Case study of the Storm on 20 June 2008 during SoWMEX/TiMREX

Wen-Chau Lee	NCAR
Ben J.-D. Jou	NTU
Rong-Guang Hsiu	NTU

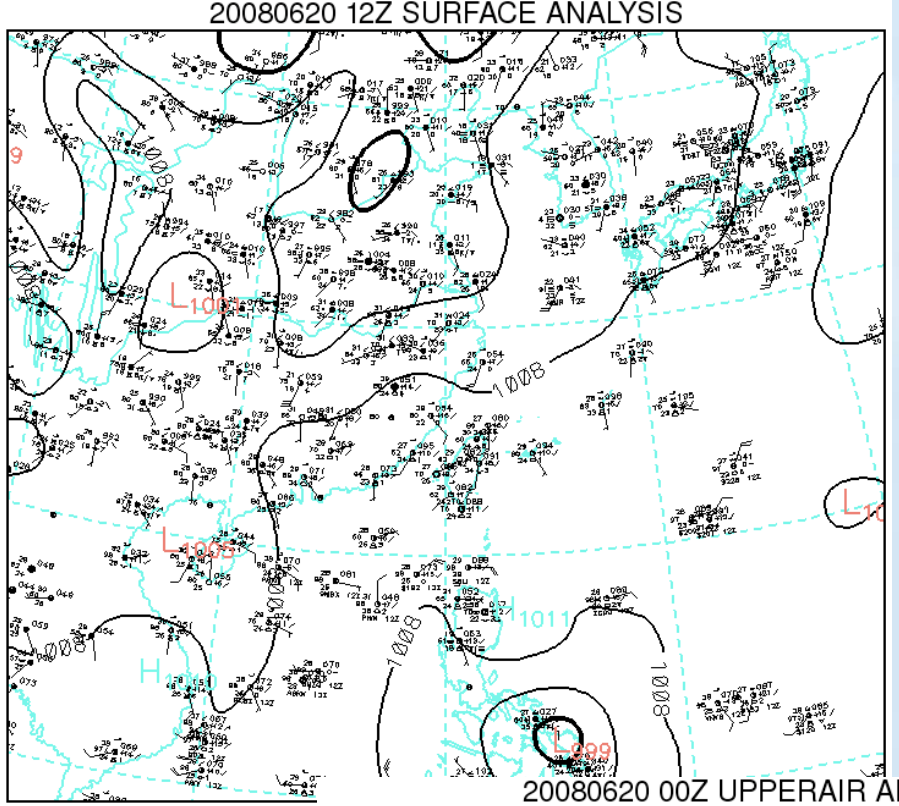
Motivation: Investigate storm initiation, structures and its interactions with a sea breeze front under weak synoptically forced environment

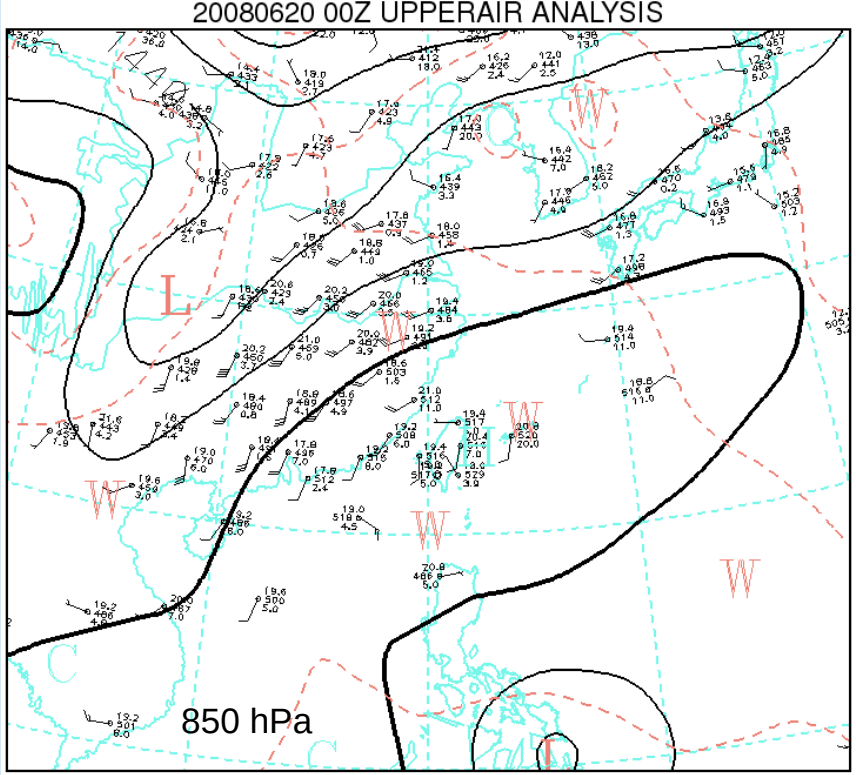
Data

- S-Pol
- Team-R
- Japanese X-band radar
- Supersite
- Surface network
- Radiosonde
- Photos
- Cloud movie

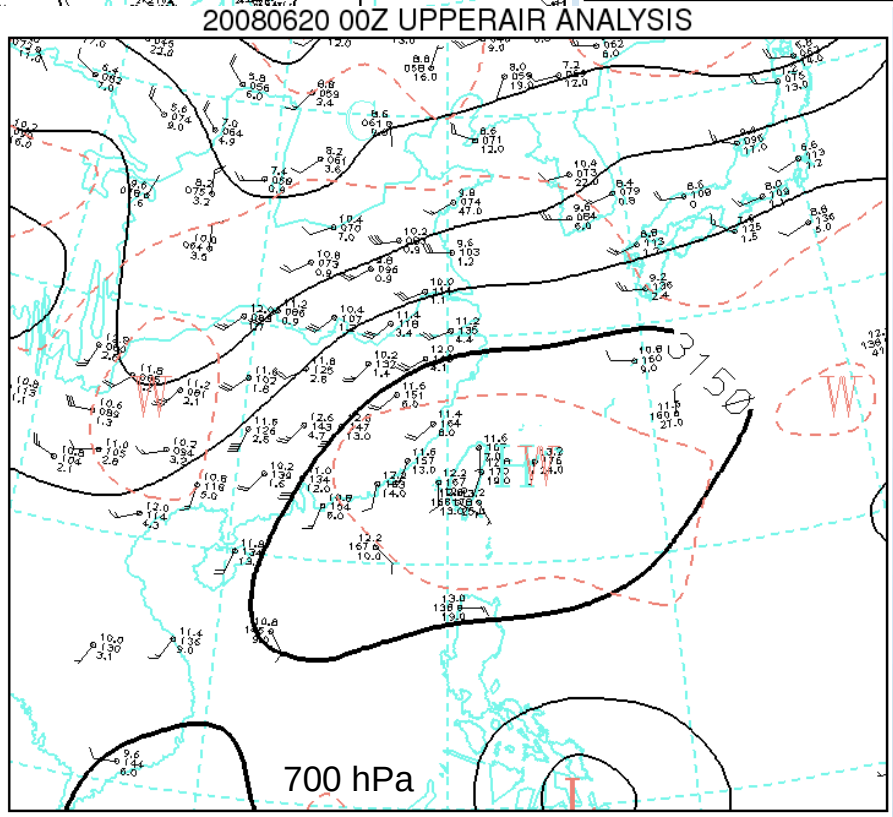
Methodology

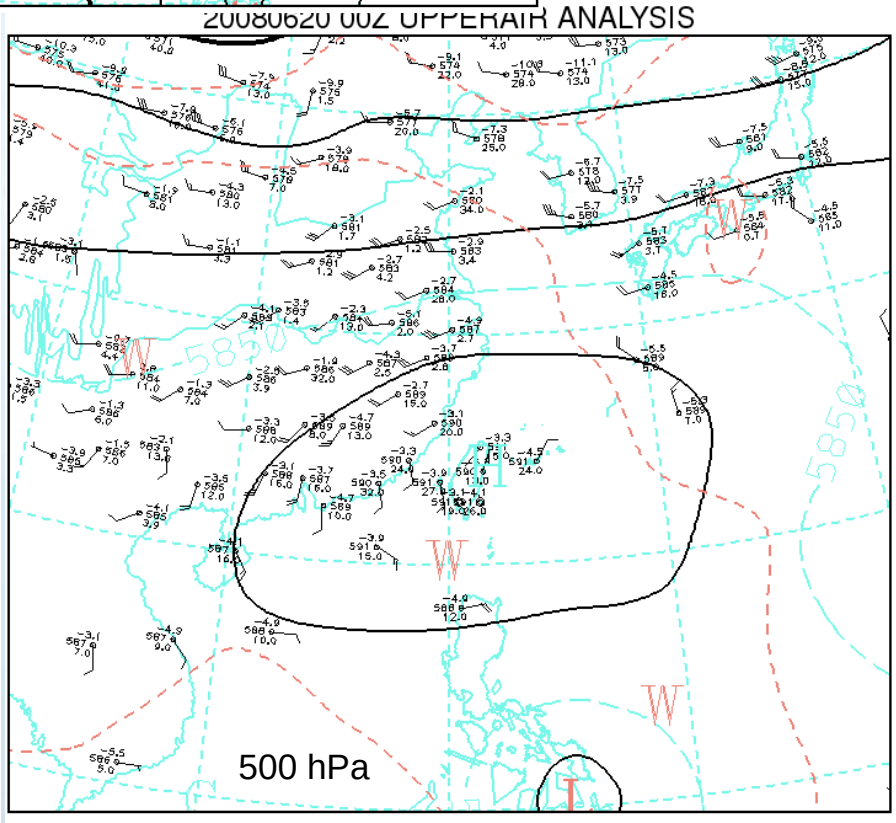
- Single Doppler analysis of sea breeze front
- Dual-Doppler analysis for storm structures
  - 500 m X 500 m X 500 m grid
  - Leise 3-step filter
  - Upward integration
- Dual-Pol data for microphysical analysis
- Possible photogrammetry analysis combined with radar data


20080620 12Z SURFACE ANALYSIS


20080620 00Z UPPERAIR ANALYSIS
850 hPa

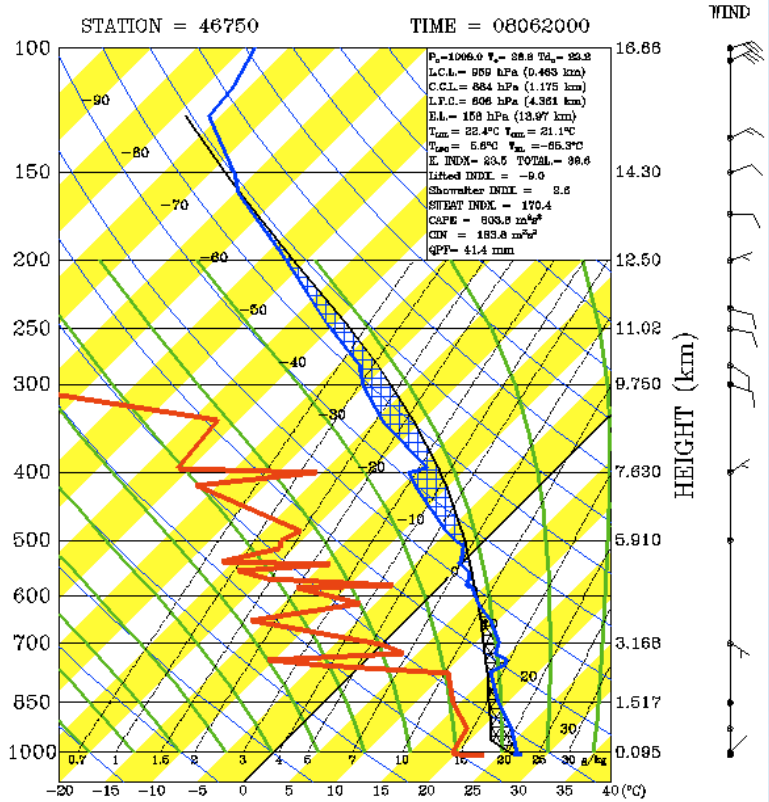
NCAR

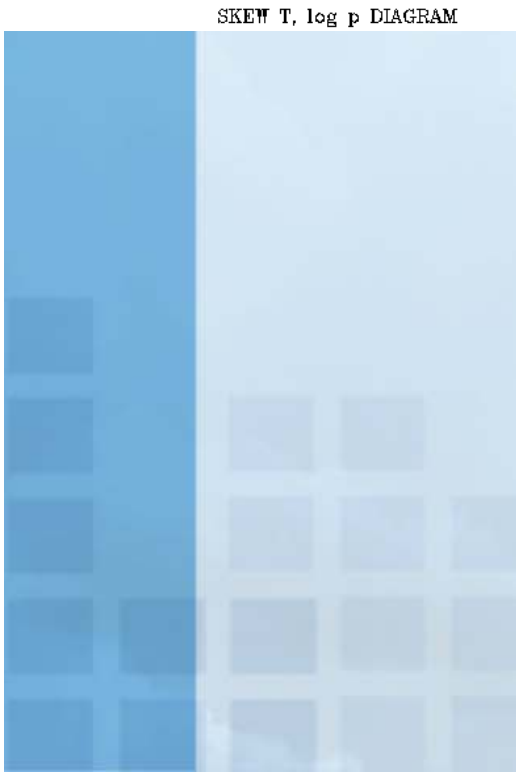

20080620 00Z UPPERAIR ANALYSIS
700 hPa

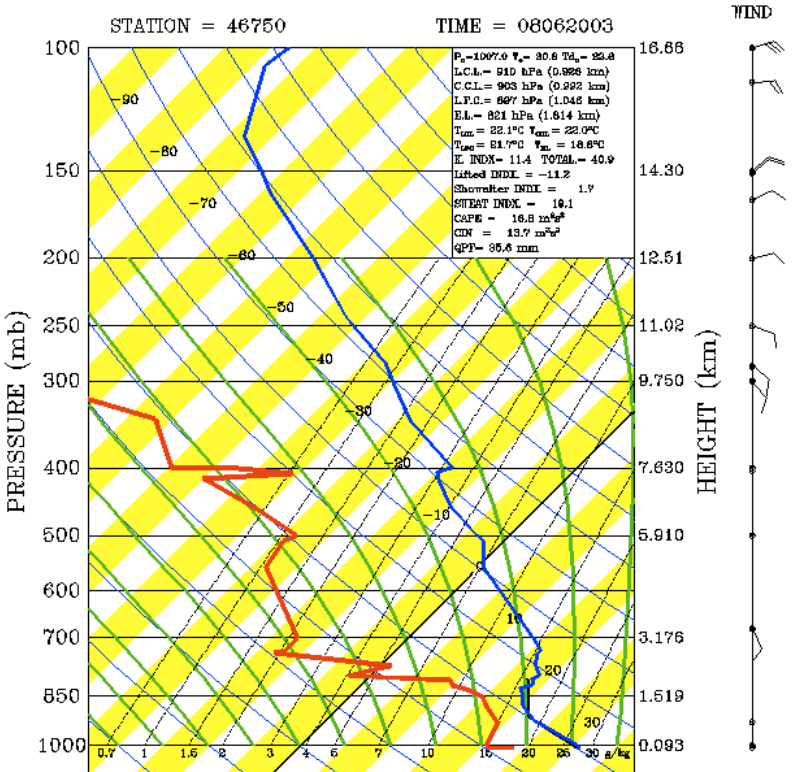

20080620 00Z UPPERAIR ANALYSIS
500 hPa

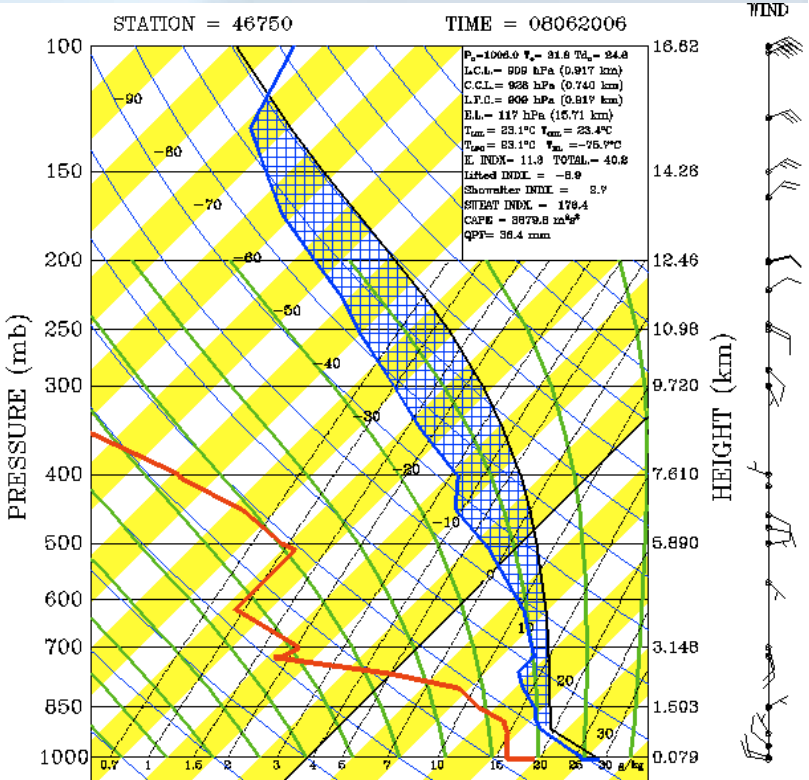
Sounding

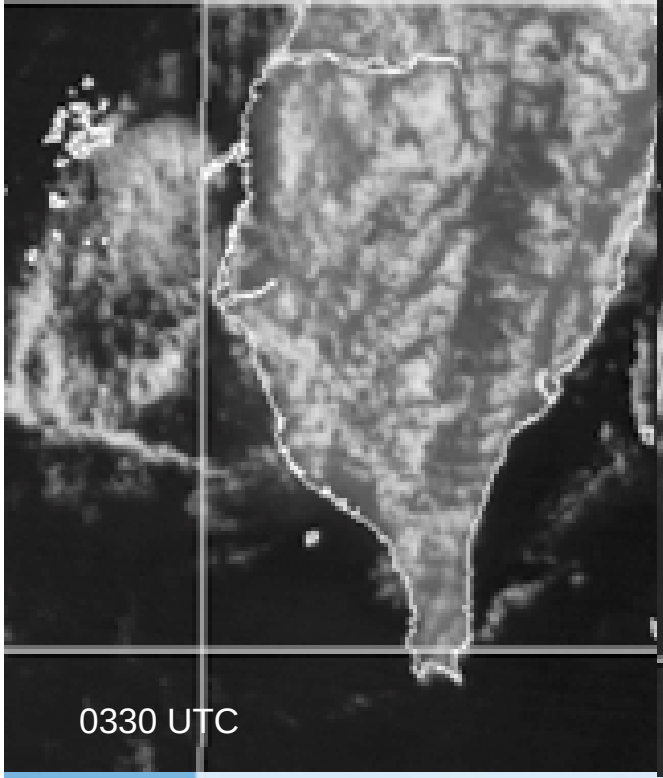
NCAR

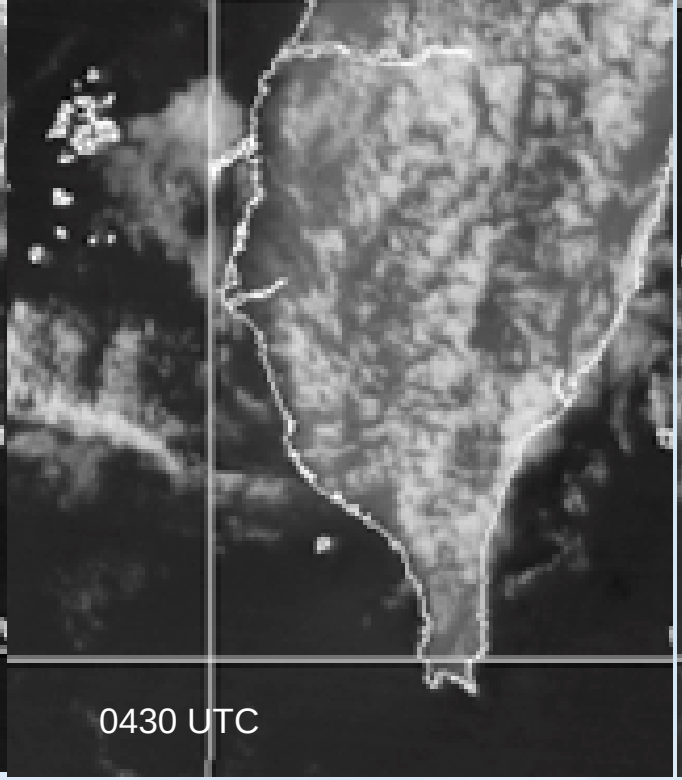


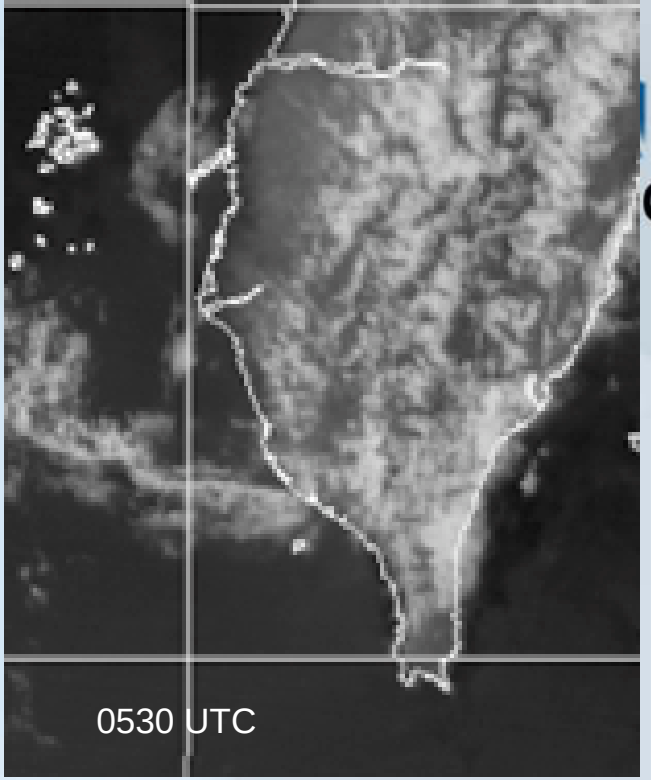




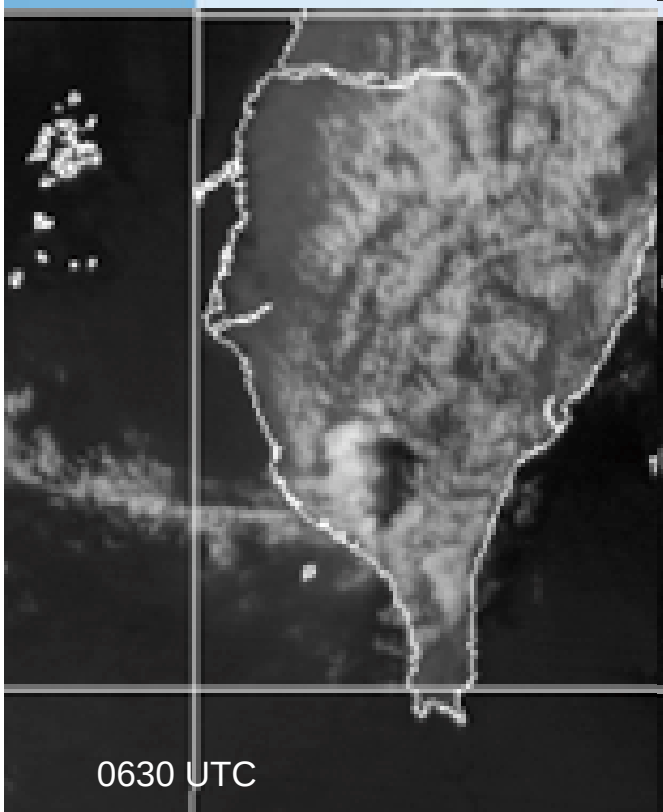


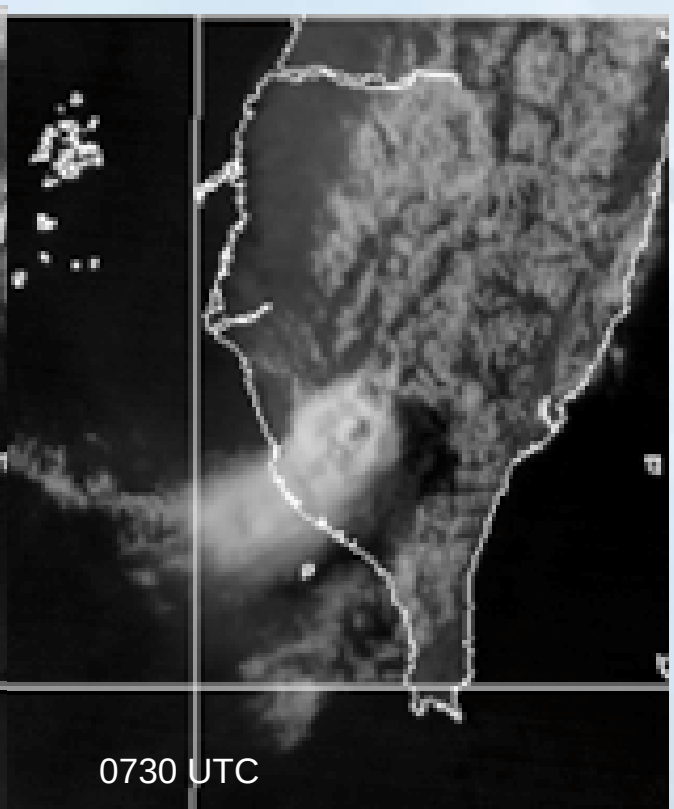


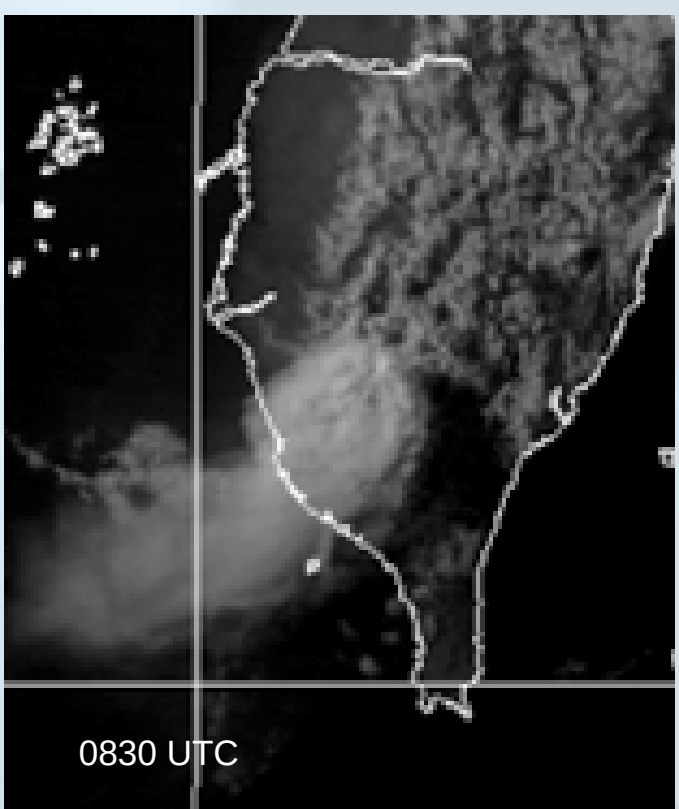


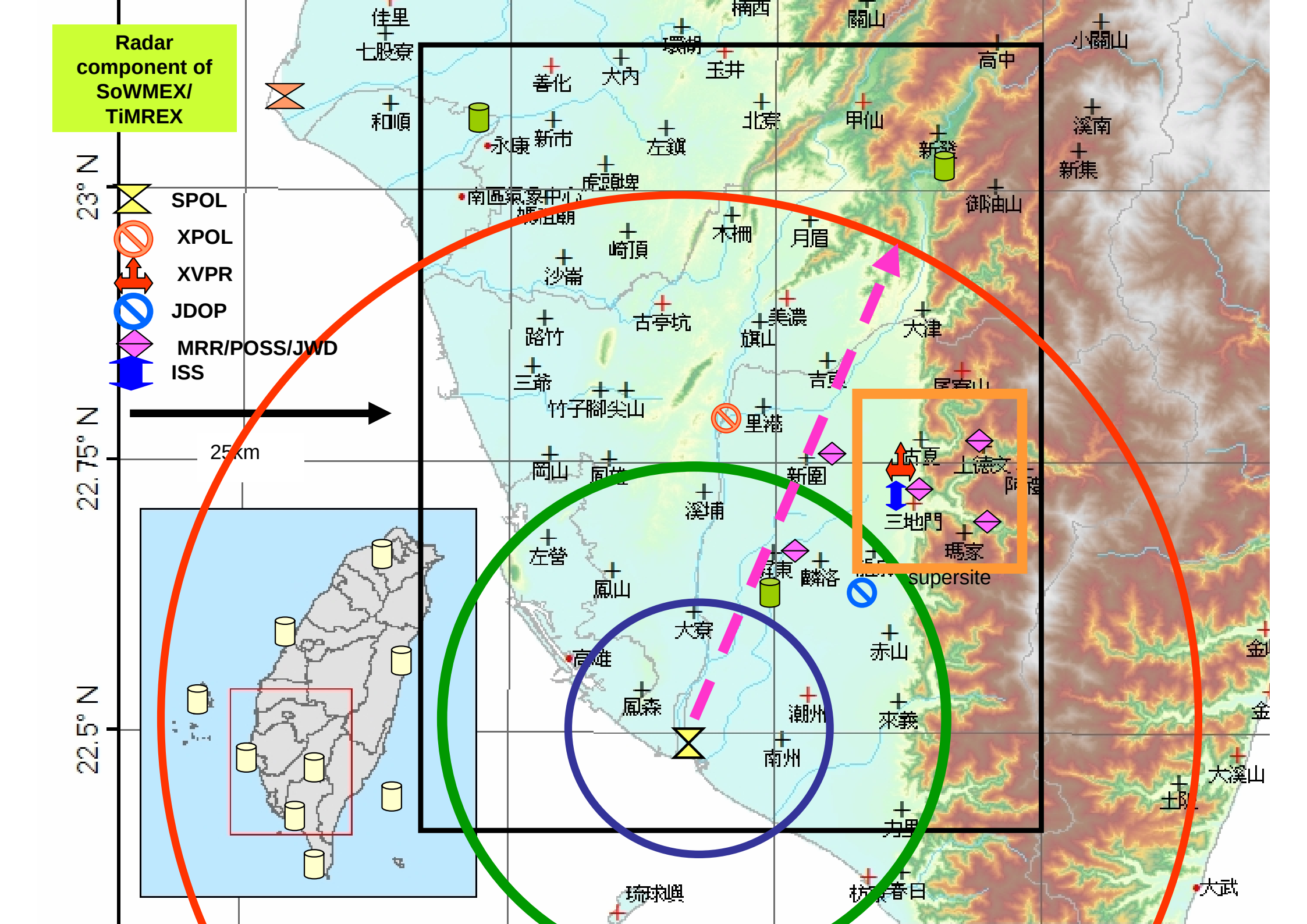


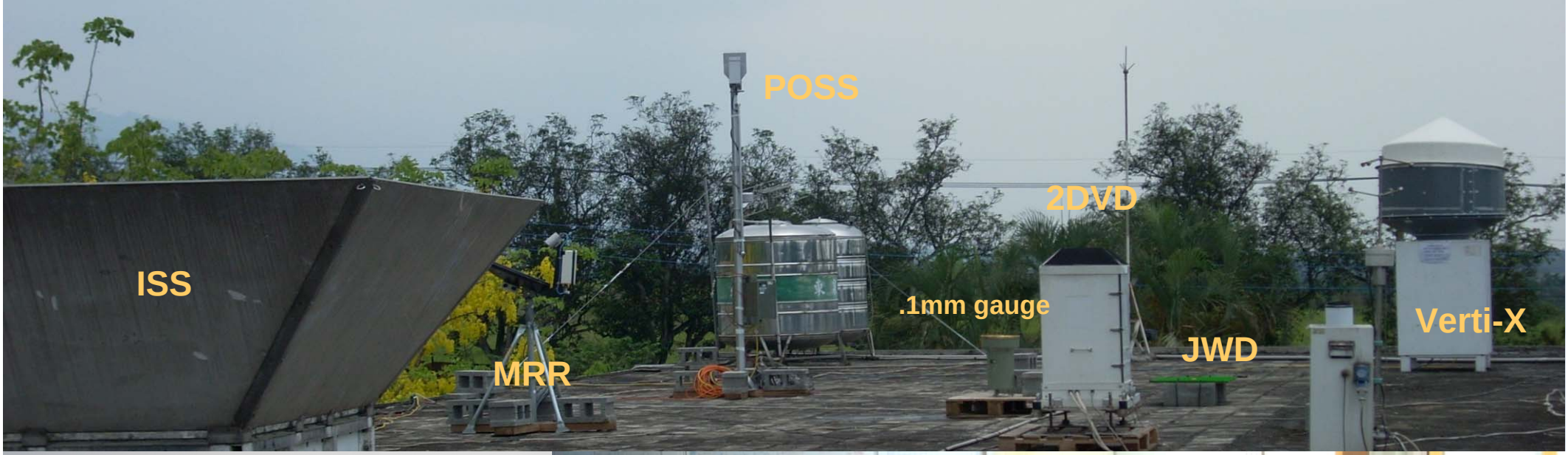
CAR



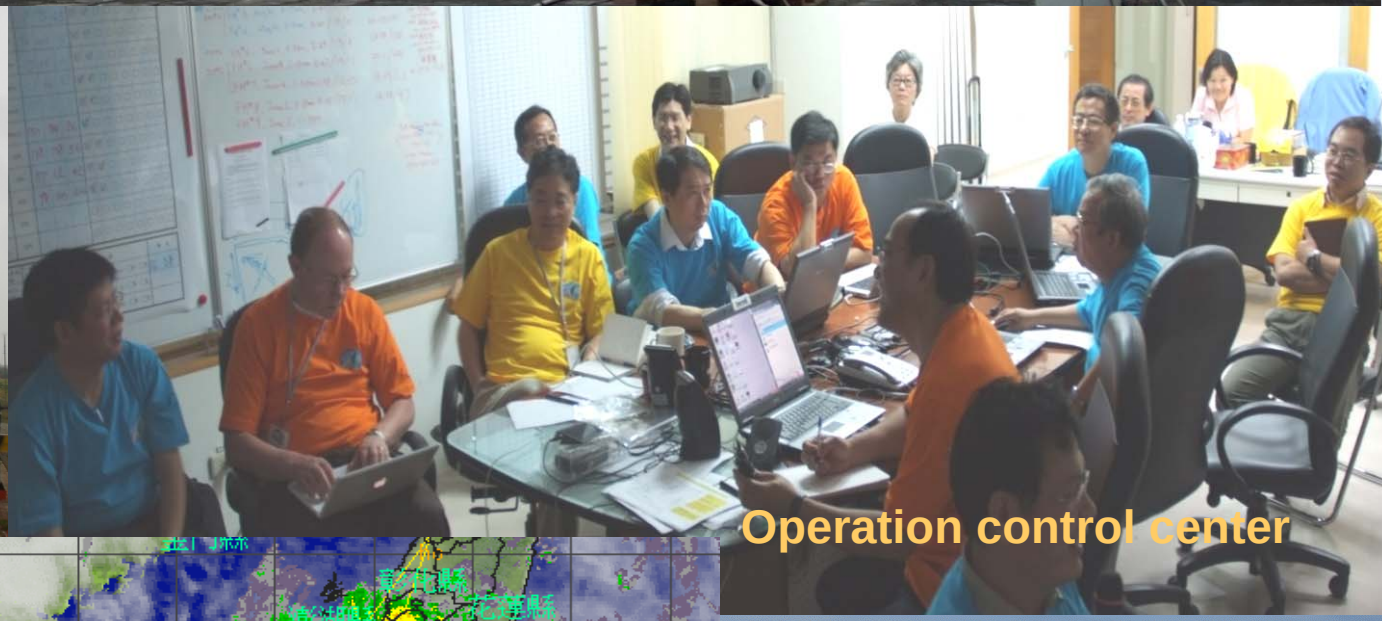




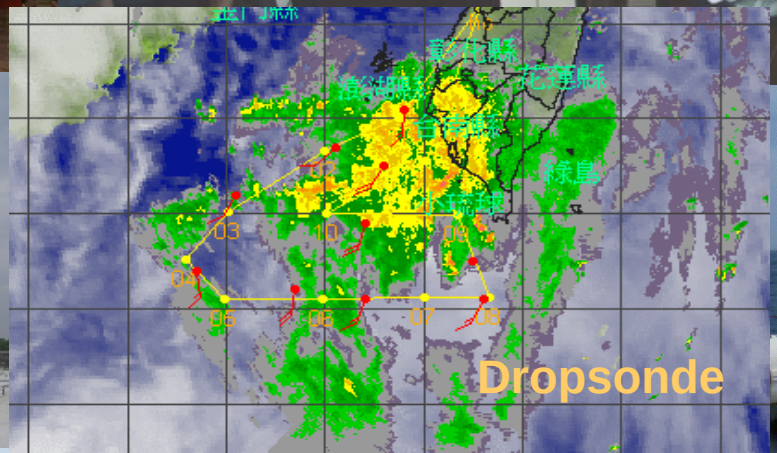

Radar component of SoWMEX/ TiMREX
SPOL
XPOL
XVPR
JDOP
MRR/POSS/JWD
ISS
25 km
supersite
23° N
22.75° N
22.5° N
佳里
七股寮
和順
善化
大內
玉井
永康
新市
左鎮
北寮
甲仙
新豐
溪南
新集
御油山
南區氣象中心
崎頂
木柵
月眉
沙崙
路竹
古亭坑
美濃
旗山
大津
三爺
竹子腳尖山
里港
岡山
新園
溪埔
三地門
瑪家
左營
鳳山
大寮
赤山
鳳森
潮州
來義
南州
琉球嶼
春日
大武
大溪山

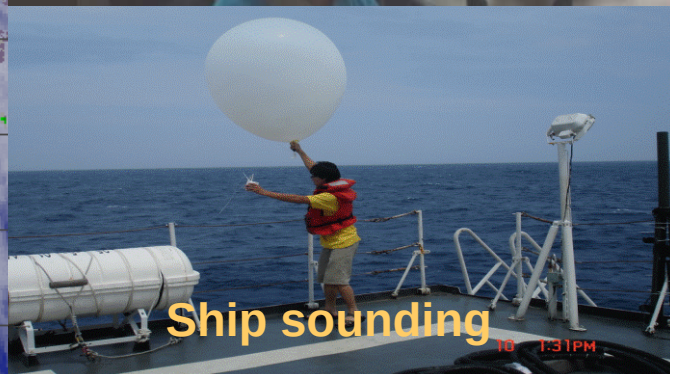

POSS
2DVD
ISS
.1mm gauge
Verti-X
JWD
MRR


SPOL and TEAM-R

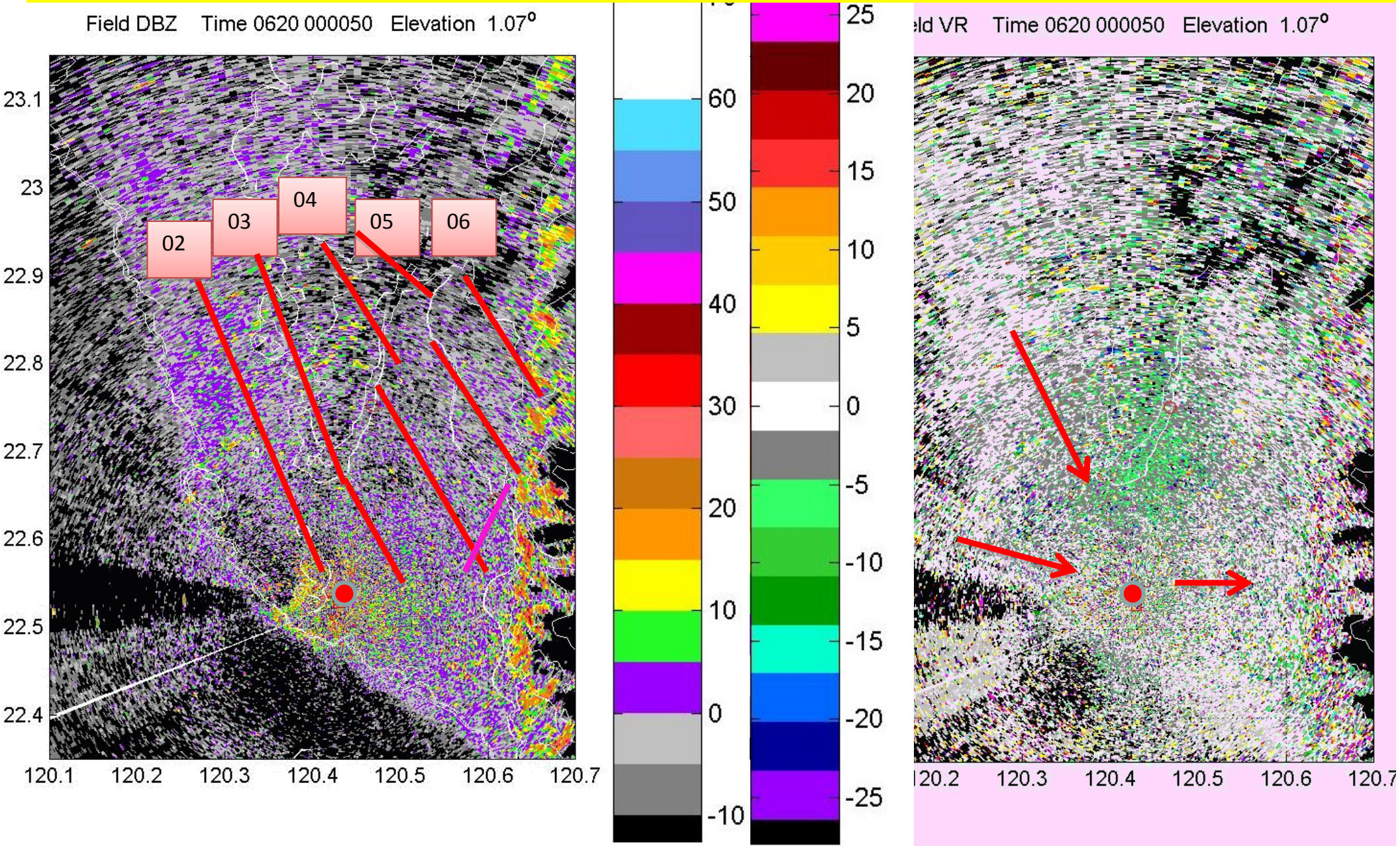

Operation control center


Japan XDOP

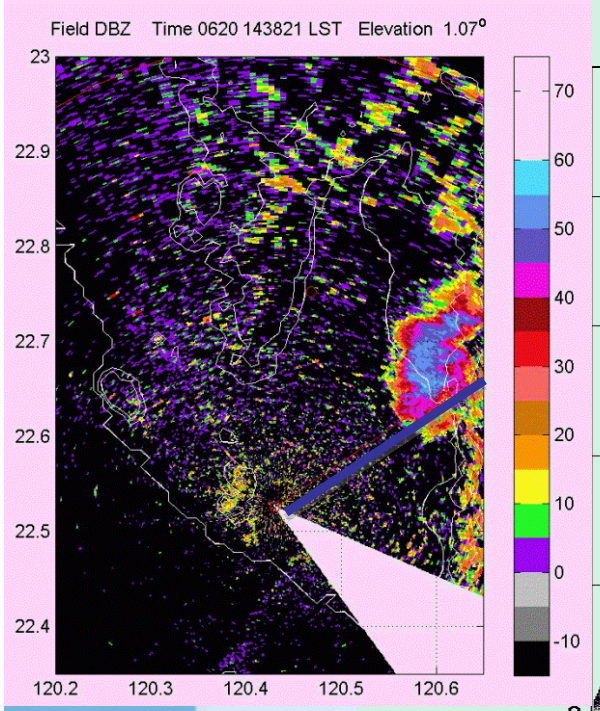

Dropsonde

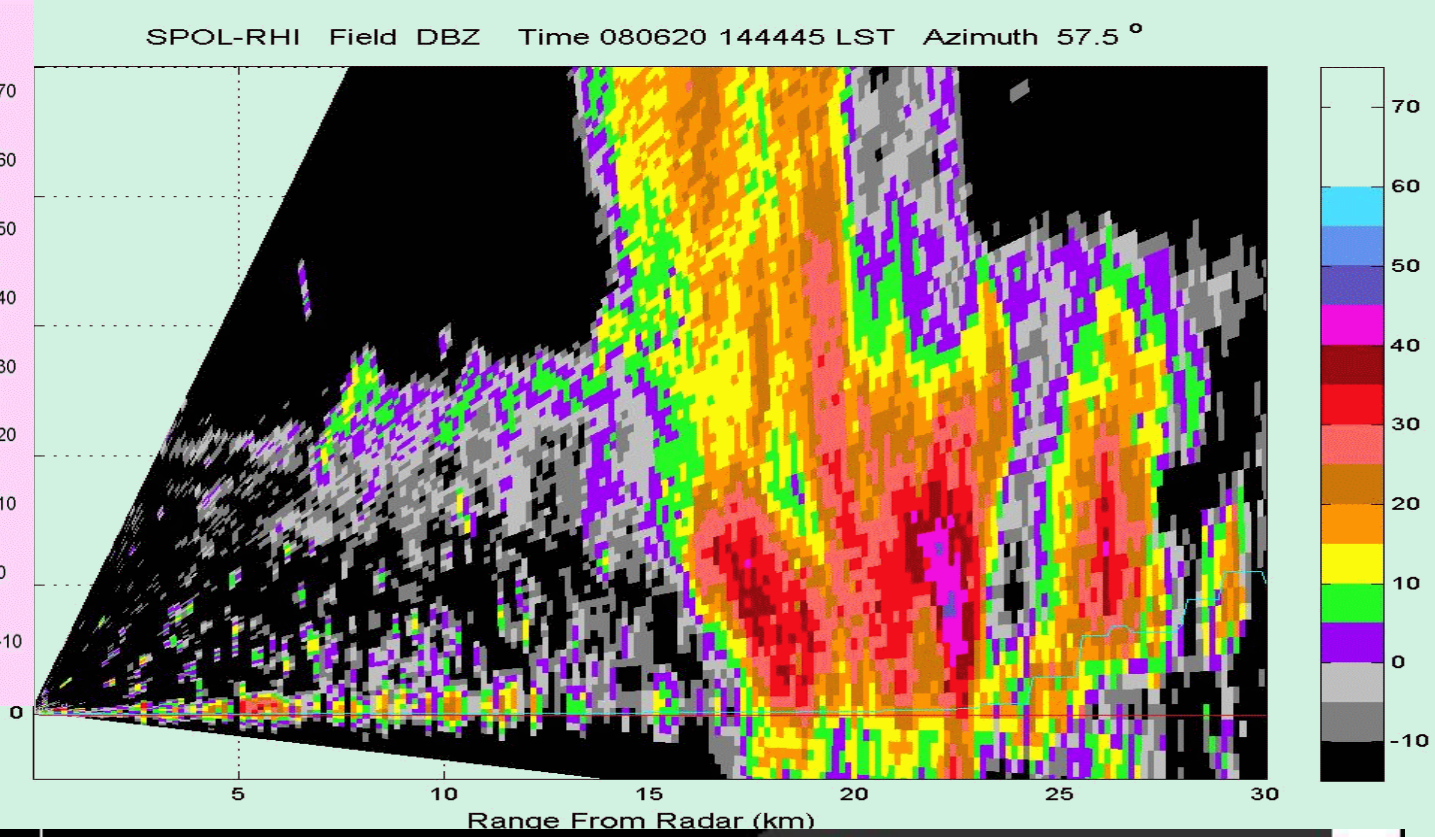

Ship sounding

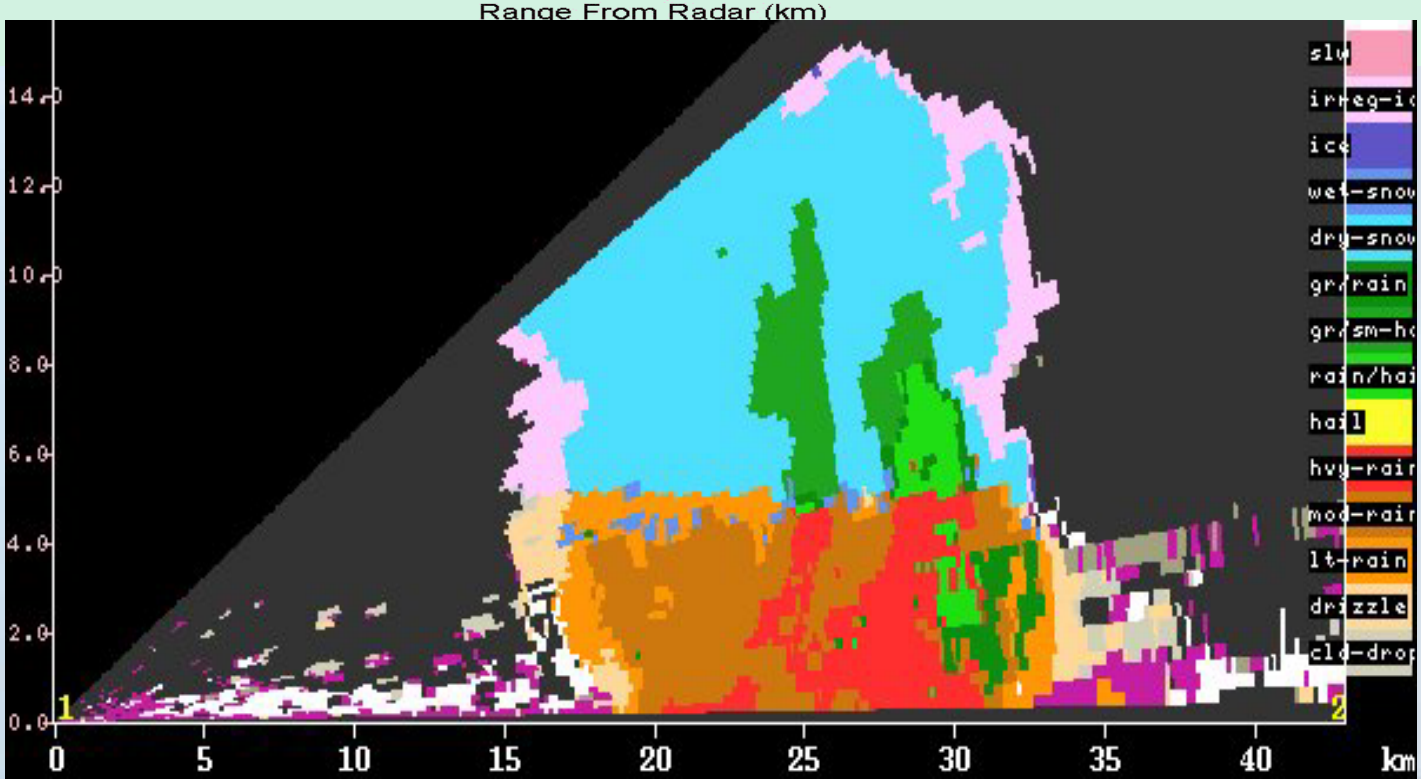
Wilson and Schreiber (1986) found that 80% of thunderstorms in E Colorado were initiated close to boundary layer convergence zones. The scatterers within the mixed layer are INSECTS and above the mixed layer the clear air return is likely due to refractive index gradients.

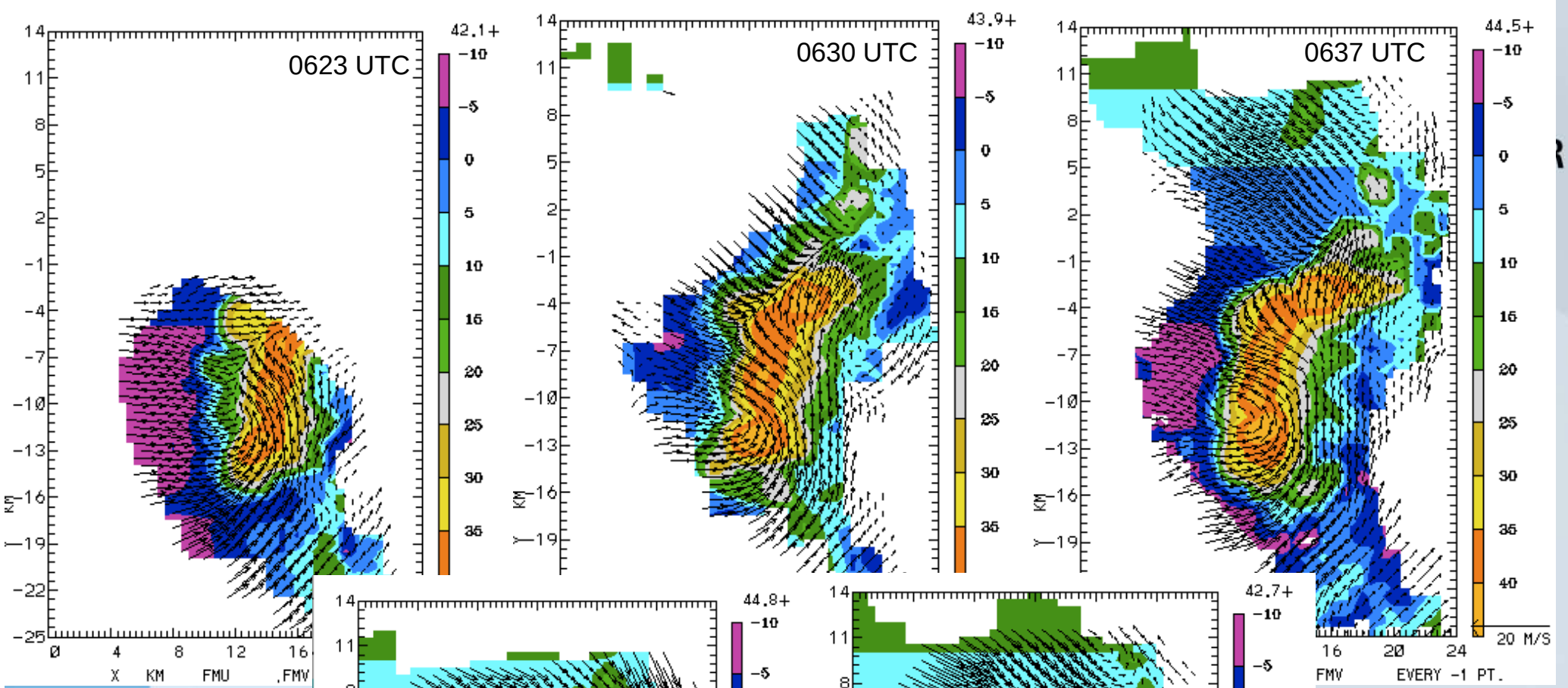


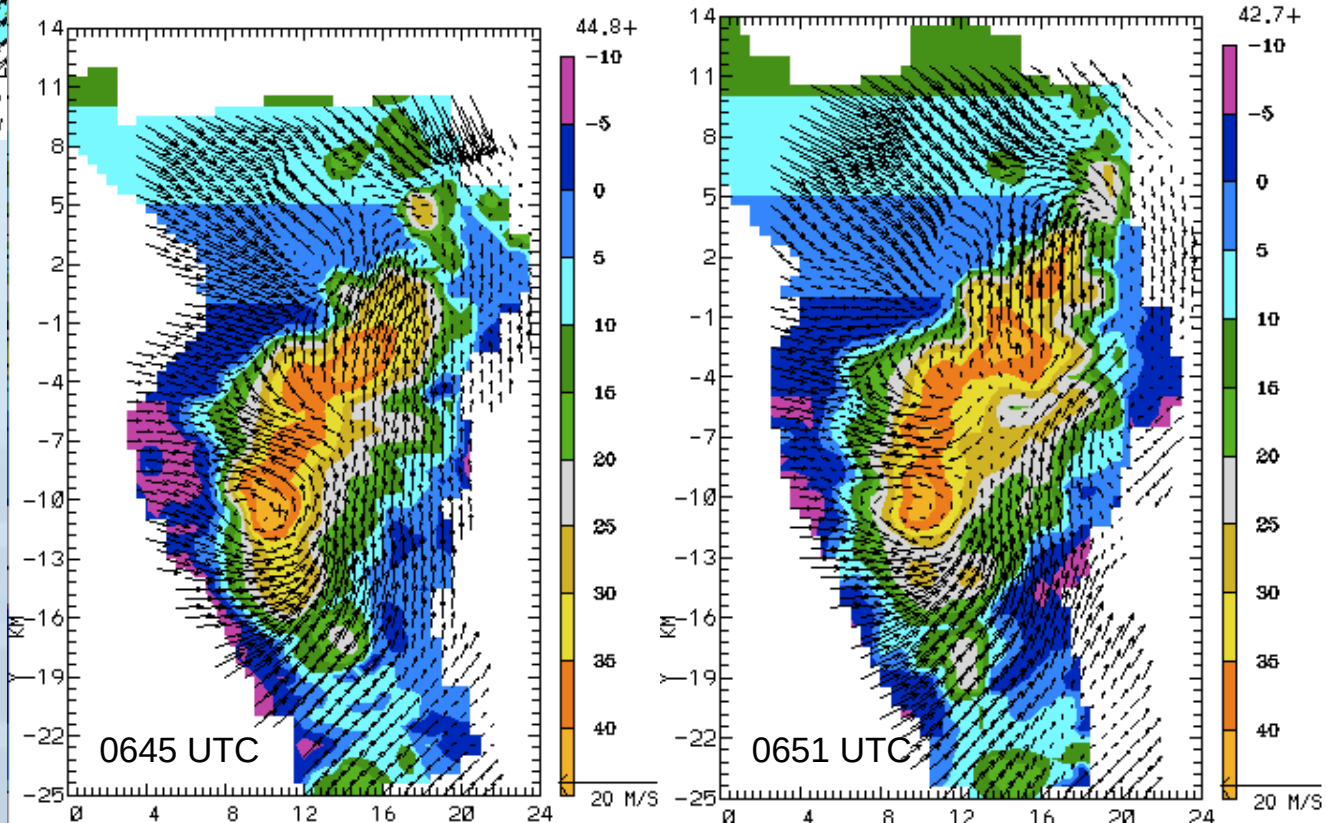
NCAR

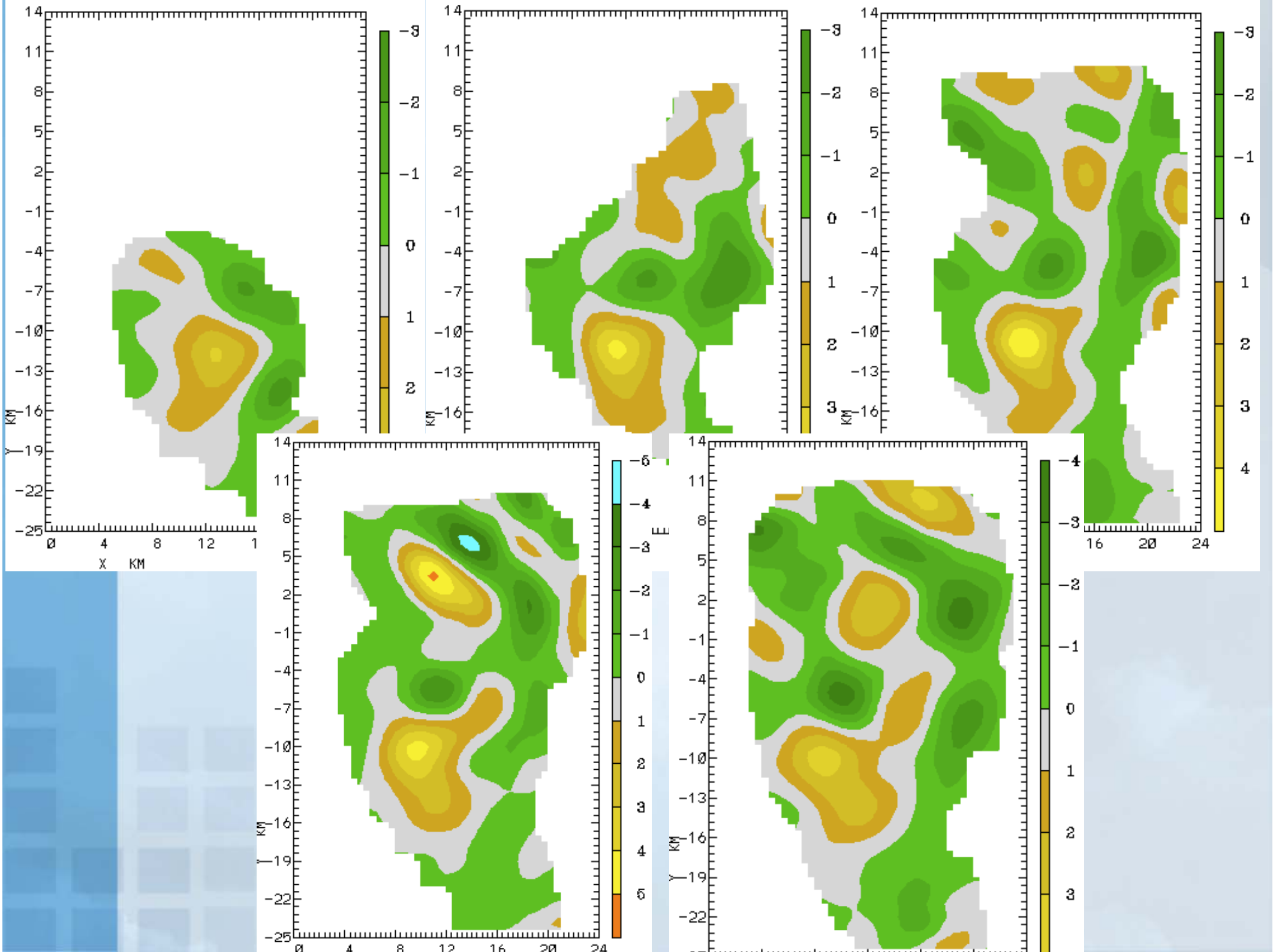

Field DBZ Time 0620 143821 LST Elevation 1.07°
23
22.9
22.8
22.7
22.6
22.5
22.4
120.2
120.3
120.4
120.5
120.6
70
60
50
40
30
20
10
0
-10


SPOL-RHI Field DBZ Time 080620 144445 LST Azimuth 57.5 °
0
5
10
15
20
25
30
Range From Radar (km)
70
60
50
40
30
20
10
0
-10

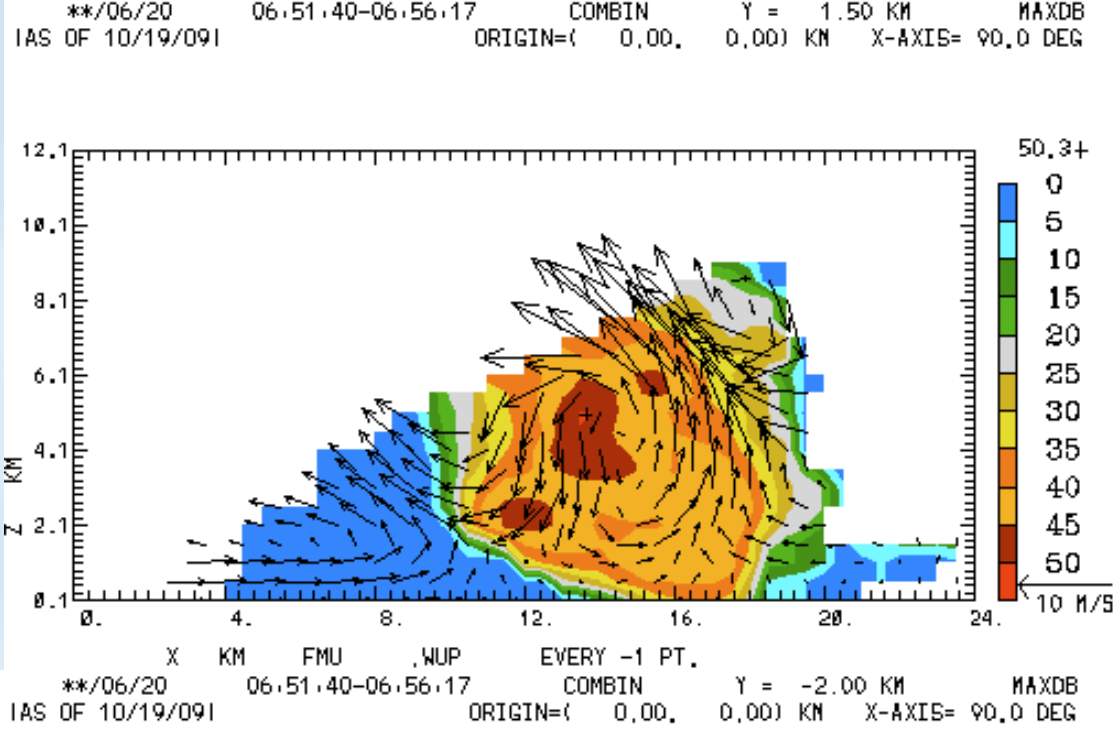

14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
5
10
15
20
25
30
35
40
km
1
2
slw
irreg-ic
ice
wet-snow
dry-snow
gr/rain
gr/sm-ha
rain/hai
hail
hvy-rain
mod-rain
lt-rain
drizzle
cld-drop

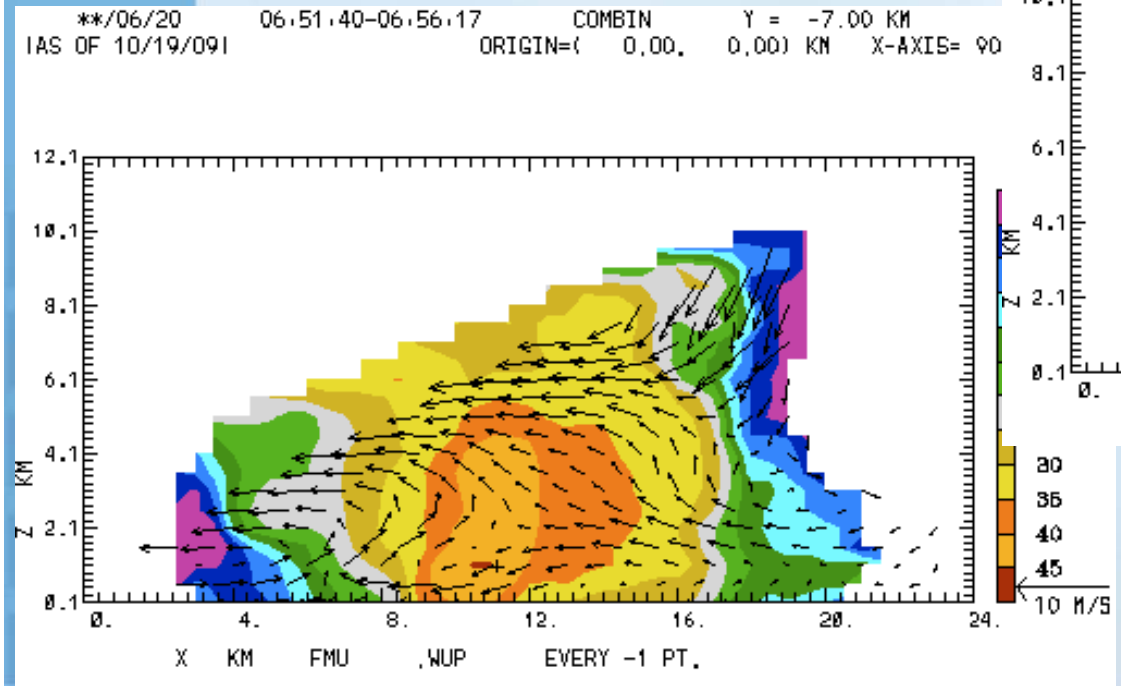

0623 UTC
0630 UTC
0637 UTC
42.1+
43.9+
44.5+
-10
-5
0
5
10
16
20
25
30
35
40
20 M/S
KM
X KM FMU .FMV
FMV EVERY -1 PT.

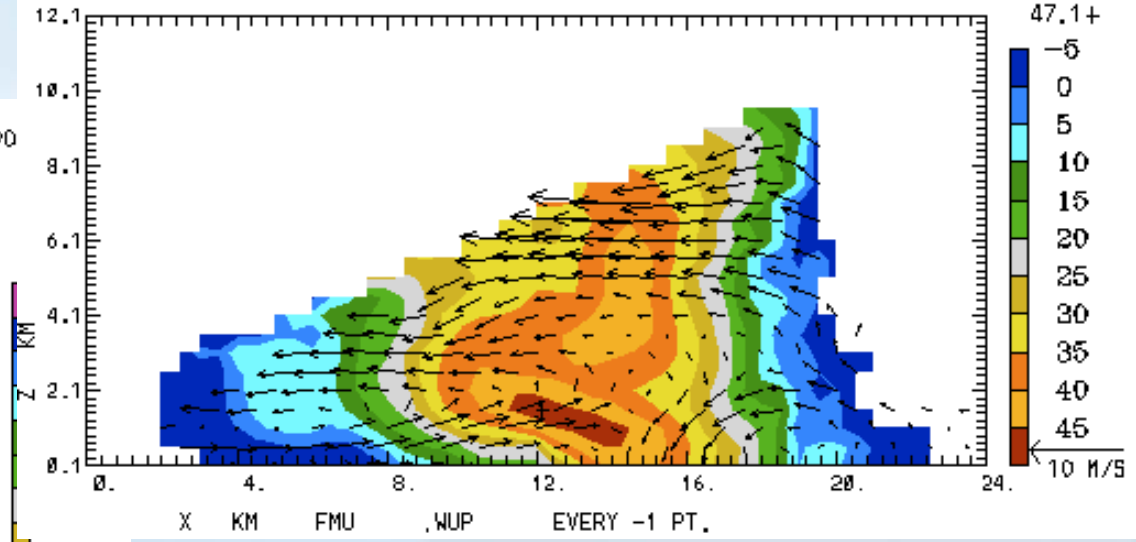

0645 UTC
0651 UTC
44.8+
42.7+
-10
-5
0
5
10
16
20
25
30
35
40
20 M/S
KM


Y KM
X KM
KM

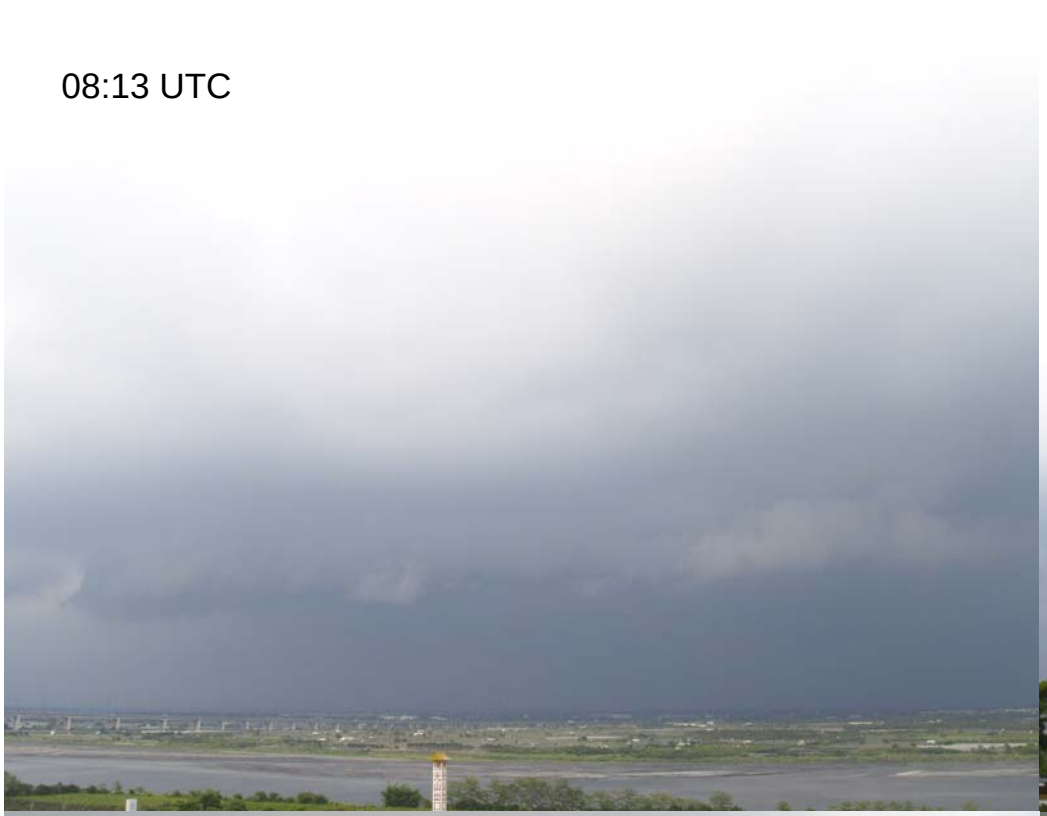
Vertical Structures at 0651 UTC







08:13 UTC



08:18 UTC

08:36 UTC

08:38 UTC

Summary

- Clutter mitigation detection (CMD) capability at S-Pol is key to extract/distinguish clear air echoes from ground-clutter contamination.
- 6/20 storm was initiated after a sea breeze front interacting with terrain.
- The storm formed along a convergence line and new cells initiated north of the storm along the convergence line, similar to those observed elsewhere in the world.
- Mesocyclones formed along the convergence line.
- Missing data from RCCG and Team-R created some limitations in this dataset.

Future Work

- Investigate the properties of the boundary and its interactions with terrain
- Investigate convection initiation around 06Z
- Continue dual-Doppler analysis to investigate storm evolution along the boundary
- Vorticity budget and thermodynamic retrieval