2015-7-20臺南新化區龍捲風分析

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Tornados:

Supercell tornados:

Non-supercell tornados:

a.伴隨熱帶氣旋(颱風、颶風)

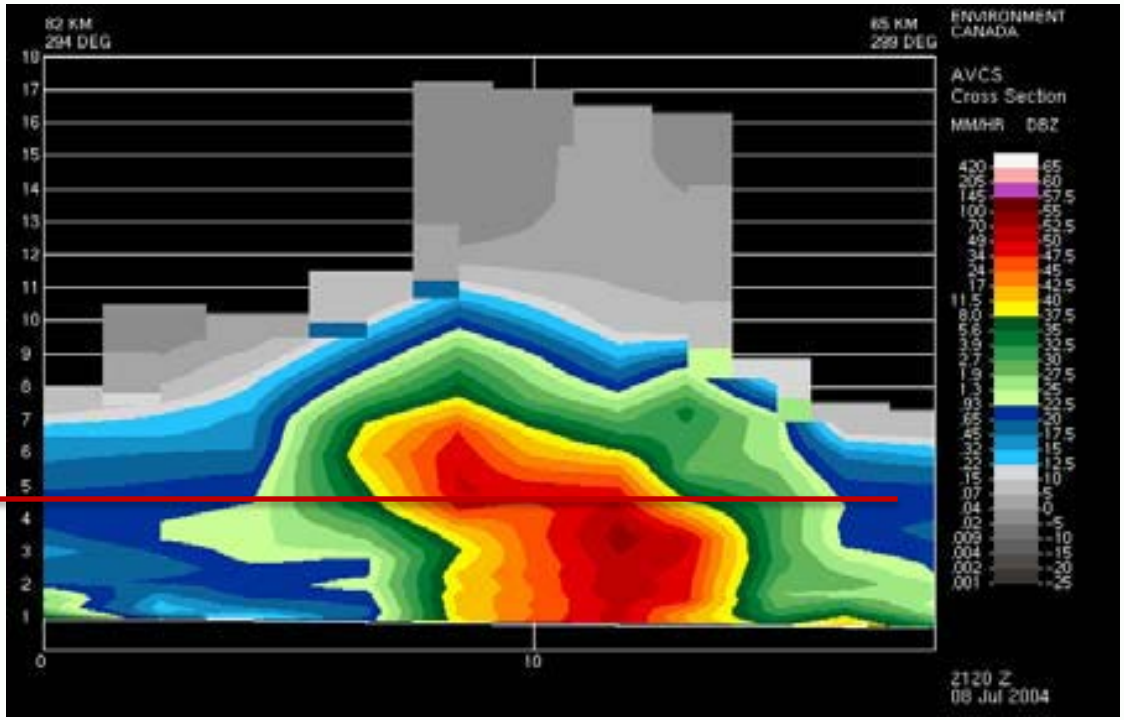
b.伴隨鋒面

c.伴隨積雲對流系統

=>mini-supercell tornados

mini-supercells:

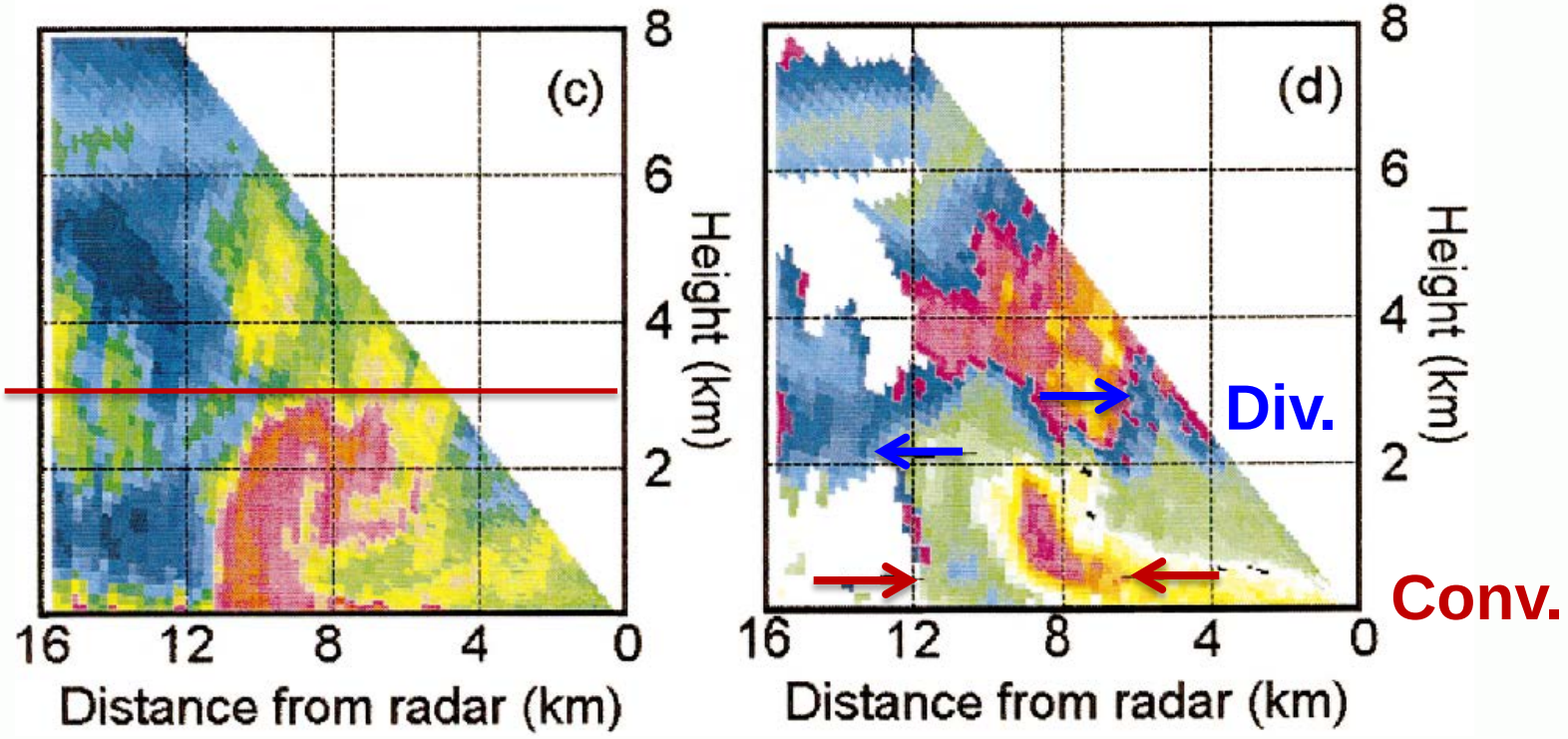
1. Similar to supercell:
   hook echo, weak echo volt, slower movement, rightward deviation track
2. Small horizontal dimension and Z<5km
3. NE-quadrant (if associated tropical cyclones)



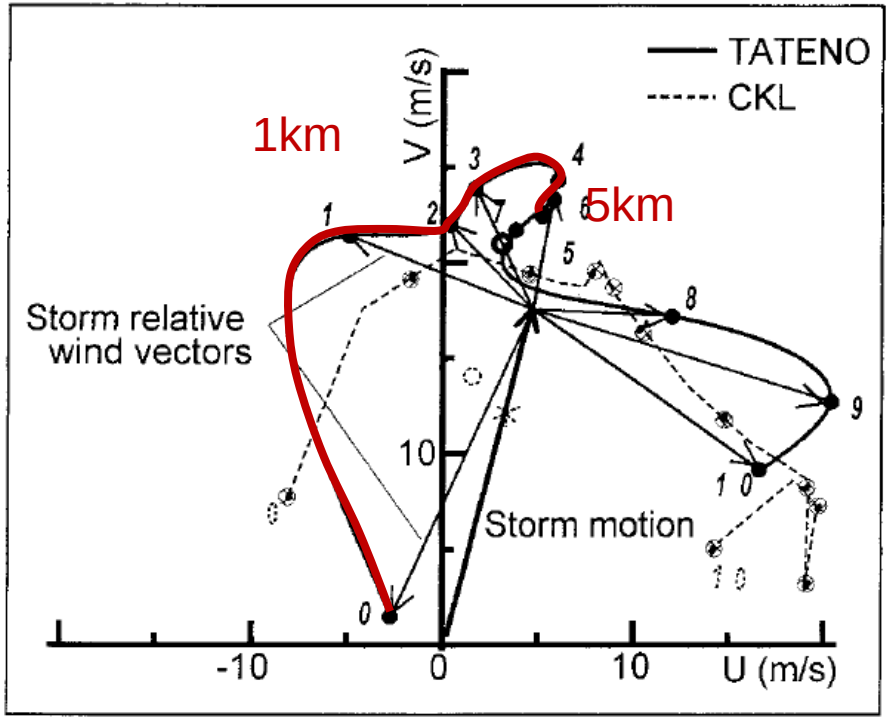
4.5km

Associated with low pressure system and surface convergence line (in Canda). (P. McCarthy and S. Massey 2006)

3km



Mini Supercells Associated with Typhoon 9019 (1990) (O. Suzuki et al. 2000)



Veering hodograph

Remarks:

1.Strong wind shear confined at the lower level and weaker at mid level
=> vertical tilting of lower level vorticity produces mid-level cyclone

2.Strong convergence at lower level and divergence aloft

3.Vertical PGF produces updraft on the right-hand side of shear vector
=> deviates storm to the right

4.底層渦度增強的幅度(5~6倍)比上層(2~3倍)大很多

2015-07-20臺南新化龍捲風

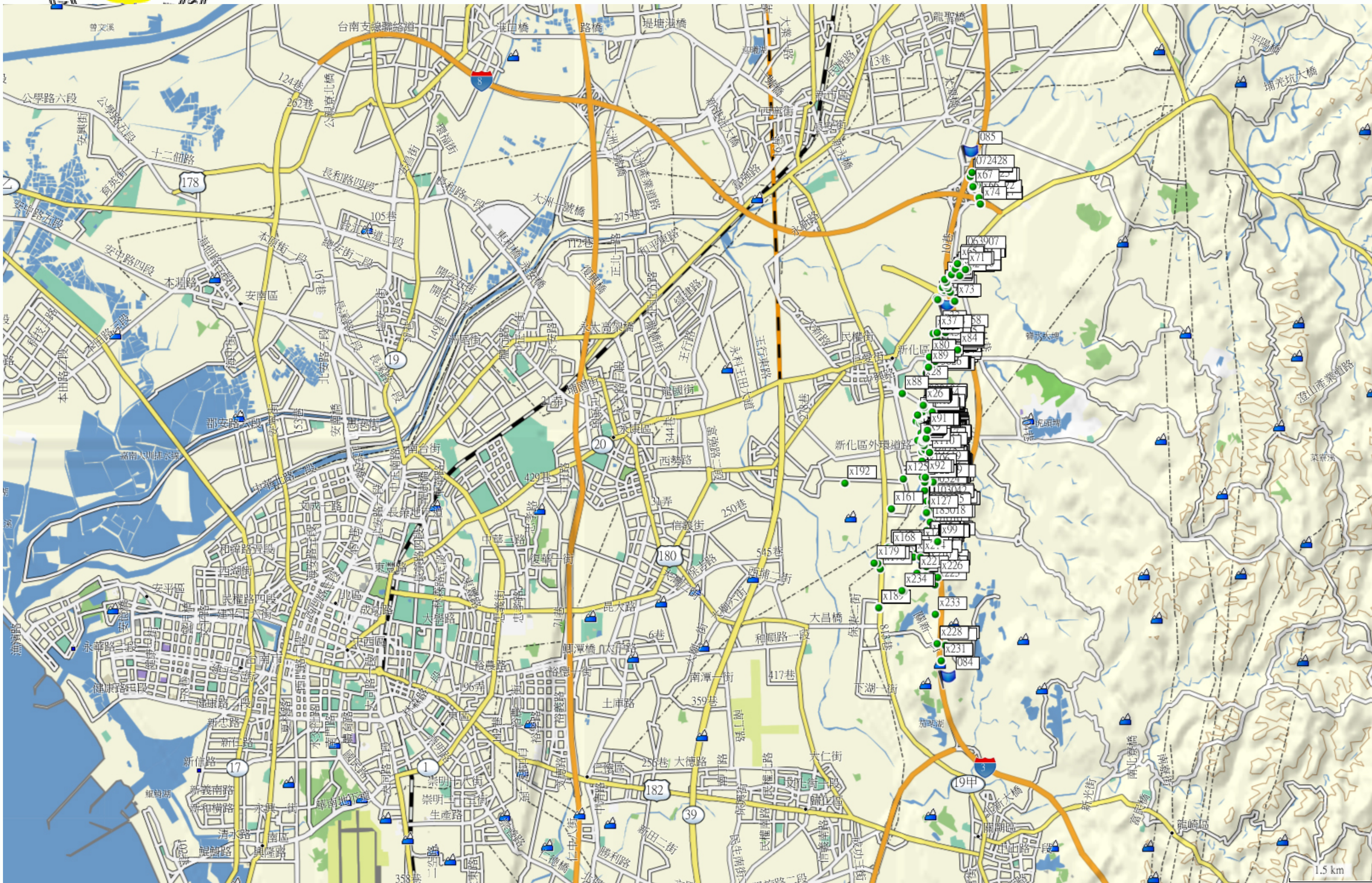
發生時間：7/20 6:30~6:45

移動速度：25度方位、12.0m/s

路徑總長：~9.5km

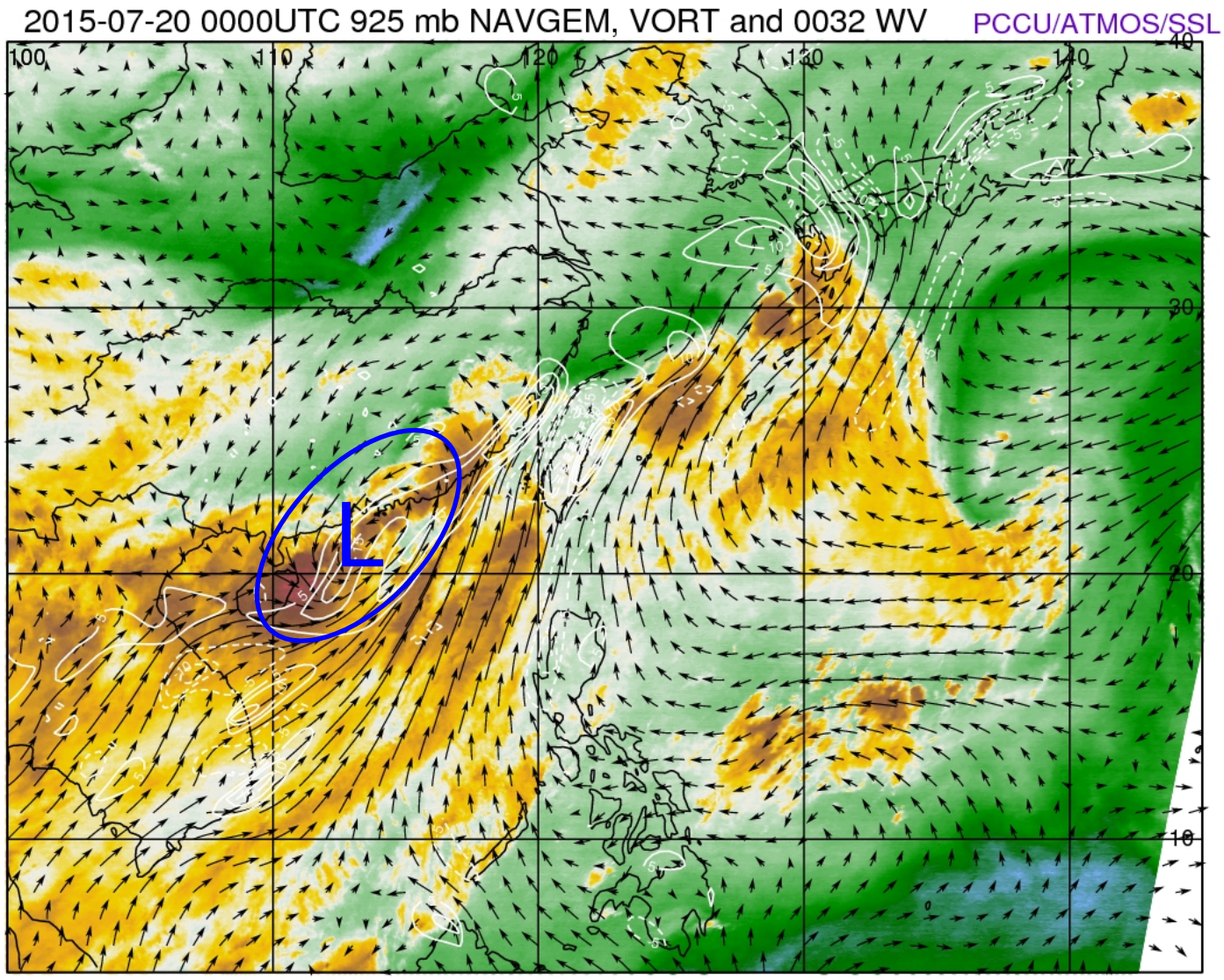
大約位於國道8號與國道10間之國道3號路段

龍捲風災損位置



台南支線聯絡道
公學路六段
十二佃路
長和路四段
安中路四段
本淵路
安南區
永大高架橋
新化區外環道路
新化區
民權街
永康區
西勢路
信義街
大昌橋
和順路一段
南灣一街
下湖一街
六仁街
大德路
仁德區
關廟區
龍崎區
中華西路
東豐路
崇明二十三街
健康路三段
新忠路
新仁路
新信路
新義南路
新和順路
清水路
鯤鯓路
興隆路
生產路
大智路
中華三路
崑大路
085
072428
x67
x74
063907
x71
x73
x37
x84
x80
x89
x88
x26
x91
x125
x92
x192
x161
x127
x99
x168
x179
x226
x234
x233
x228
x231
084
178
19
20
180
182
39
17
1
1.5 km

2015-07-20 00UTC 925mb wind and WV



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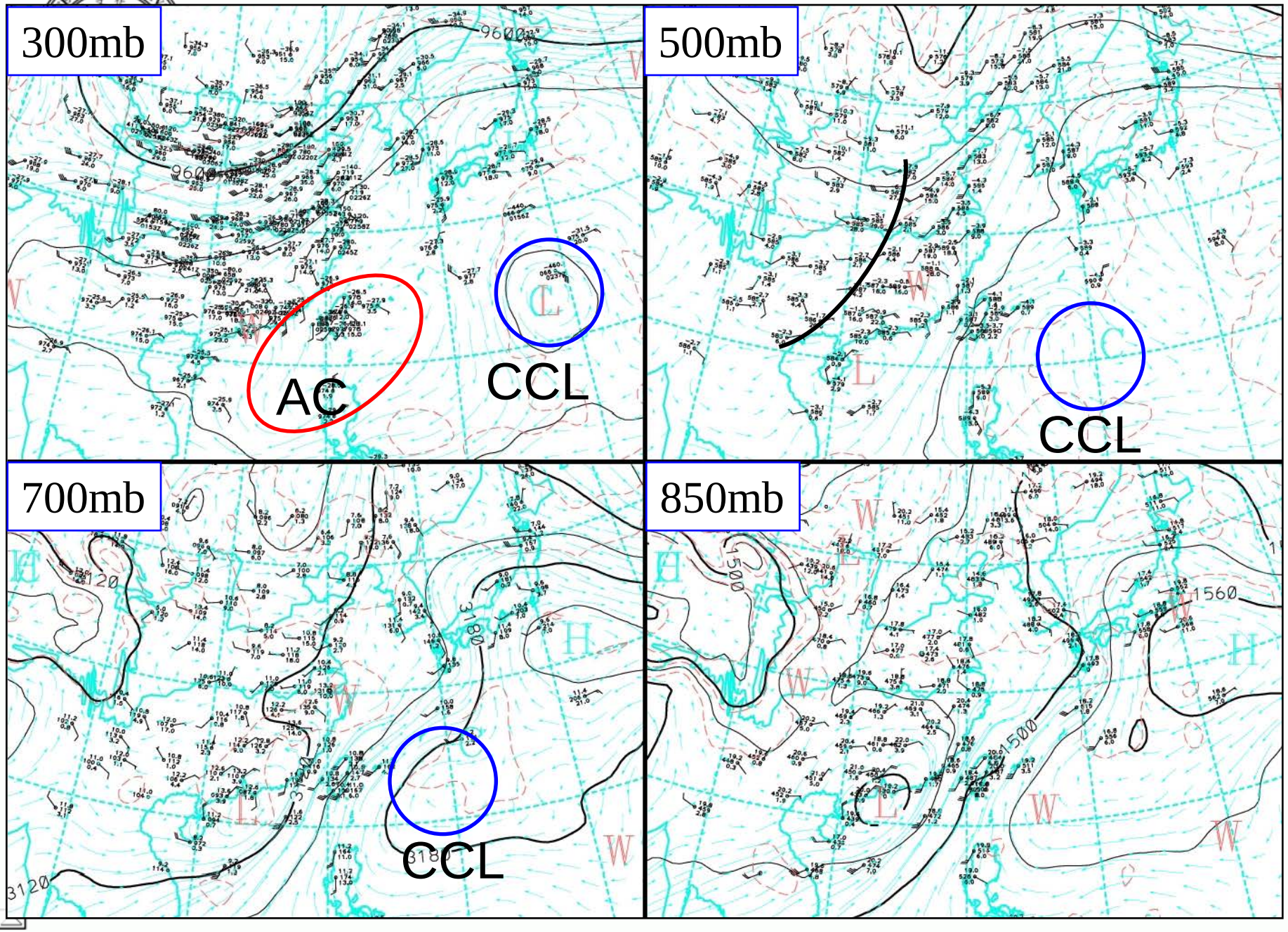
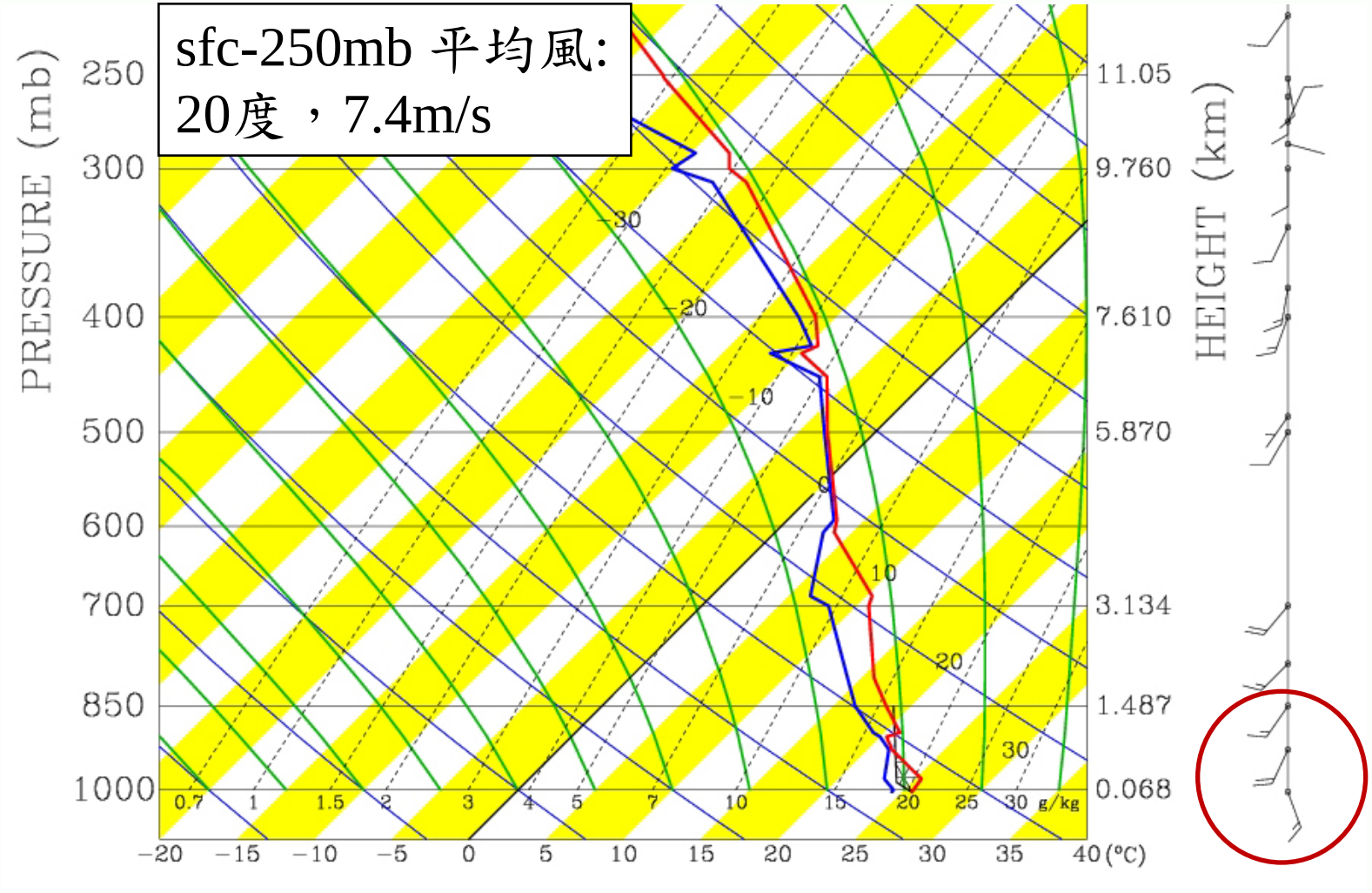
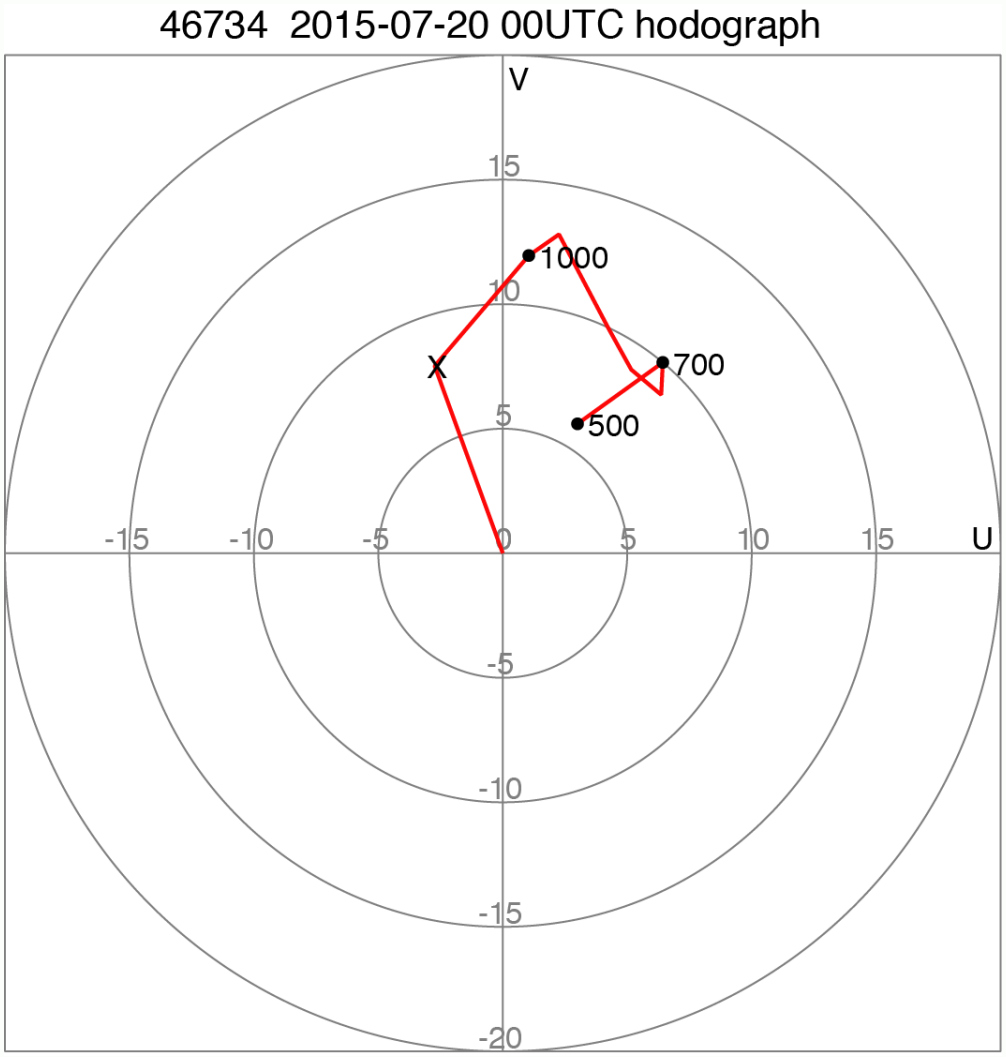
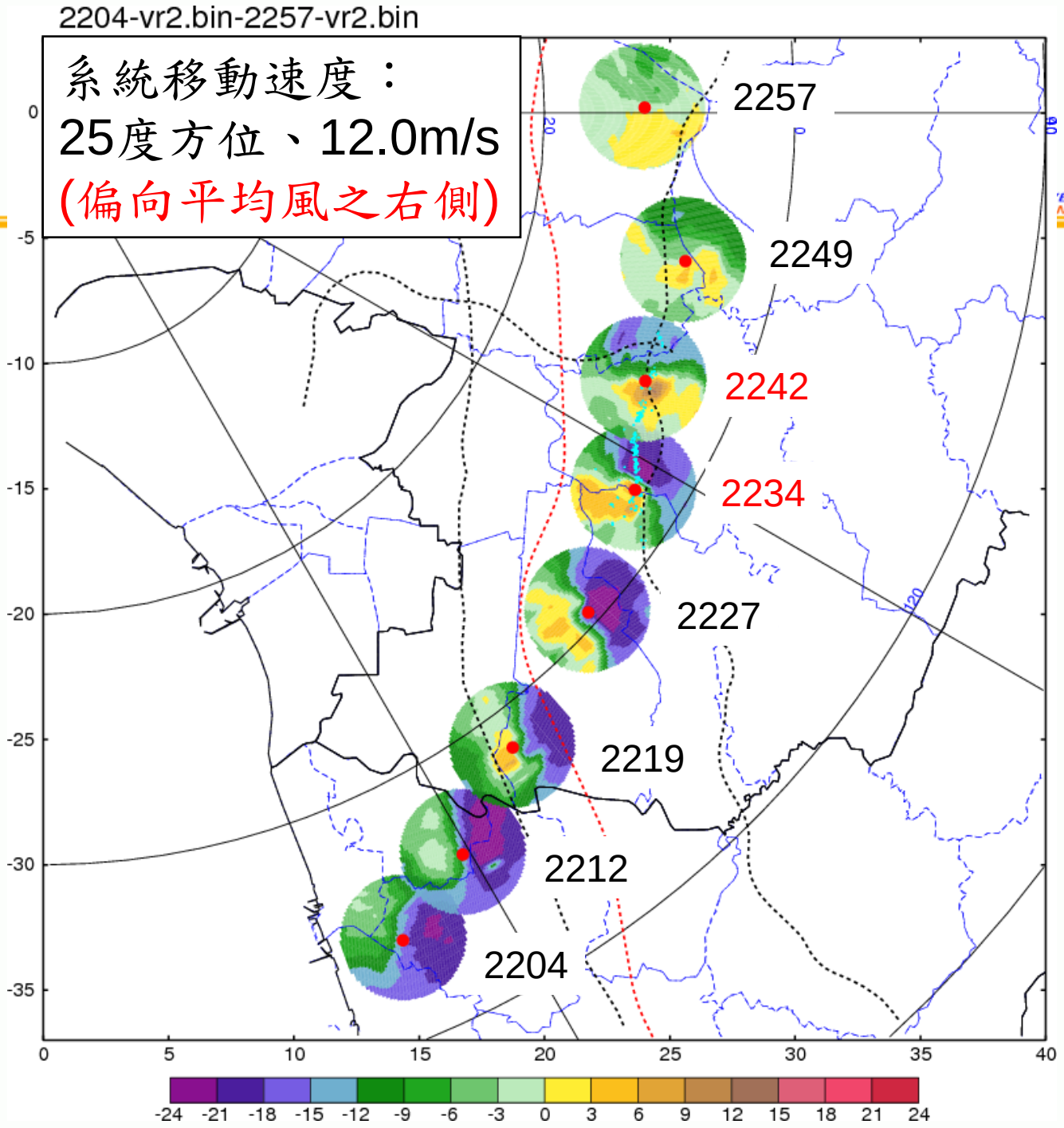


46734 2015-07-20 00UTC



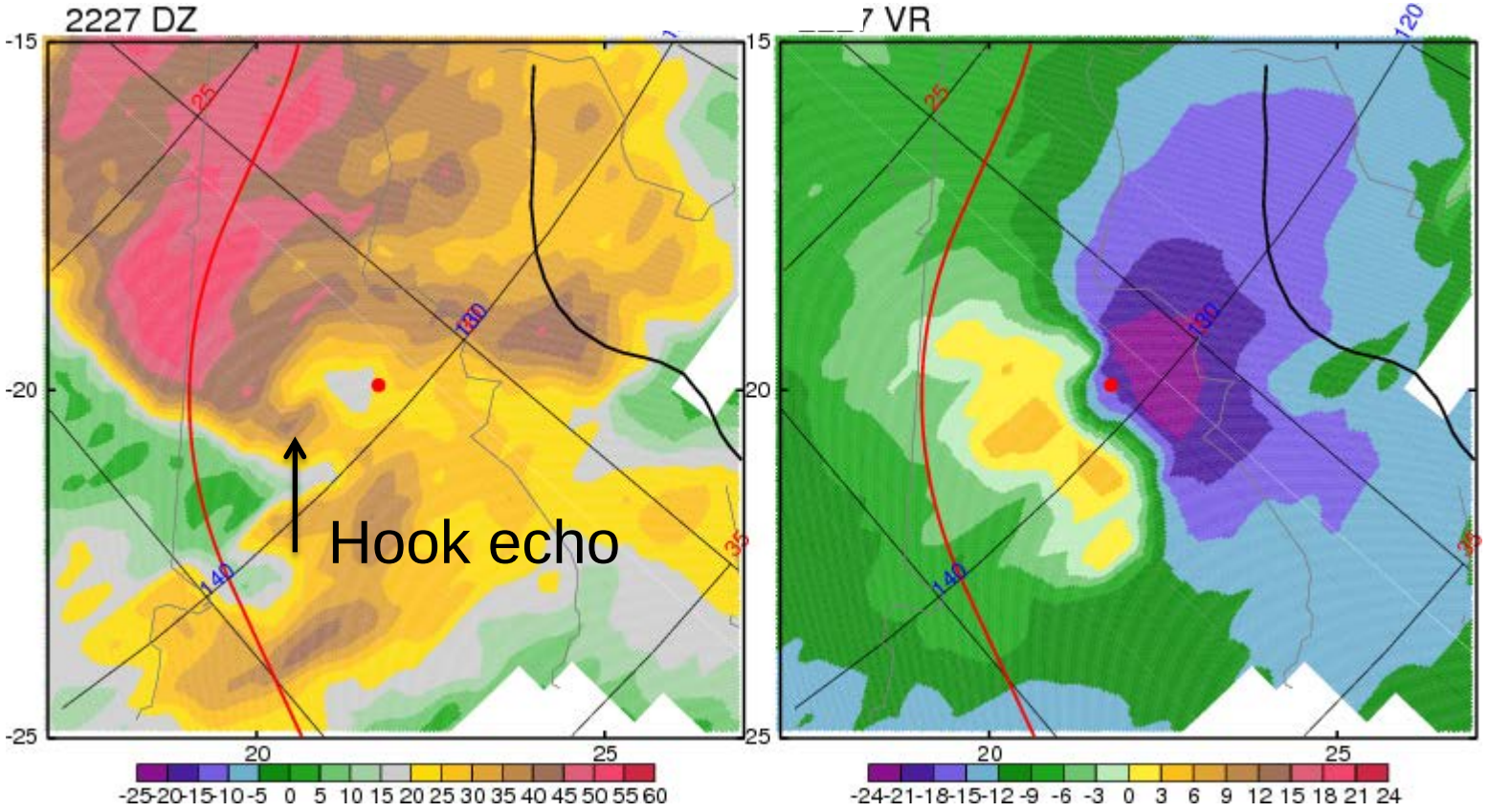
風徑圖veering with height




2204-vr2.bin-2257-vr2.bin
系統移動速度：
25度方位、12.0m/s
(偏向平均風之右側)
2257
2249
2242
2234
2227
2219
2212
2204
0
-5
-10
-15
-20
-25
-30
-35
0
5
10
15
20
25
30
35
40
-24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24

龍捲風發生前一個volume

2227



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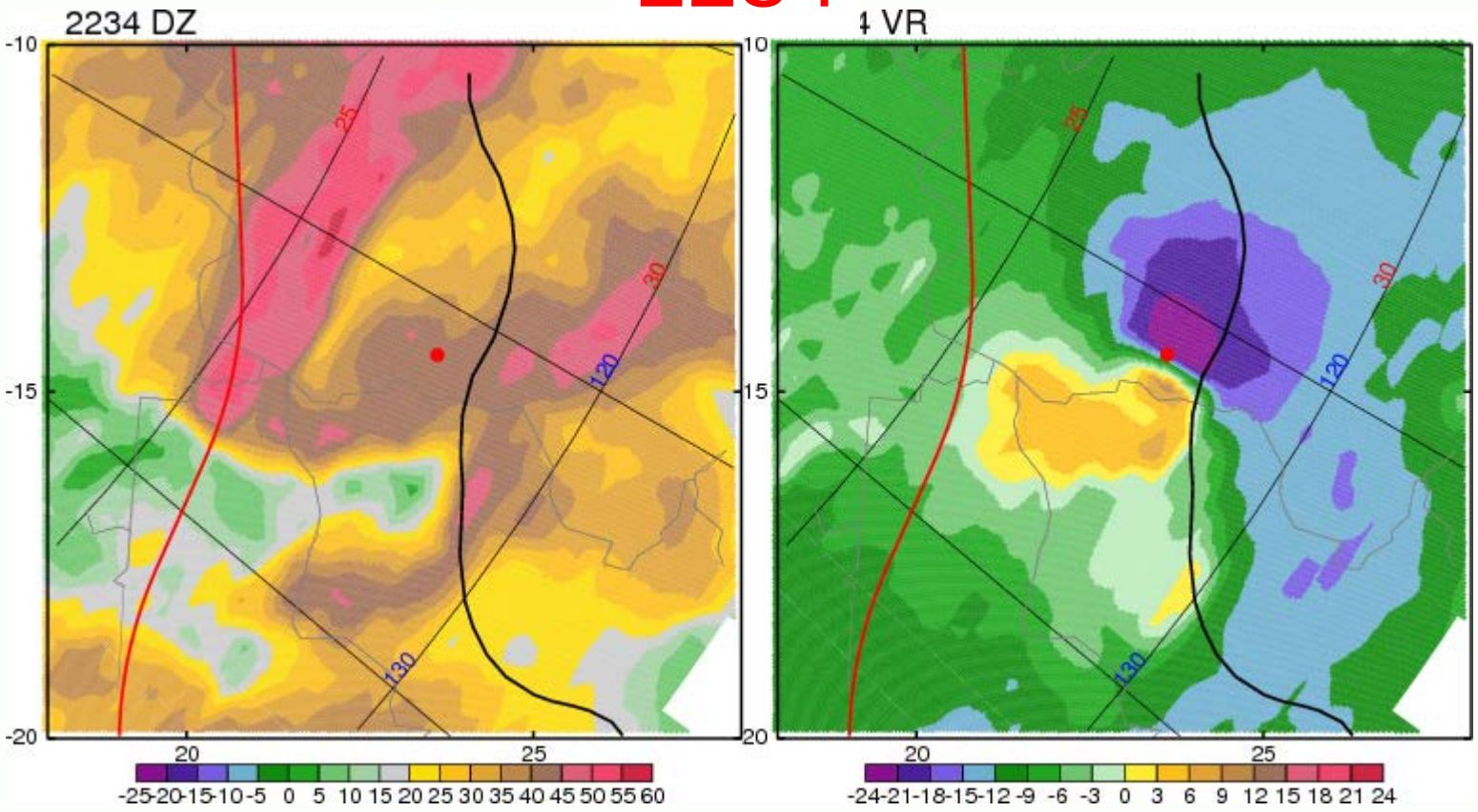
2234 DZ
4 VR
-10
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120
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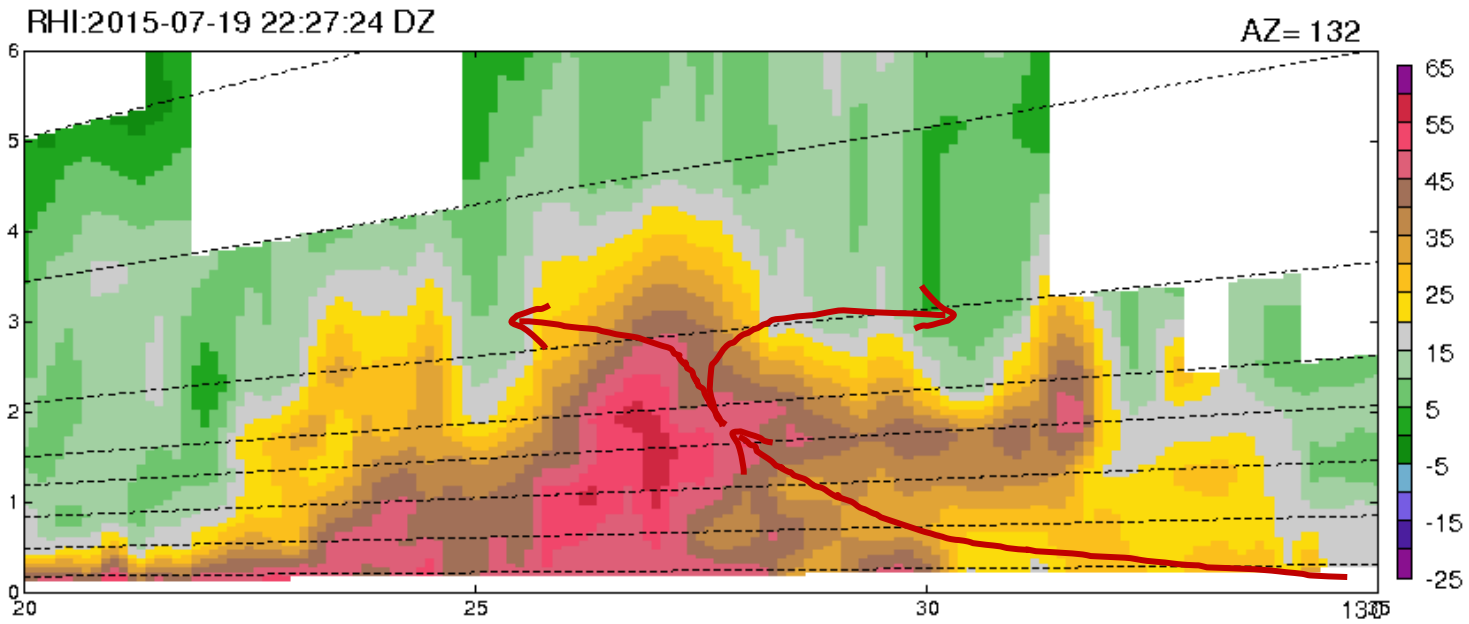
25
-25-20-15-10-5 0 5 10 15 20 25 30 35 40 45 50 55 60
-24-21-18-15-12 -9 -6 -3 0 3 6 9 12 15 18 21 24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AZ= 132
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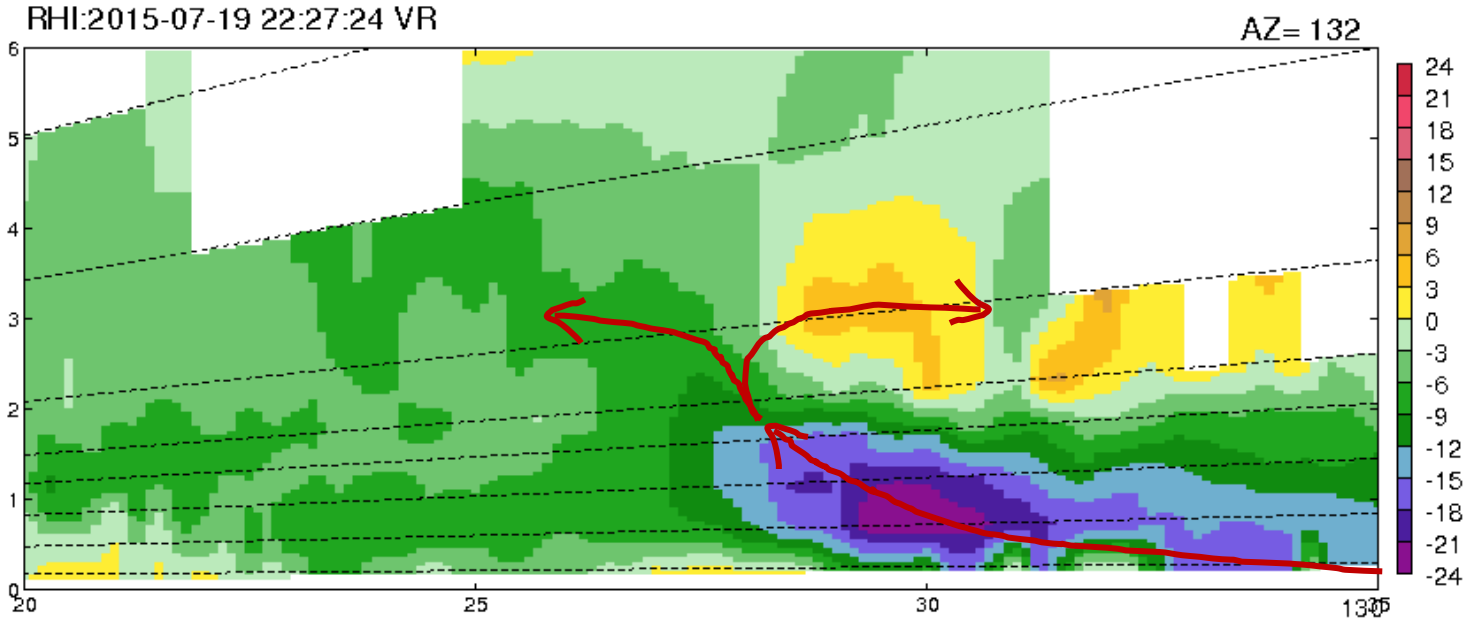
RHI:2015-07-19 22:27:24 VR
AZ= 132
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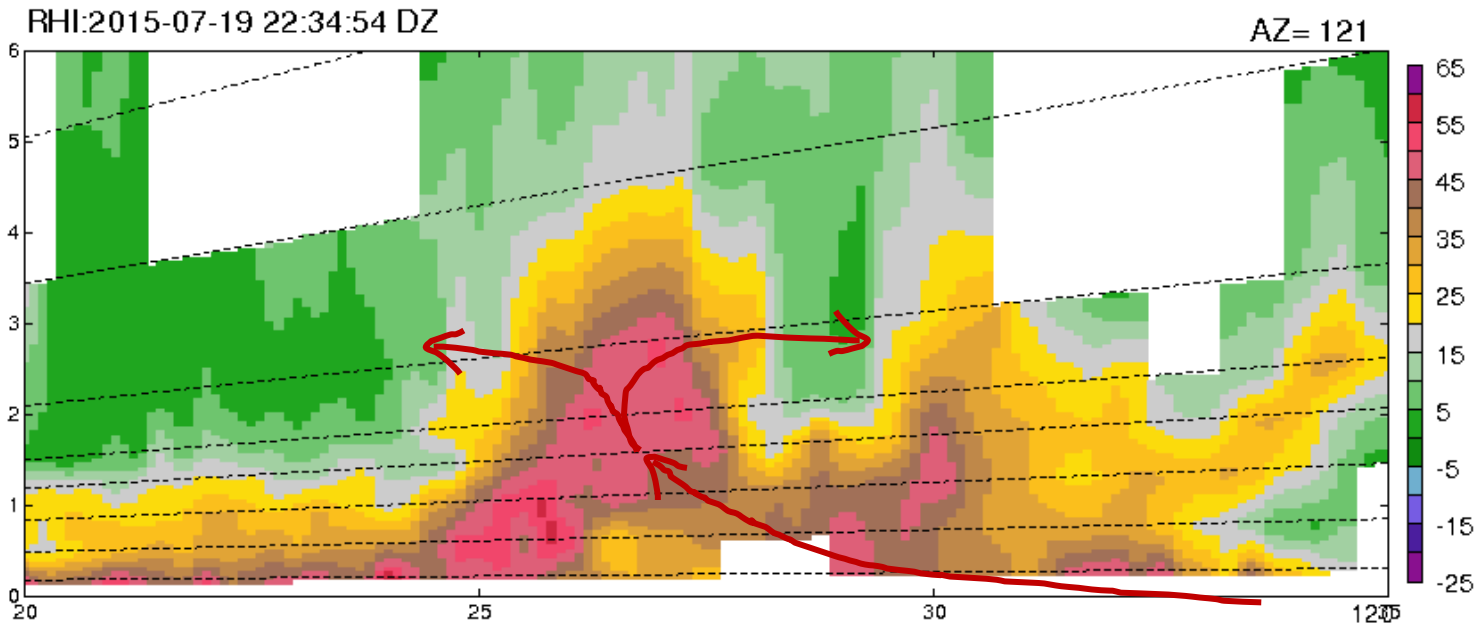
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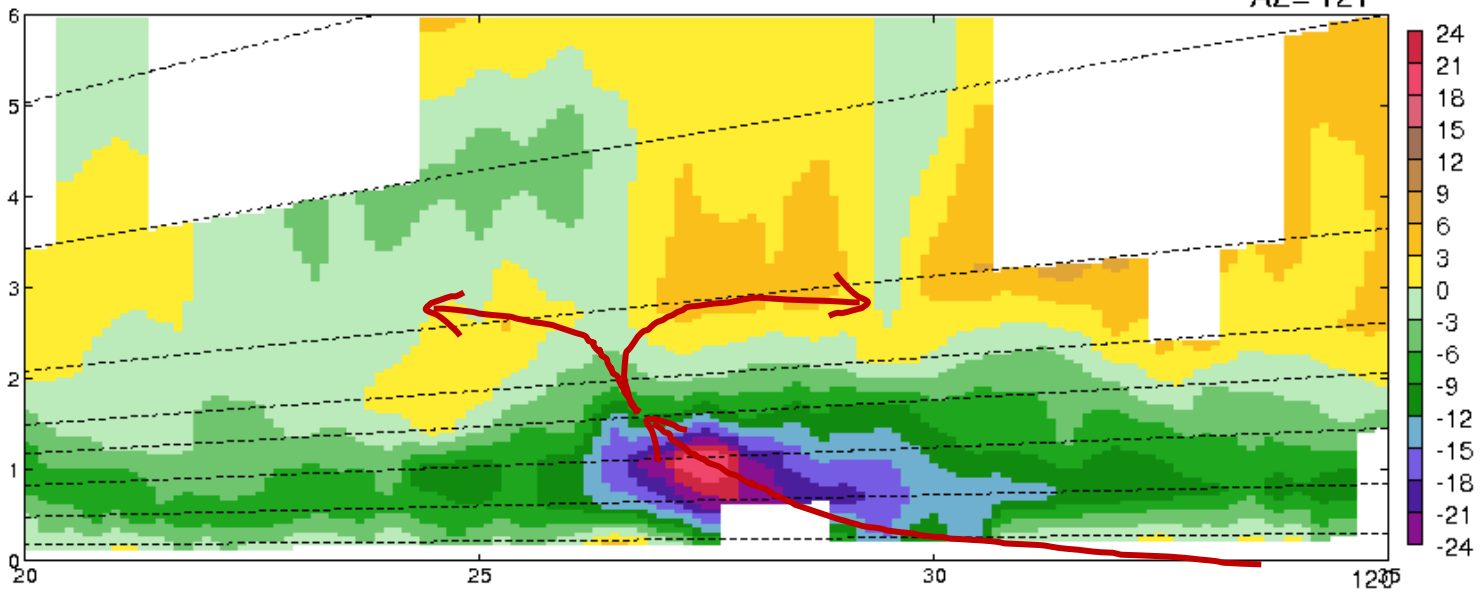
RHI:2015-07-19 22:34:54 VR
AZ= 121
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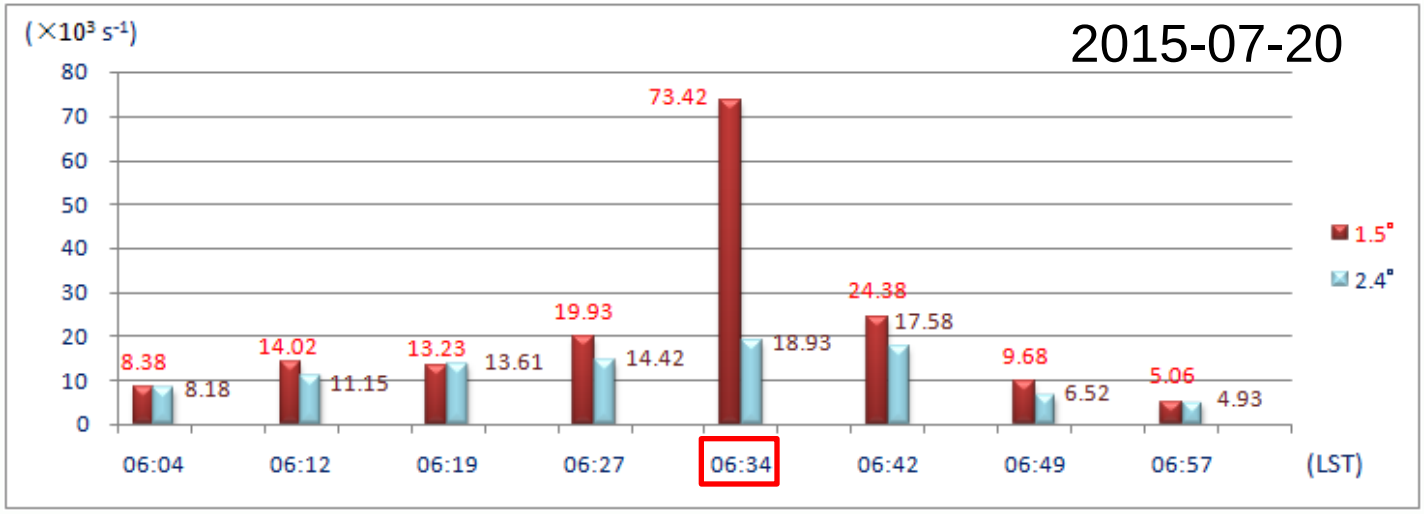
30

Vorticity @ 1.5 and 2.4 deg.



總結

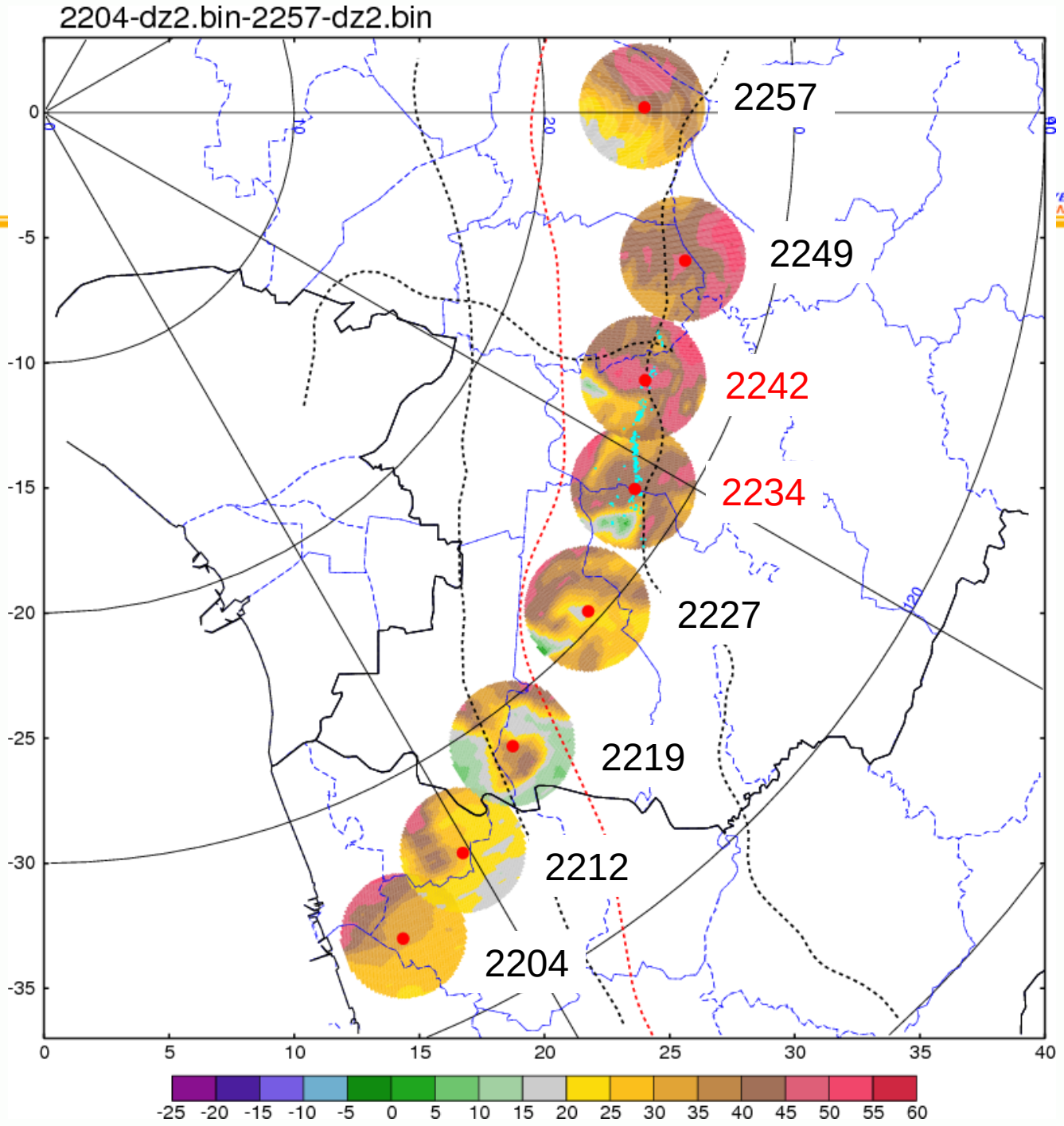
一.綜觀環境:

1.底層低壓槽伴隨強勁的西南風(shear instability)及暖溼空氣
2.位於850~500mb之槽前，300mb有AC
3.東側有upper level CCL，下伸到700mb左右
4.探空顯示底層有較強的垂直風切，且風徑圖veering with height
5.系統移動方向偏向平均風之右側

二.對流系統:

1.Hook echo, weak-echo region, strong lower-level inflow and upper-level outflow
2.1.5度低層渦度增強遠大於2.4度
➔resemble small size supercell

謝謝！！


2204-dz2.bin-2257-dz2.bin
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-25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60