

Rapid Update Low-level Analysis Using Radar, Surface, and Model data over Taiwan: Preliminary Study Based on TiMREX Data

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Outline

- VDRAS analysis method
- May 31 case description and VDRAS setup
- Preliminary results
- Summary

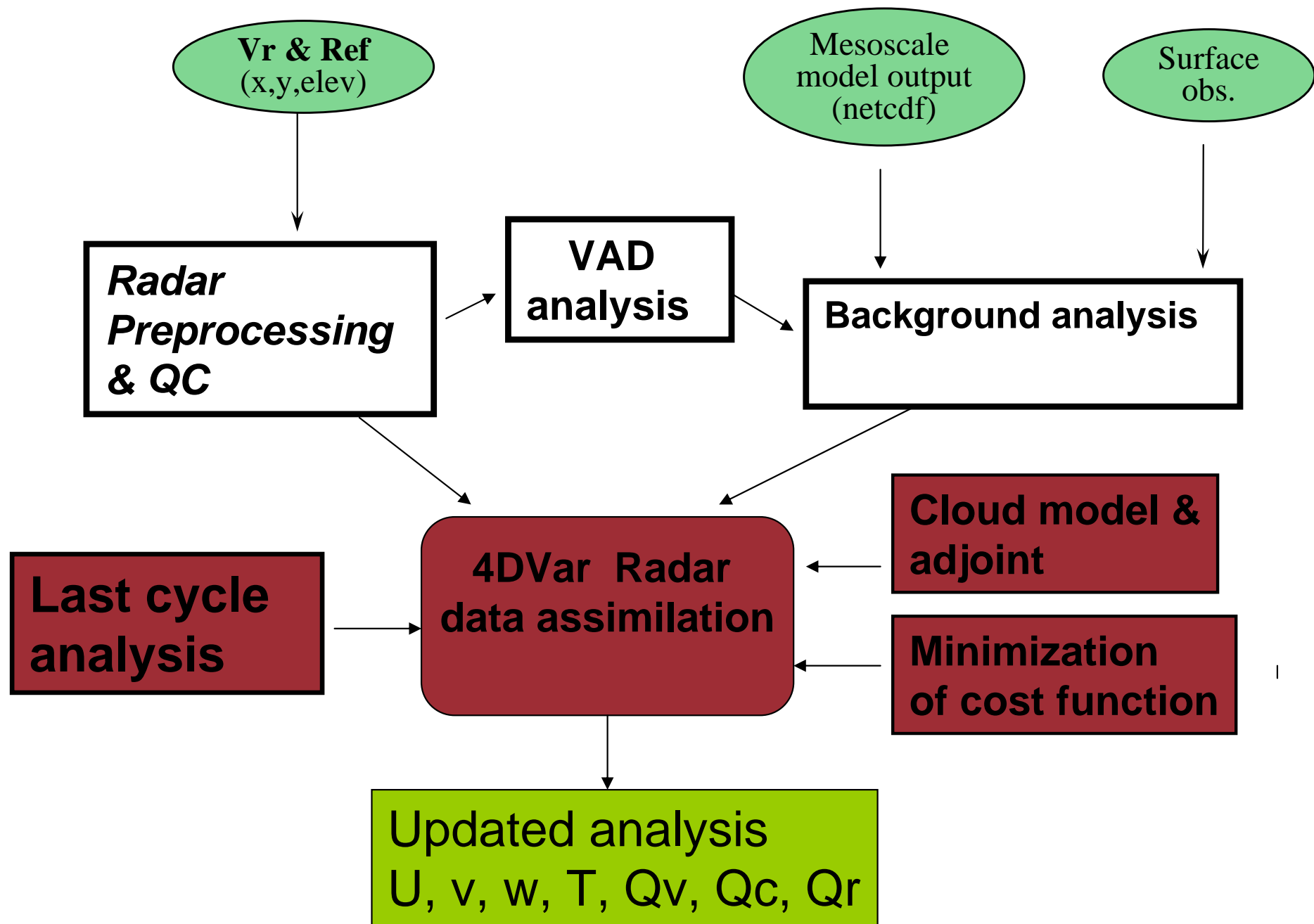


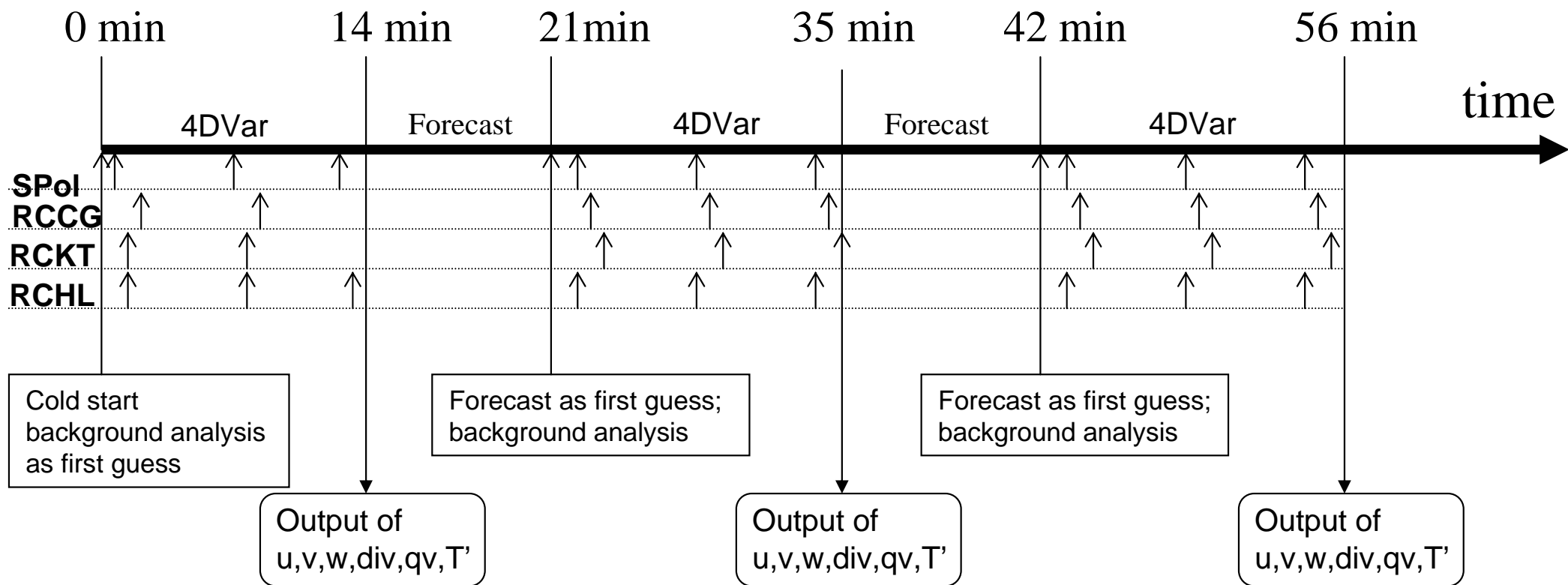
General description of VDRAS

- VDRAS is an advanced data assimilation system for high-resolution (1-3 km) and rapid updated (6-18 min) analysis
- Produce Low-level wind, temperature, humidity analysis
- VDRAS assimilates mesoscale model data, surface data, and radar radial velocity and reflectivity data from single or multiple radars
- The core is a 4-dimensional data assimilation scheme based on a warm-rain cloud-scale model
- It has been installed at nearly 20 sites for nowcasting application since 1998



VDRAS analysis flow chart





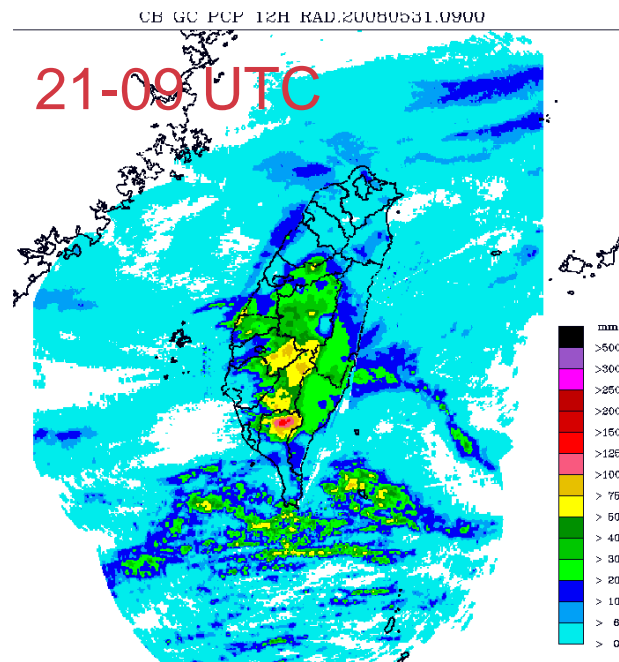
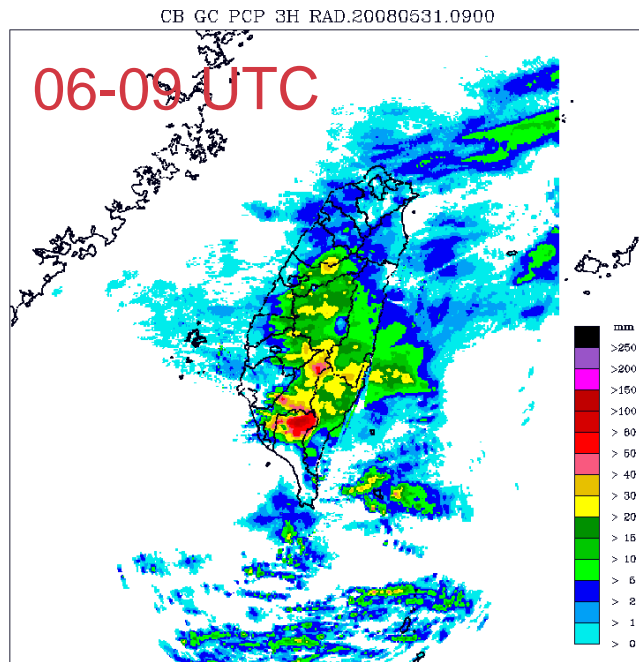
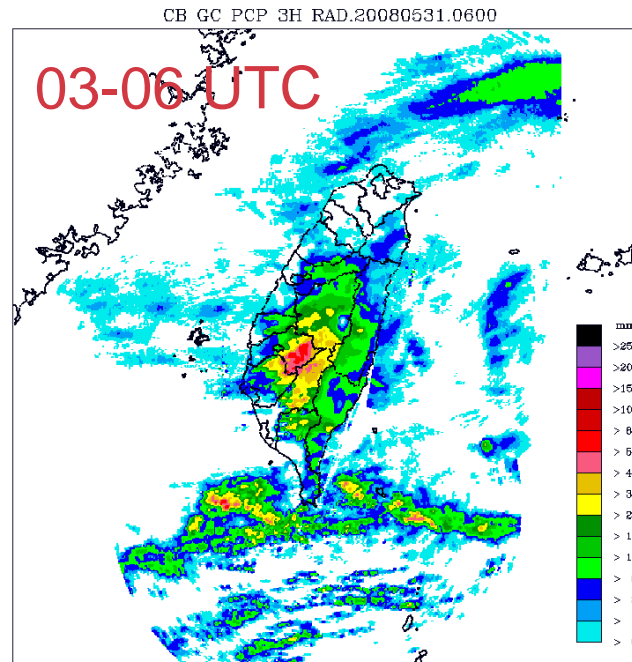
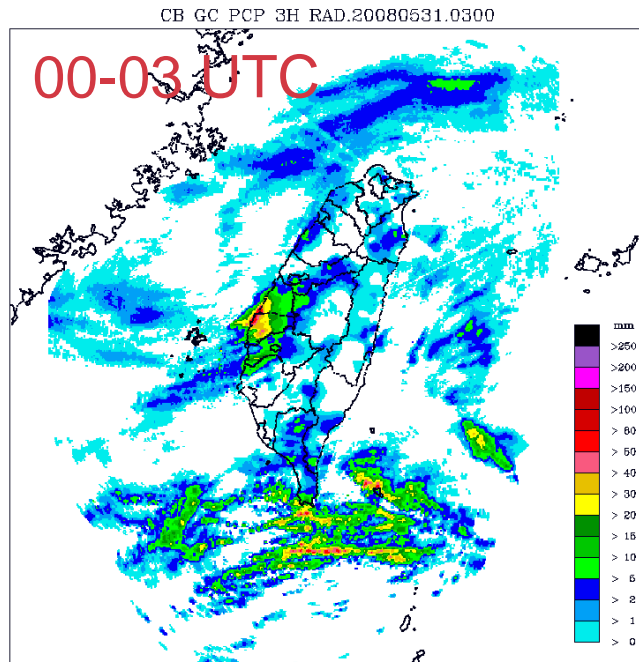
SoWMEX/TiMREX case of 31 May 2008

S-Pol reflectivity from 03 UTC to 08 UTC

QuickTime?and a
BMP decompressor
are needed to see this picture.

SoWMEX/TiMREX case of 31 May 2009

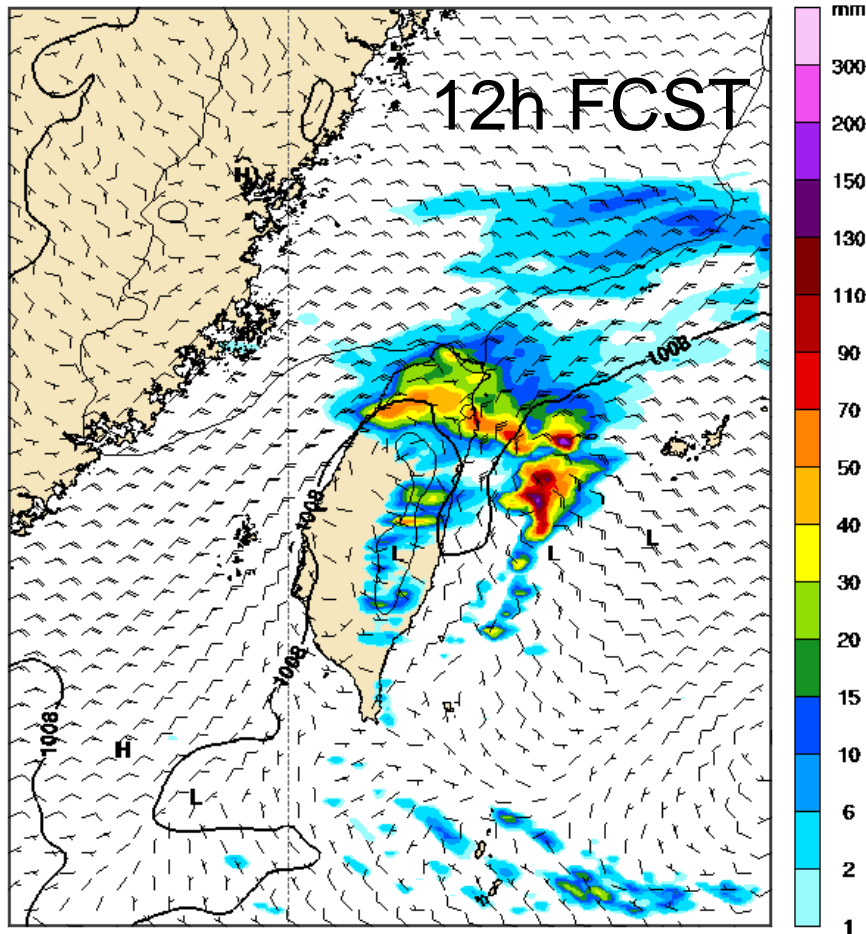
QPESUMS accumulated precipitation



CWB WRF 5km Forecasts valid at 12 UTC

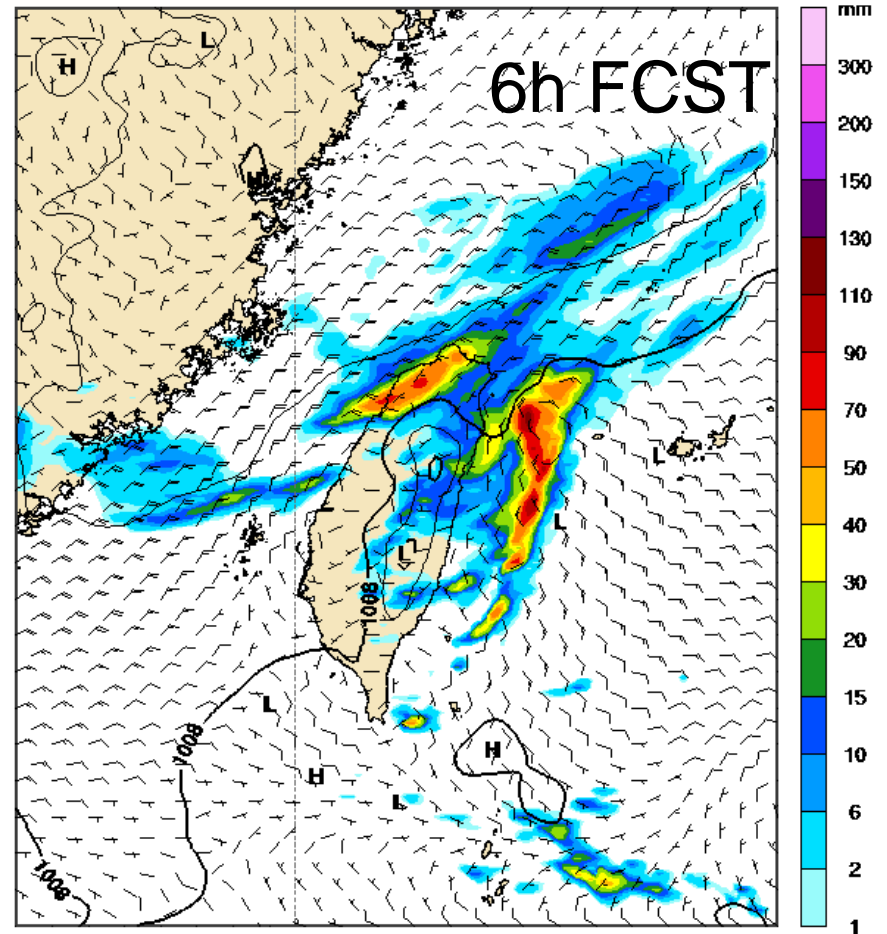
CWB WRF 12-hr forecast
Initial at 0000 UTC 31 May 2008 Valid at 1200 UTC 31 May 2008

6-hr Acc. Rainfall (mm) / SLP (hPa) / sfc winds (knots)



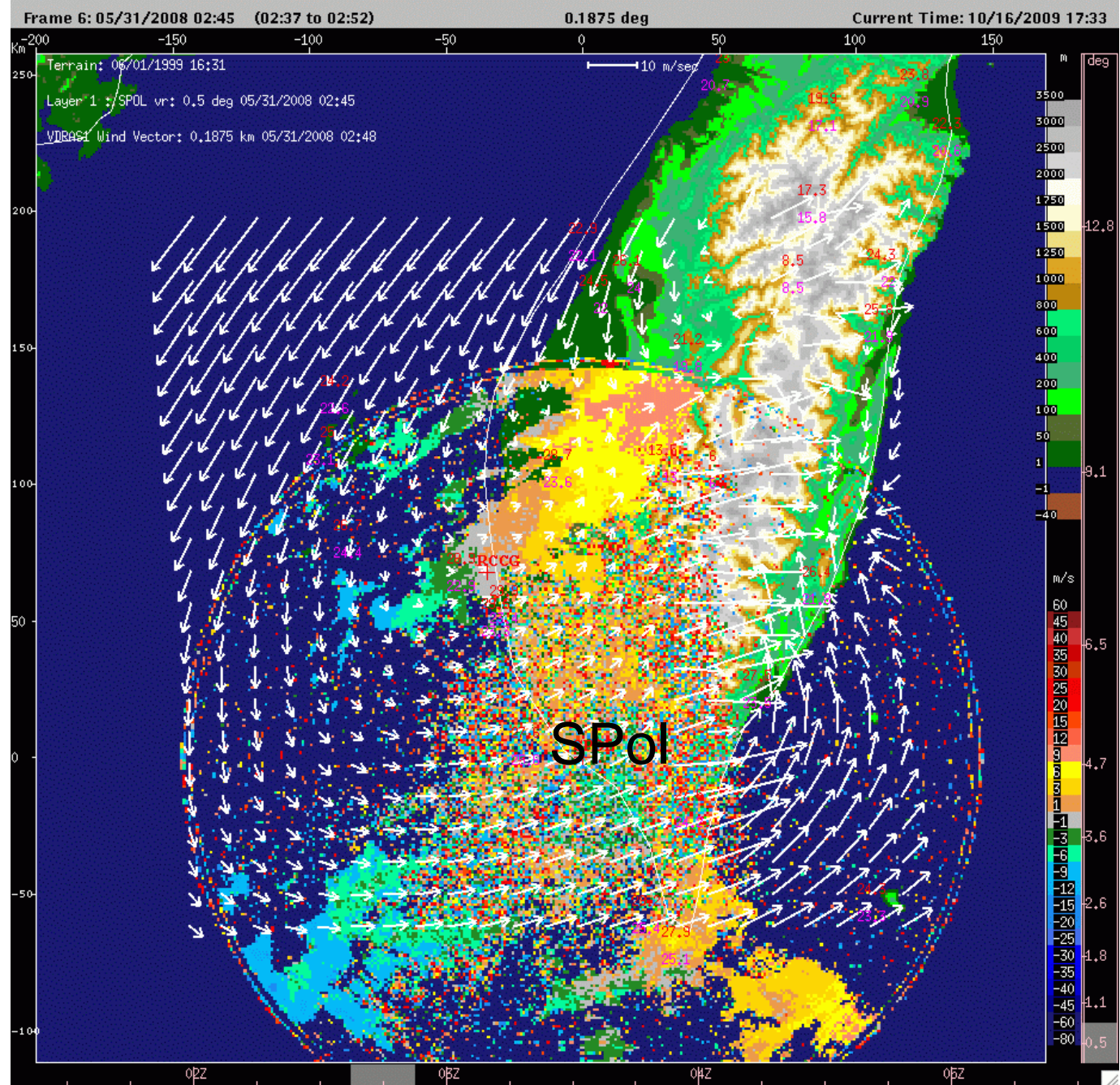
CWB WRF 06-hr forecast
Initial at 0600 UTC 31 May 2008 Valid at 1200 UTC 31 May 2008

6-hr Acc. Rainfall (mm) / SLP (hPa) / sfc winds (knots)



VDRAS Domain

- $270\text{km}^2 \times 5.625\text{km}$ with a resolution of $3\text{km} \times 0.375\text{km}$
- WRF 3km hourly forecasts as background
- 42 AWS stations
- S-Pol radial velocity and reflectivity
- Assimilation window is 10 min



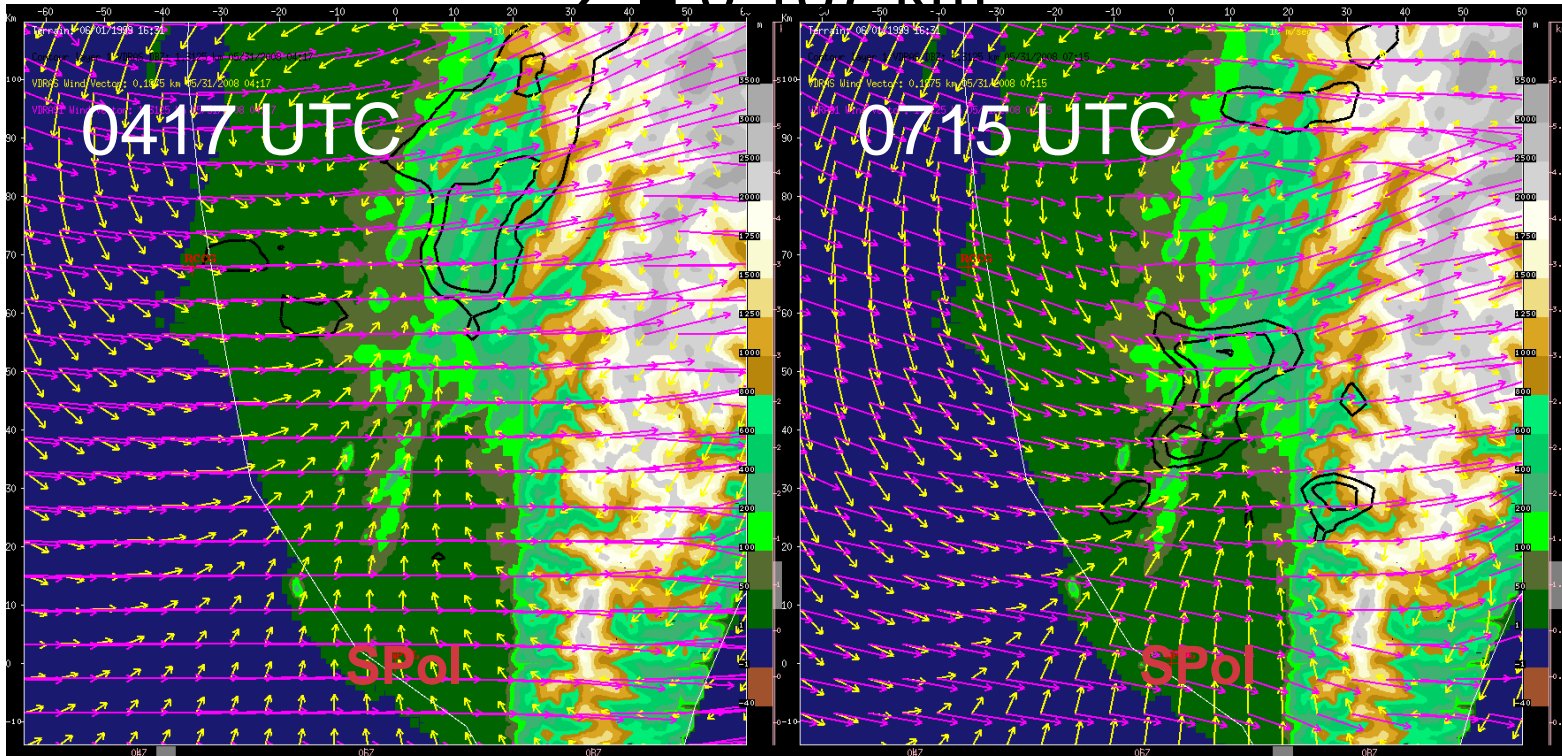
VDRAS vertical velocity (color) and wind vector

Red contours: 25 & 35 dBZ reflectivity

QuickTime?and a
BMP decompressor
are needed to see this picture.

SPoI

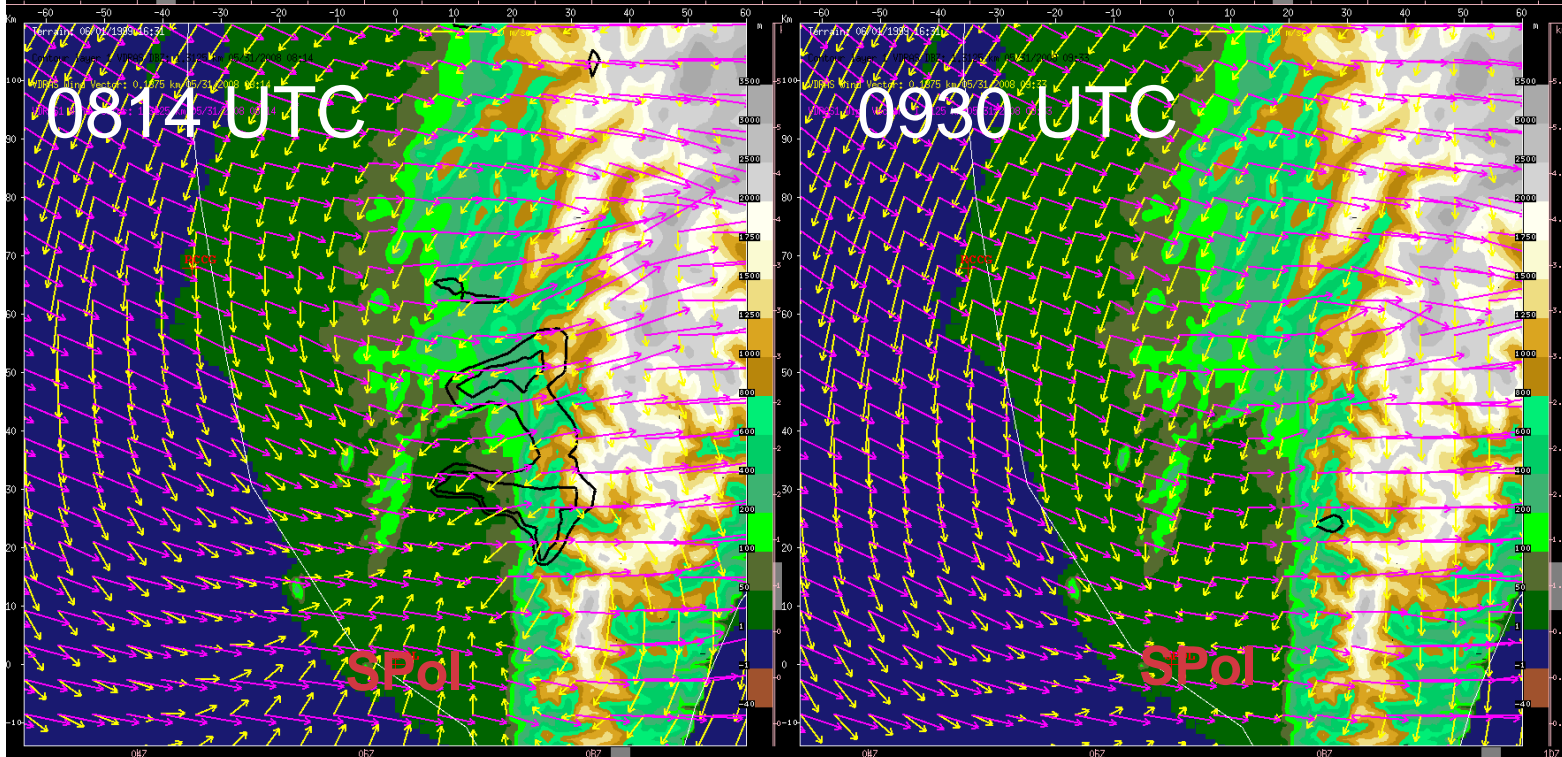
Z = 0.187 km

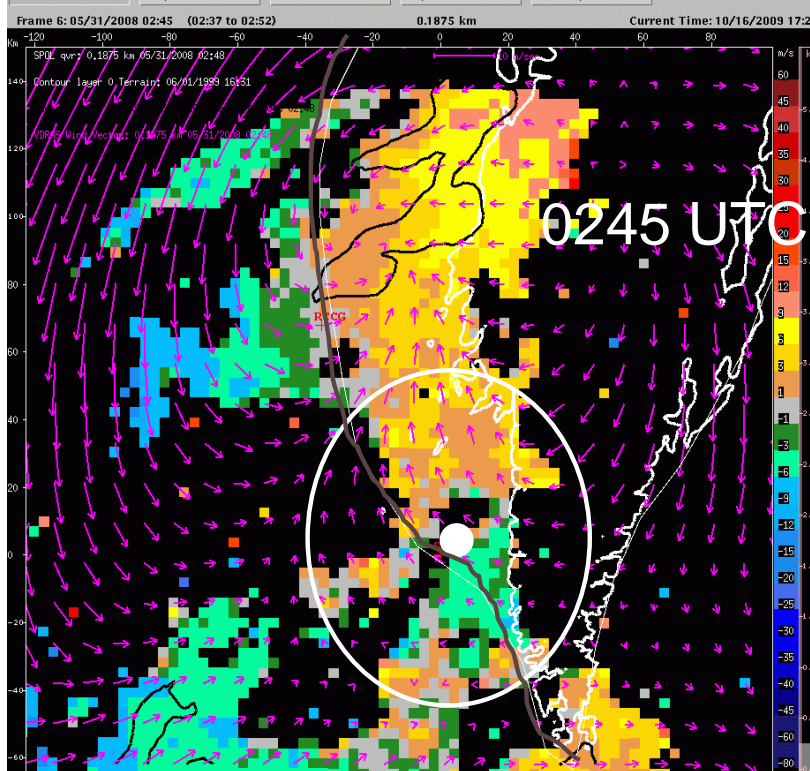
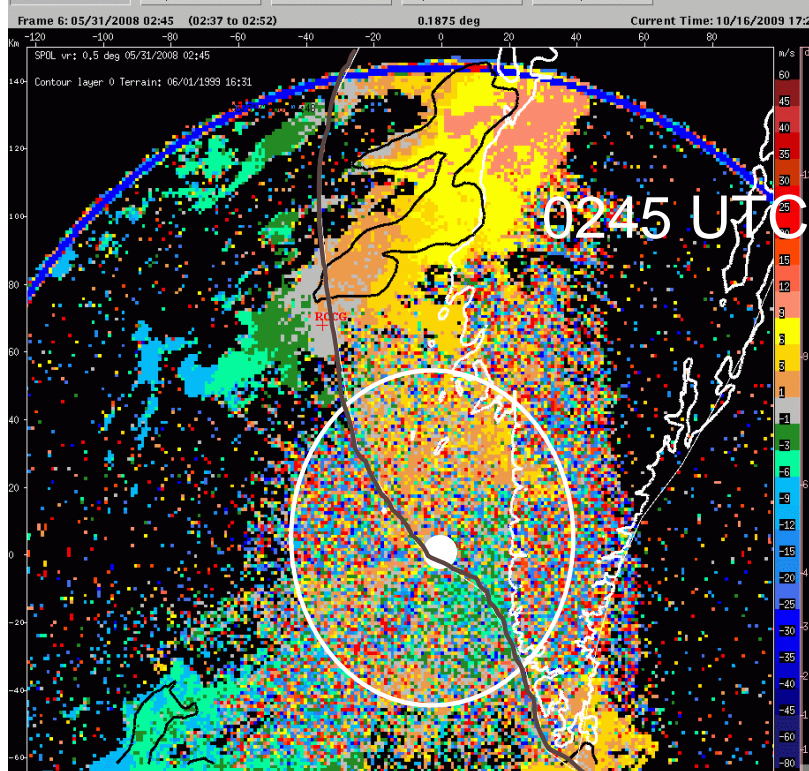


Comparison of VDRAS wind with 3km WRF wind

- WRF
- VDRAS

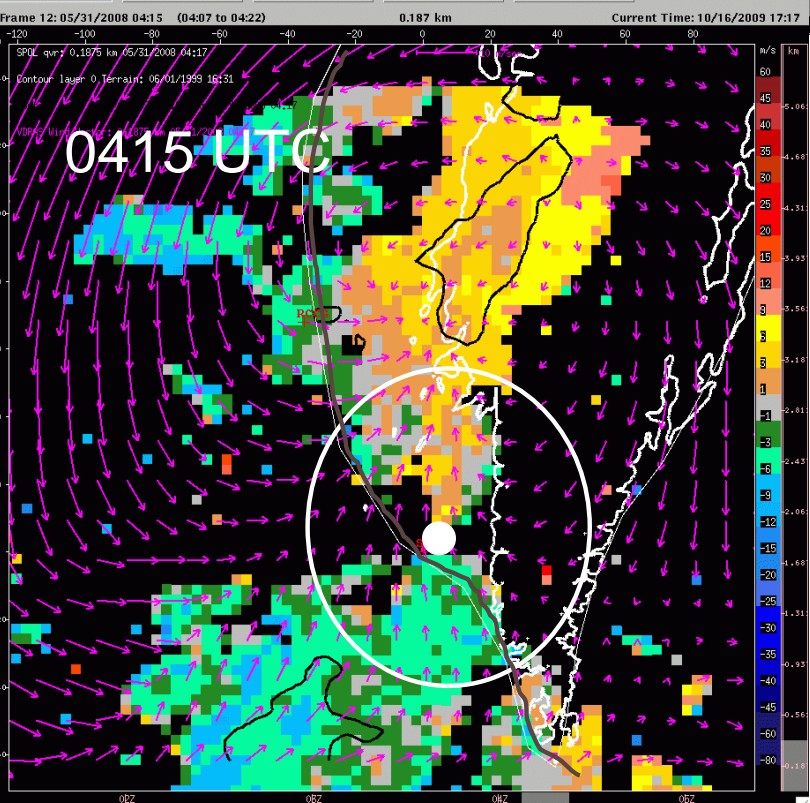
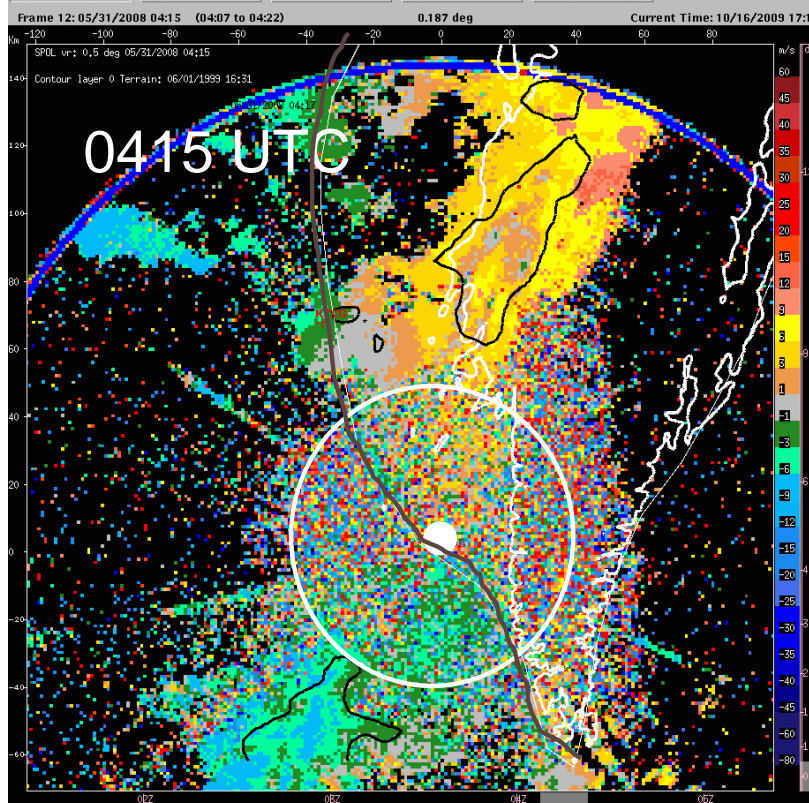
Black contours: 25 & 35 dBZ REF

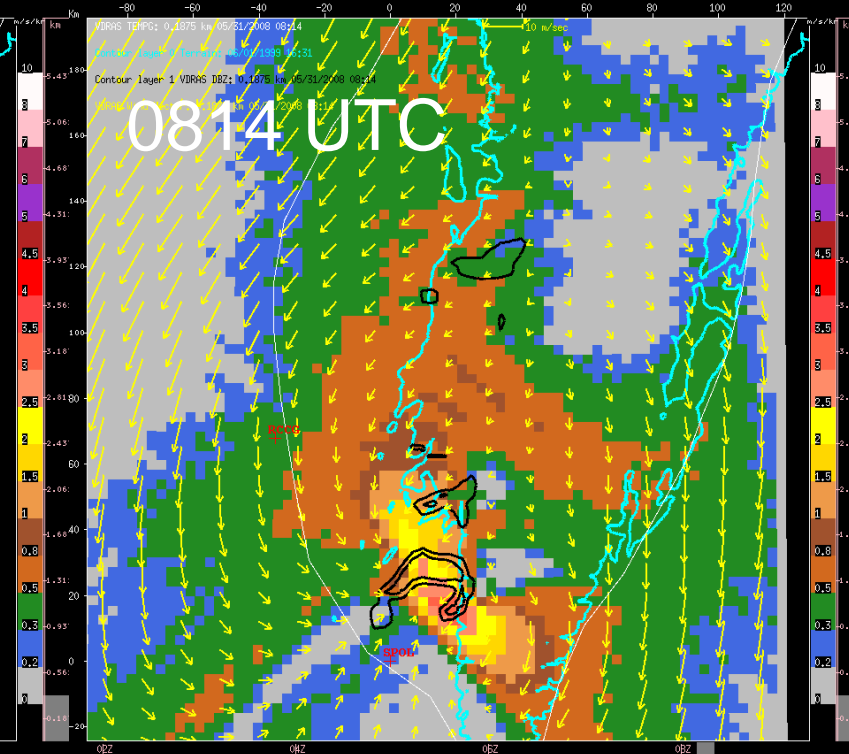
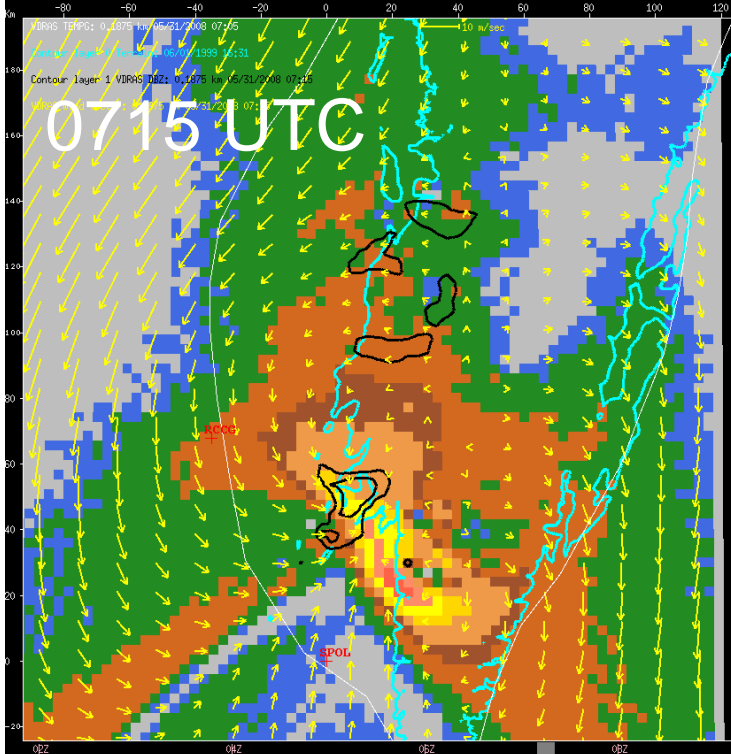
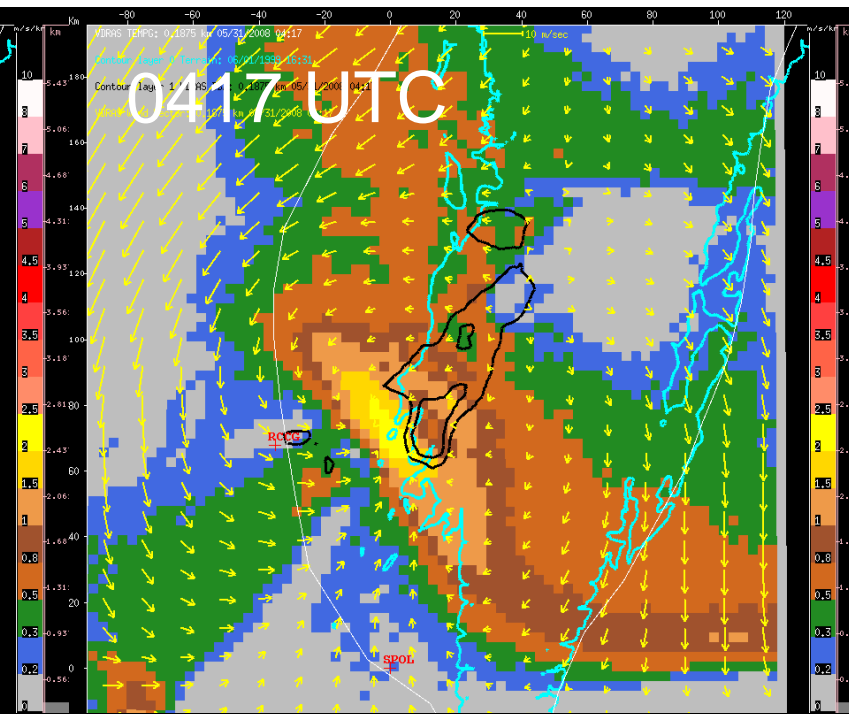
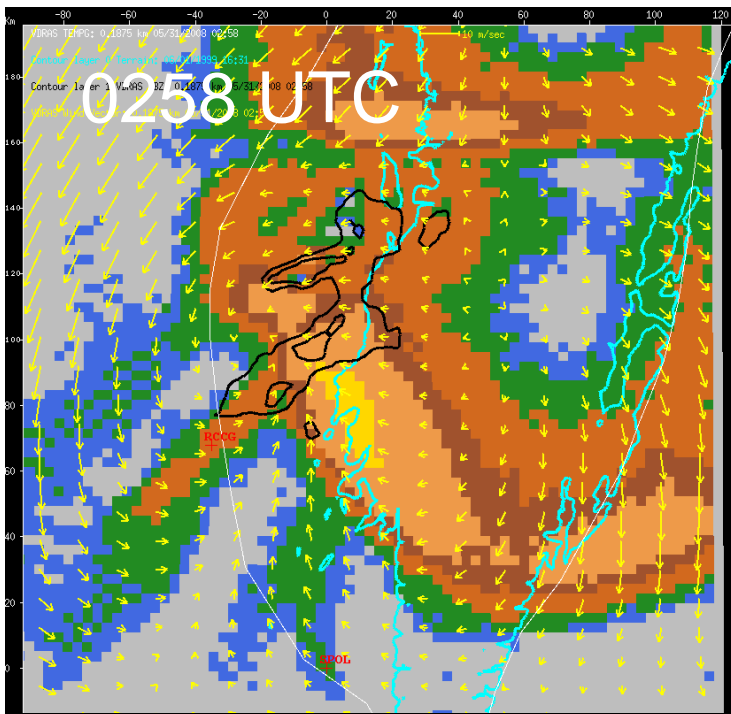




Spol radial
Velocity(0.5°)
before and
after VDRAS
QC

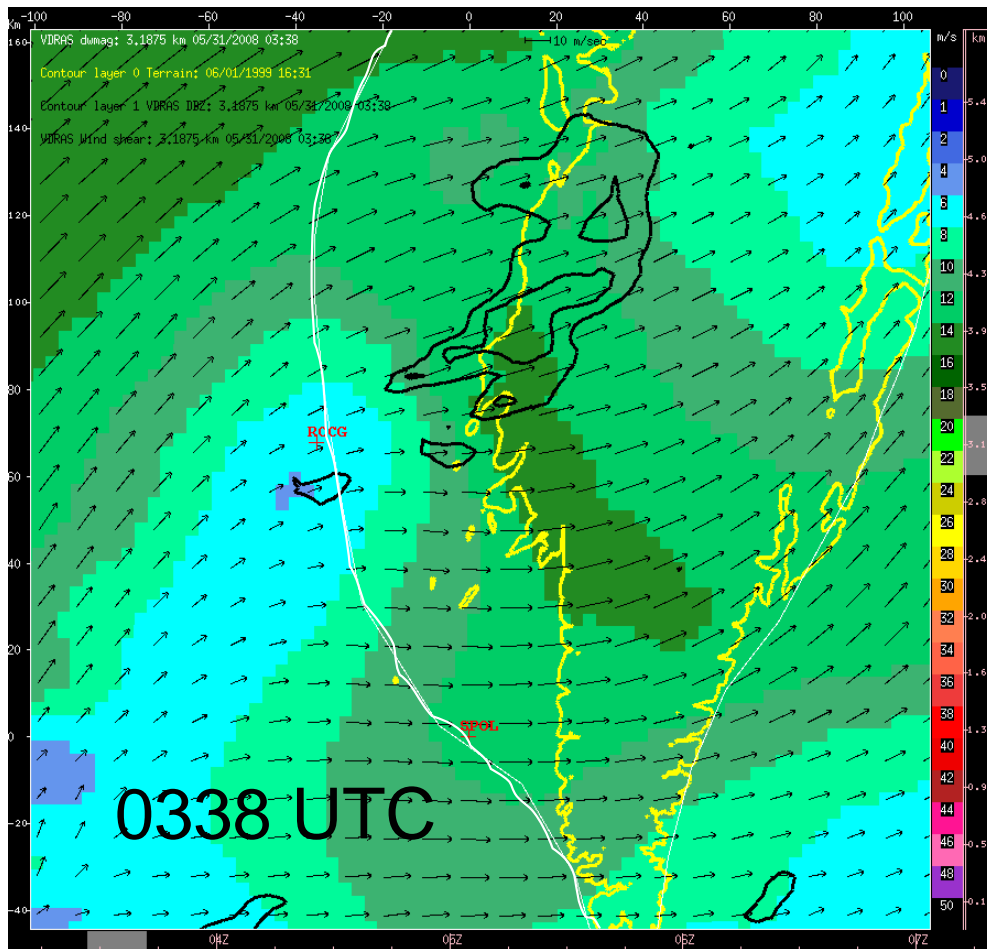
VDRAS wind
At Z= 0.187km



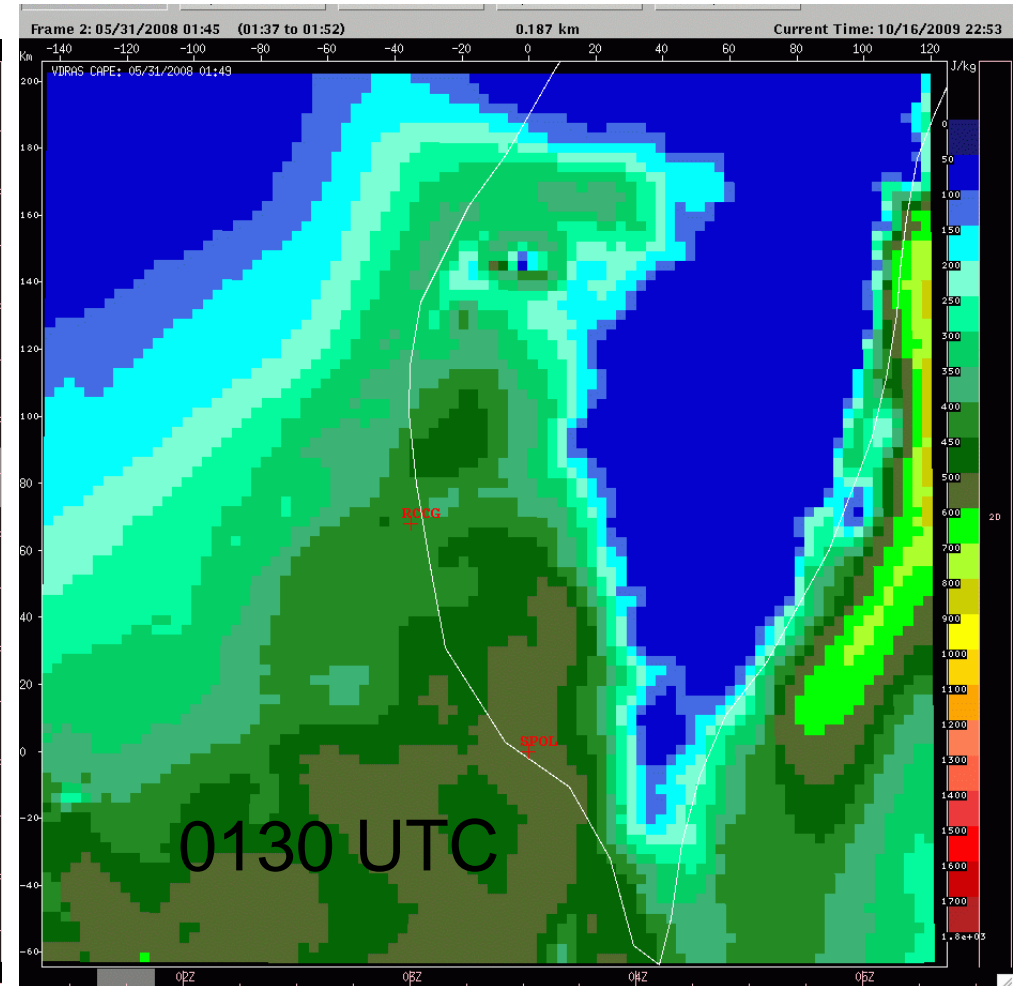


Temperature
gradient at
 $Z = 0.187\text{km}$

Vertical shear magnitude and direction (3km-0.19km)



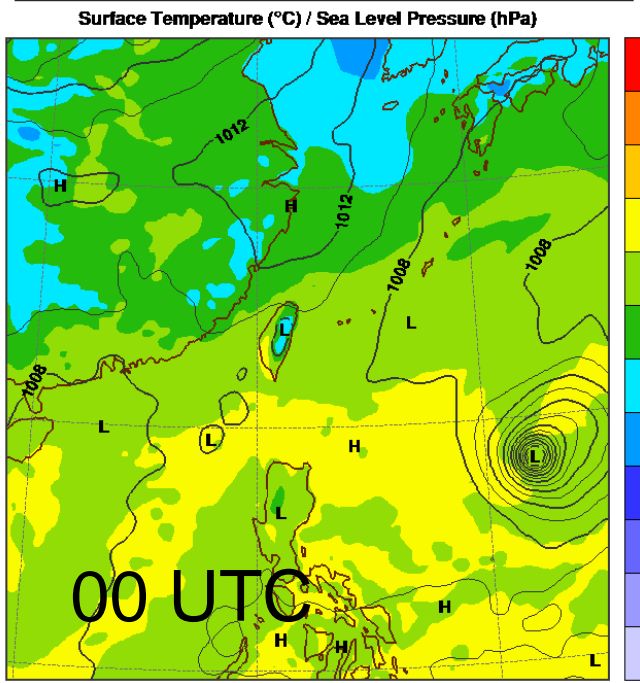
CAPE



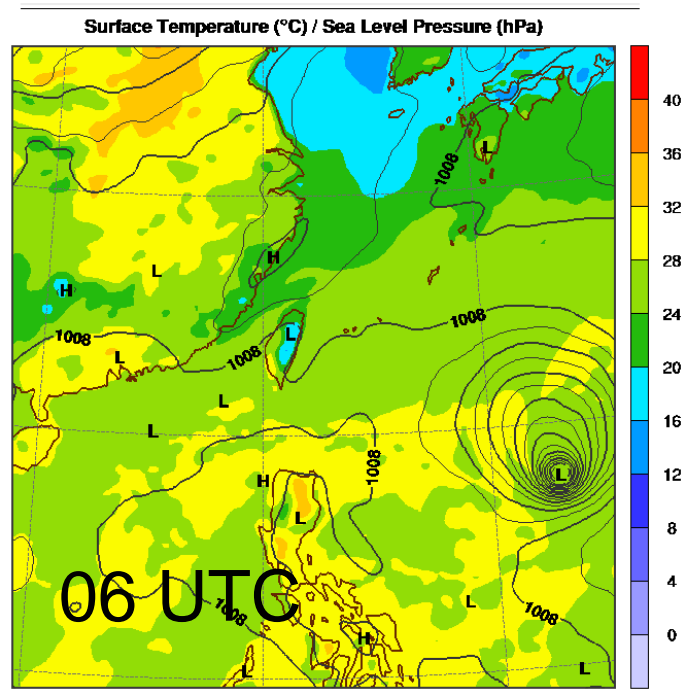
Summary

- VDRAS analyzes the southwesterly flow in the southern plain that is crucial for the initiation of the orographical precipitation.
- VDRAS reveals the uplift caused by a convergence line and the mountain upslope, an important predictor for nowcasting storm.
- S-Pol provides low-level clear air signals that are believed to be crucial for the analysis.
- High temperature gradient, low-level shear, and CAPE in the southern plain and foothills are all indications of convective initiation.
- More cases will be analyzed to help develop conceptual models for nowcasting precipitation in the Taiwan area.





Initial at 0000 UTC 31 May 2008 Valid at 0000 UTC 31 May 2008



Initial at 0600 UTC 31 May 2008 Valid at 1200 UTC 31 May 2008

Surface Temp and Height

700 mb wind and height

at 00 UTC, 06 UTC, 31 May

