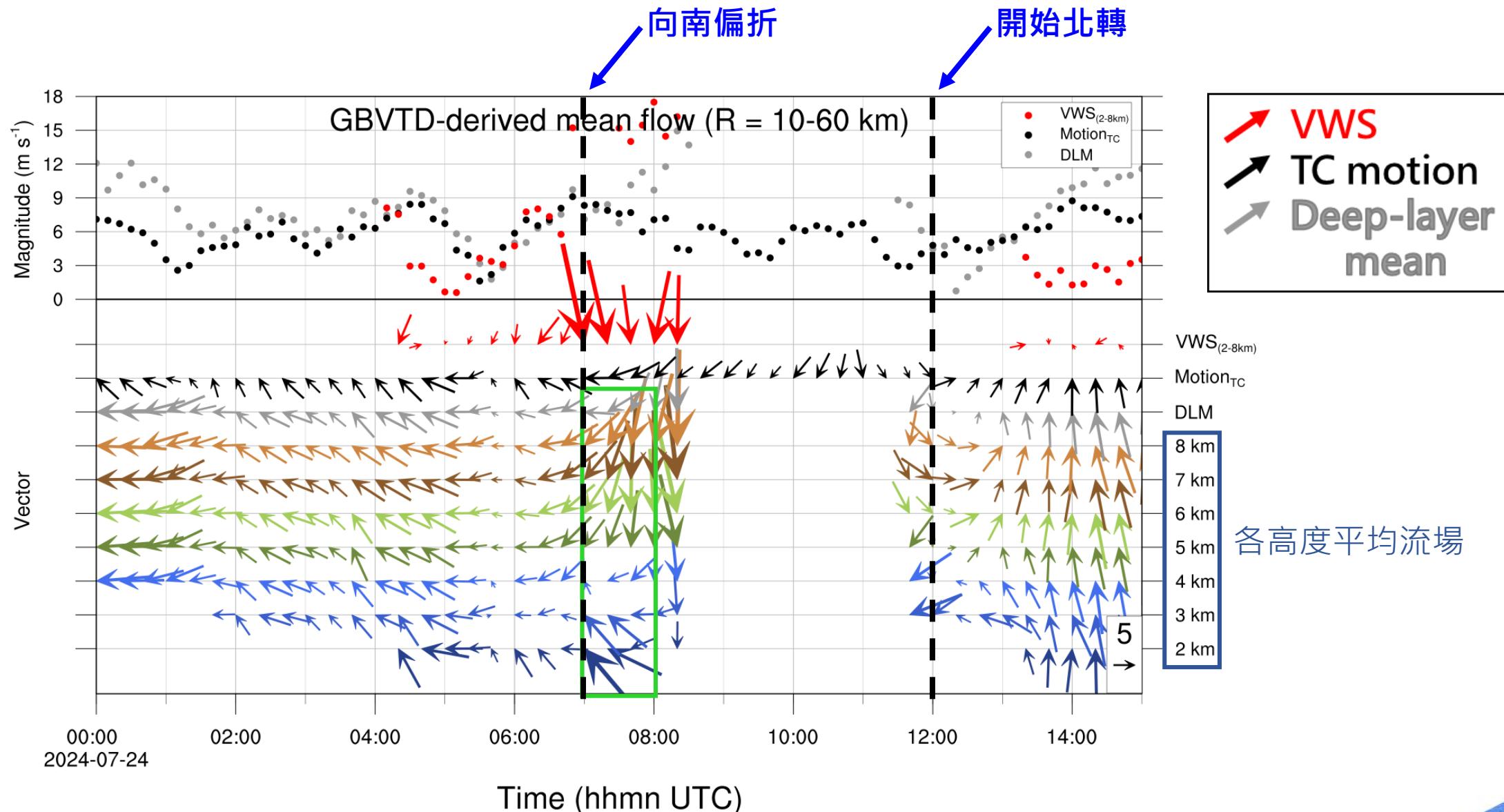


凱米颱風臨臺路徑

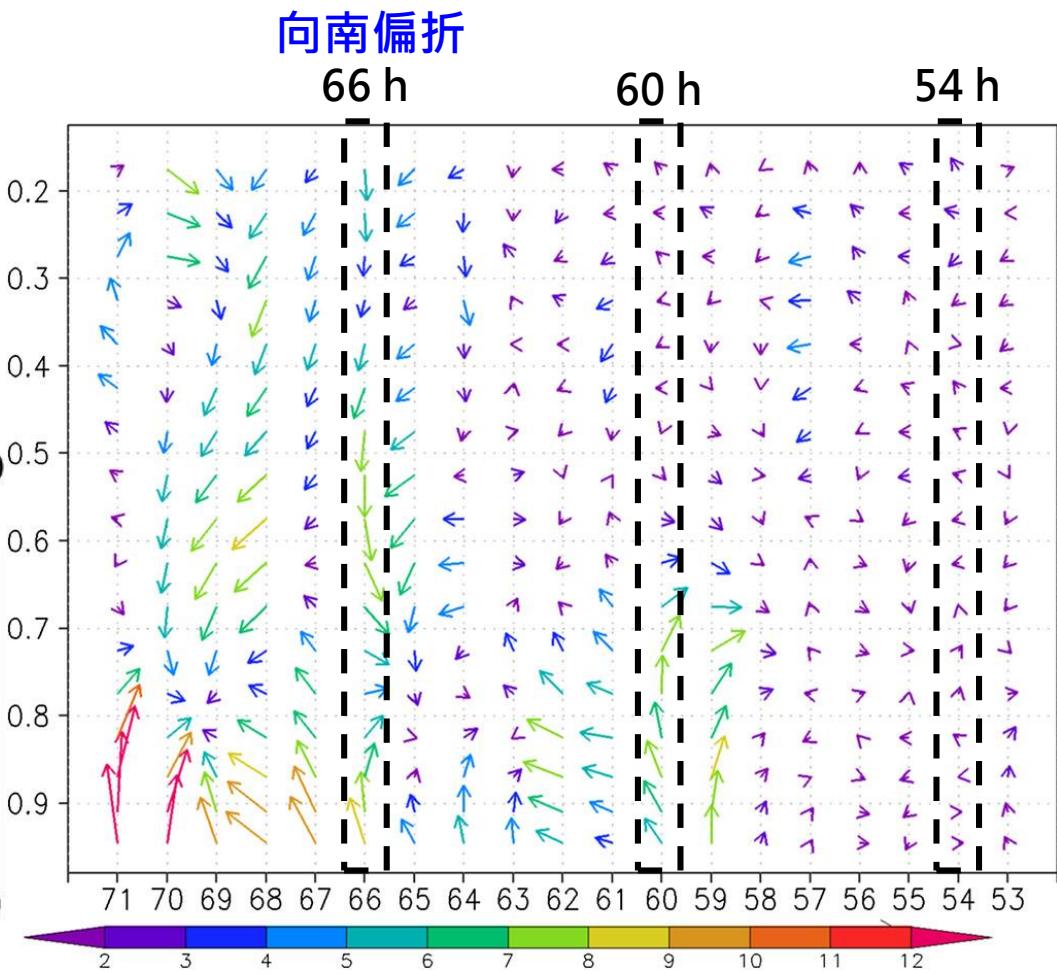
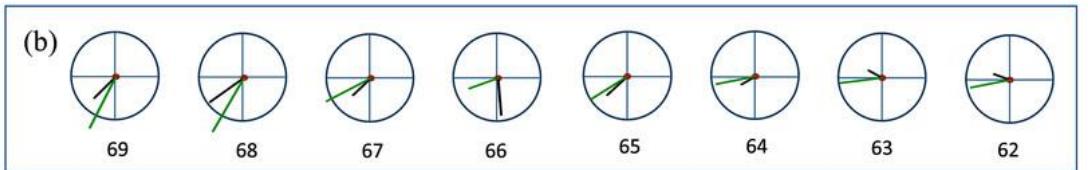
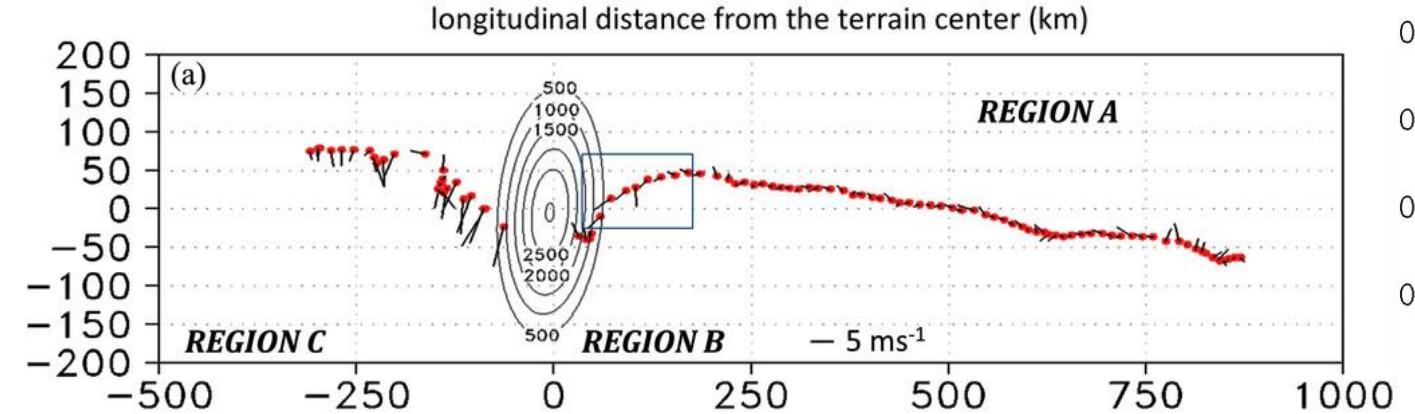
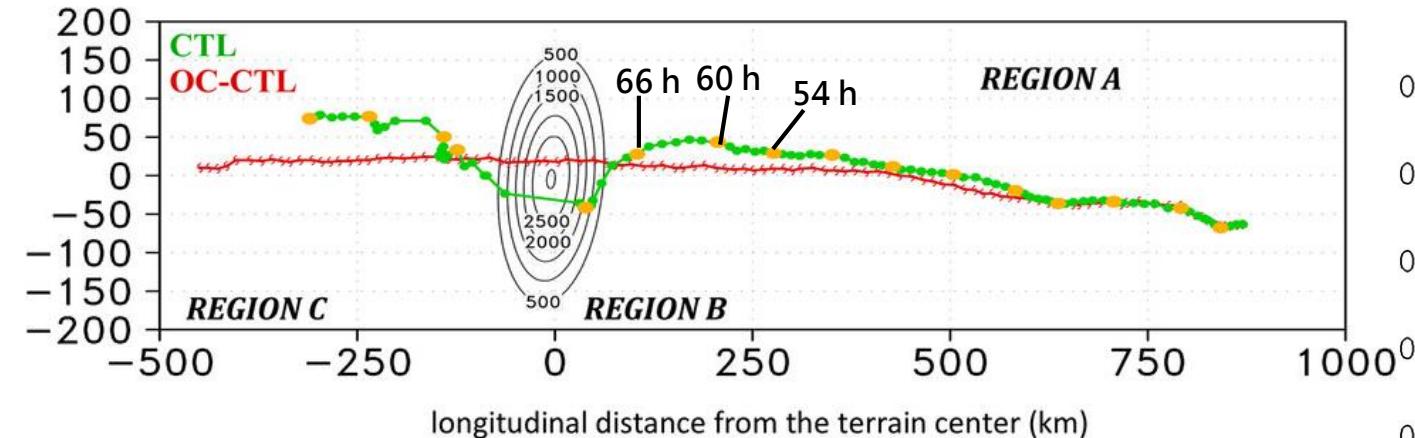


雷達推估之平均流場時間序列

驅動颱風向南的流場分量
主要分布於中層與高層



平均流之垂直分布 數值模擬結果



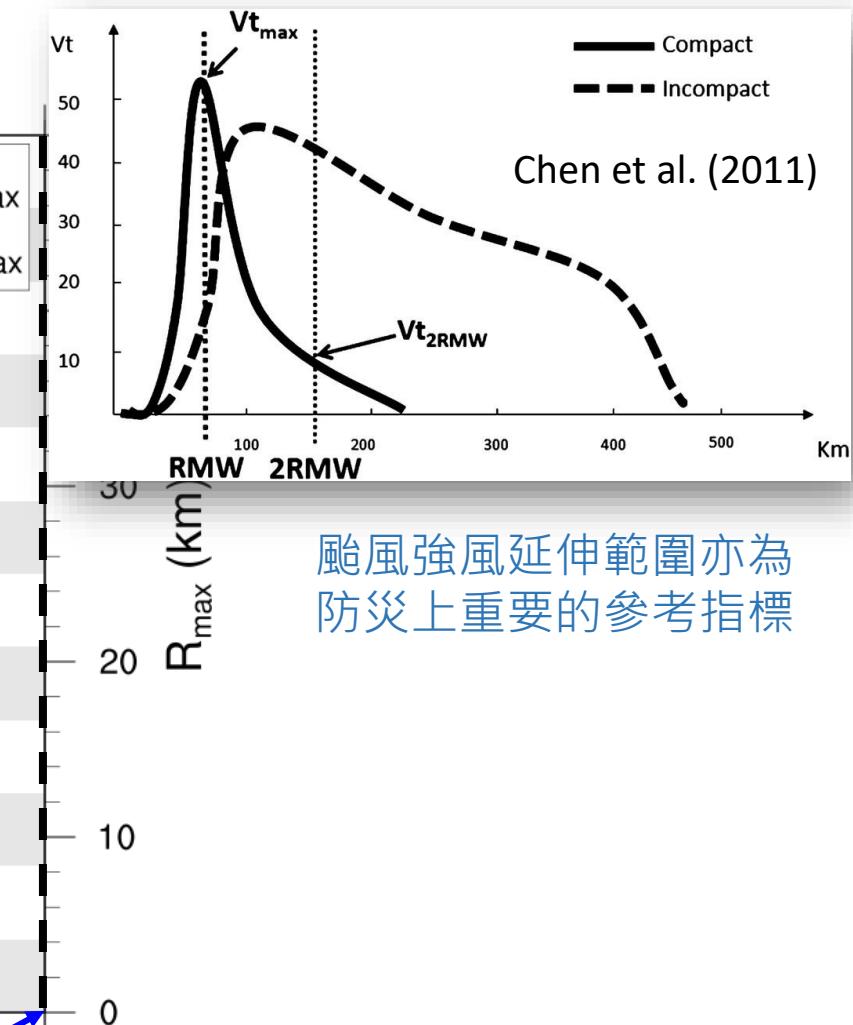
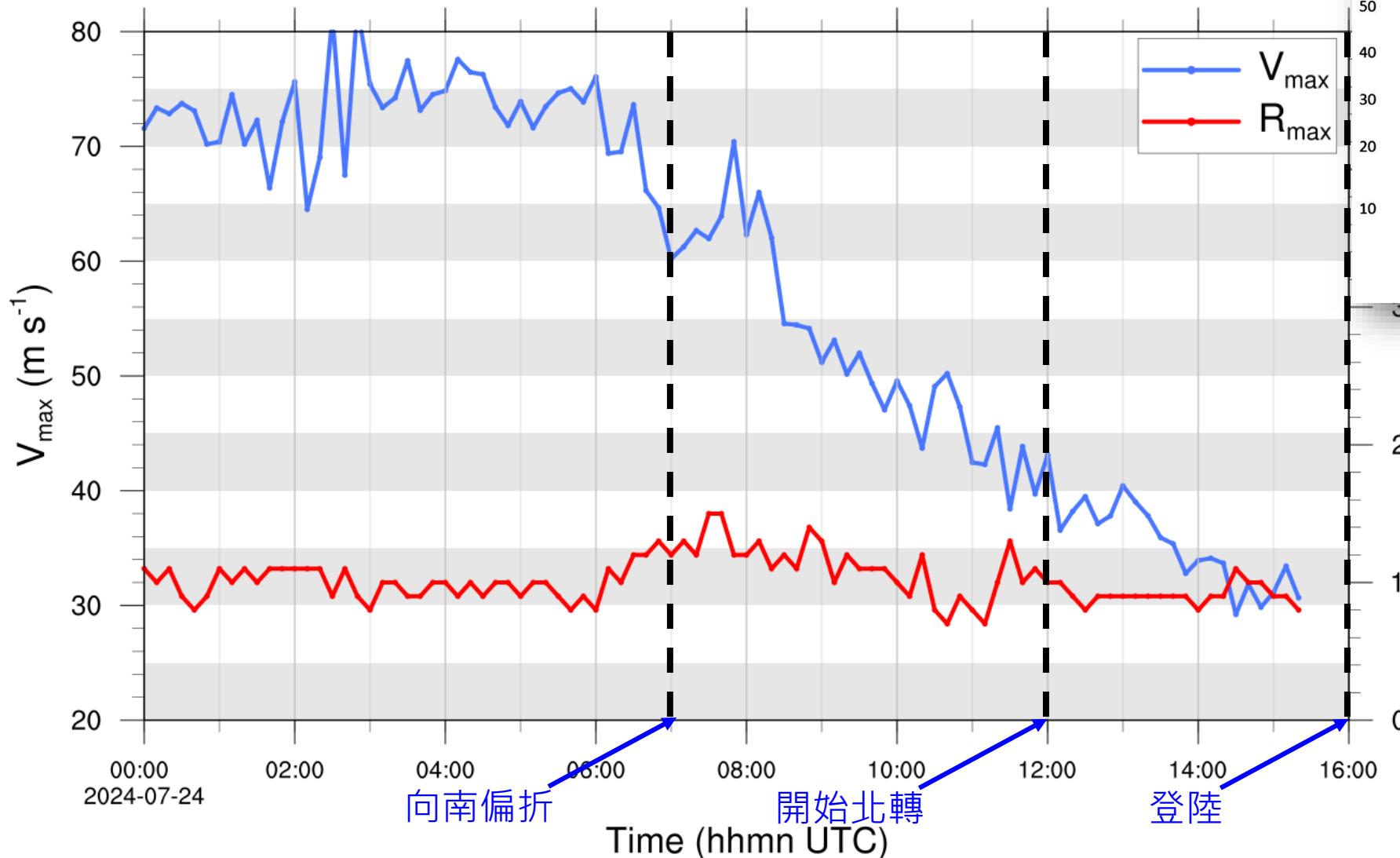


凱米颱風風雨分布

3公里高度最大風速與最大風速半徑

花蓮雷達

GAEMI(2024) @3.0 km



颱風強風延伸範圍亦為
防災上重要的參考指標

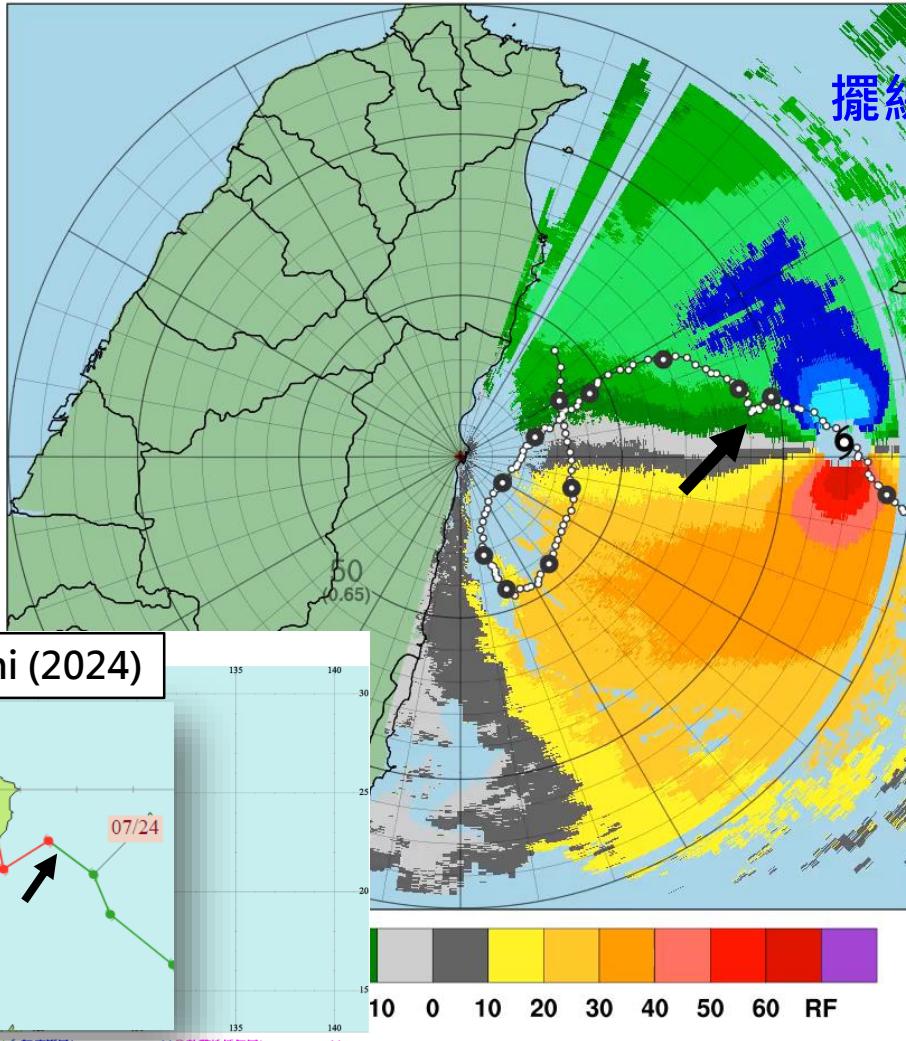
雙眼牆與擺線運動

2024-0724-0403 UTC 0.50PPI

RCHL bvel_rawqc

$m s^{-1}$

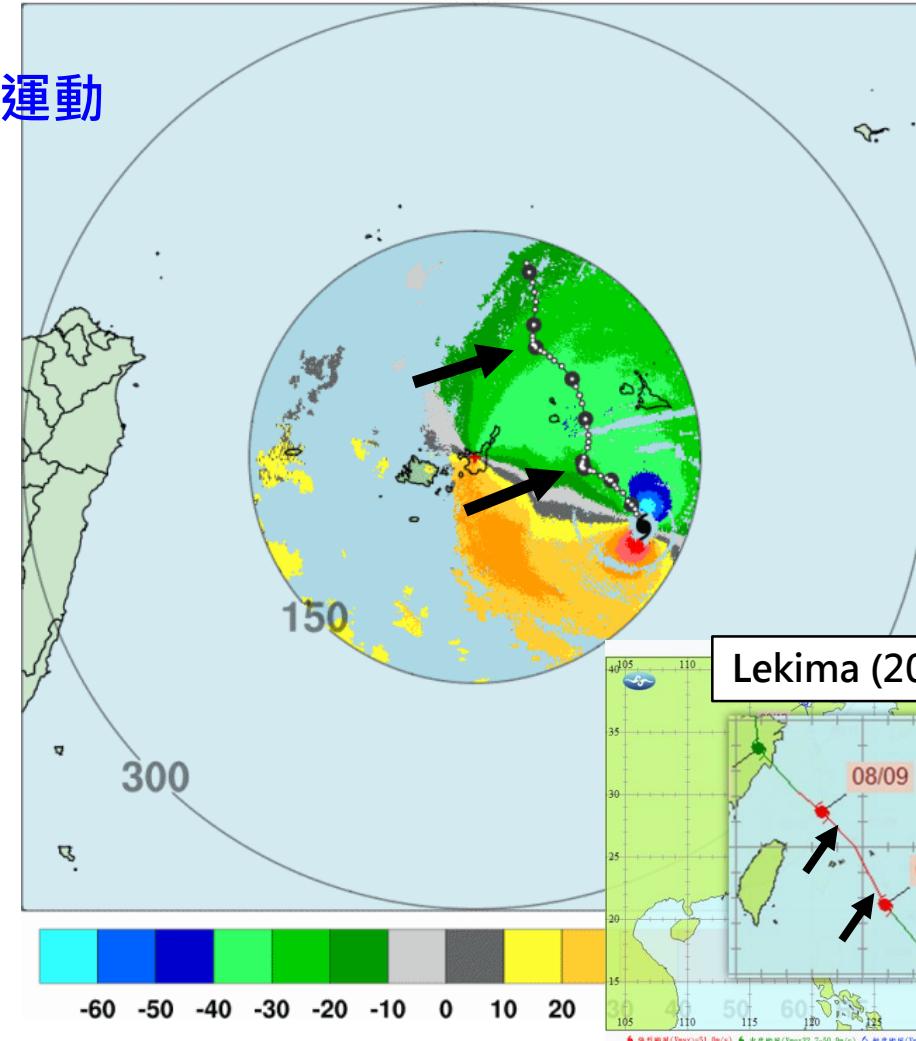
擺線運動



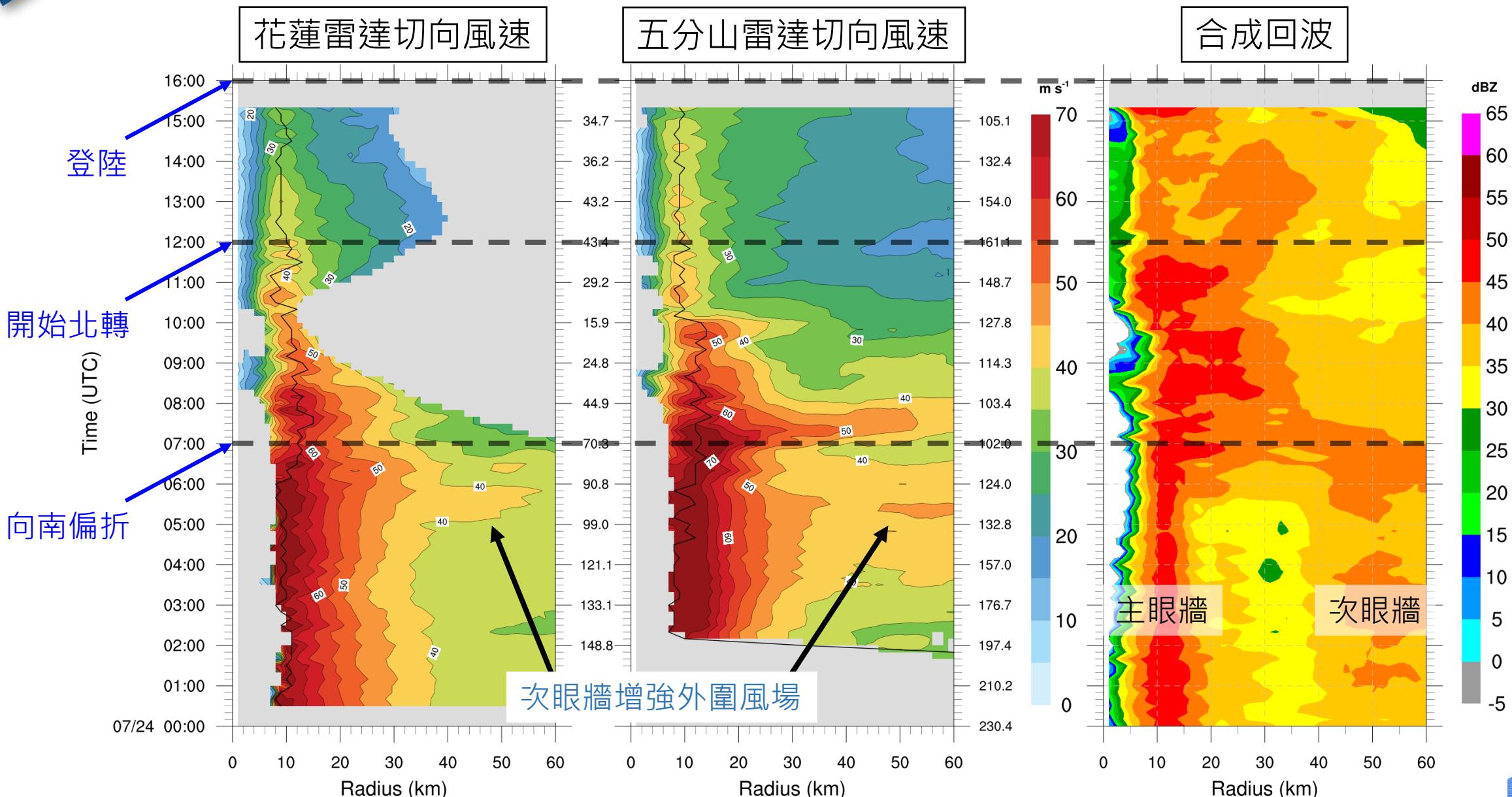
2019-0808-0915 UTC 1.10PPI

ISHI bvel_vda

$m s^{-1}$



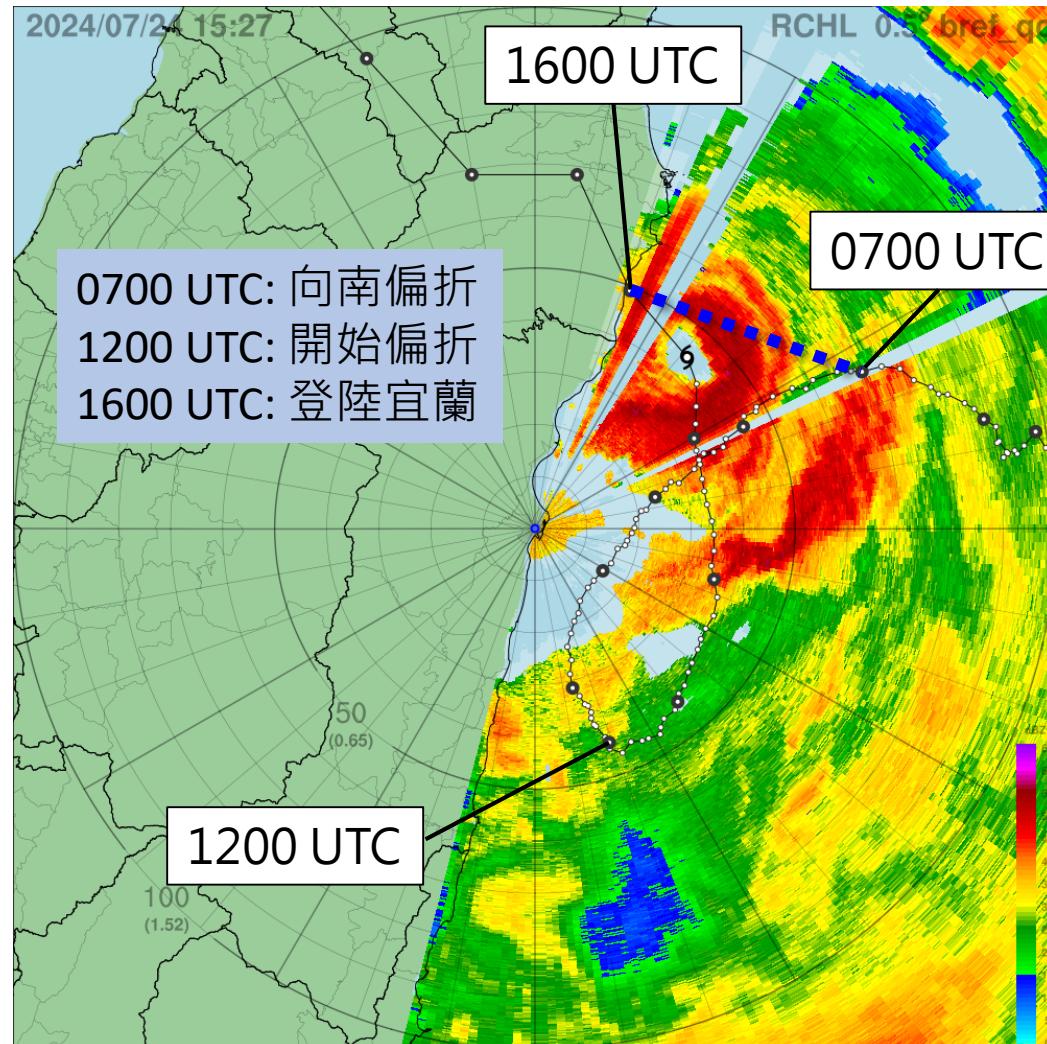
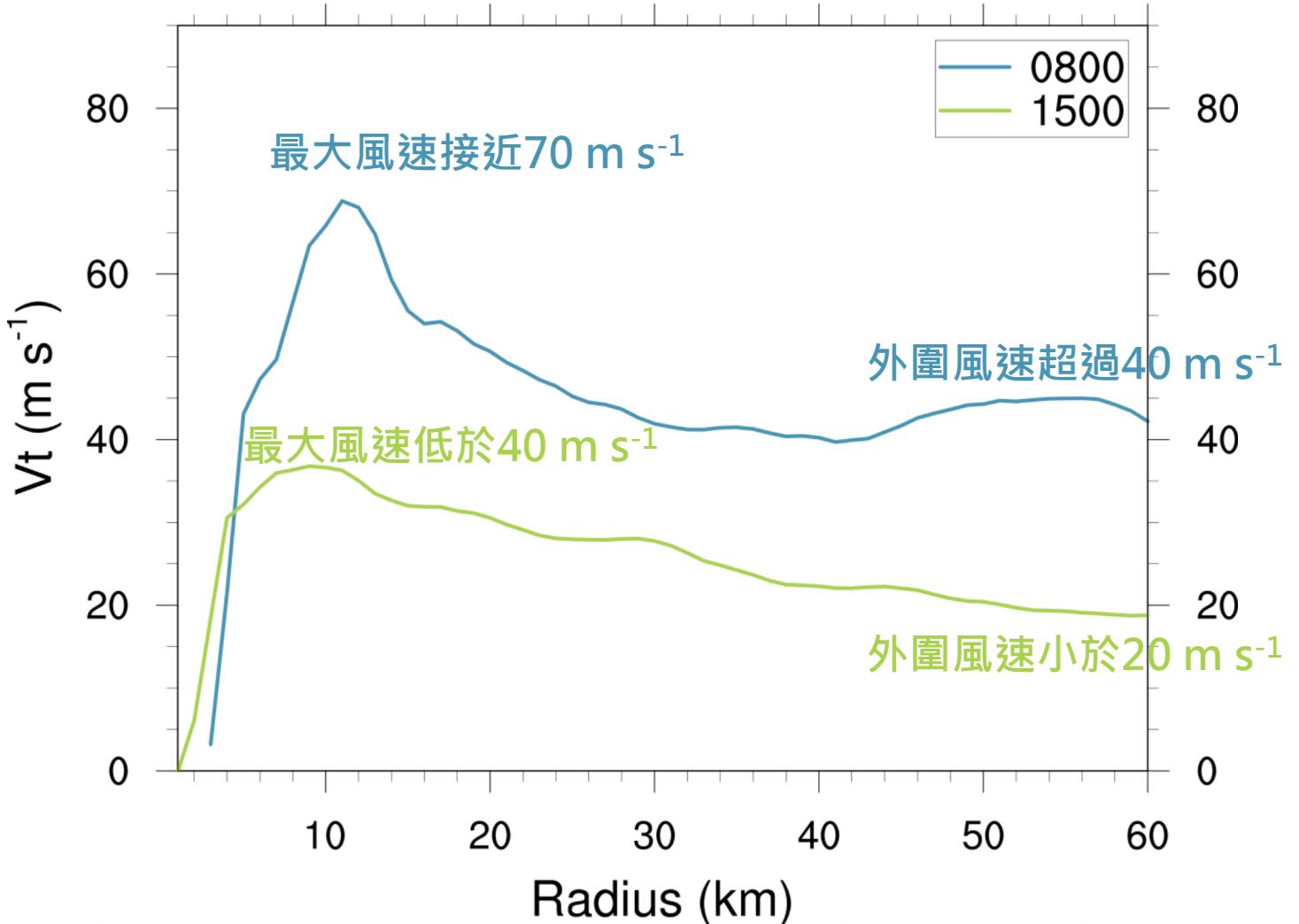
軸對稱切向風與回波場@3km



打轉前後風場分布比較

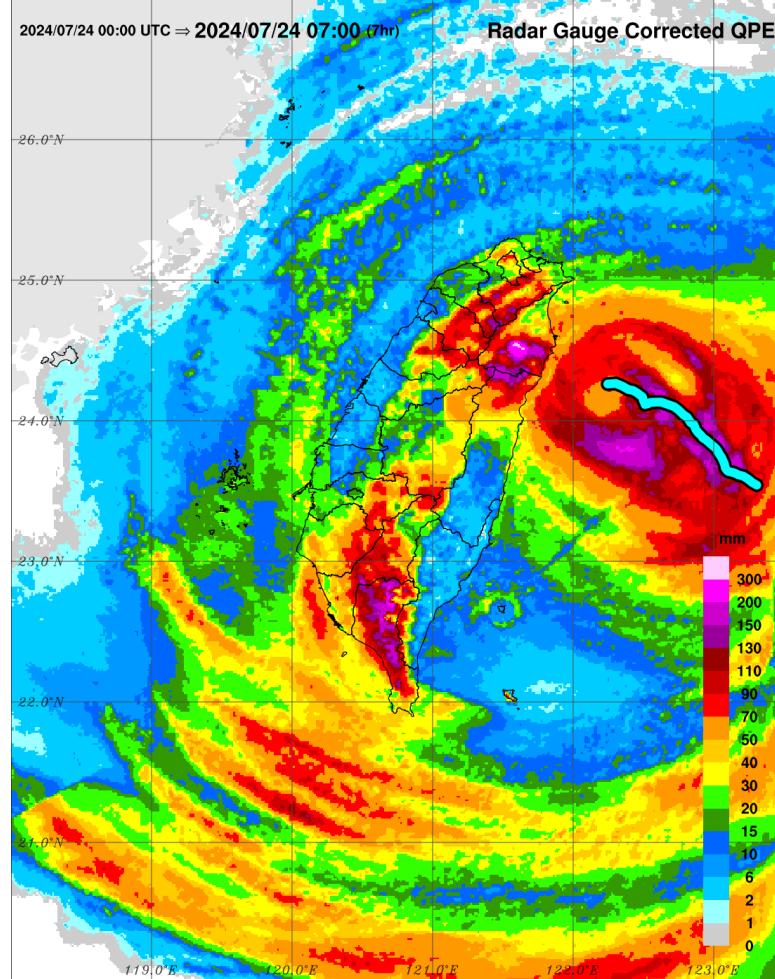
3公里高度軸對稱風剖面

GBVTD Vt (20240724)

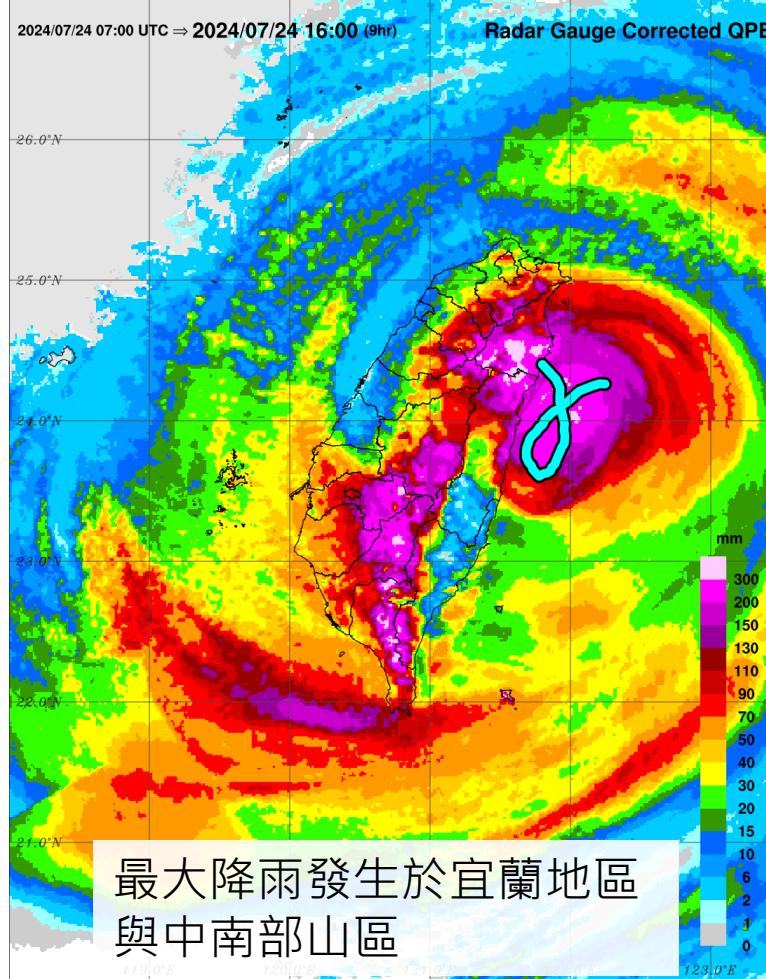


7/24 降雨配置

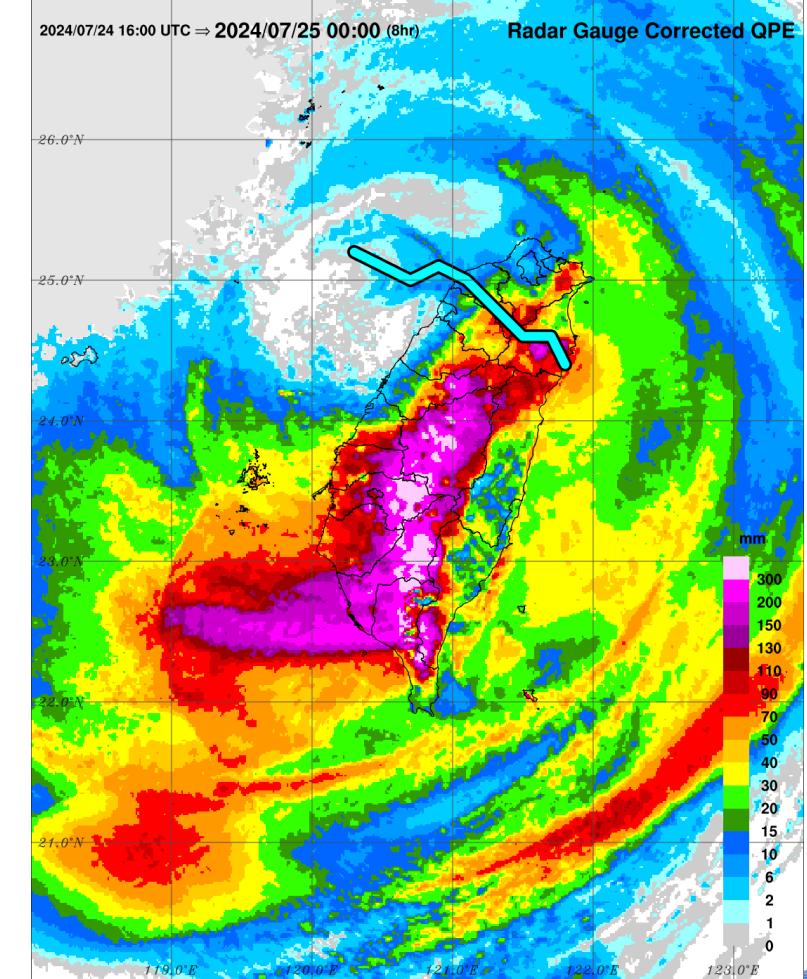
打轉前: 0000-0700 UTC



打轉期間: 0700-1600 UTC



登陸後: 1600-0000 UTC



小結

- 凱米颱風侵襲臺灣期間，雷達網可對其風雨結構進行完整的觀測，包含雙眼牆結構、擺線運動、以及打轉時的風雨結構變化。
- 平均流分析顯示，颱風開始向南偏折時，驅動颱風向南的流場分量主要分布於中層與高層，此與過去數值模擬研究結果相符。此現象可做為未來類似颱風的風雨預報參考資訊。
- 雙眼牆結構約持續6小時，路徑向南偏折後因受臺灣地形影響，外眼牆逐漸減弱且併入內眼牆，並伴隨外圍風場的減弱。
- 颱風路徑向南偏折前，3公里高度之最大風速約達 70 m s^{-1} ；打轉期間最大風速逐漸減弱，登陸時最大風速約降至 30 m s^{-1} ，對登陸地區之風力威脅降低。
- 然而，颱風打轉期間約歷時9小時，期間最大降雨發生於宜蘭地區與中南部山區，兩區域最大累積降雨均超過 300 mm ，顯著增加颱風侵襲期間造成之總累積雨量。

謝謝聆聽

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WEATHER
ADMINISTRATION



Looping Track Typhoon GAEMI – Inner Core Structure Evolution (4)

➤ Circulation structure – axisymmetric component [retrieved by applying GVT technique, Jou et al. 2008]

- Period I (northwestward track) : upright radius of maximum wind (RMW).
- Period II (southward deflection) : eyewall convection enhanced, increased V_t max., outward slopping eyewall and RMW.
- Period III (northward deflection) : eyewall convection and V_t max. weakened significantly.

→ Inner core structure evolution associated with intensity change.

Axisymmetric Circulation Structure radius-height cross section

