

**Preliminary Study on the  
Characteristics of Radar echo  
under the Influence of Typhoon-  
introduced Southwest Flow**

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*National Defense University*

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# Disasters



**Typhoon Mindulle !**



**Typhoon Bilis !**



**Typhoon Kalmaegi !**



**Typhoon Morakot !**

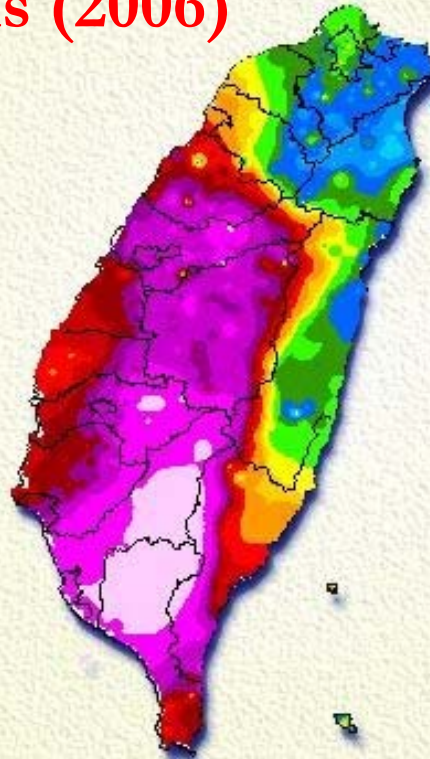
# Torrential Rainfall Brought by Typhoon-introduced Southwest flow

- Typhoon Mindulle 2004. 7. 2. ~ 7. 3.
- Typhoon Haitang 2005. 7. 19.
- Typhoon Bilis 2006. 7. 14.
- Typhoon Sepat 2007. 8. 19.
- Typhoon Kalmaegi 2008. 7. 18.
- Typhoon Morakot 2009. 08. 08.

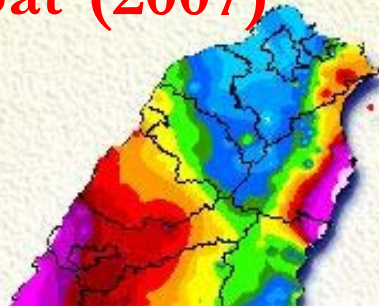
# Rainfall Distribution

Adopted from CWB web site: <http://www.cwb.gov.tw>

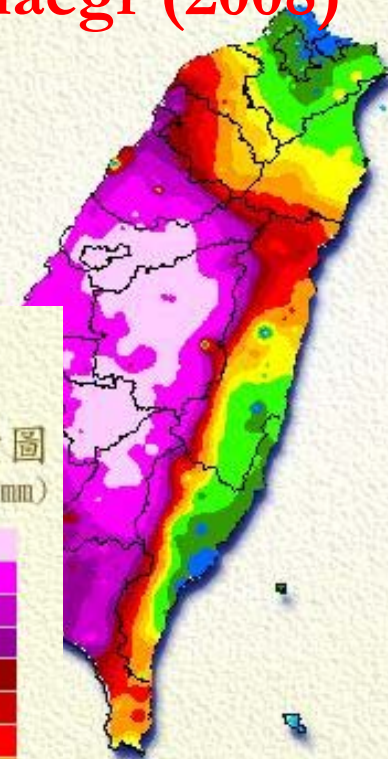
7/14 00:00 ~ 7/14 24:00  
**Bilis (2006)**



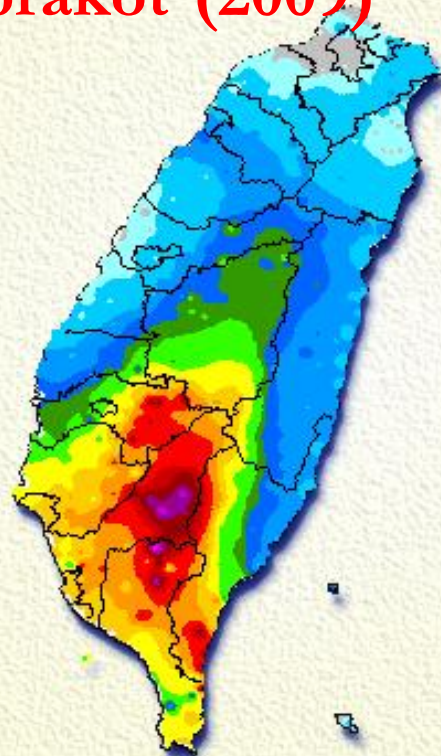
8/19 00:00 ~ 8/19 24:00  
**Sepat (2007)**



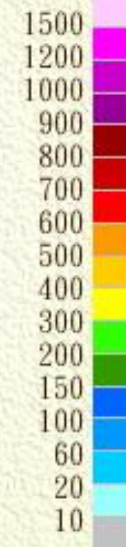
7/18 00:00 ~ 7/18 12:00  
**Kalmaegi (2008)**



8/08 00:00 至 8/08 20:00  
**Morakot (2009)**

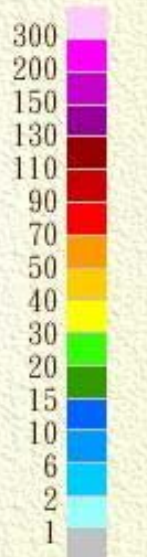


累積雨量圖  
毫米 (mm)



中央氣象局製

累積雨量圖  
毫米 (mm)



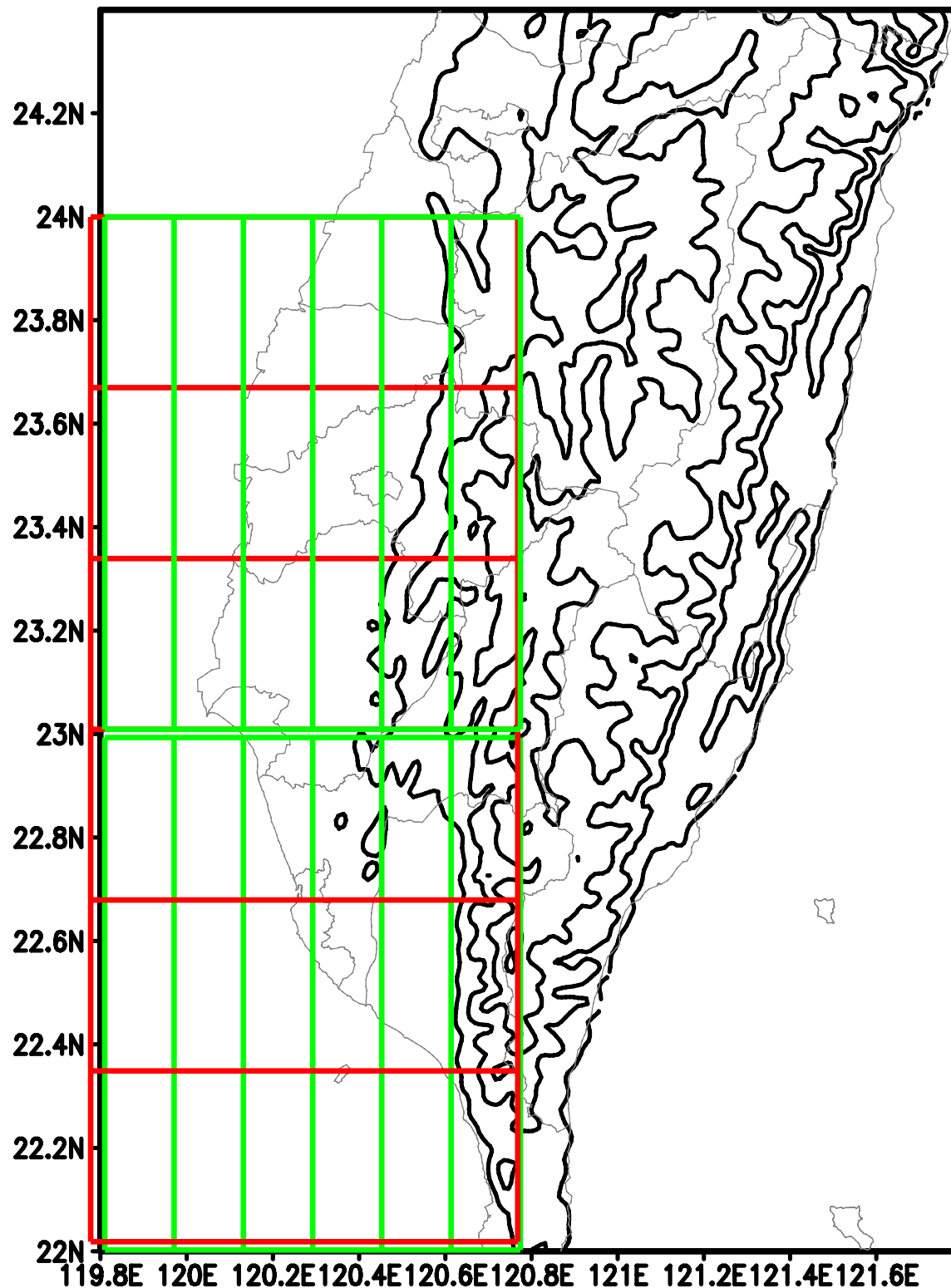
中央氣象局製

Dataset:  
1.4° elevation  
collected by Chiku  
radar

Hovmöller  
diagram

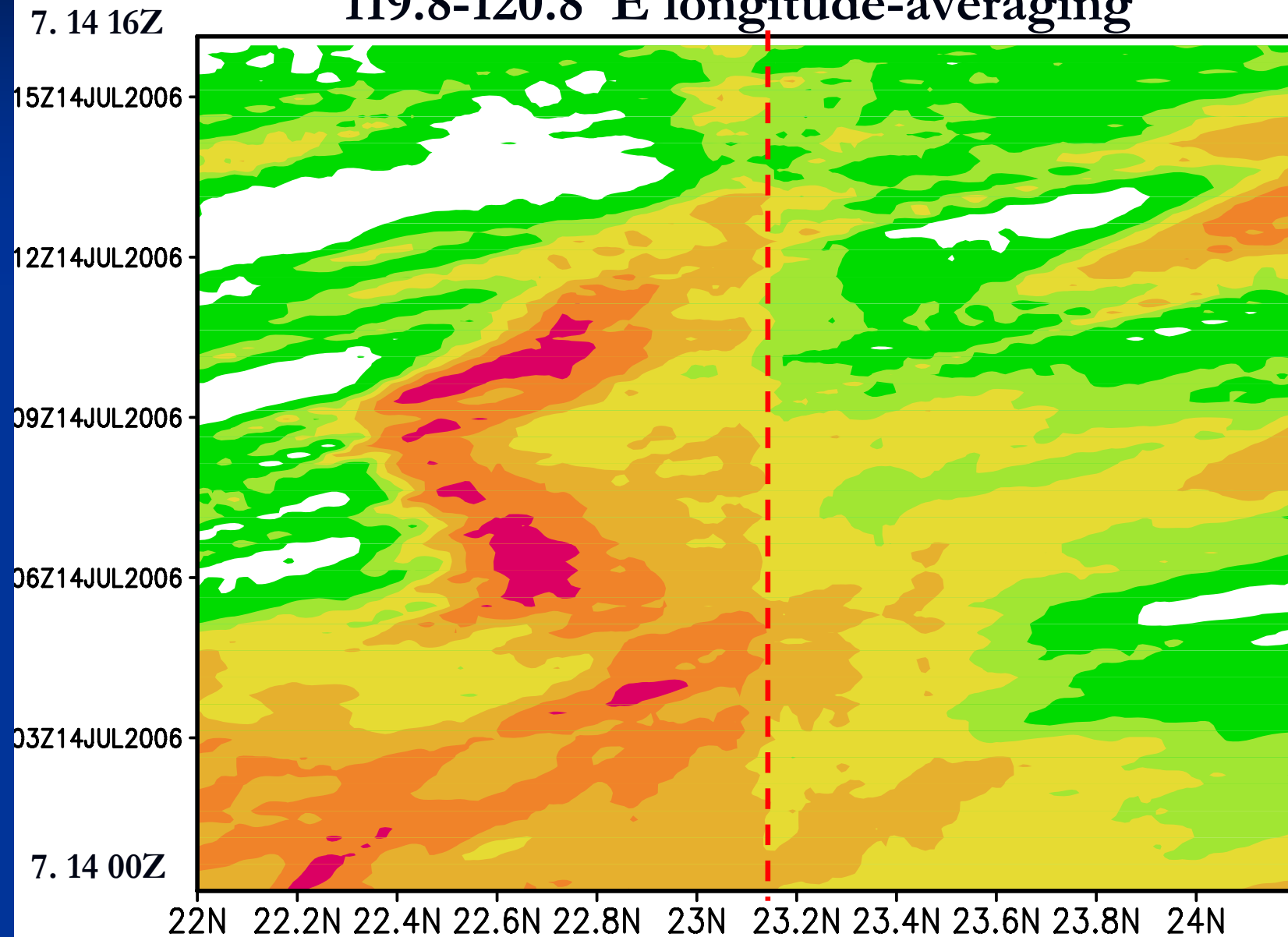
Longitude averaging

Latitude averaging



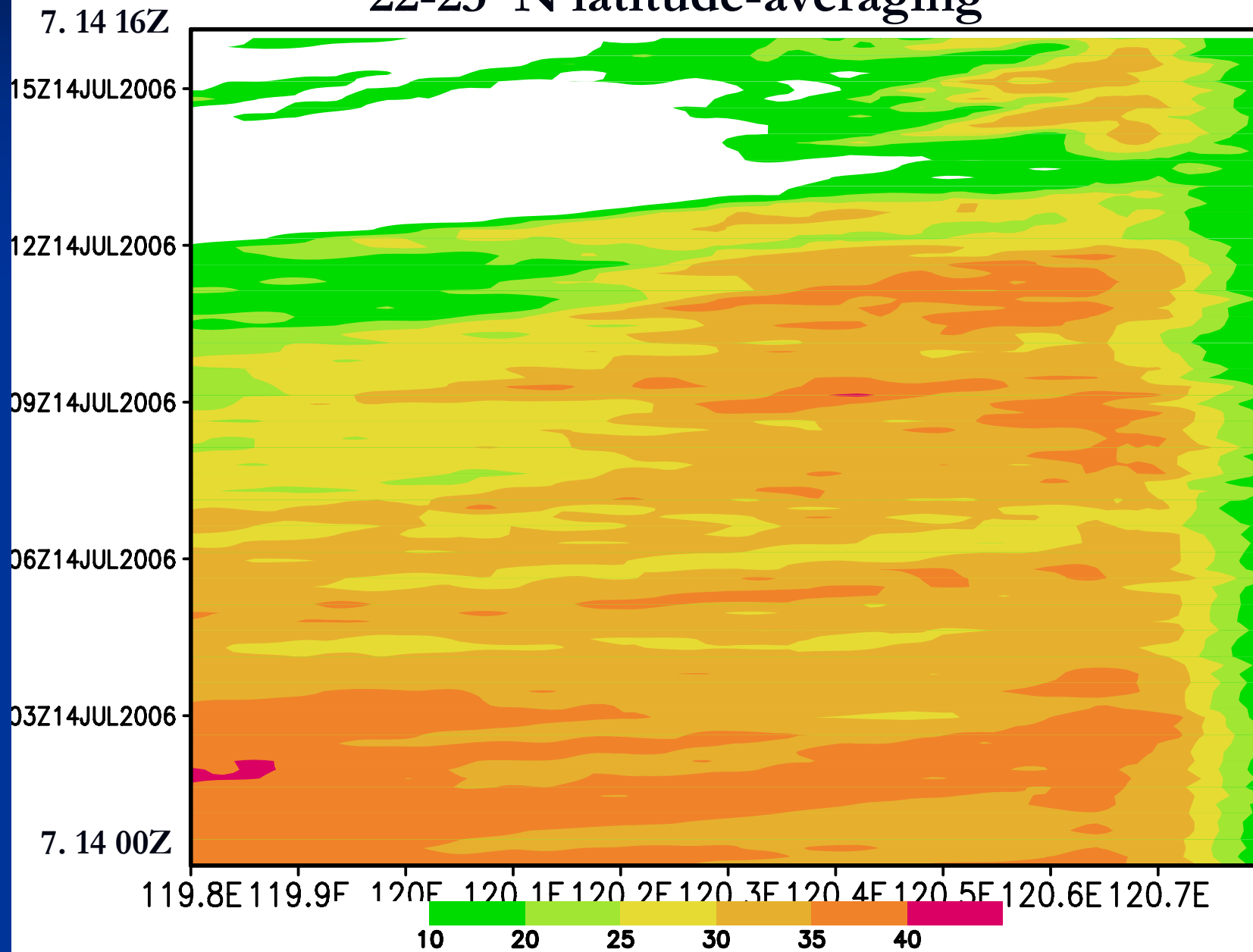
# Typhoon Bilis (2006)

119.8-120.8° E longitude-averaging



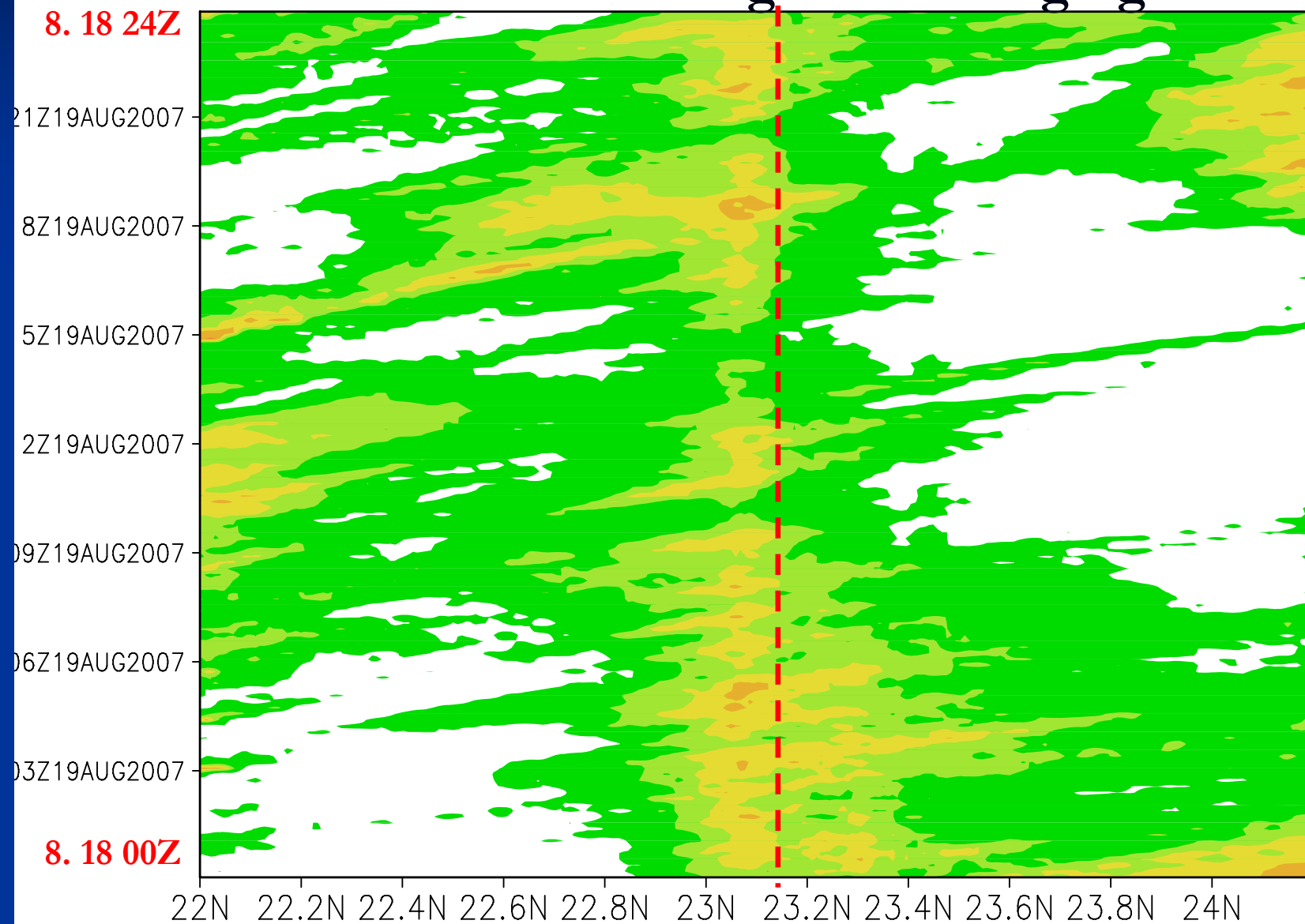
# Typhoon Bilis (2006)

22-23° N latitude-averaging



# Typhoon Sepat(2007)

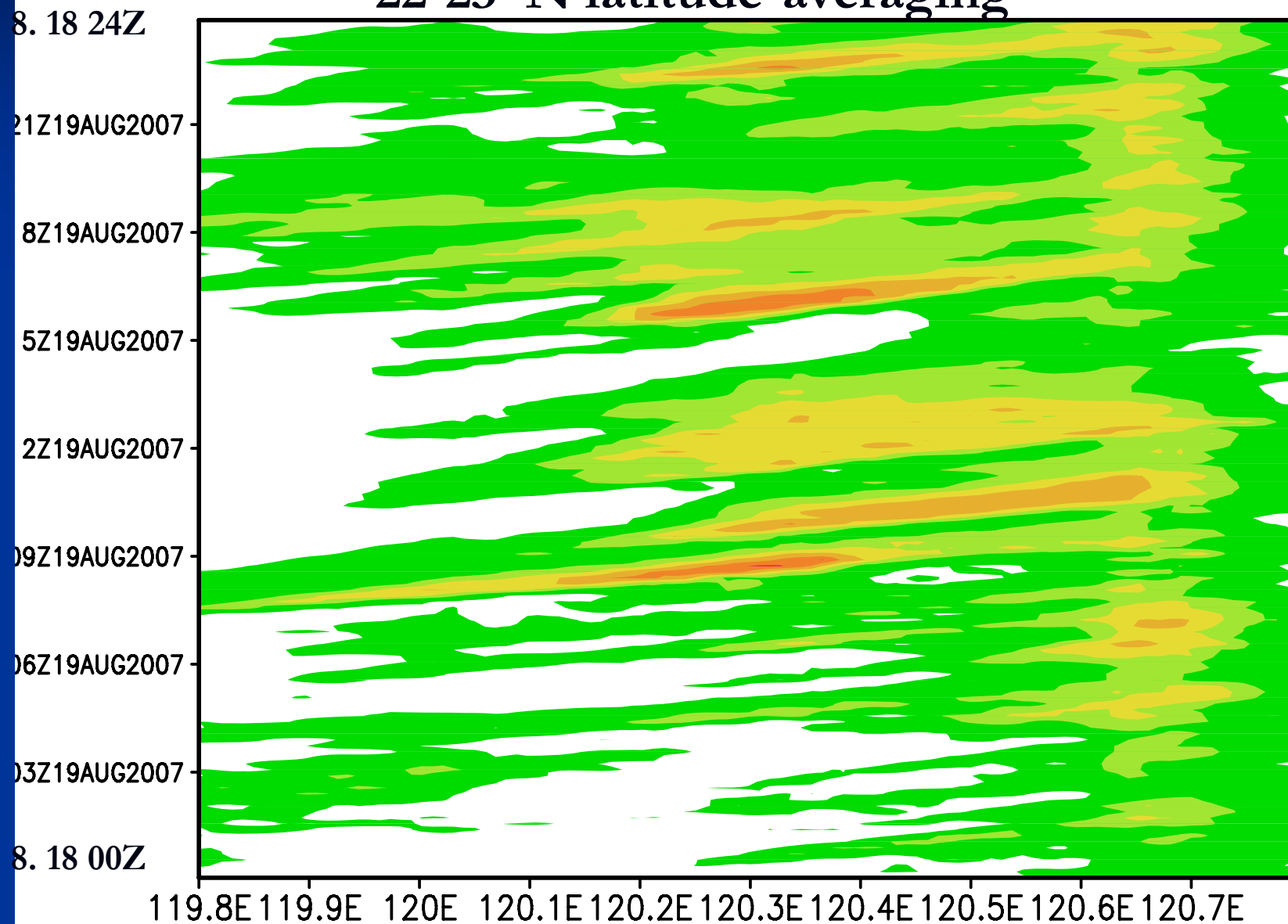
119.8-120.8° E longitude-averaging





# Typhoon Sepat (2007)

22-23° N latitude-averaging



# Typhoon Kalmaegi (2008)

7. 18 12Z 12Z18JUL2008

09Z18JUL2008

06Z18JUL2008

03Z18JUL2008

00Z18JUL2008

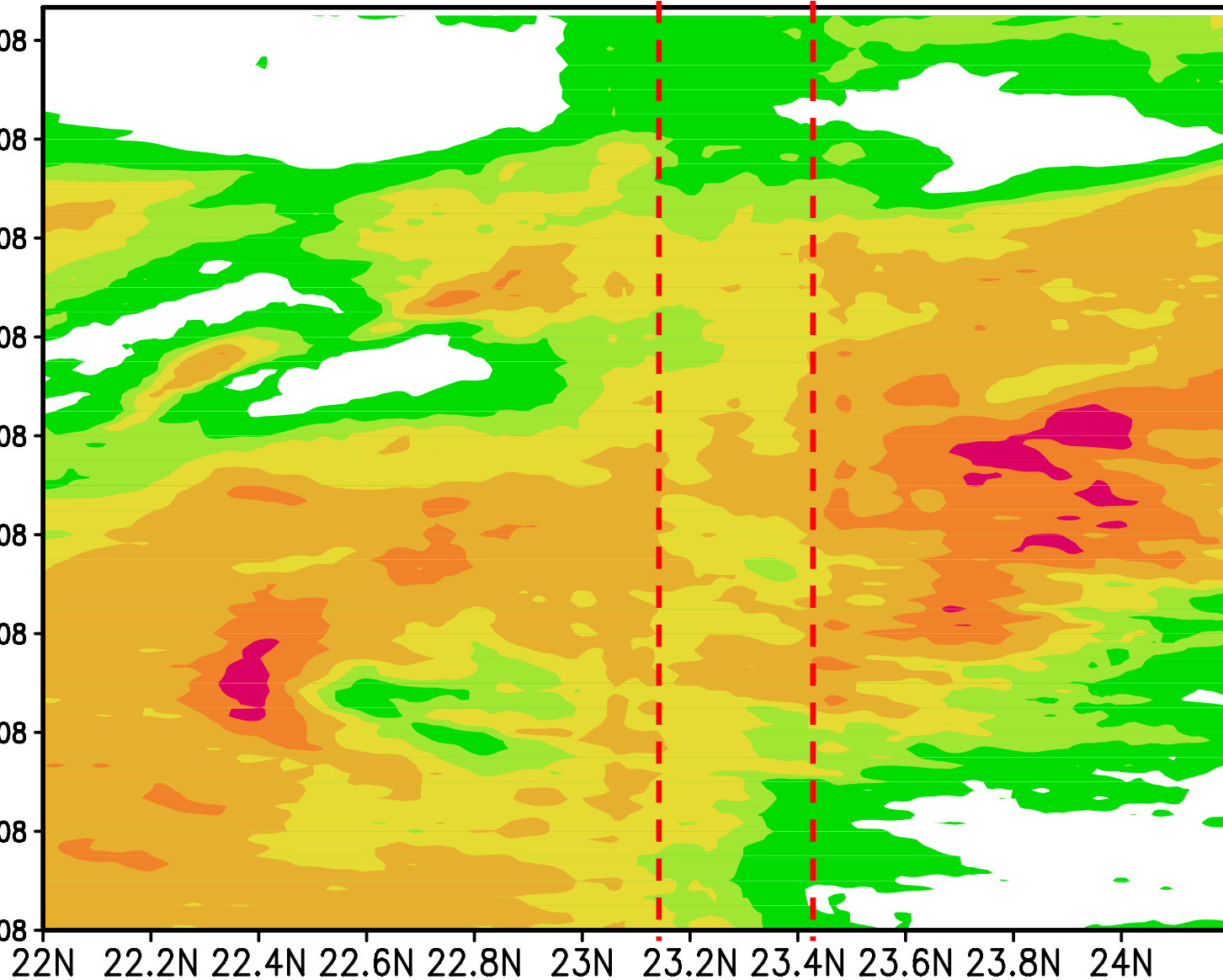
21Z17JUL2008

18Z17JUL2008

15Z17JUL2008

12Z17JUL2008

7. 17 09Z 09Z17JUL2008



# Typhoon Kalmaegi (2008)

23-24° N latitude-averaging

7. 18 12Z 12Z18JUL2008

09Z18JUL2008

06Z18JUL2008

03Z18JUL2008

00Z18JUL2008

21Z17JUL2008

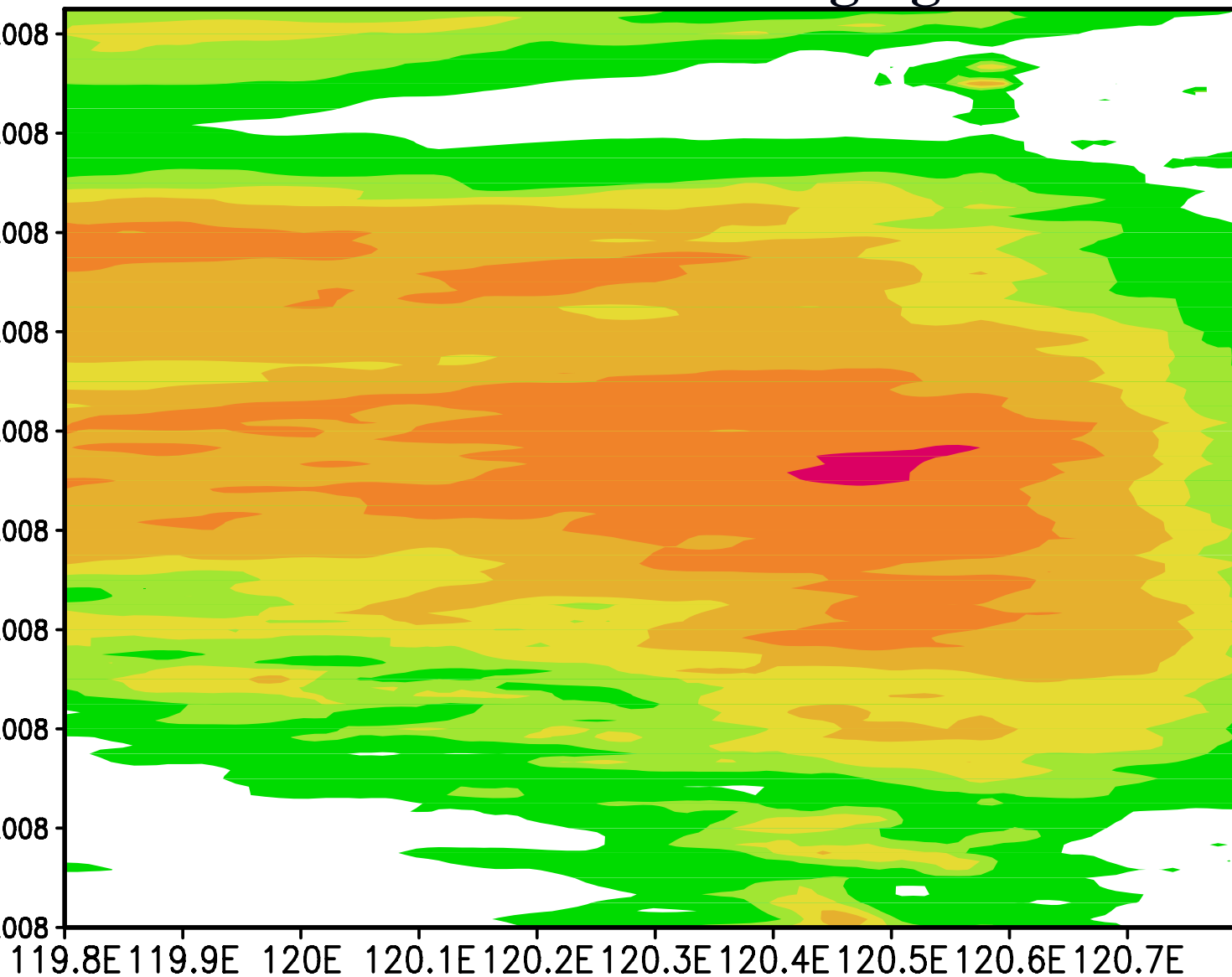
18Z17JUL2008

15Z17JUL2008

12Z17JUL2008

7. 17 09Z 09Z17JUL2008

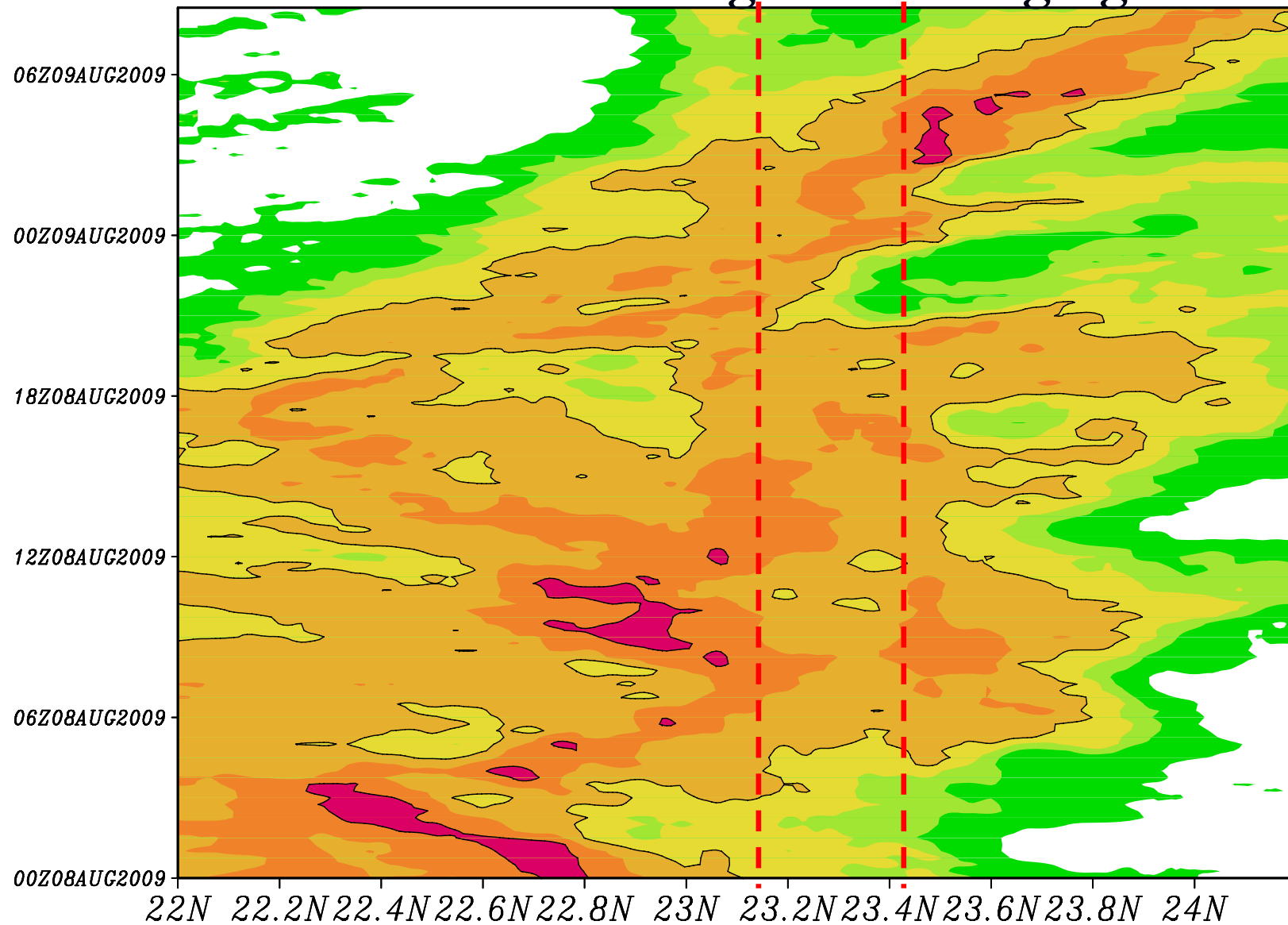
15 hrs



10 20 25 30 35 40

# Typhoon Morakot (2009)

119.8-120.8° E longitude-averaging



# 22-23° N latitude-averaging

8.9 06Z

06Z09AUG2009

00Z09AUG2009

18Z08AUG2009

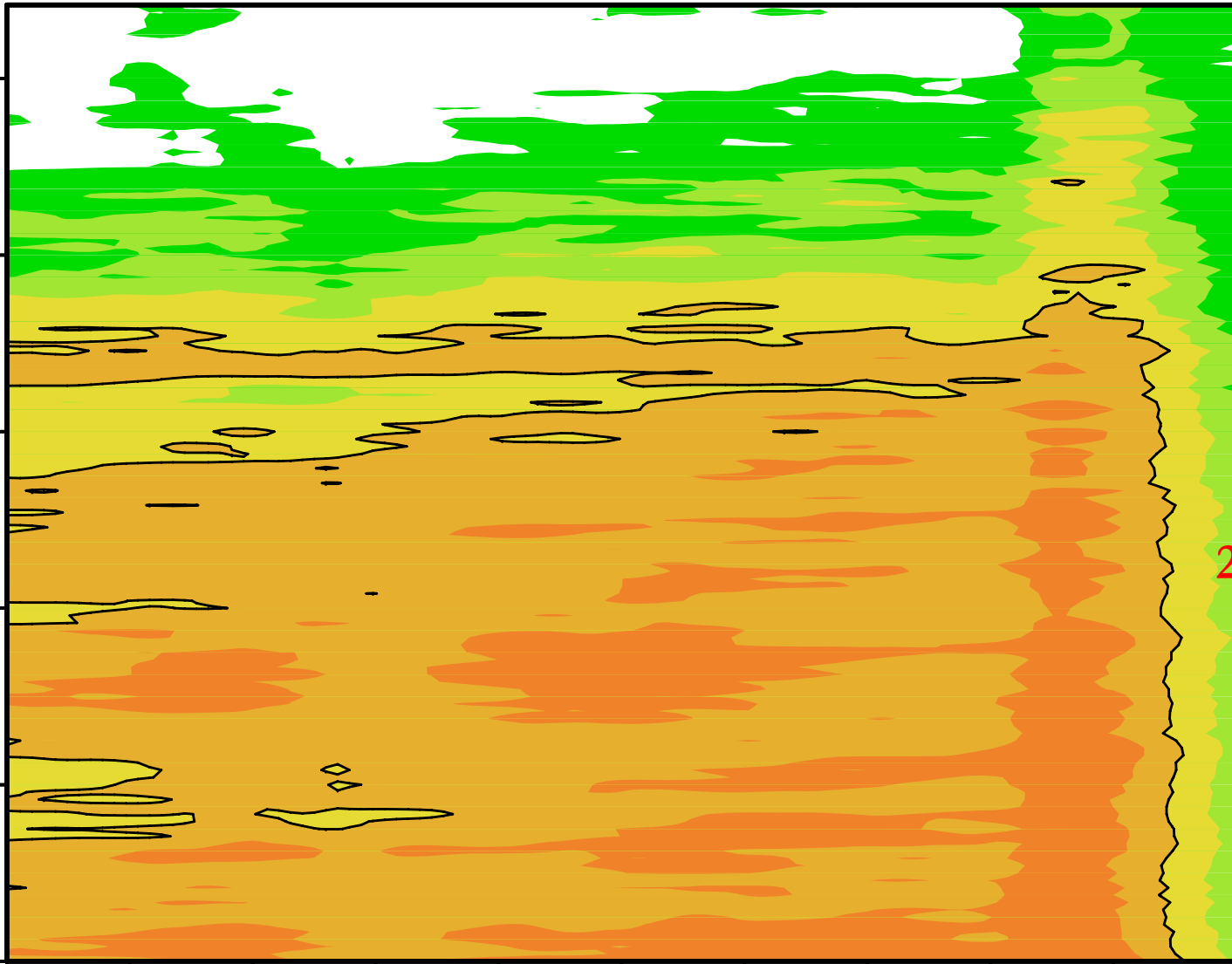
12Z08AUG2009

06Z08AUG2009

8.8 00Z

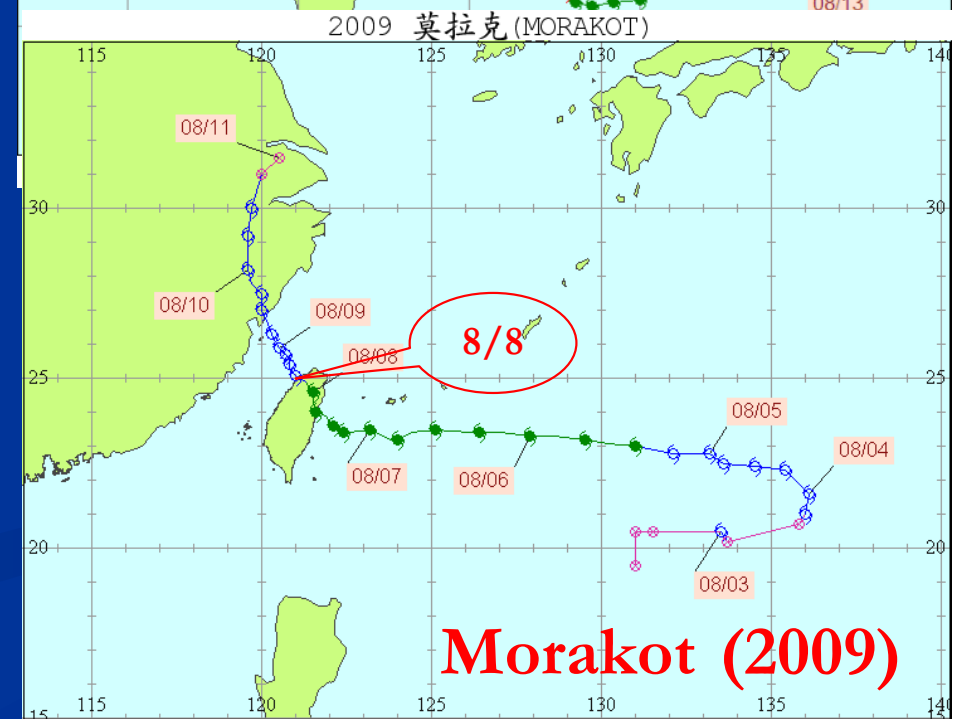
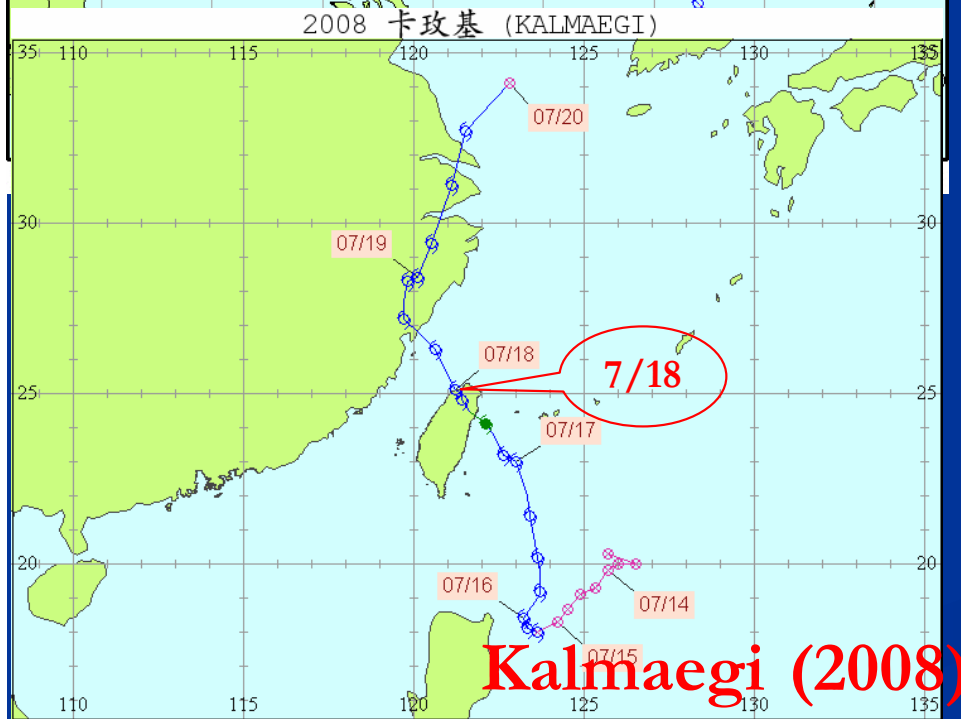
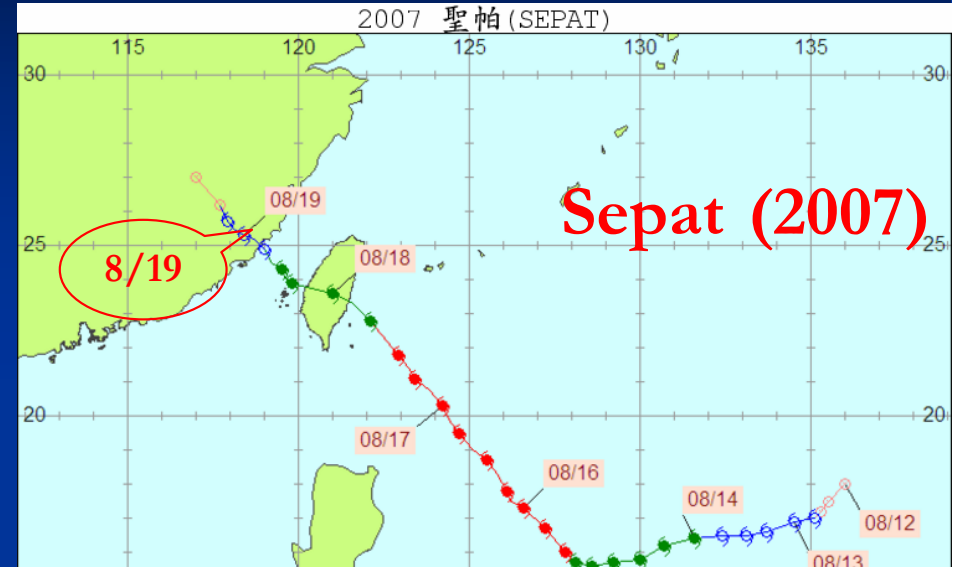
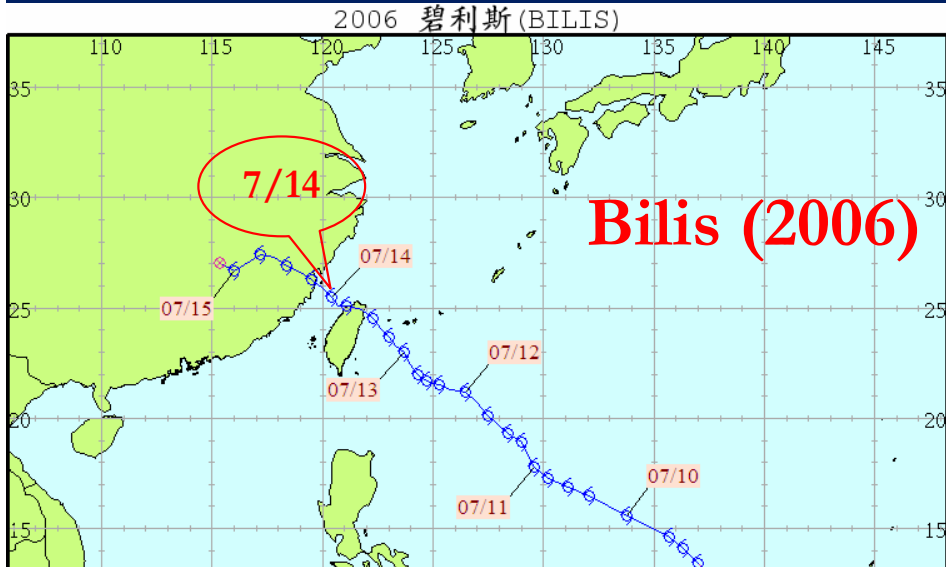
00Z08AUG2009

119.8E 119.9E 120E 120.1E 120.2E 120.3E 120.4E 120.5E 120.6E 120.7E



20 hrs

# Typhoons' Propagation and Location



● 強烈颱風 ( $V_{max} \geq 51.0 \text{ m/s}$ ) 
 ● 中度颱風 ( $V_{max} 32.7 \sim 50.9 \text{ m/s}$ ) 
 ● 輕度颱風 ( $V_{max} 17.2 \sim 32.6 \text{ m/s}$ ) 
 ● 熱帶氣旋 ( $V_{max} < 17.2 \text{ m/s}$ )

● 強烈颱風 ( $V_{max} \geq 51.0 \text{ m/s}$ ) 
 ● 中度颱風 ( $V_{max} 32.7 \sim 50.9 \text{ m/s}$ ) 
 ● 輕度颱風 ( $V_{max} 17.2 \sim 32.6 \text{ m/s}$ ) 
 ● 熱帶氣旋 ( $V_{max} < 17.2 \text{ m/s}$ )

# Question-

# The Southwesterly flow

Introduced by typhoon?

Interact with typhoon?

# Summary

- The intense echoes will be confined at  $23^{\circ}$  N or intensify in the area between 23 and  $23.2^{\circ}$  N.
- The intense echo sustained over 15 and 20 hrs have an opportunity to occur heavy rainfall.
- The issue that the southwest flow interact with typhoon or is introduced by typhoon need to be clarified in the future.



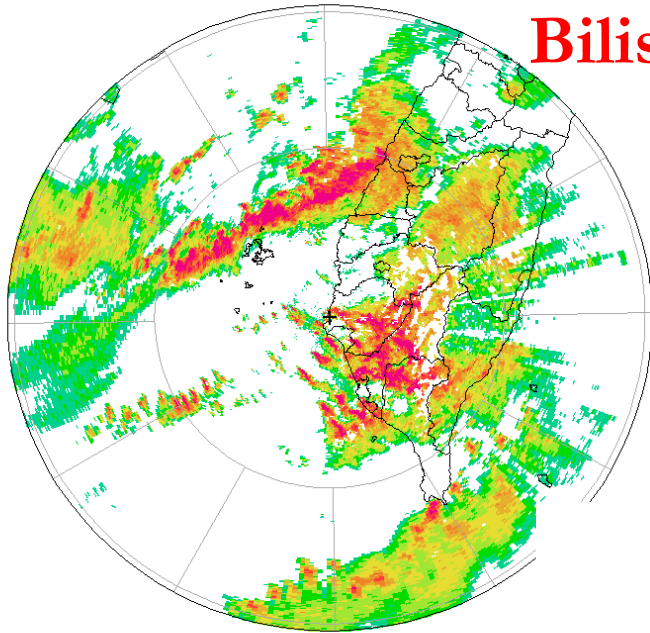
**Thank you for your attention!**

May God's grace be with you!

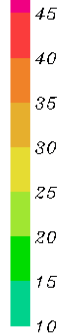
# Evolution of Rainabnd

2006 JUL 14 12:18UTC RCCG 1.4° PPI

**Bilis (2006)**

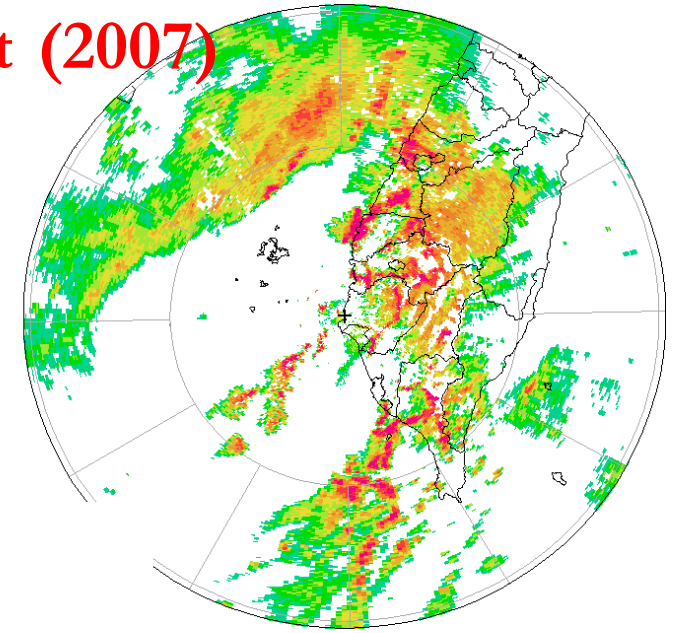


(dBZ)



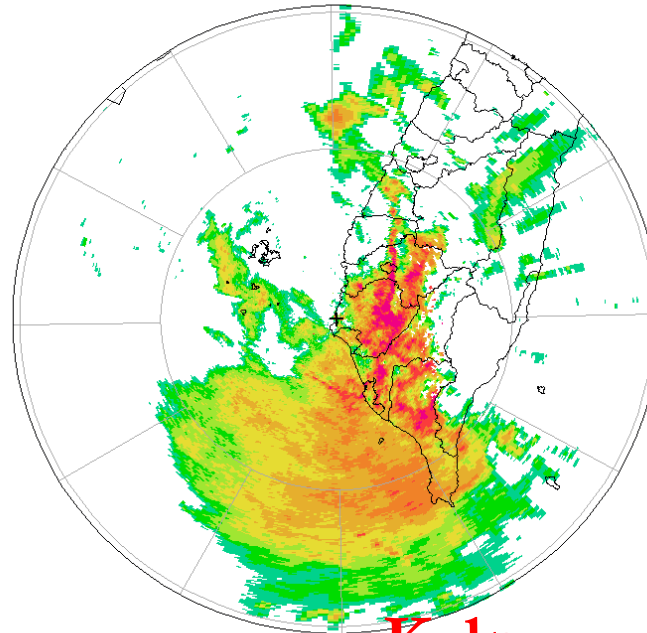
2007 AUG 19 23:54UTC RCCG 1.4° PPI

**Sepat (2007)**



2008 JUL 17 09:08UTC RCCG 1.4° PPI

**Kalmaegi (2008)**



(dBZ)

