The preliminary results of a Doppler radar data 4DVAR experiment during 2008 SoWMEX IOP-8

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Introduction

■Radar can provide high resolution radial wind and reflectivity data.

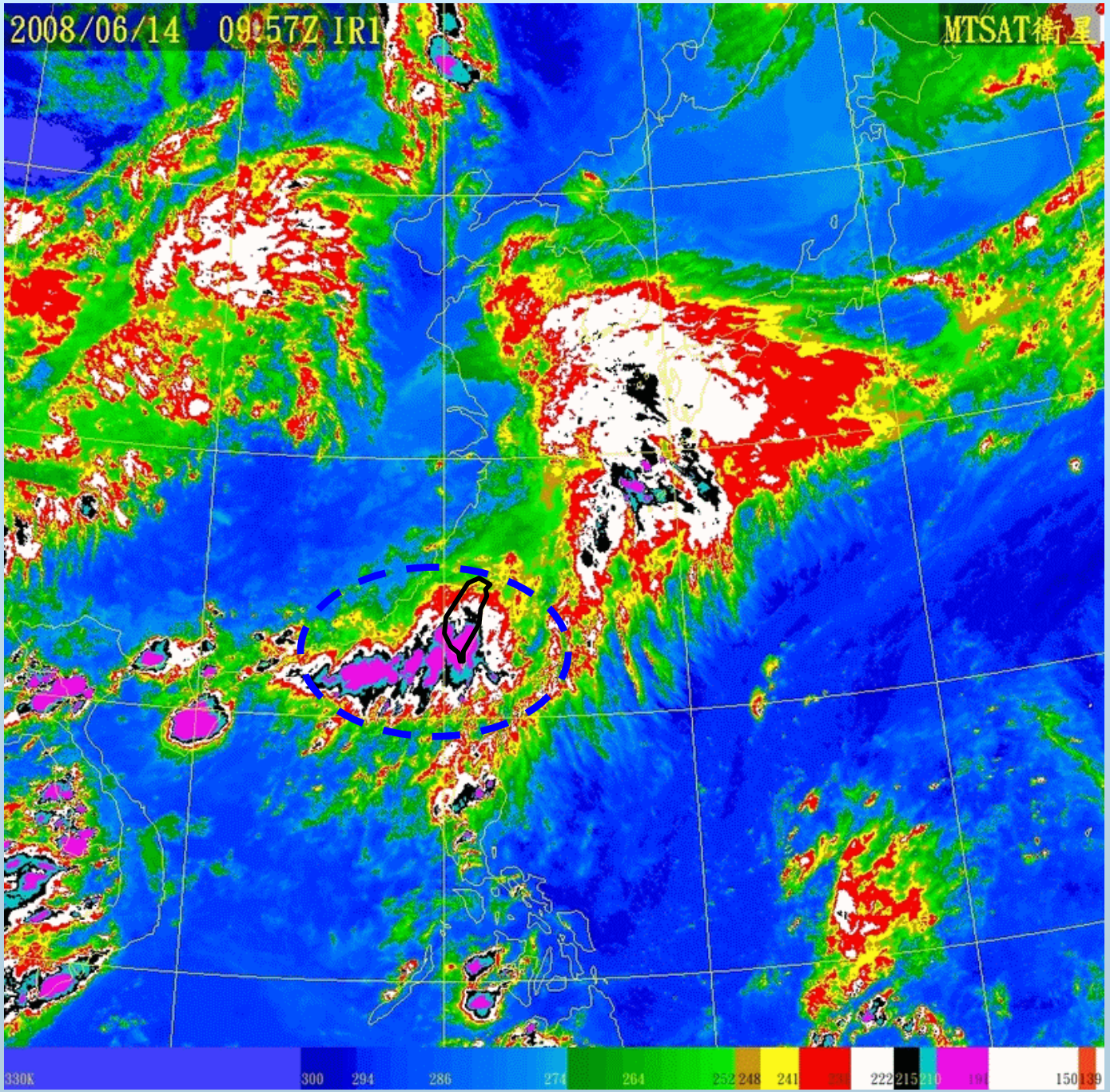
■Assimilate Taiwan radar data into a cloud model (VDRAS) to simulate the mesoscale convection system.

■Understand the potential of radar data assimilation system for quantitative precipitation forecast in Taiwan.

Outline

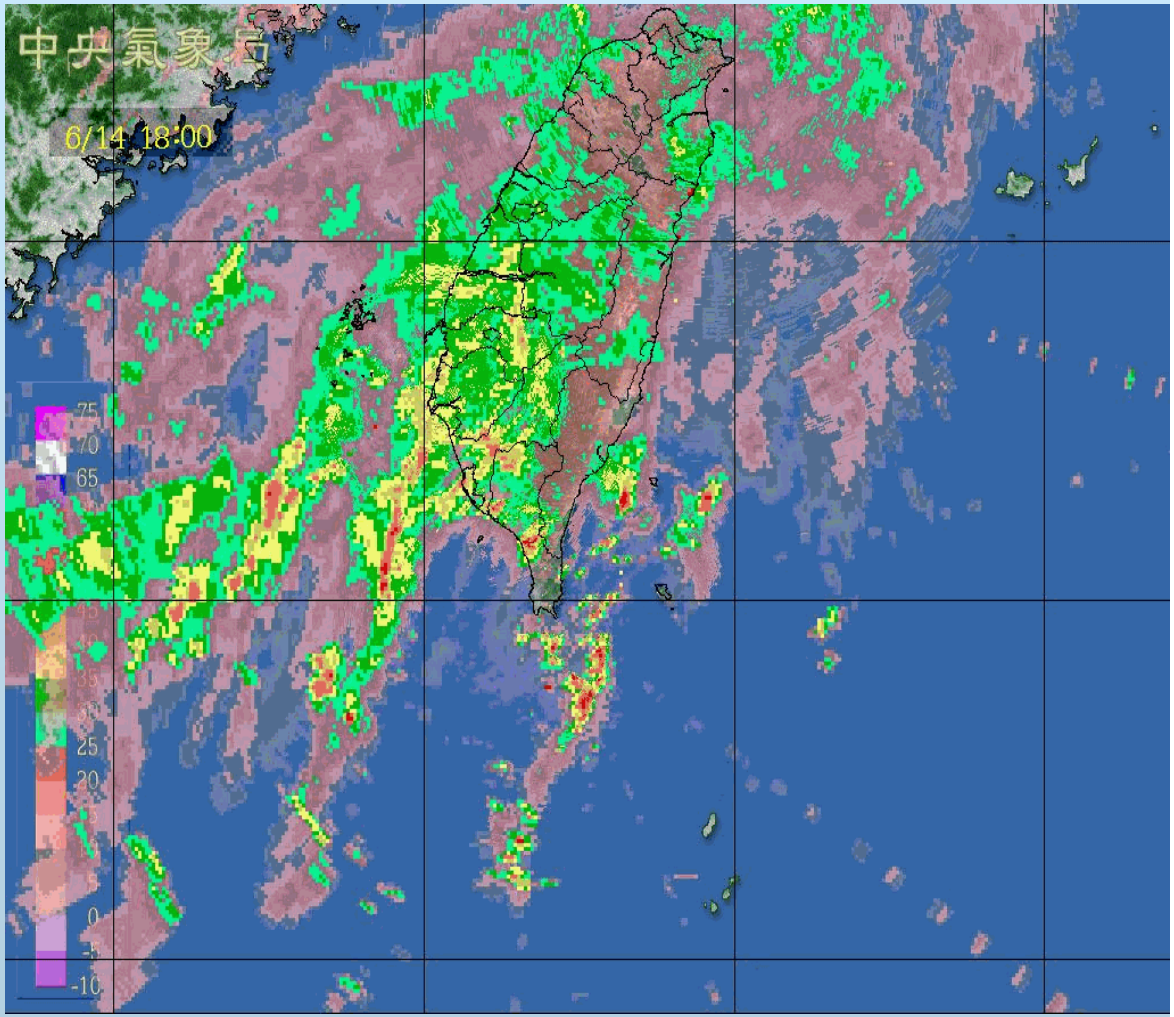
- 14 June 2008 case during IOP-8
- Experimental design
- Preliminary Results
  - Analysis
  - Forecast
- Summary and future work

IOP-8: Jun/14/2008~17/JUN/2008



The studied case:
JUN/14/2008 UTC 10:00 ~ UTC 14:00

MCS moving eastward



CV from Central Weather Bureau

Experimental design

Model

■ **VDRAS (V**ariational **D**oppler **R**adar **A**ssimilation **S**ystem**)**

- Developed by Dr. Sun and Crook, NCAR

- 4D-Var based radar data assimilation cloud model system

- Warm-rain process only (microphysics parameterization)

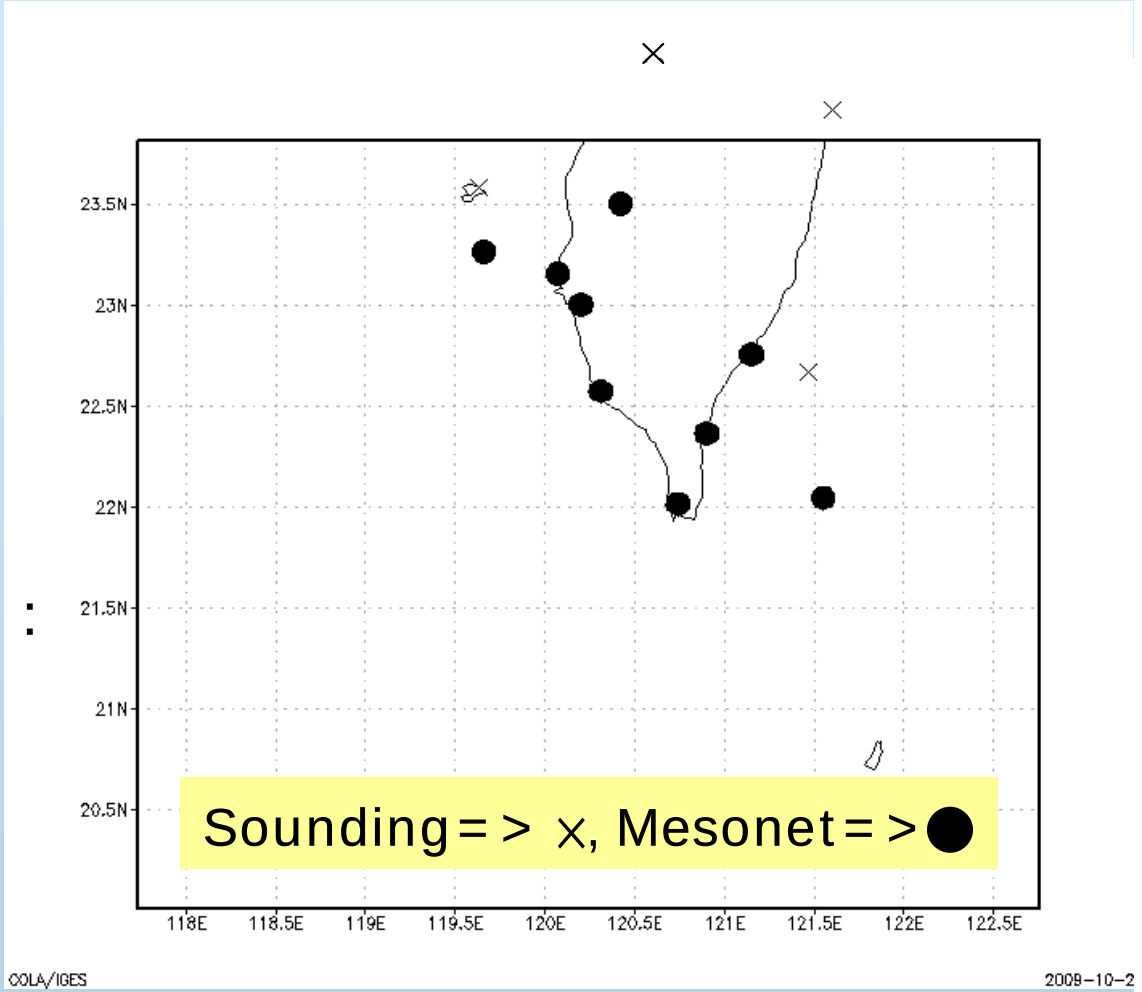
q_r : rain water
q_c : cloud water
q_v : vapor

-No terrain (Cartesian coordinate)

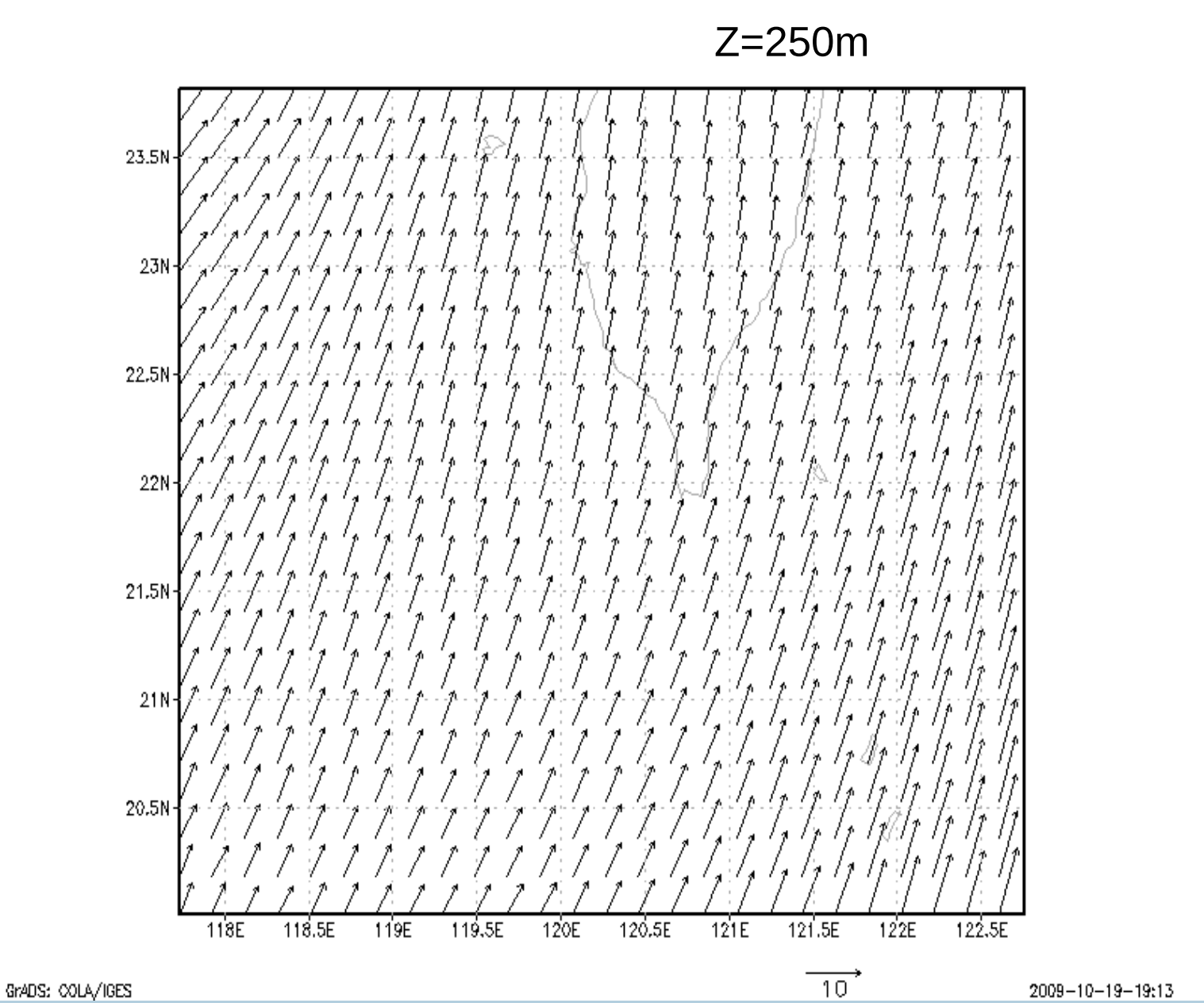
- **Domain** :
  520km *480km * 15km

- **Grid space** :
  Horizontal → 4km*4km
  Vertical → 500m

- **Mesoscale background field** :
  - Soundings at UTC1200
  - Surface stations
  - VAD



Mesoscale background wind in lowest level



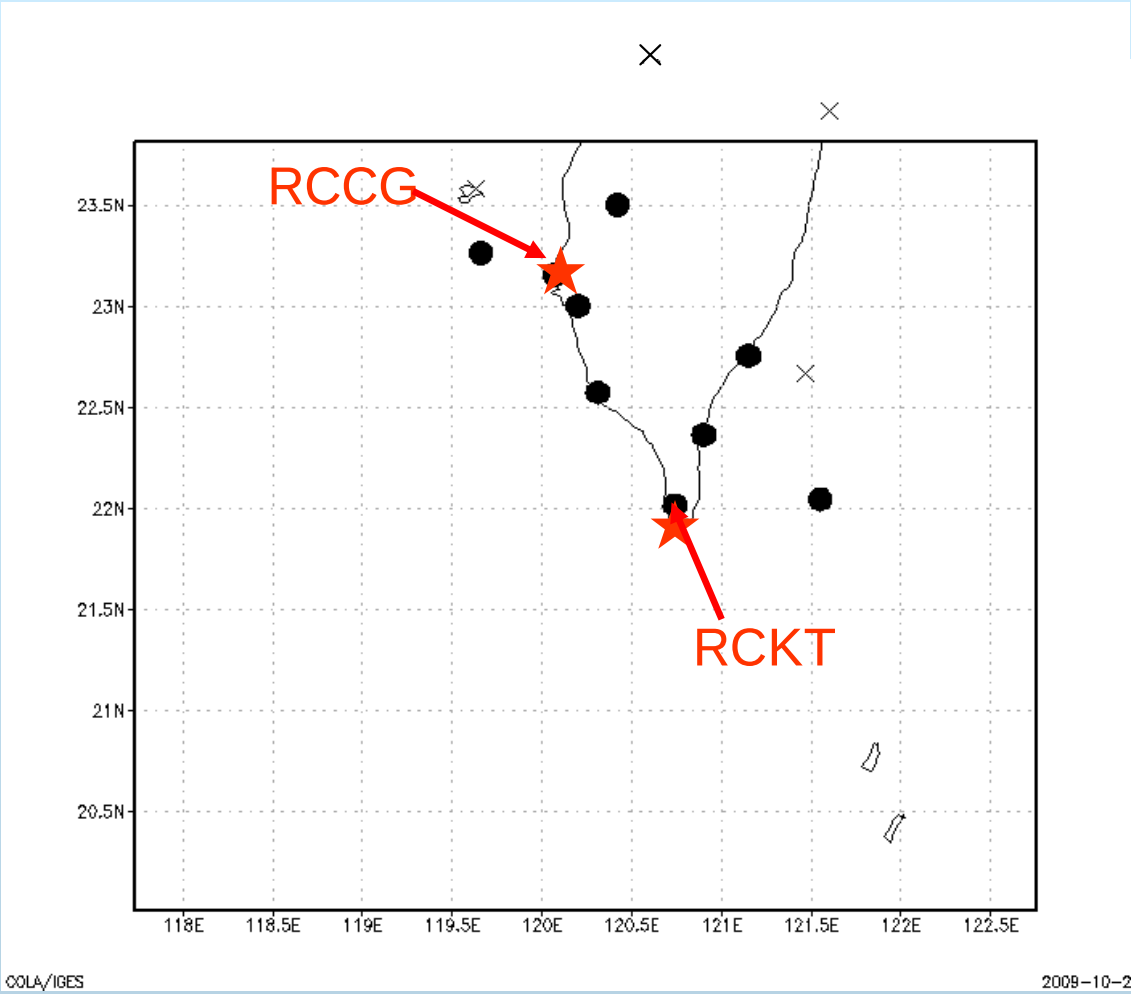
●**Radar data** : Chi-Ku (RCCG) and Ken-Ting (RCKT) radars of Central Weather Bureau.

●**Quality Control:**
Unfolding (RASTA, Dr. Jen-Hsin Teng, CWB)
→ Eliminate ground clutter

- Criteria for eliminating ground clutter

  Reflectivity > 30 dBZ

  Radial Velocity: +2~-2 m/s

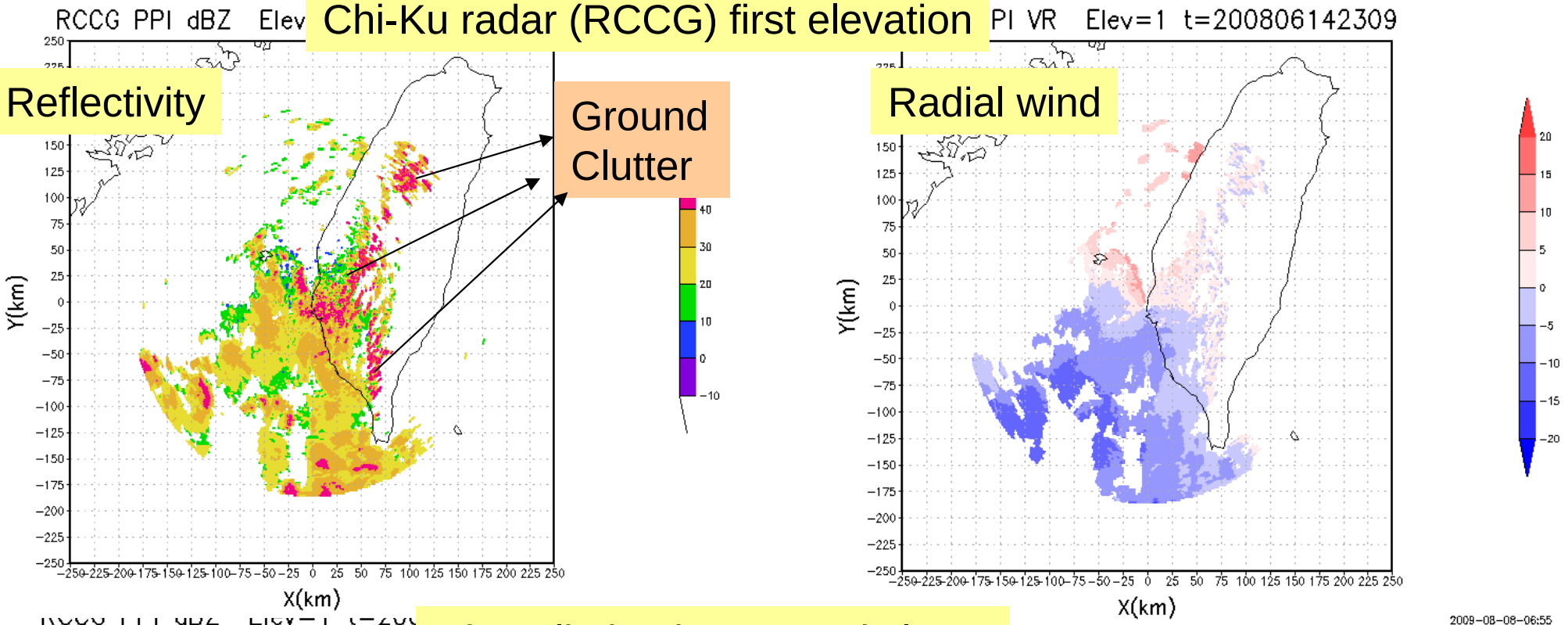


Chi-Ku radar (RCCG) first elevation

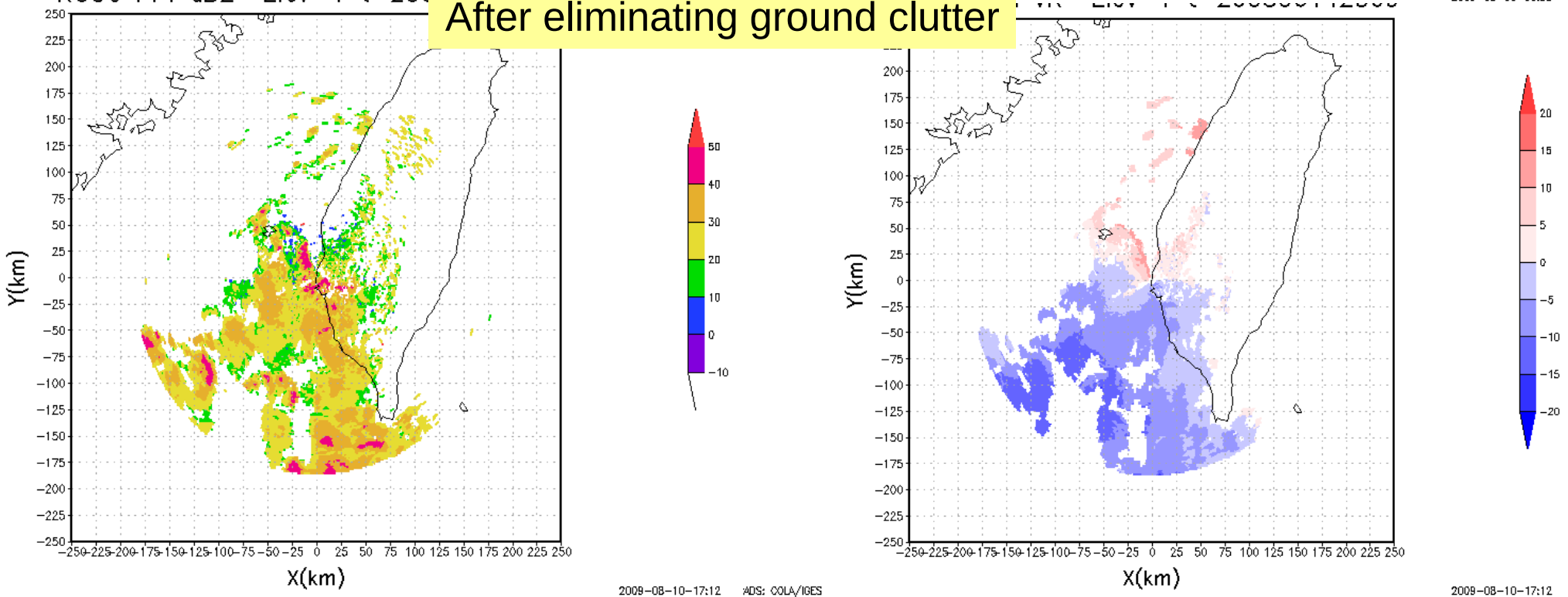
Reflectivity

Ground Clutter

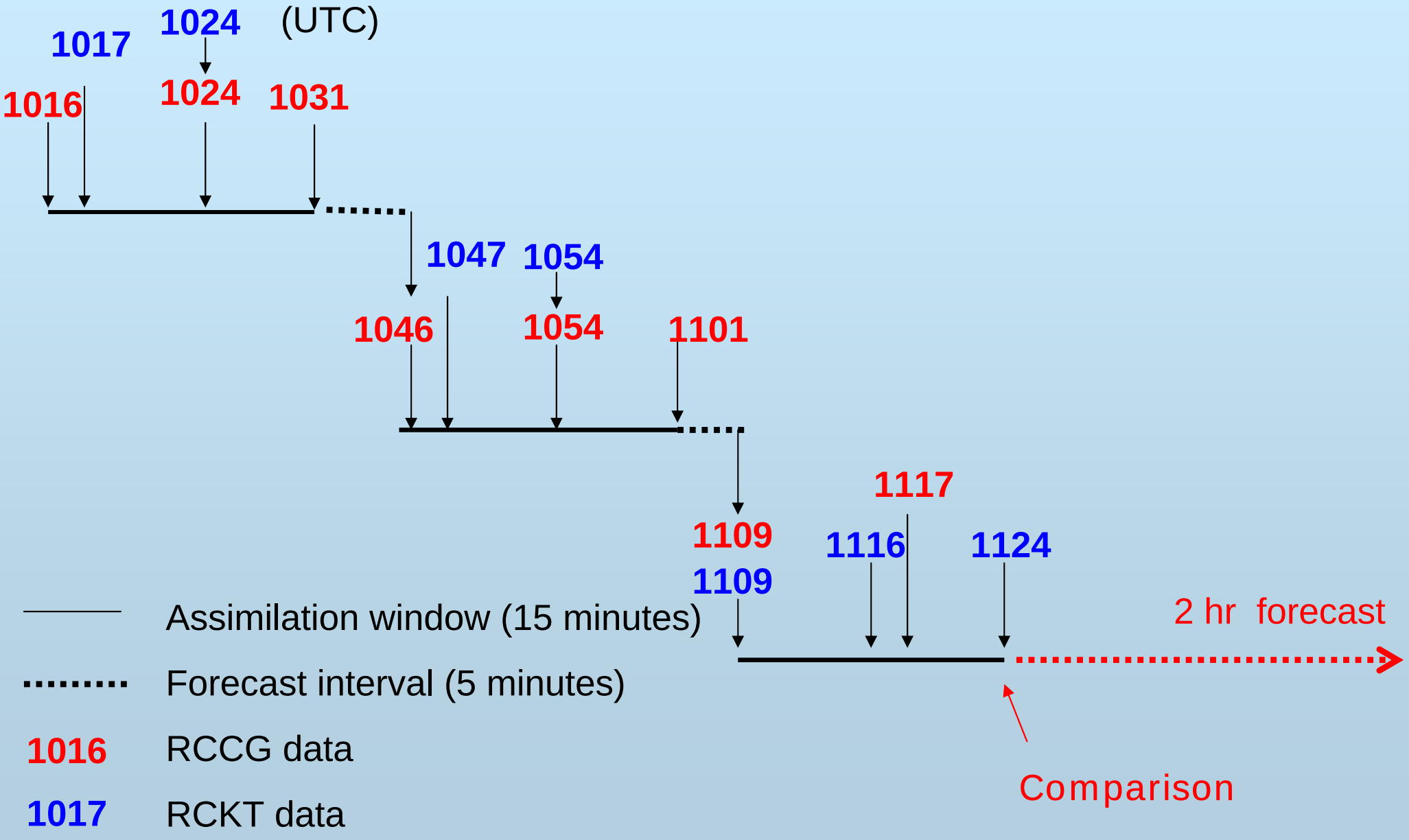
Radial wind



After eliminating ground clutter



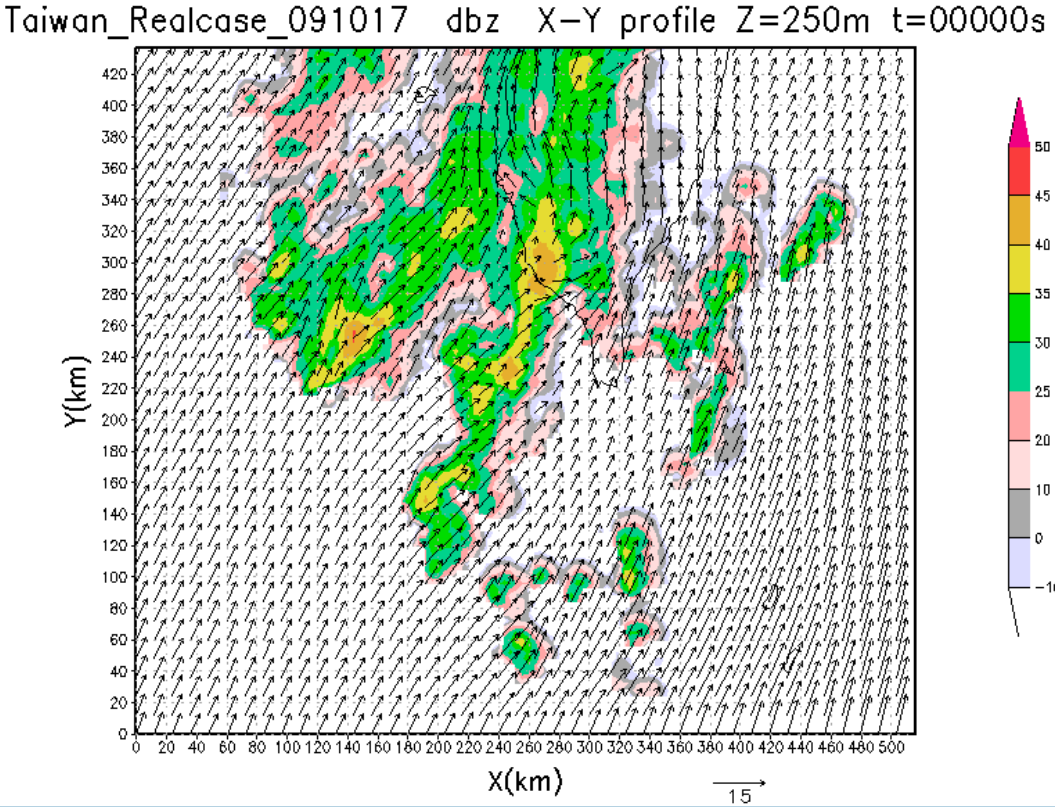
3 cycles : each assimilate five to six volume scan from 2 radars

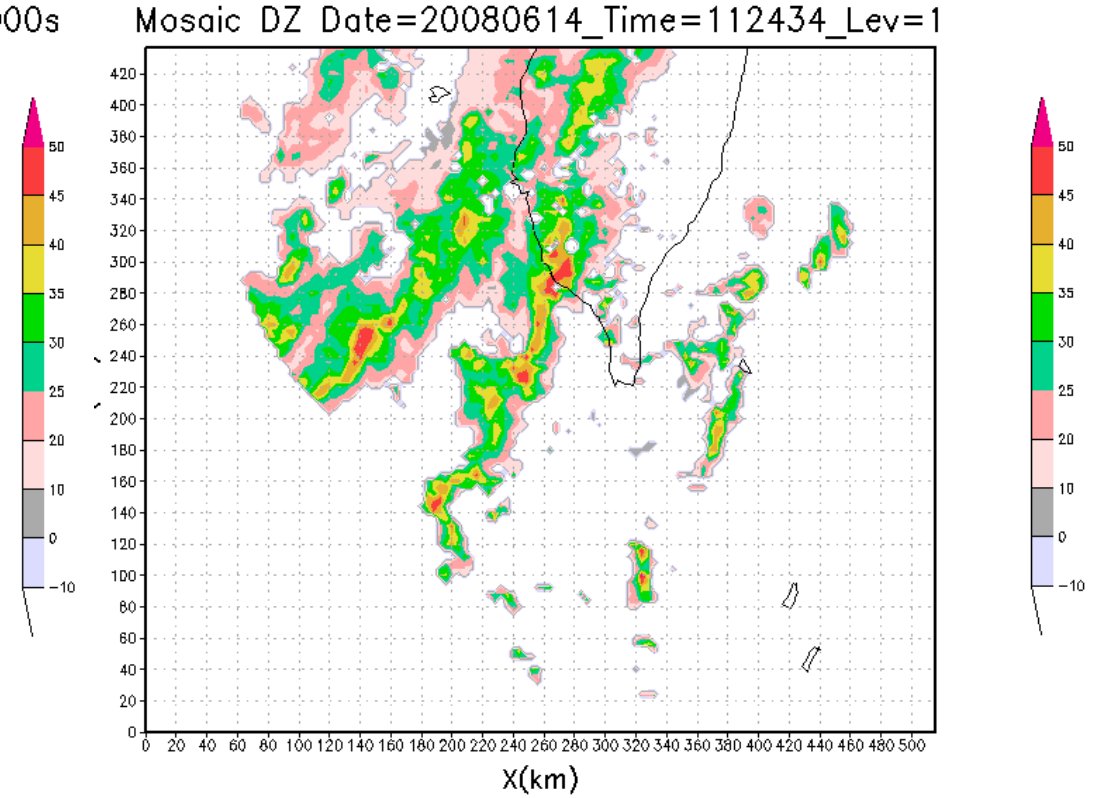


Preliminary Results

Analysis from VDRAS
Lowest level at UTC 1124

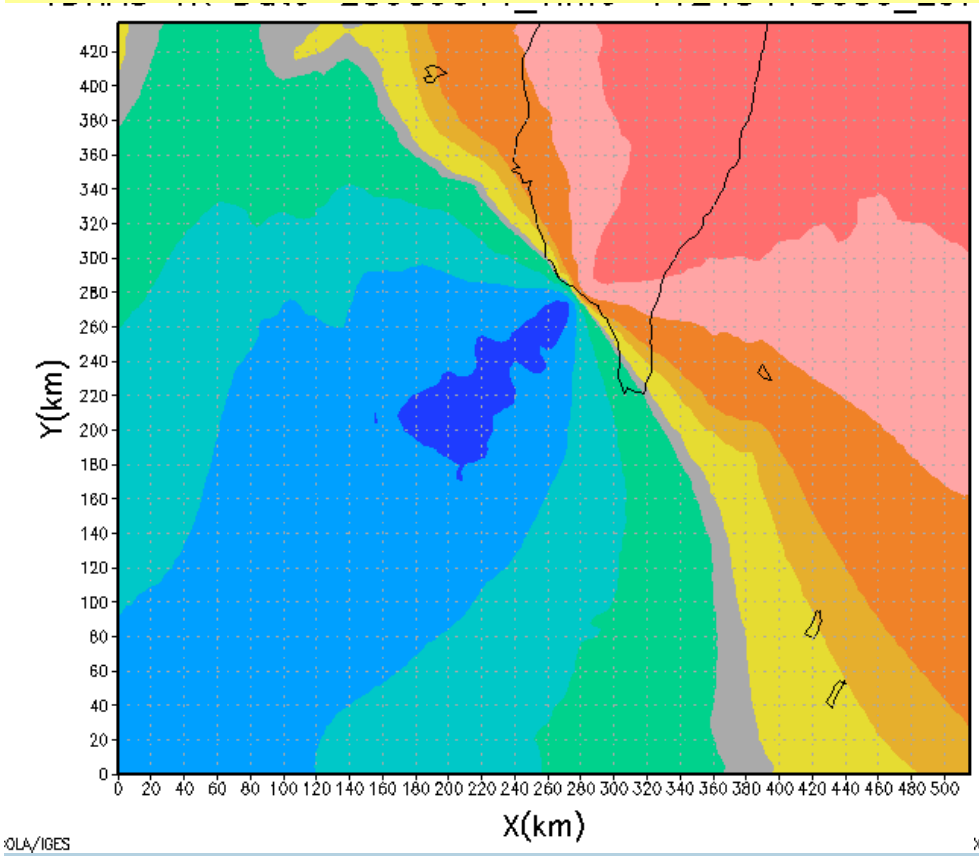
Composited radar reflectivity



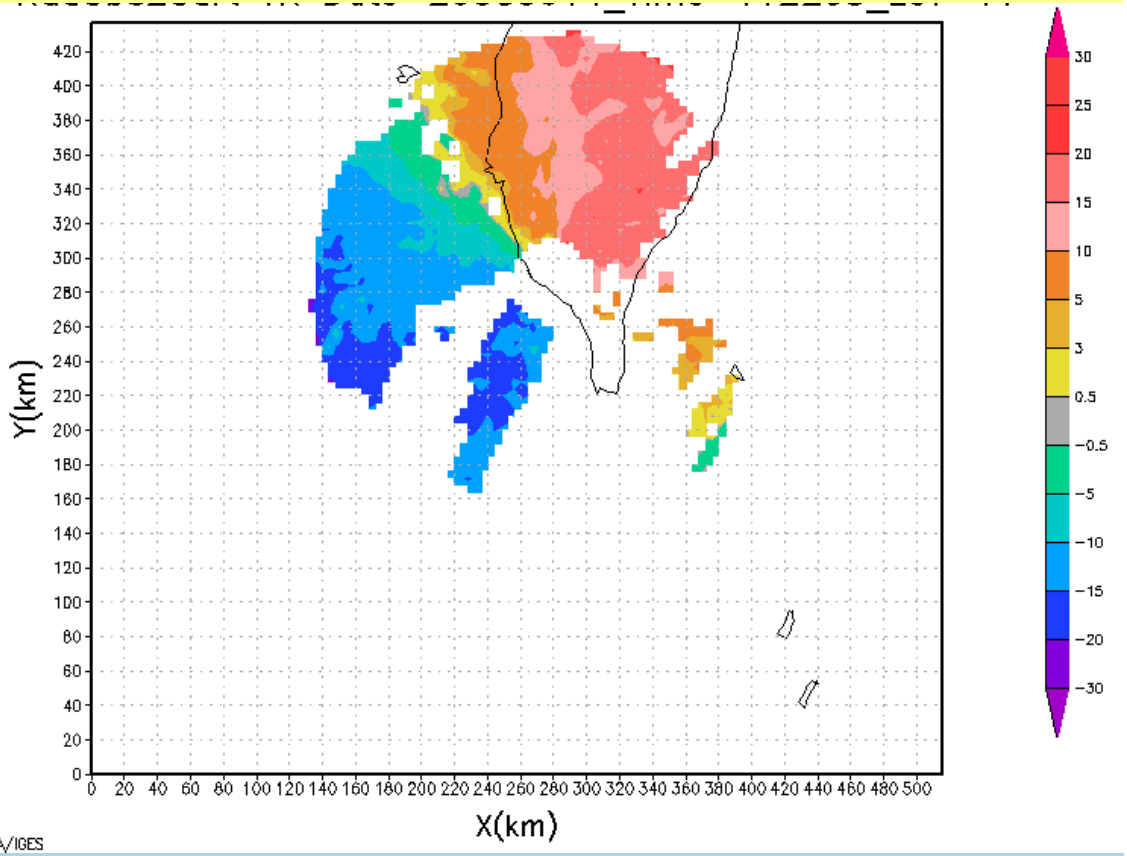


Analysis from VDRAS in 11th level

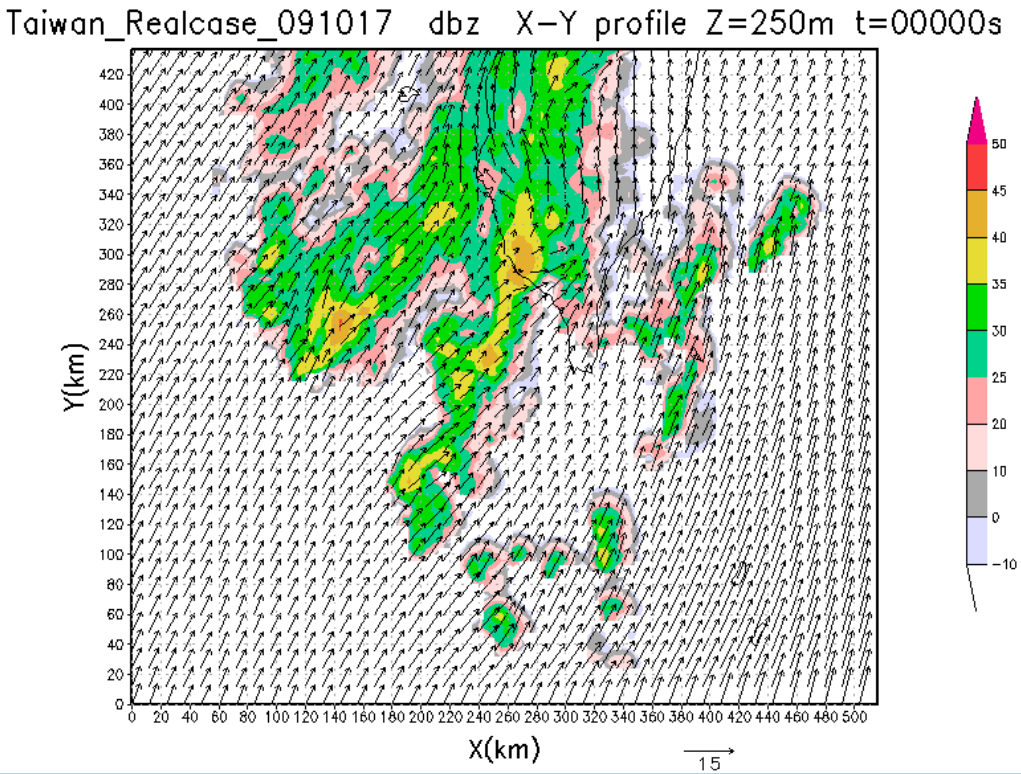
Radial wind projected to SPOL radar site at UTC 1124



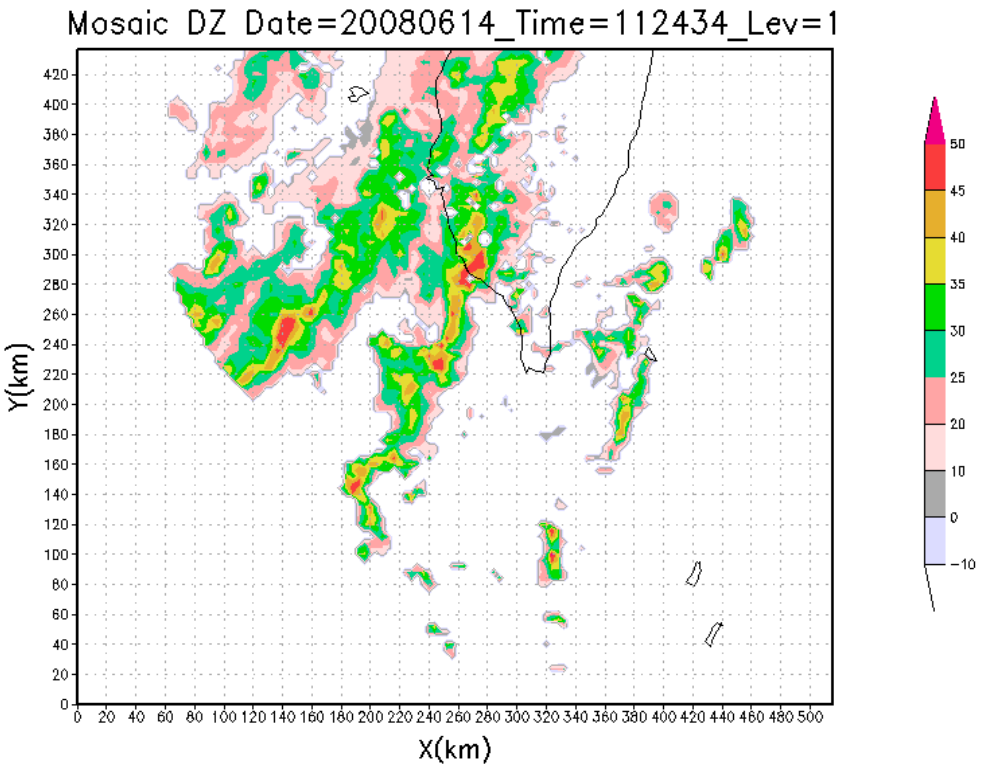
Radial wind observed by SPOL at UTC1122



Forecast from 1124 to 1324 UTC



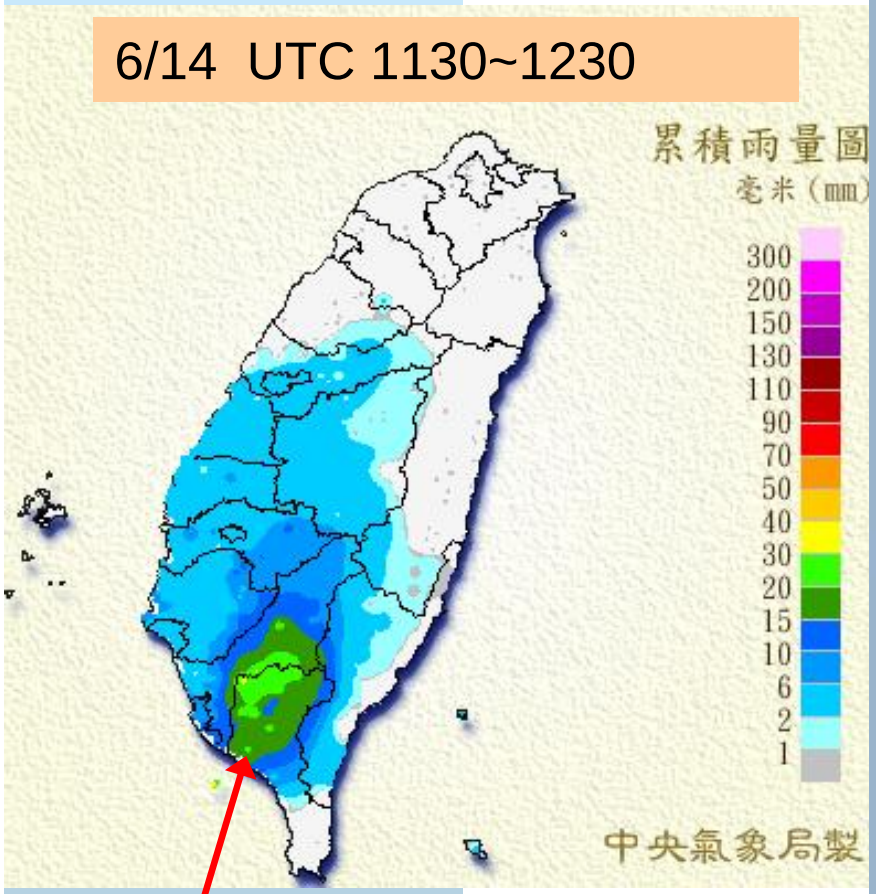
Composited radar reflectivity



One hour accumulated precipitation

Observation

6/14 UTC 1130~1230



Precipitation produced
by terrain blocking

Summary

■Use VDRAS to assimilate Taiwan radar data for simulating the mesoscale convection system.

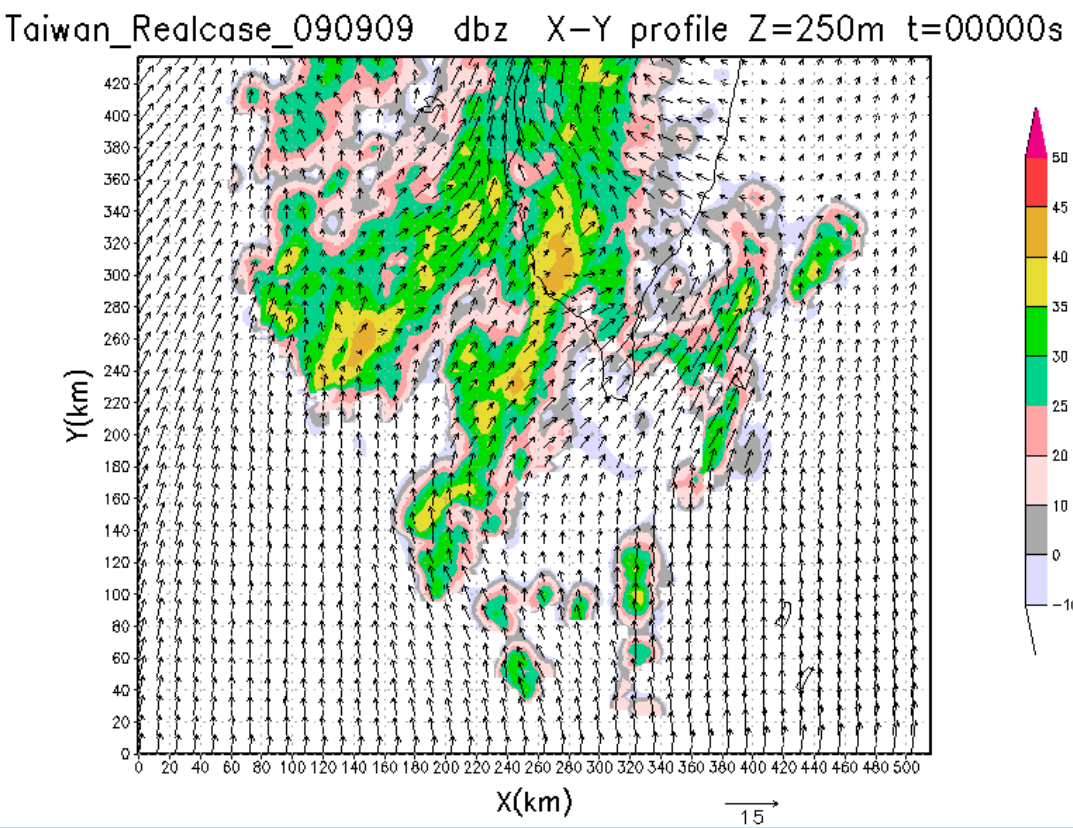
■MCS can be retrieved through assimilating radar data.

■VDRAS couldn’t perform terrain effect for Taiwan case.

Future work: combine the VDRAS with WRF to improve terrain effect

- WRF can takes into account the terrain.
- WRF provides the boundary conditions and background field to VDRAS.
- VDRAS assimilates the observations, and the resulting analysis fields can be feed back to WRF for longer forecast.

The end
Thanks for your attention.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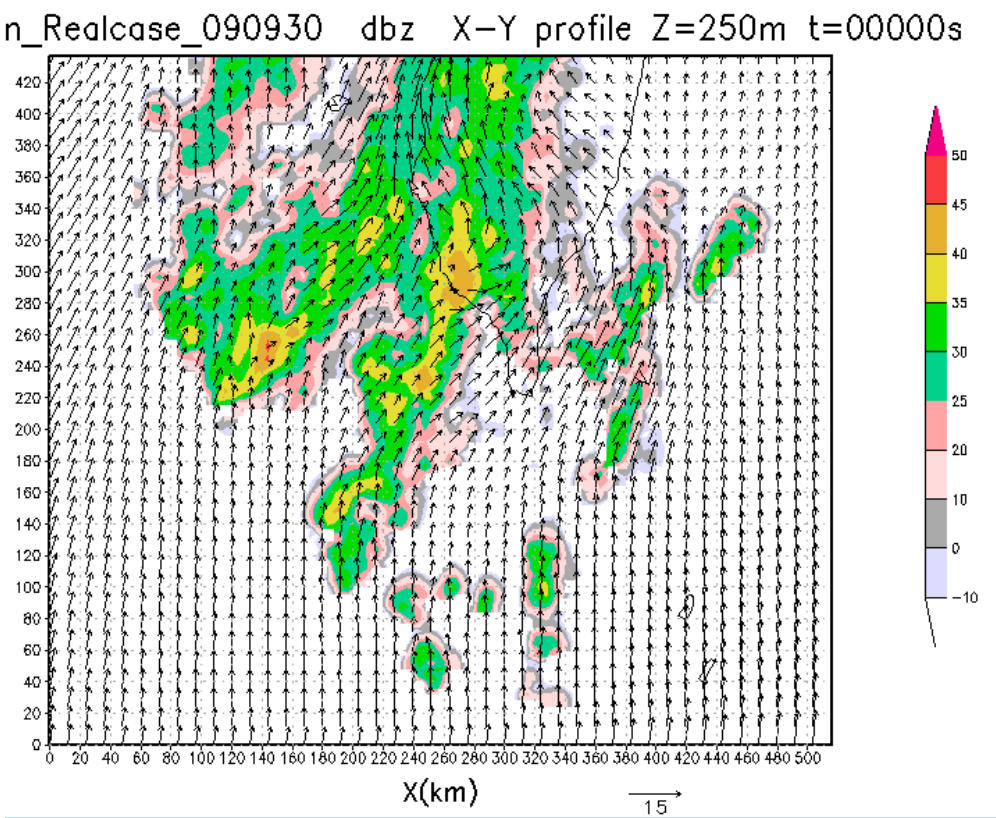
Y(km)
X(km)
15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X(km)
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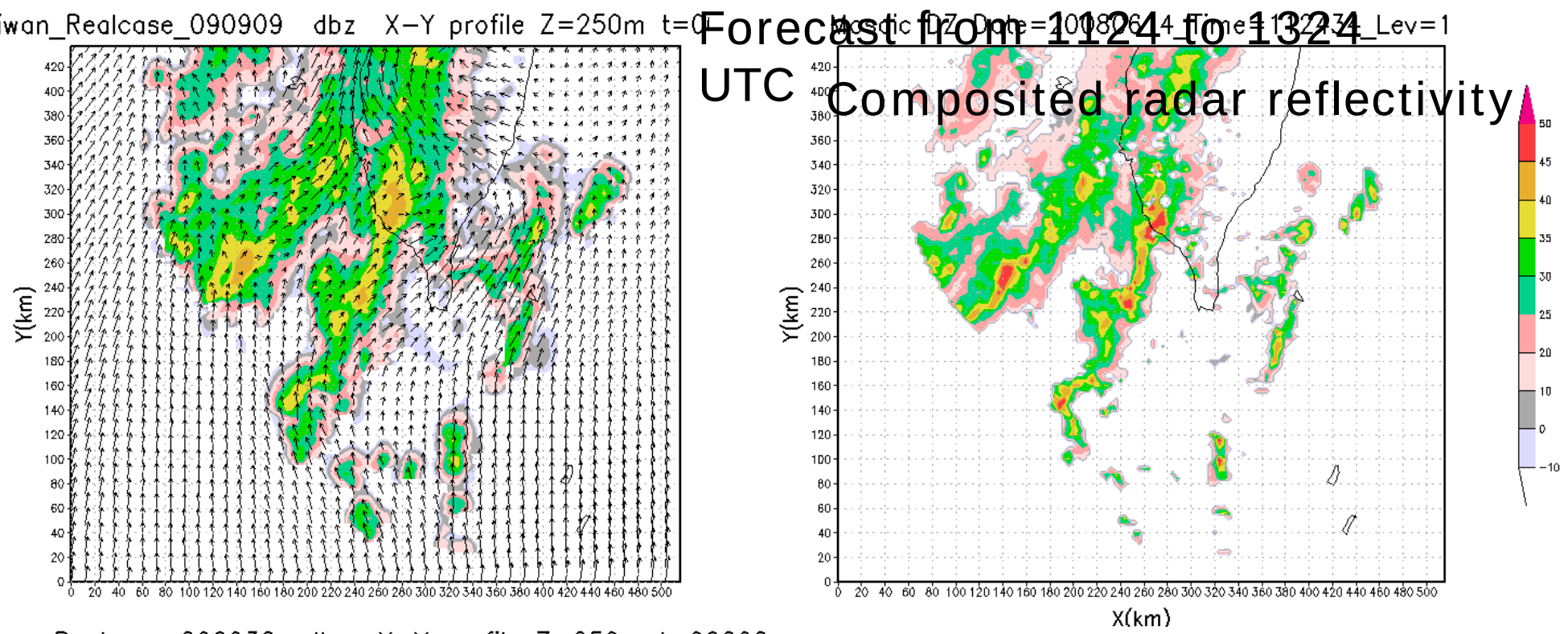
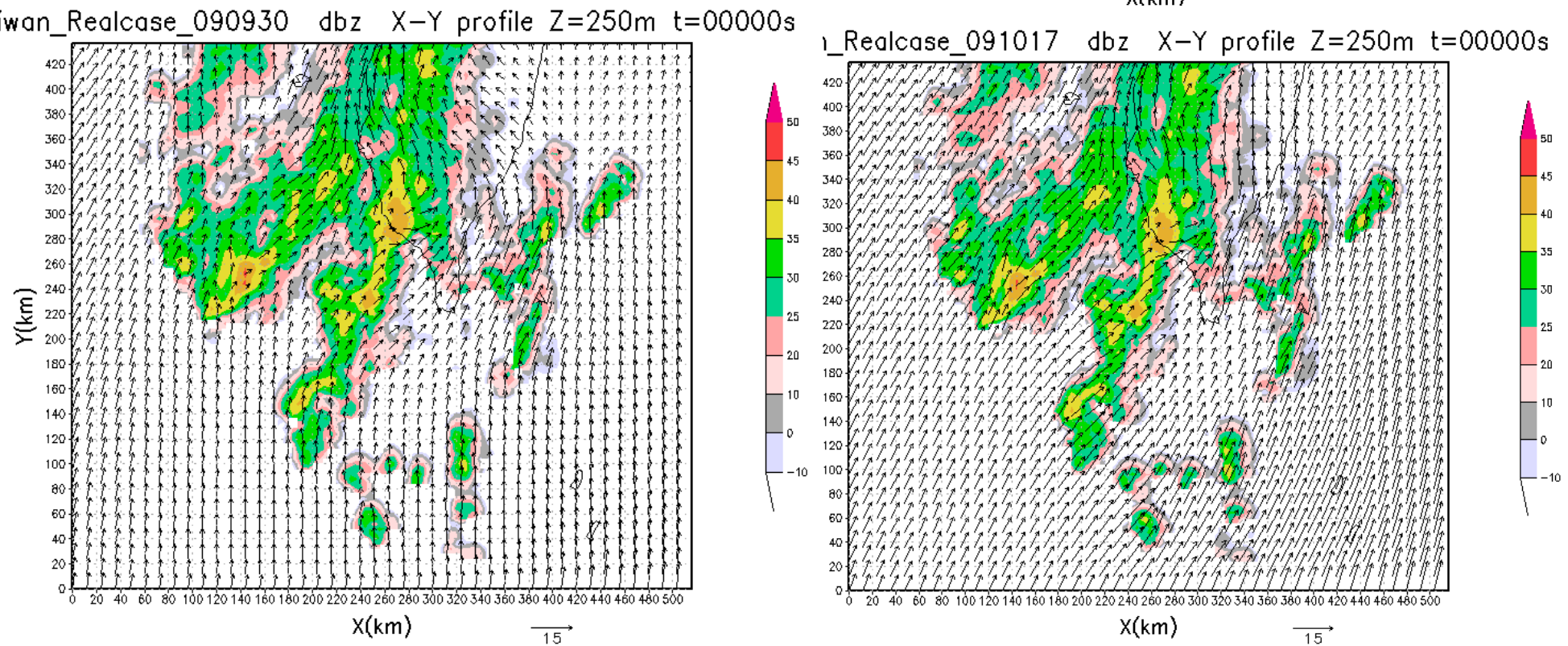
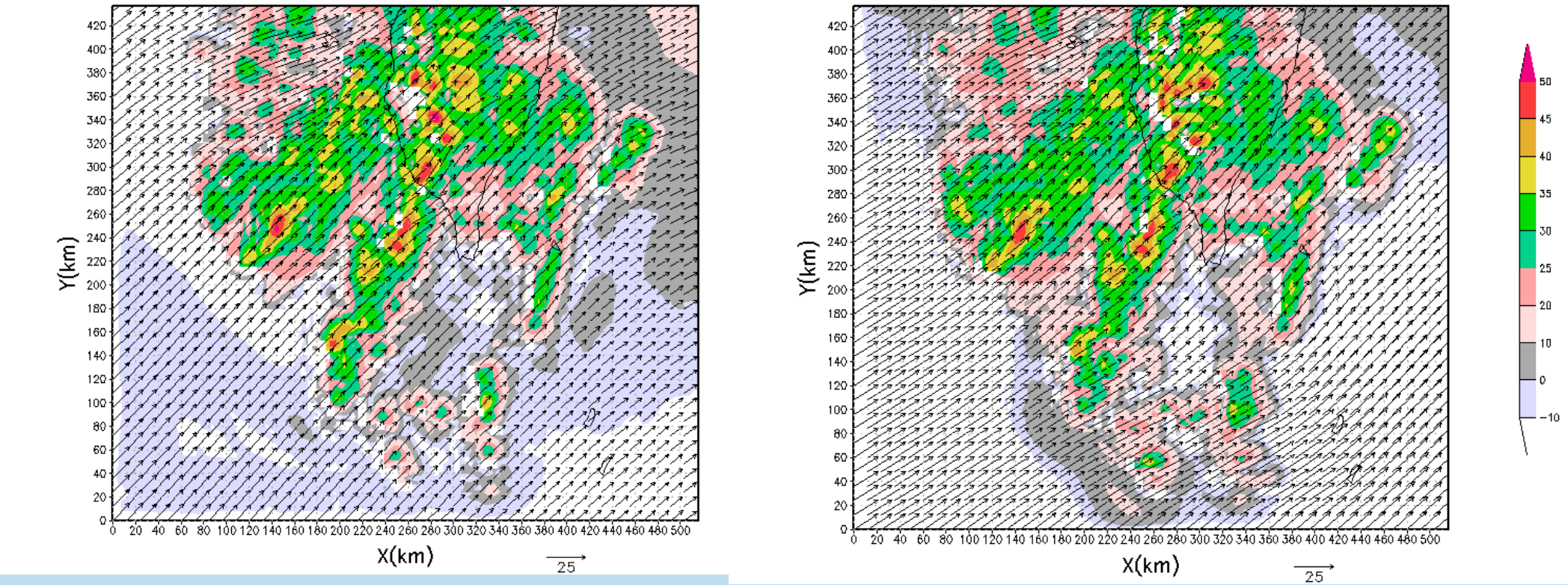
Forecast from 1124 to 1324 UTC

Composited radar reflectivity



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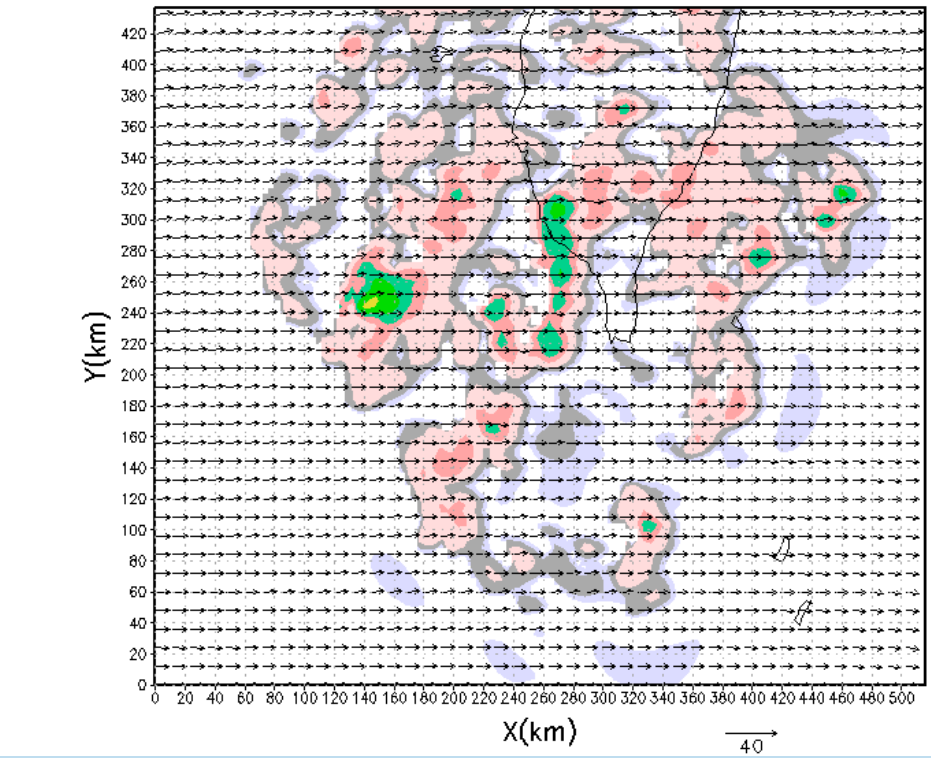
Taiwan_Realcase_091017 dbz X-Y profile Z=5250m t=00000s
Y(km)
X(km)
25
50
45
40
35
30
25
20
10
0
-10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Y(km)
X(km)
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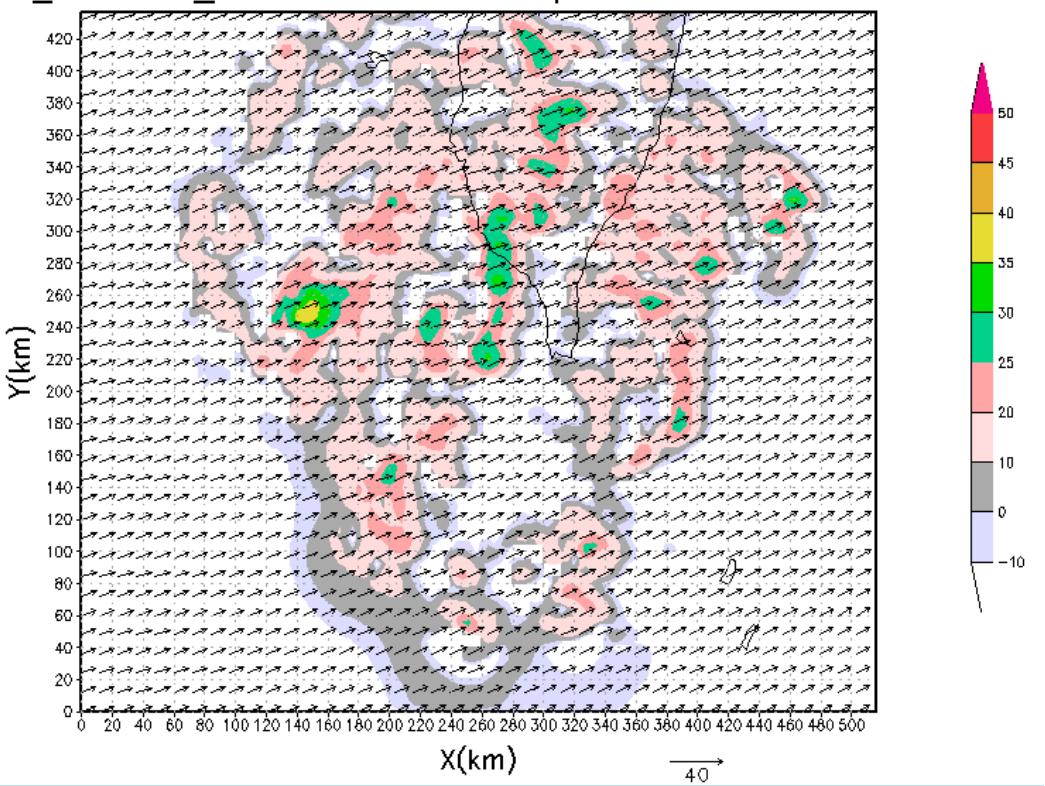
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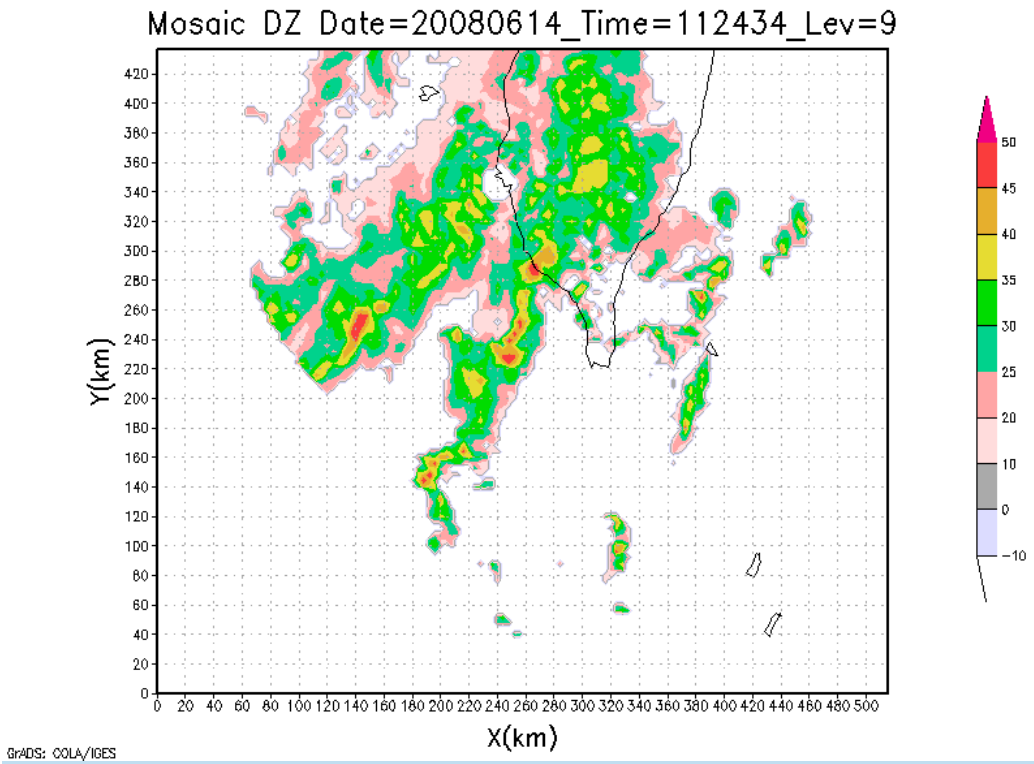
Y(km)
X(km)
40
50
45
40
35
30
25
20
10
0
-10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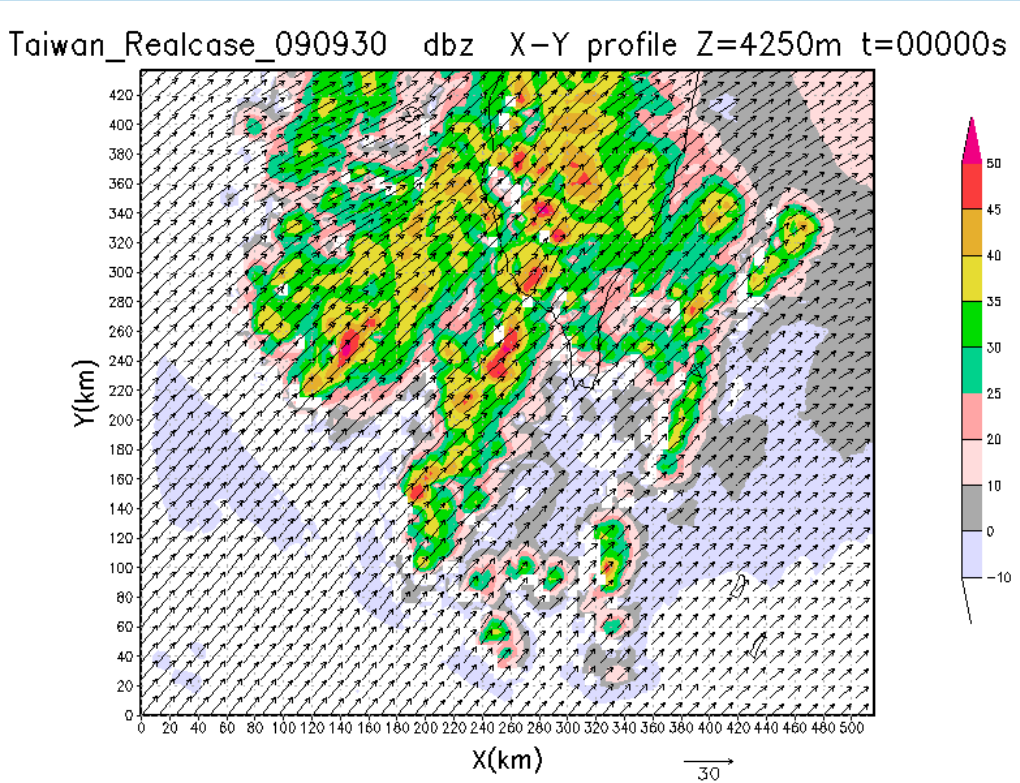
Y(km)
X(km)
GrADS: COLA/IGES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Y(km)
X(km)
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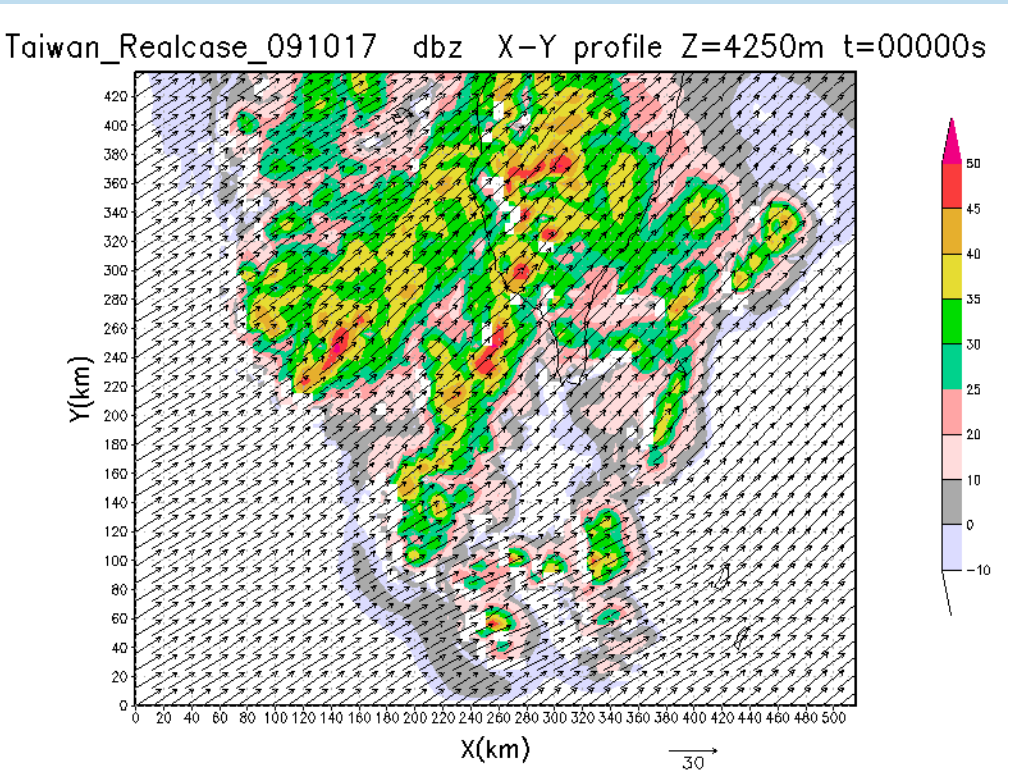
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Y(km)
X(km)
30