A comparison of SoWMEX/TiMREX wind observations with WRF and VDRAS 3-D wind fields on 31 May 2008

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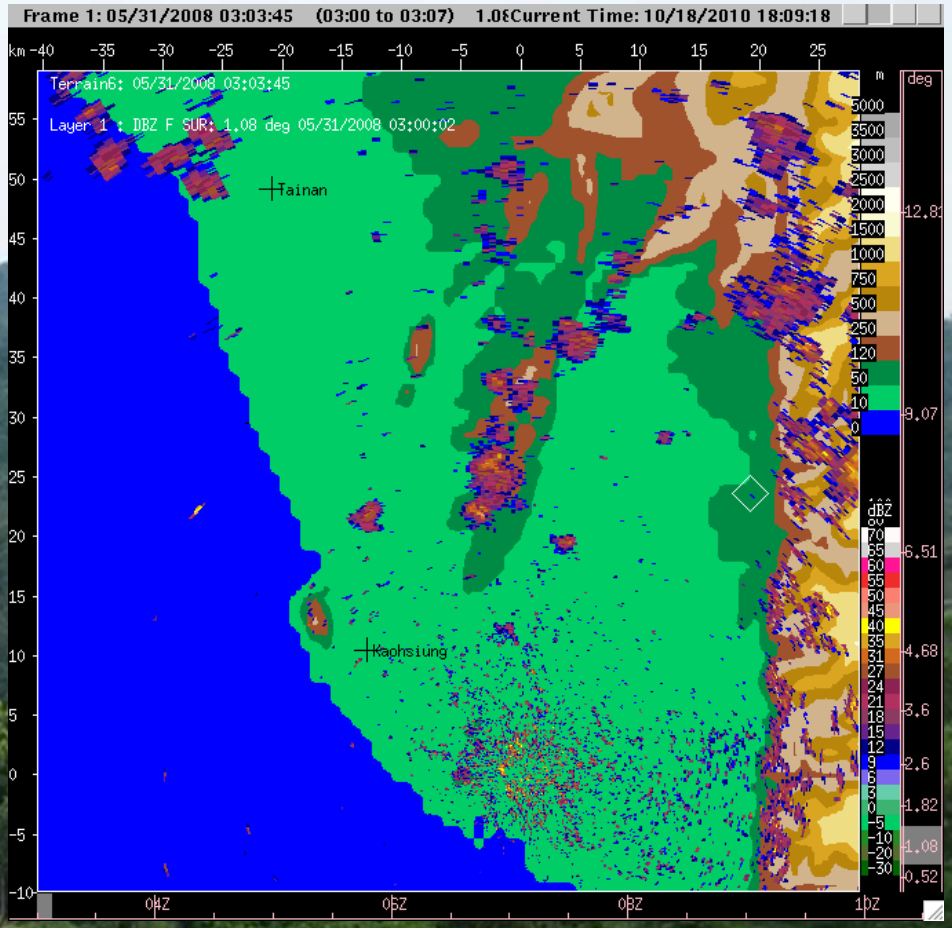
Motivation

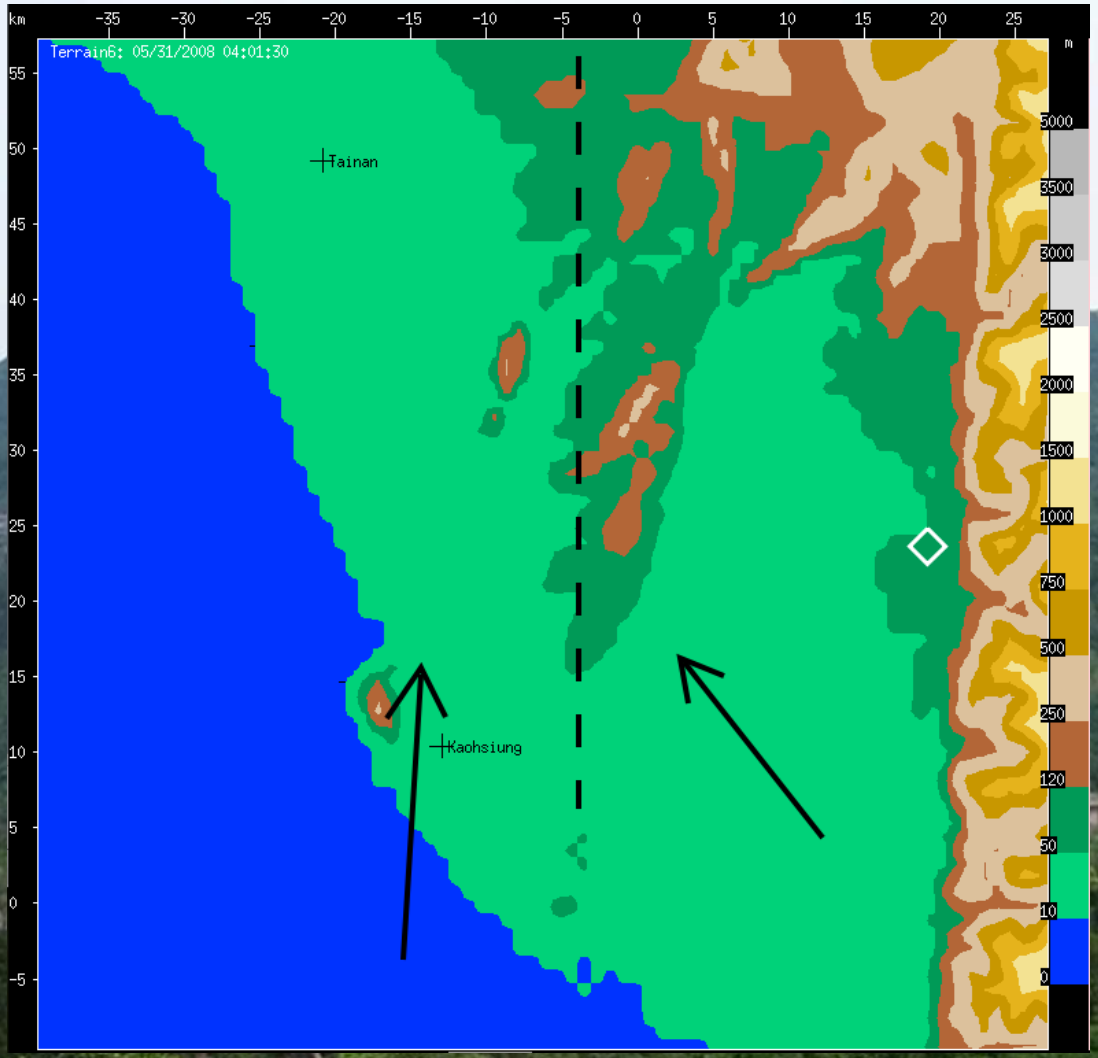
- Transfer AutoNowCaster (ANC) system to Central Weather Bureau (CWB) to nowcast heavy rainfall
- Wind direction and magnitude significant, should include in ANC
- Would wind profiler help?
  - Try 31 May case that has WRF and VDRAS runs done to test if further research is advisable
- These results are preliminary!

31 May 2008 Case

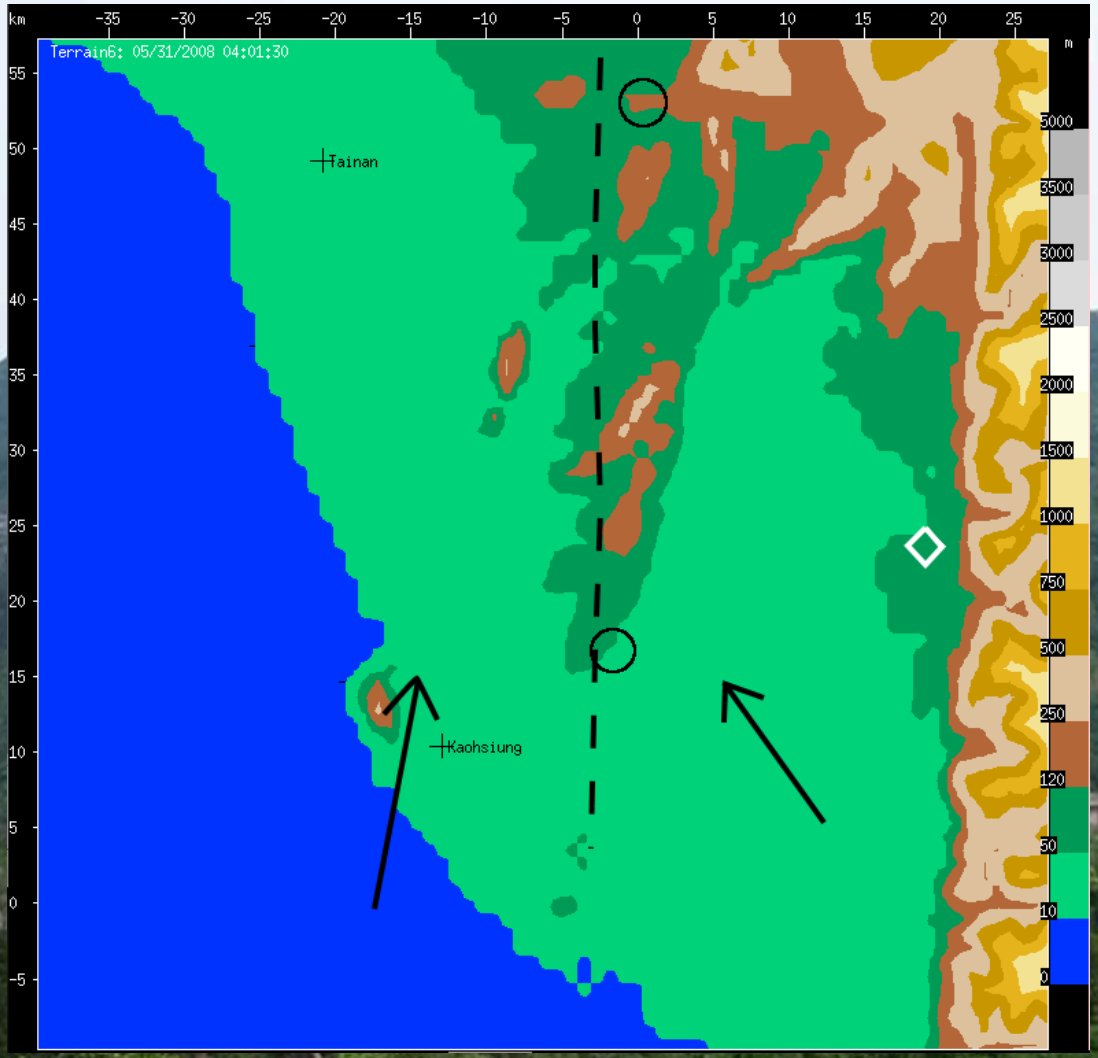
- Synoptically forced
- Mei Yu front approach from north
- Southwesterly low-level jet ahead of front
- Two events in southern Taiwan
- Have surveillance scans from S-Pol to use in VDRAS



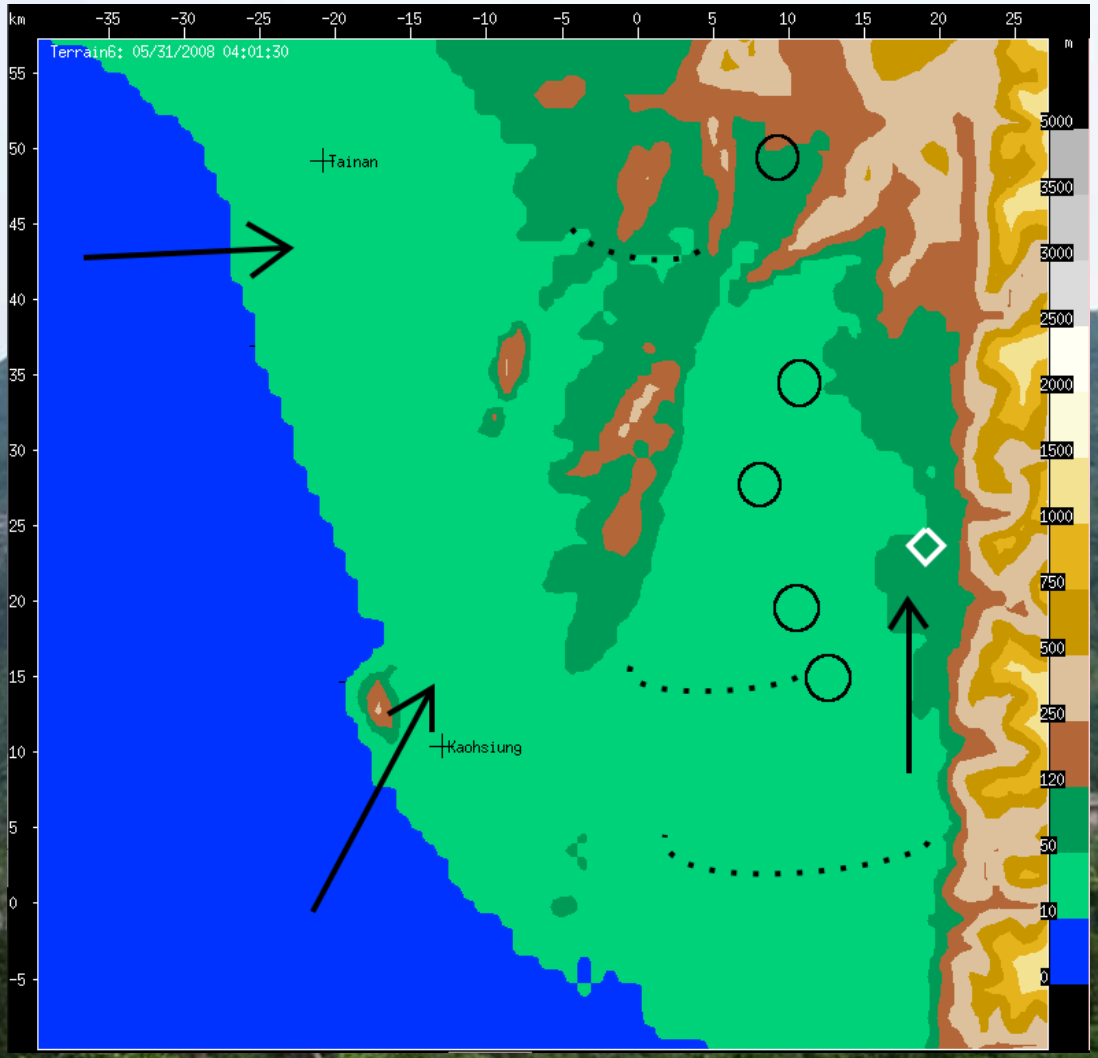
31 May 2008 Case
0300 UTC



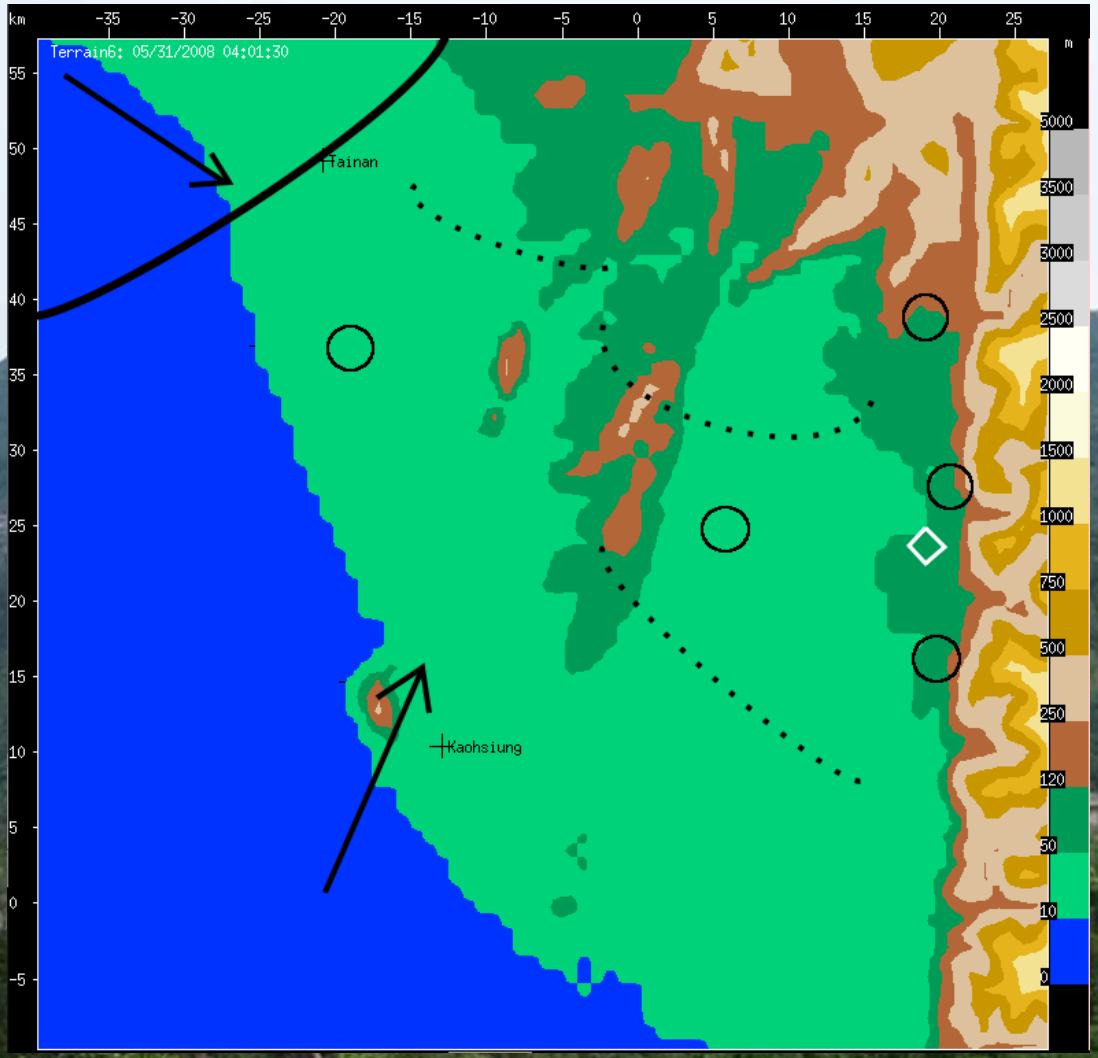
31 May 2008 Case
0400 UTC



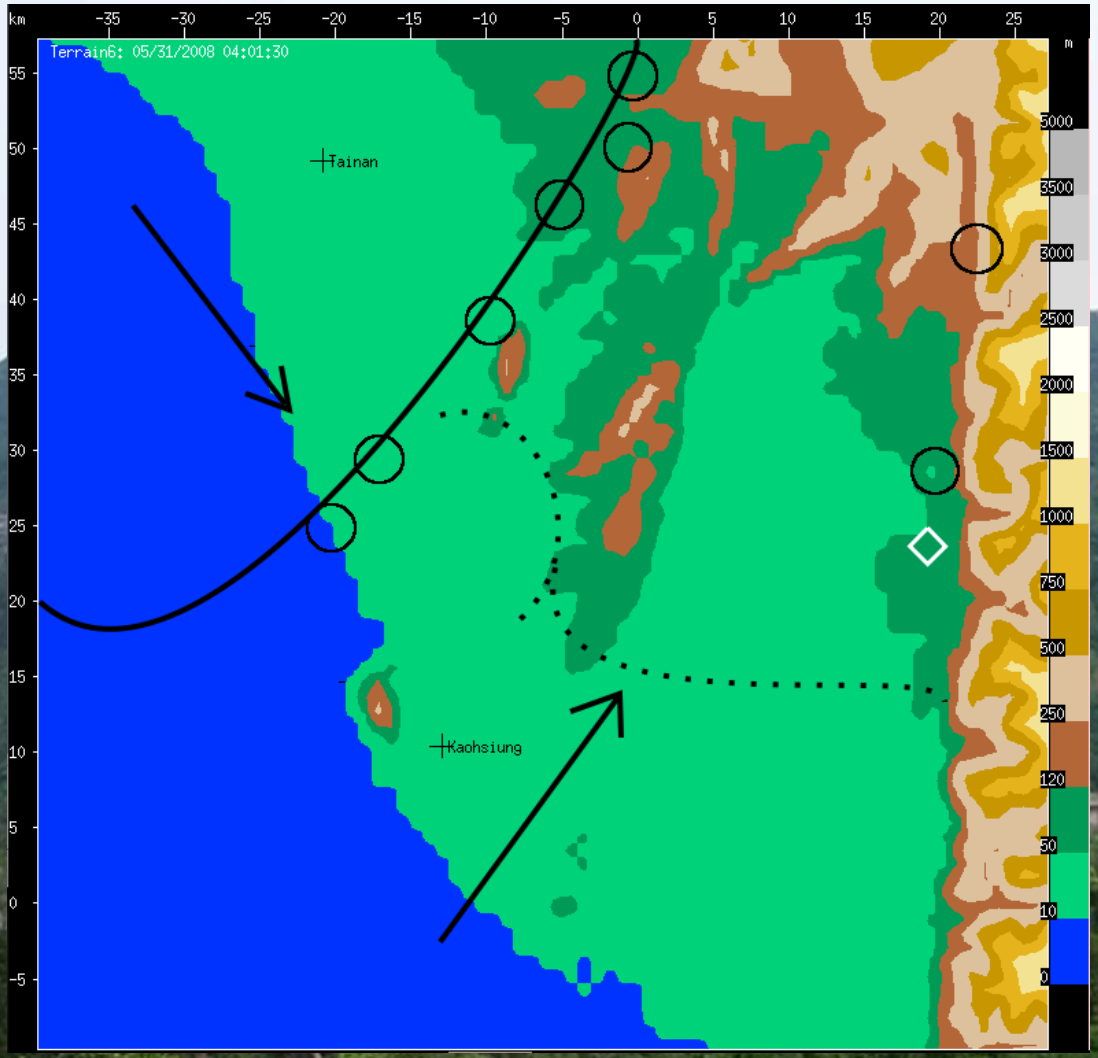
31 May 2008 Case
0500 UTC



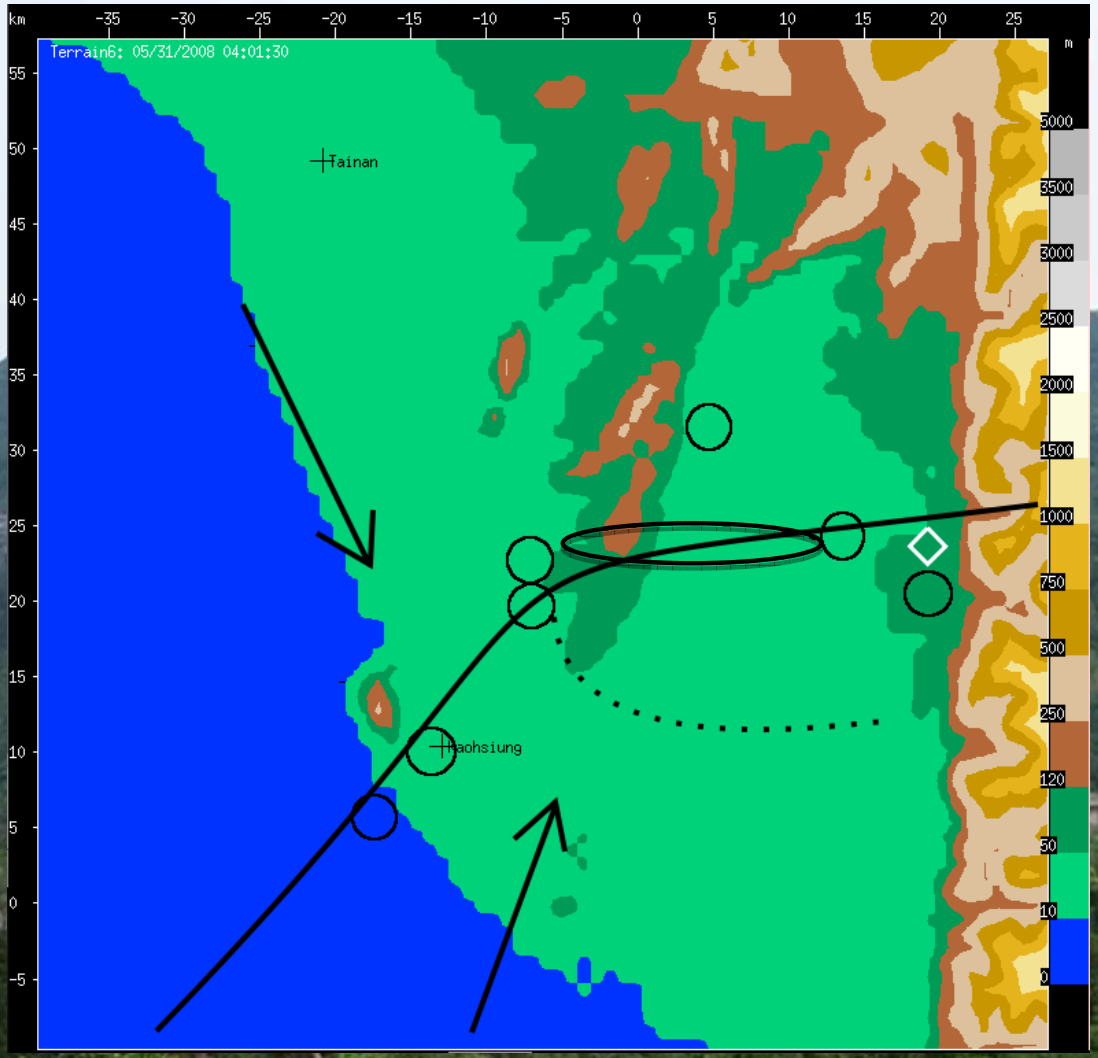
31 May 2008 Case
0600 UTC



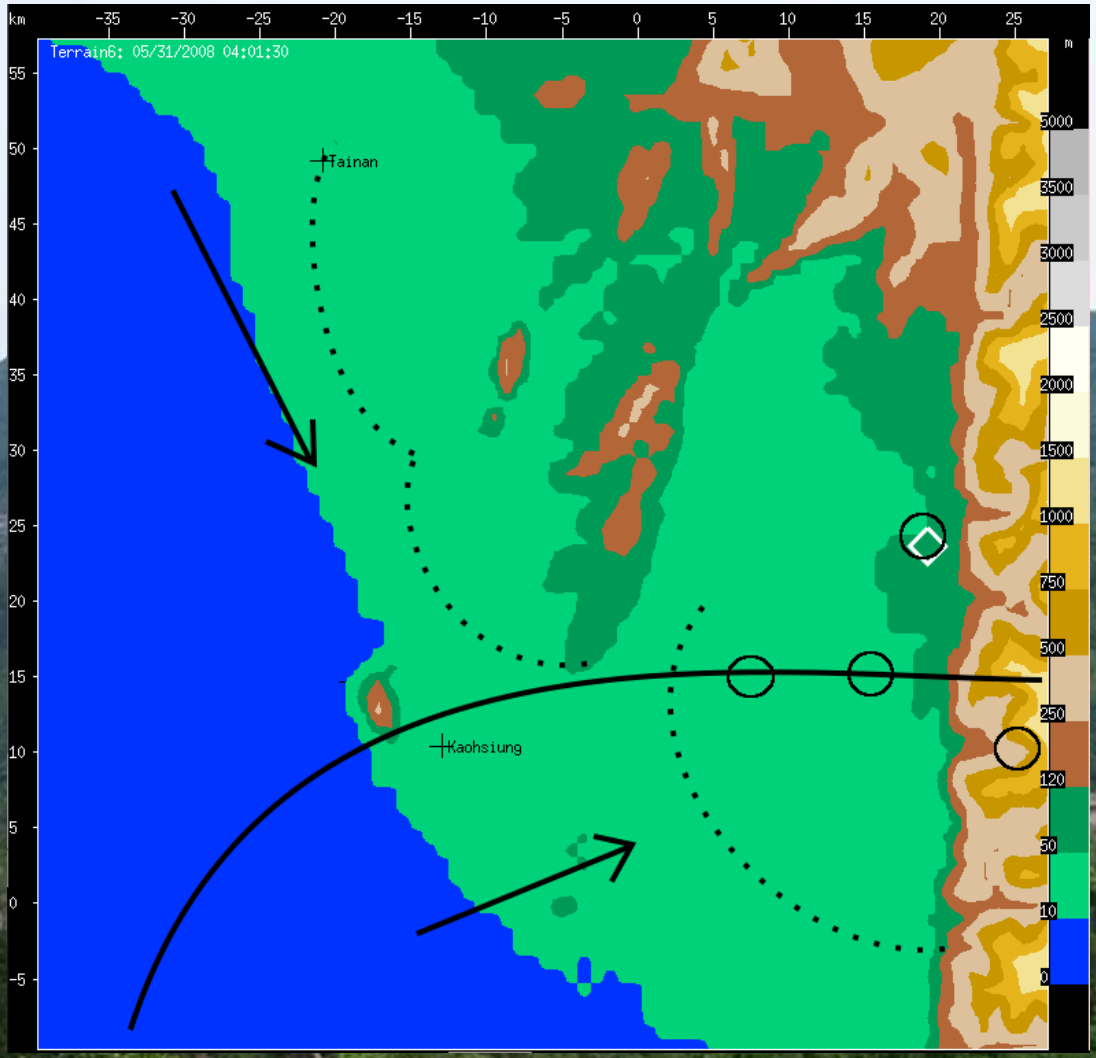
31 May 2008 Case
0700 UTC



31 May 2008 Case
0800 UTC



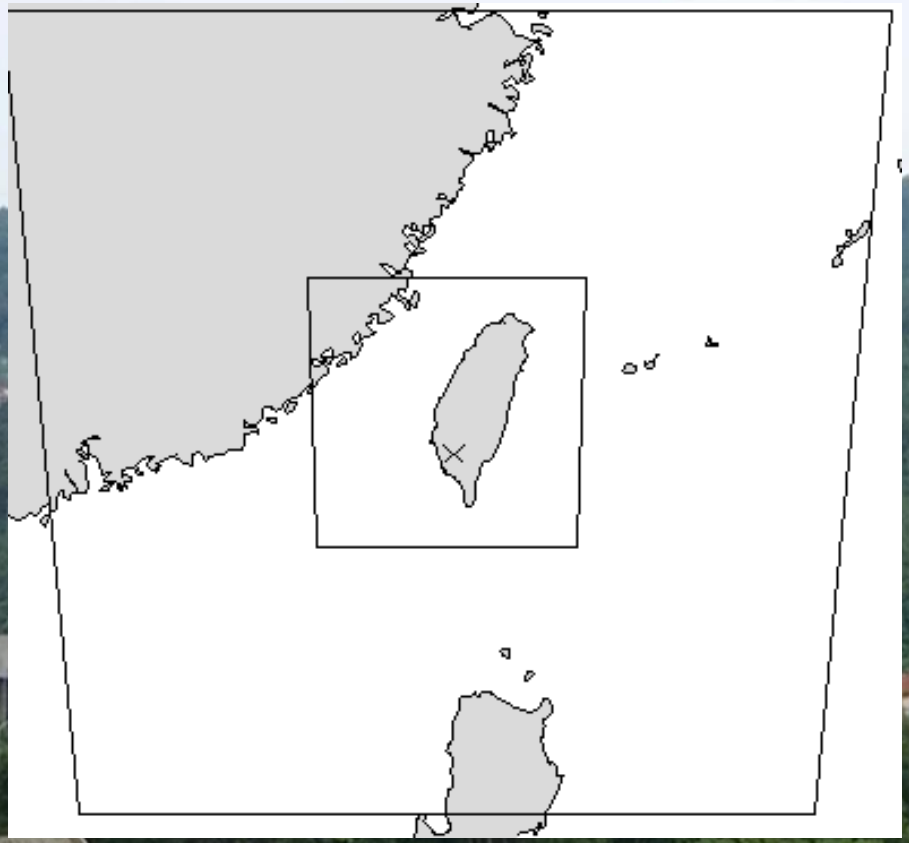
31 May 2008 Case
0900 UTC



Data

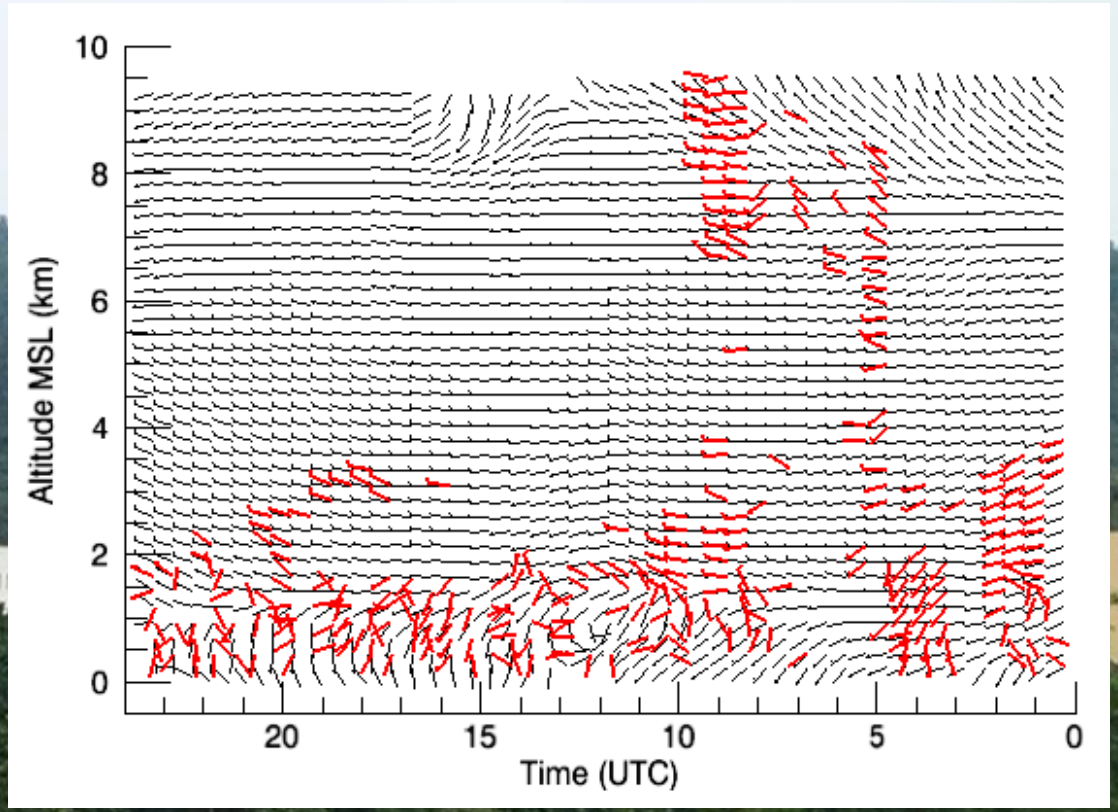
- NCU ISS Wind Profiler
  - 915 MHz
  - High mode 9.4 km AGL, 0.238 km resolution
  - Low mode 4.9 km AGL, 0.098 km resolution
- WRF model rerun (run at NCAR)
  - 3 km resolution inner domain
- VDRAS run using WRF and S-Pol
  - 4-D Variational Doppler Radar Assimilation System
  - Assimilated S-Pol velocities

Wind Profiler – WRF Domain



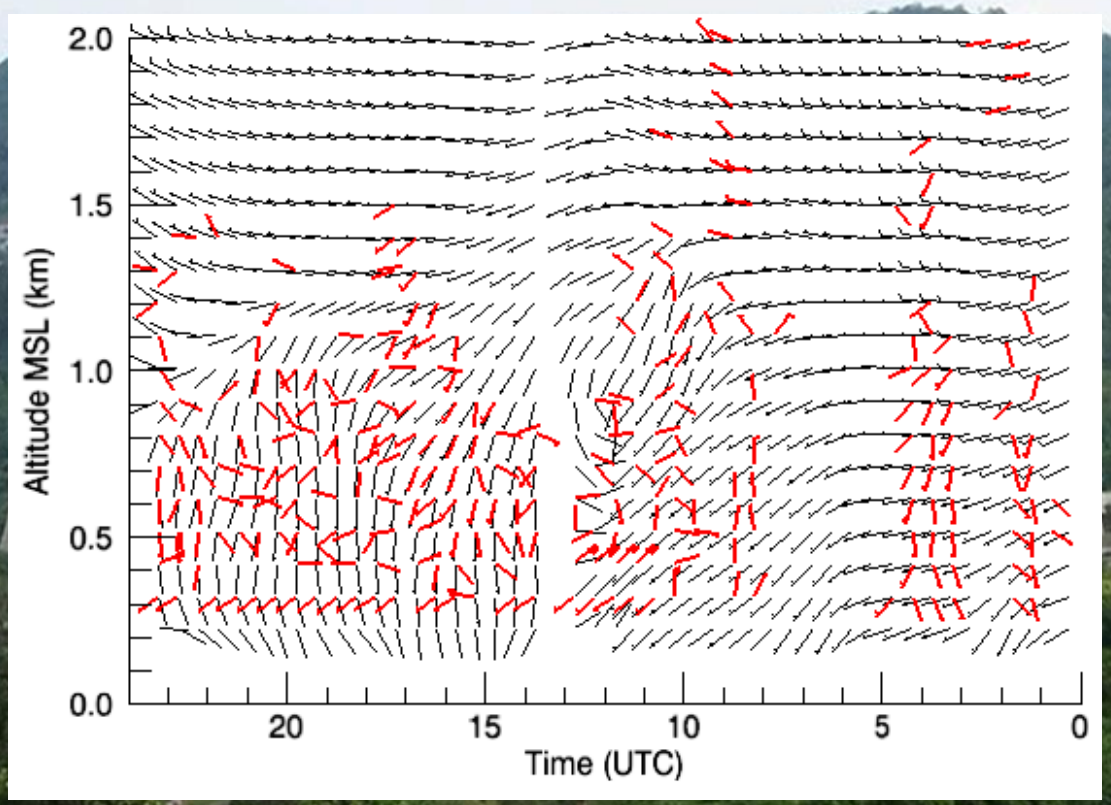
Wind Profiler – WRF High Mode

- Few profiler observations in upper levels
- Mostly westerly in upper levels
- Few northerly and southerly components in upper levels



Wind Profiler – WRF
Low Mode Below 2 km

- Key differences in 0400 UTC and 0800 UTC events



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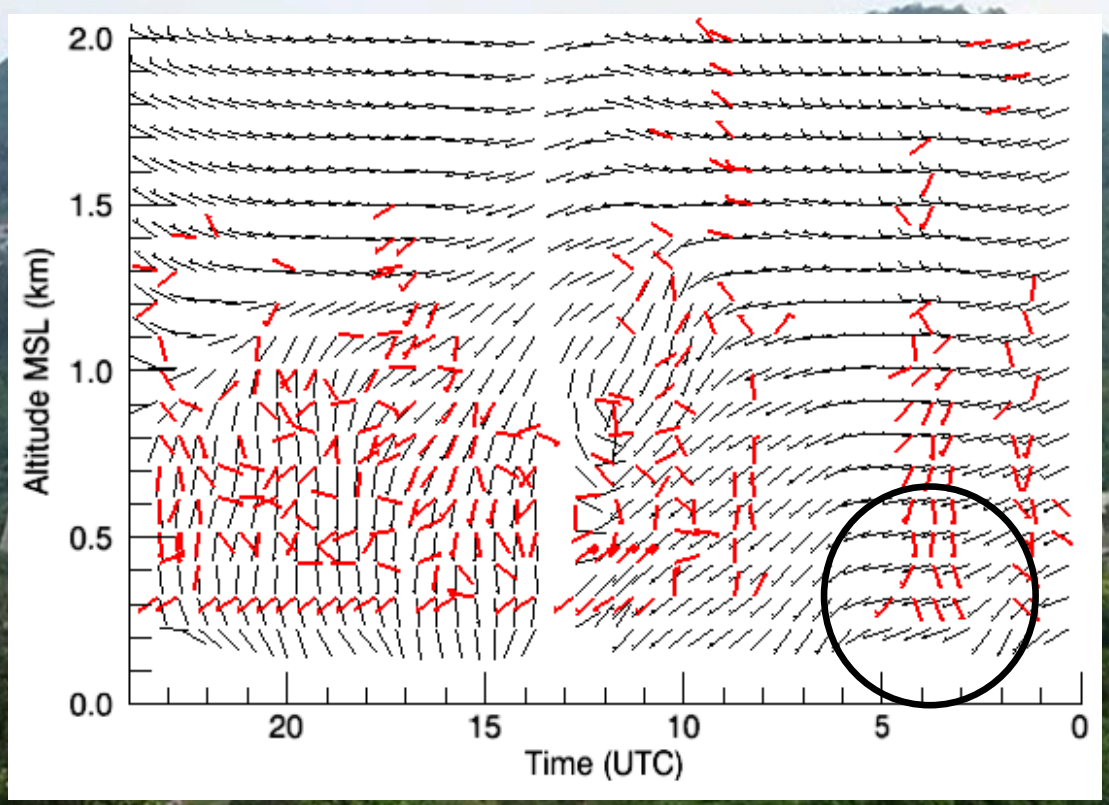

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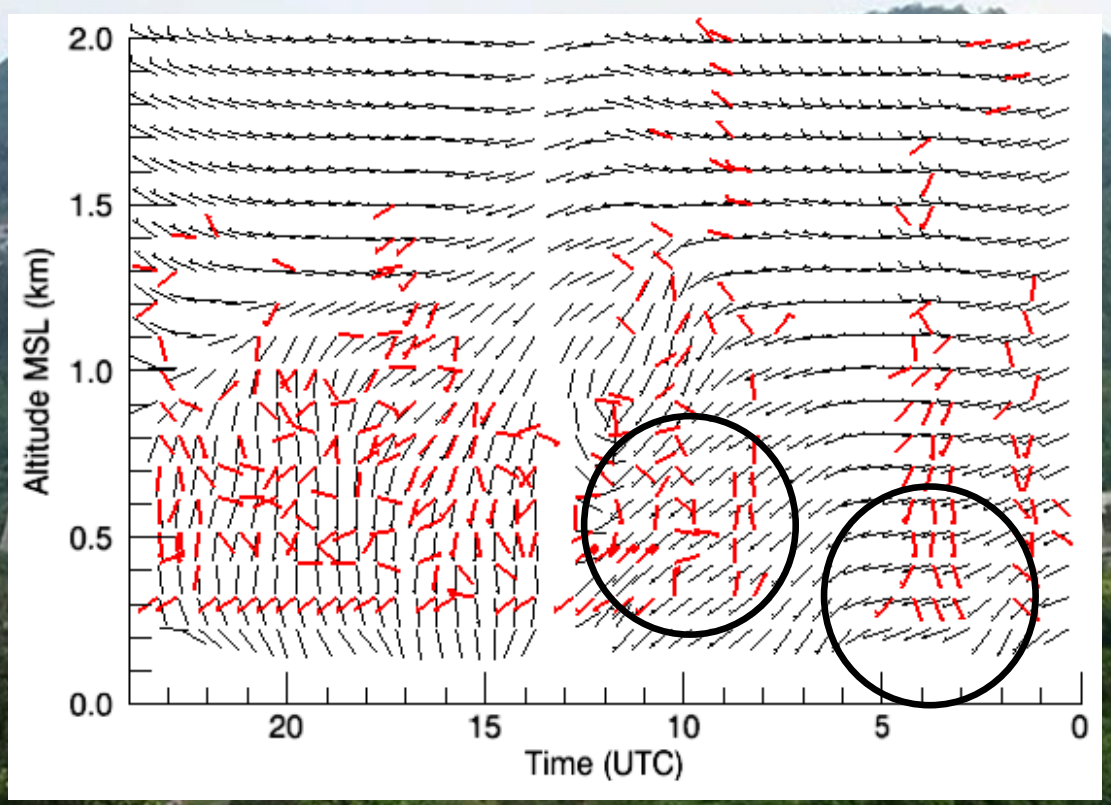
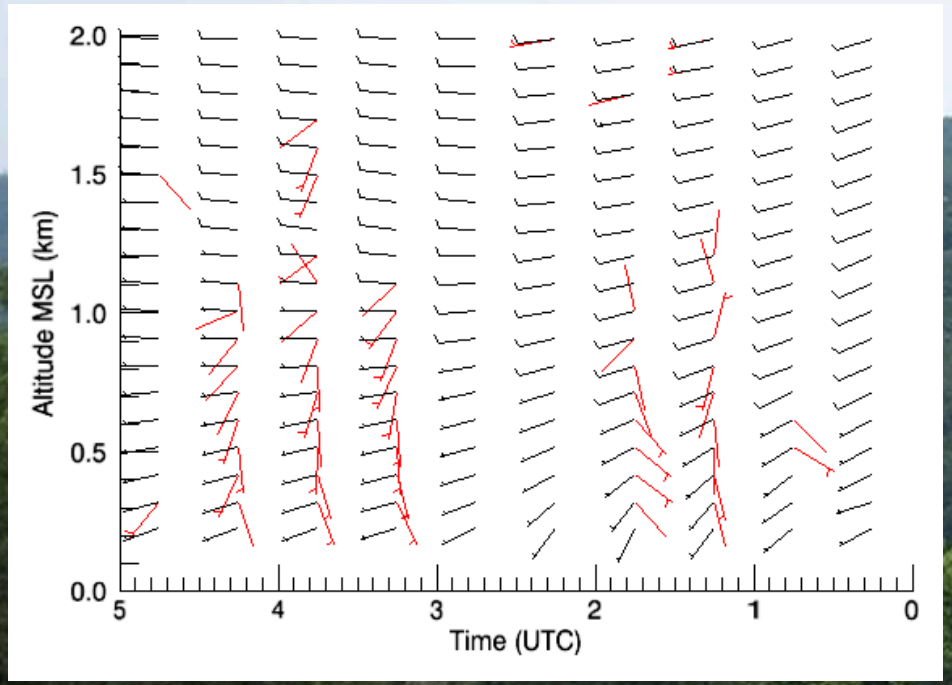
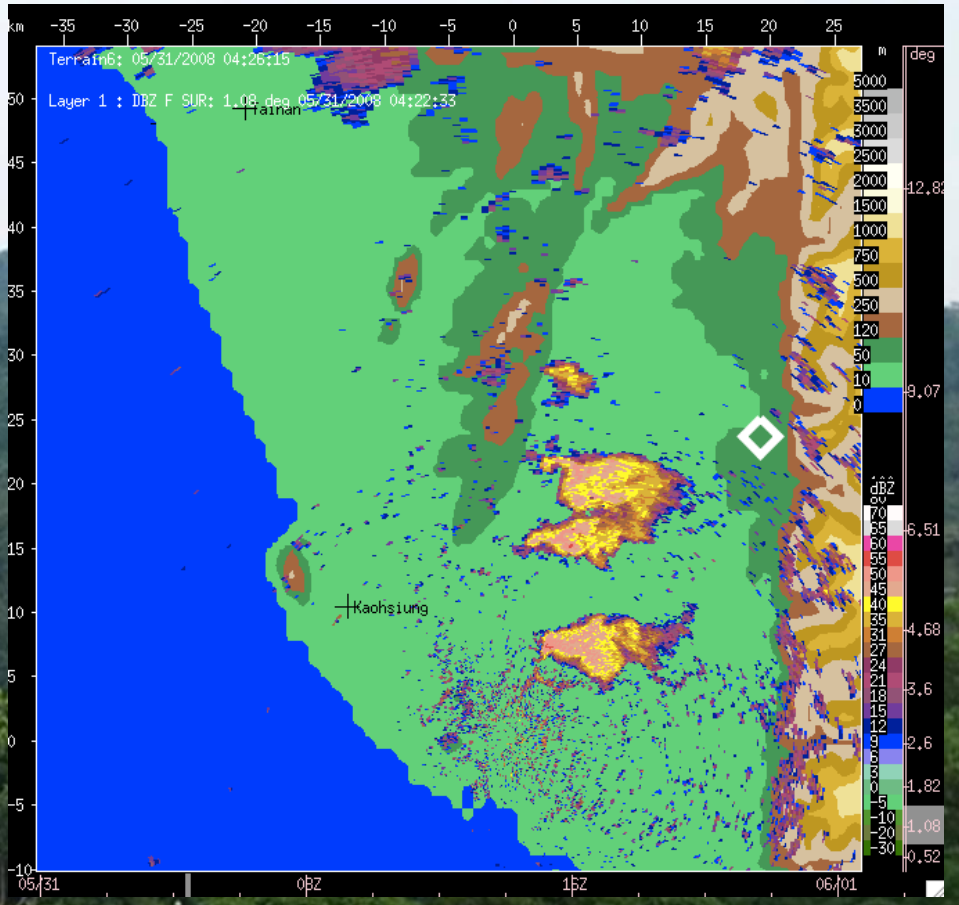


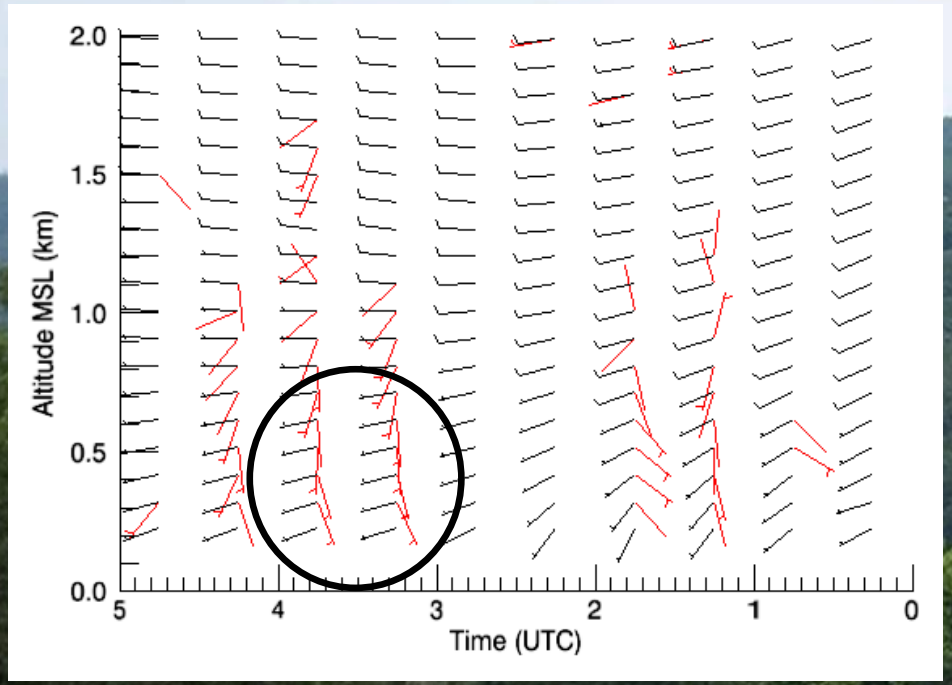
Wind Profiler – WRF
0400 UTC Event



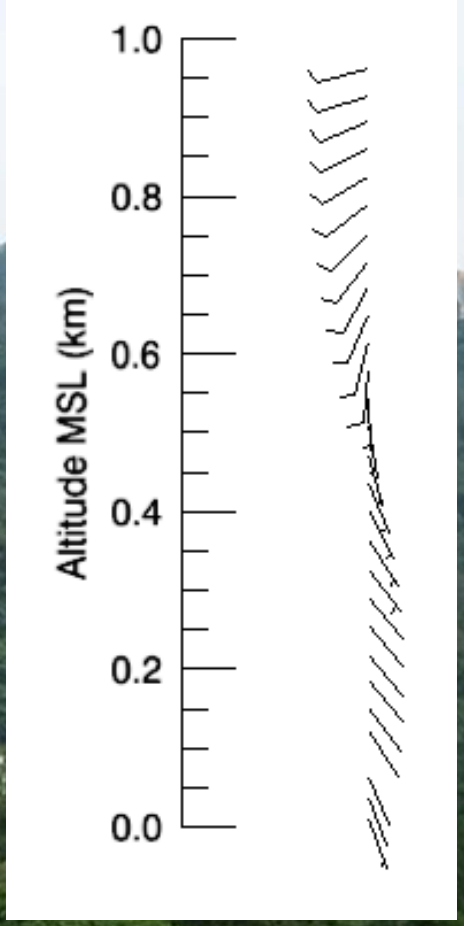
S-Pol 0426 UTC



Wind Profiler - WRF
0400 UTC Event

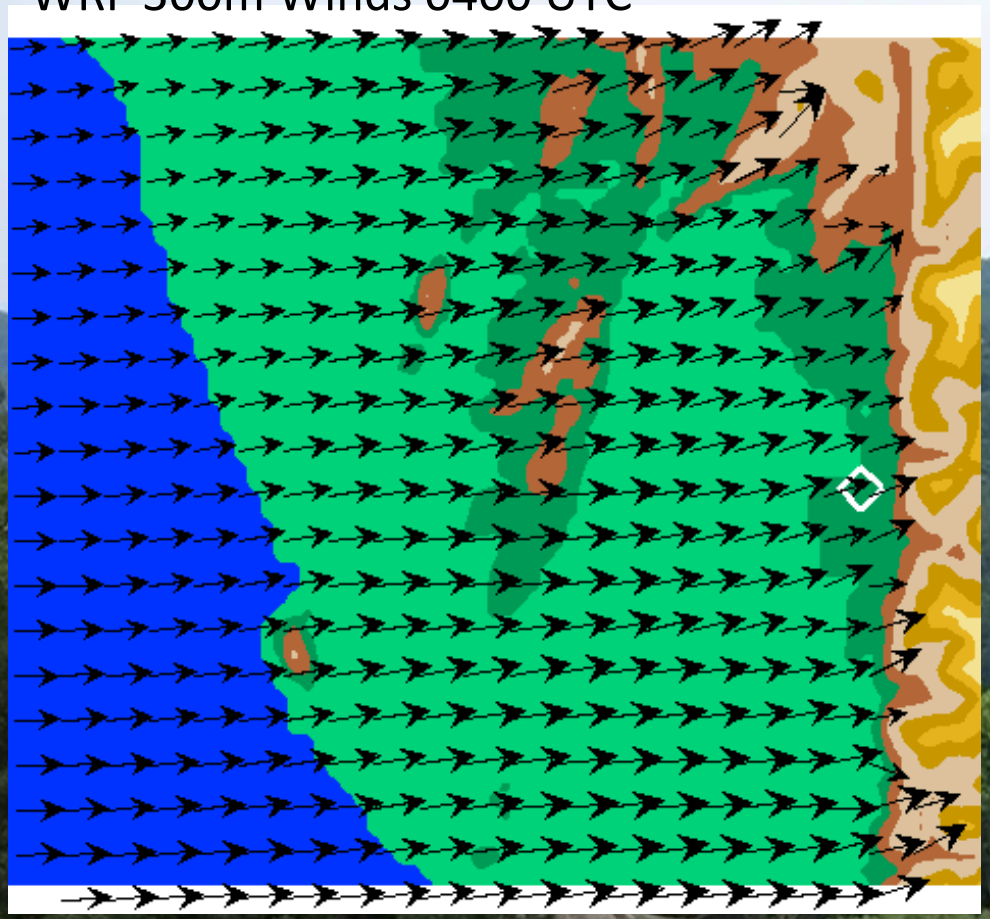


Pingtung Sounding 0300 UTC



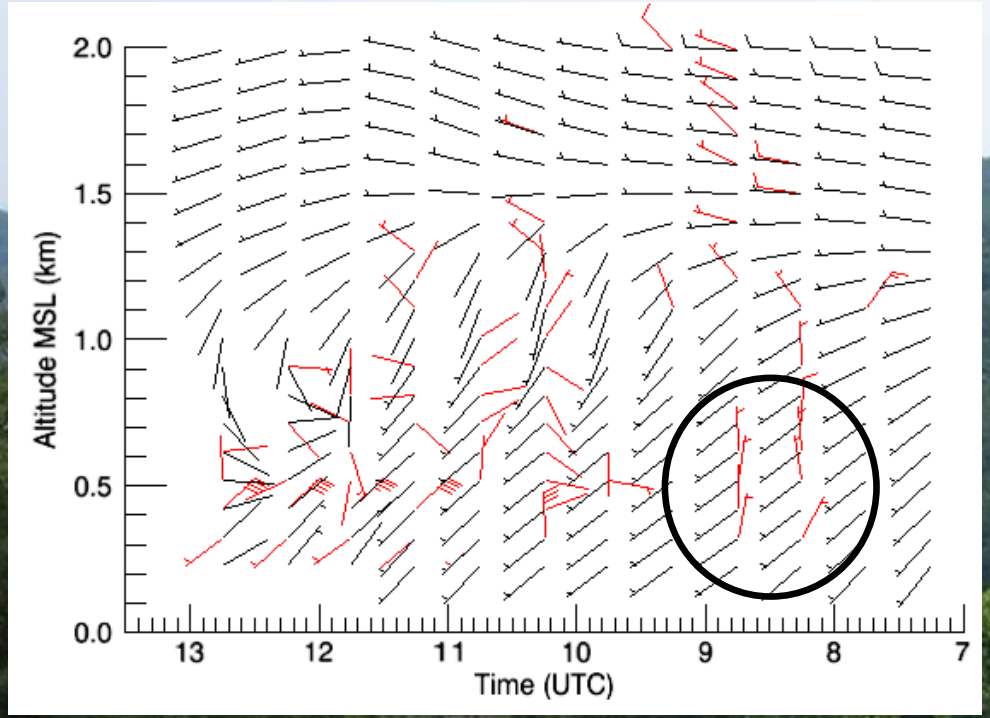
Wind Profiler – WRF
0400 UTC Event

WRF 300m Winds 0400 UTC

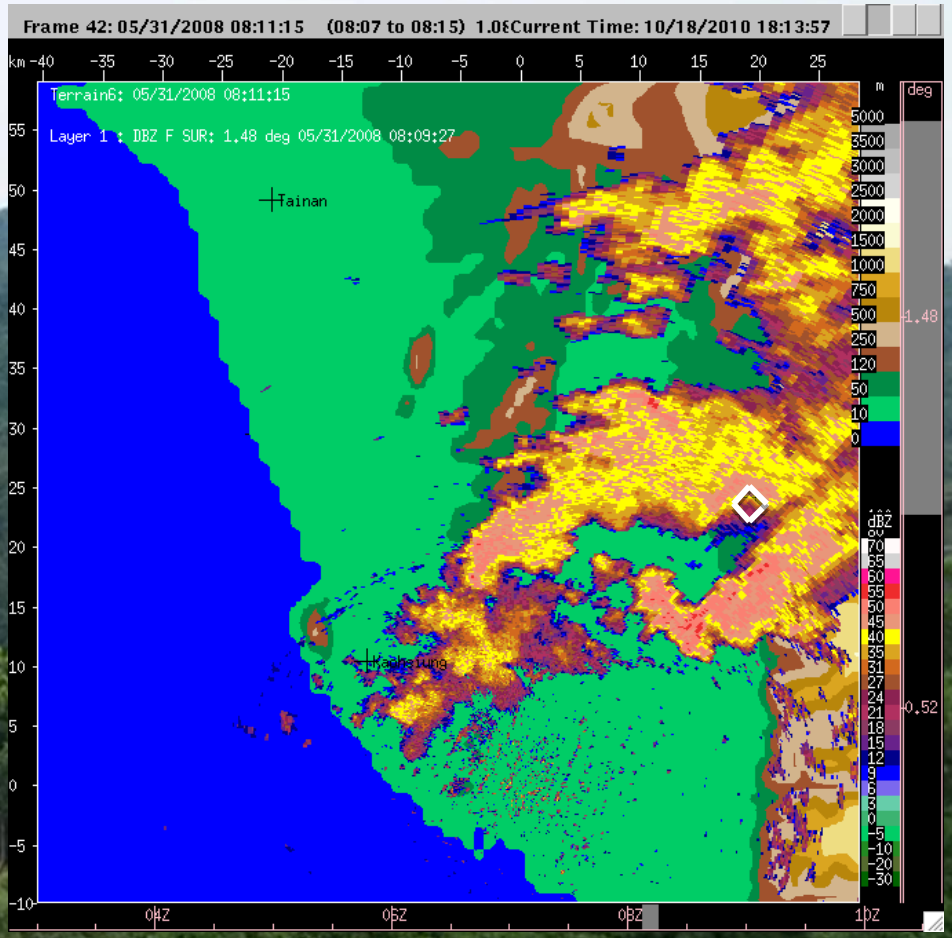


0400 UTC

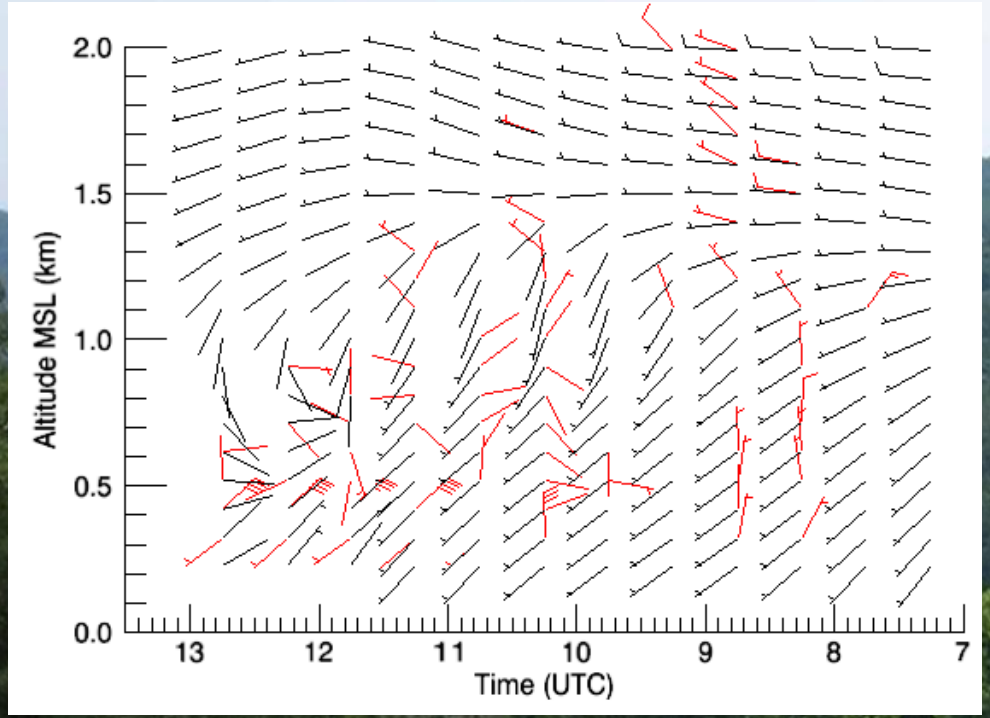
WRF Profiler – WRF 0800 UTC Event



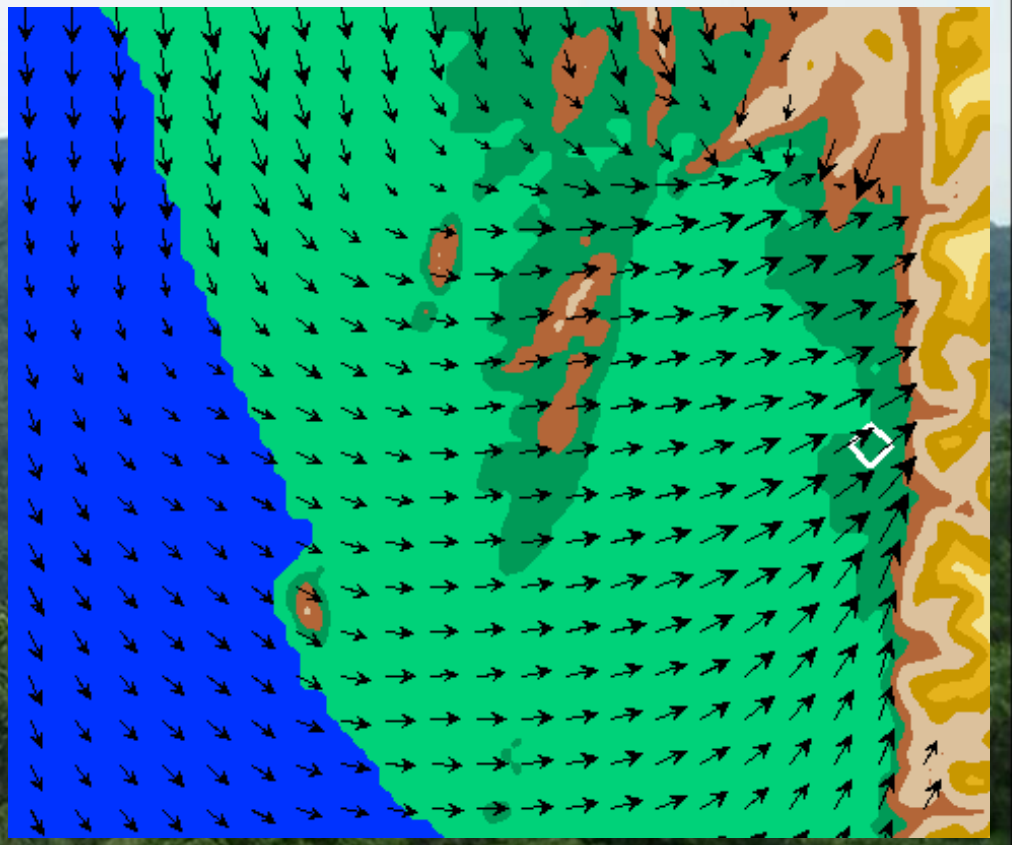
S-Pol 0811 UTC



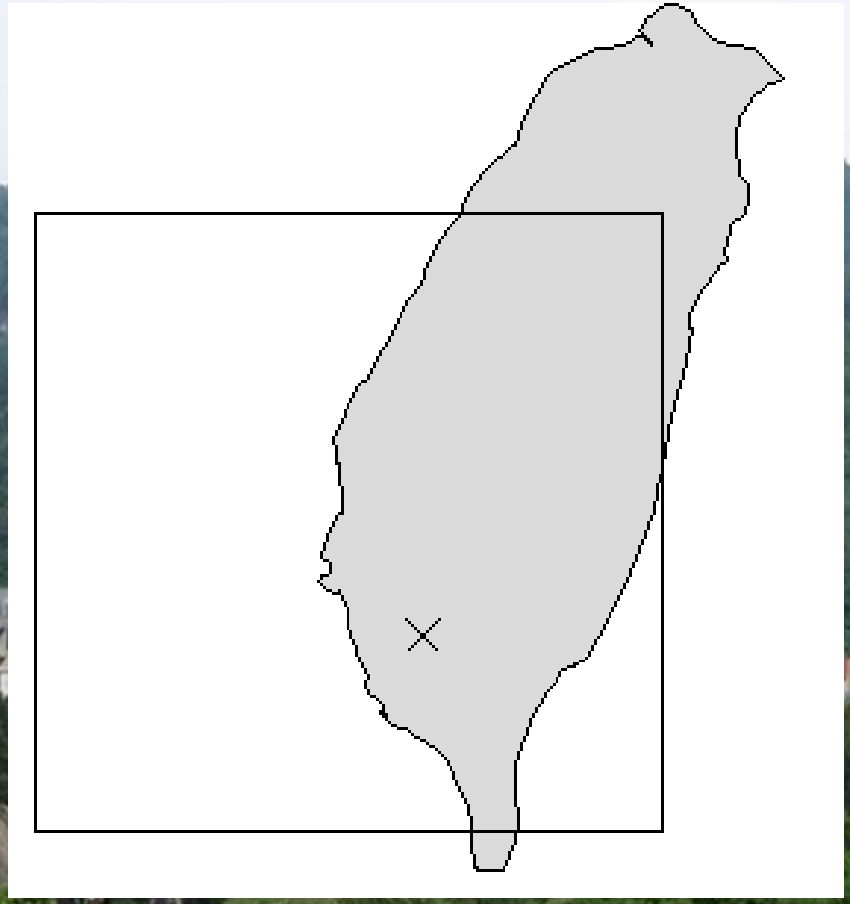
Wind Profiler – WRF
0800 UTC Event



WRF Winds 1000 UTC

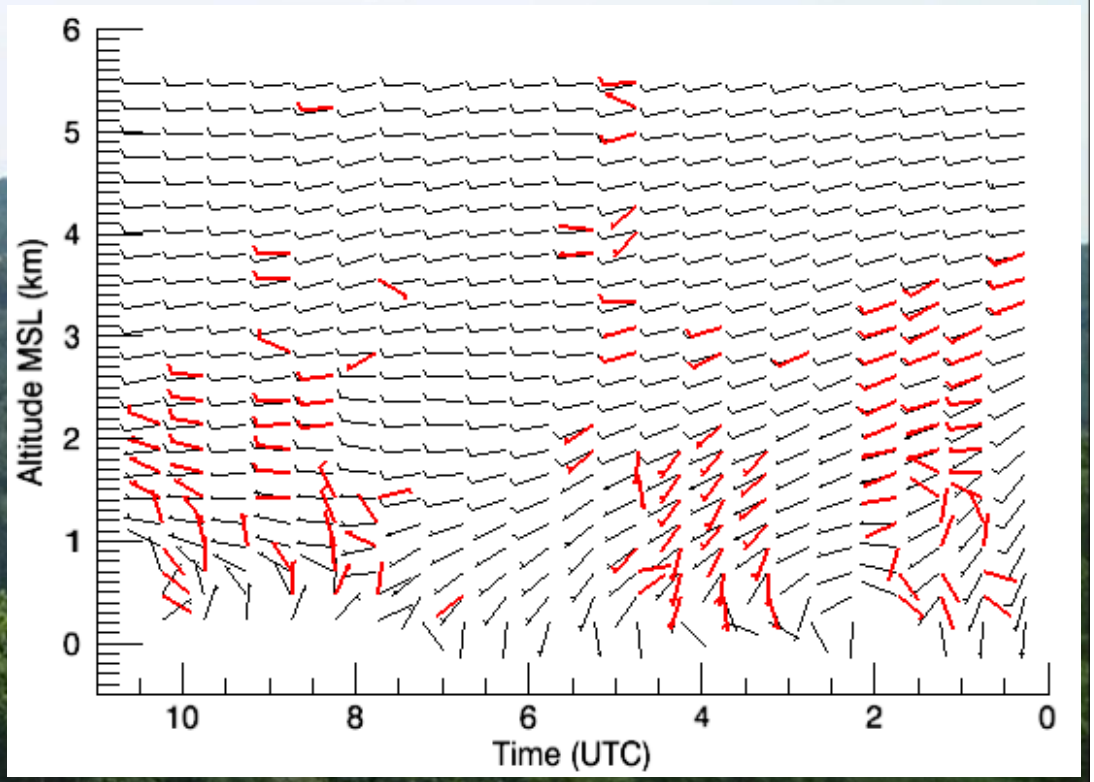


Wind Profiler – VDRAS Domain



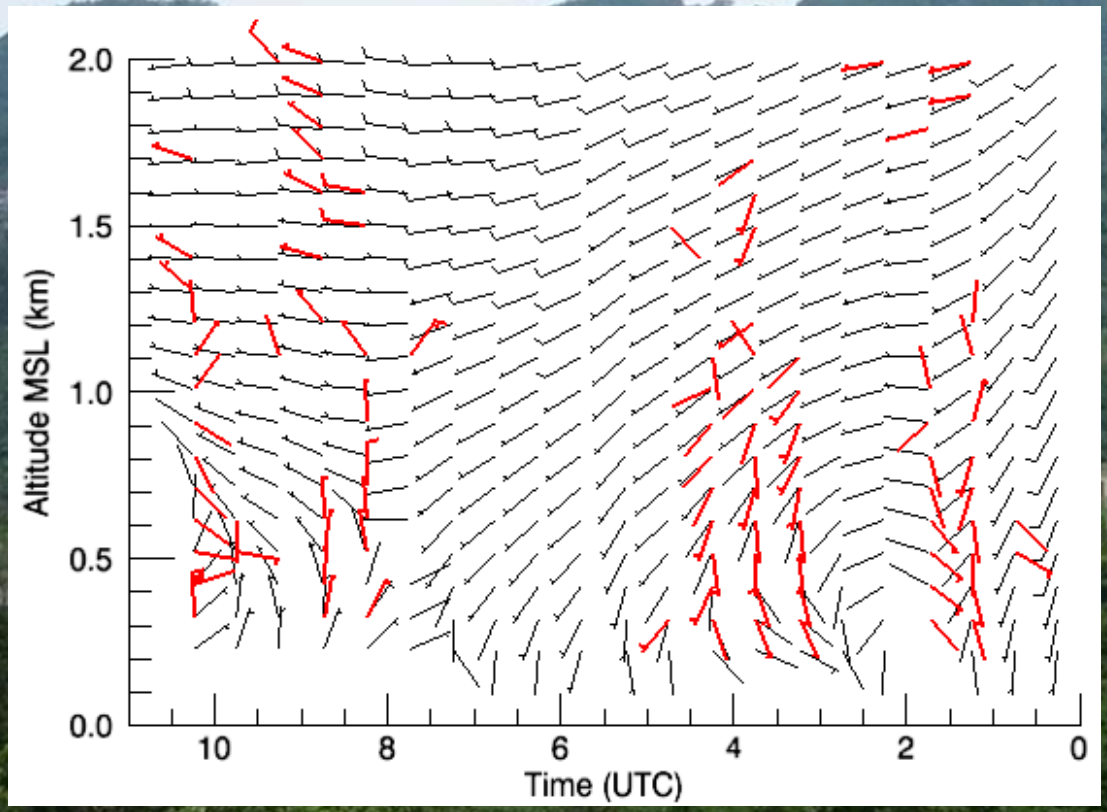
Wind Profiler – VDRAS High Mode

- Few observations aloft
- Higher level winds match fairly well



Wind Profiler – VDRAS Low Mode Below 2 km

- Captures easterly component and timing of Mei Yu front



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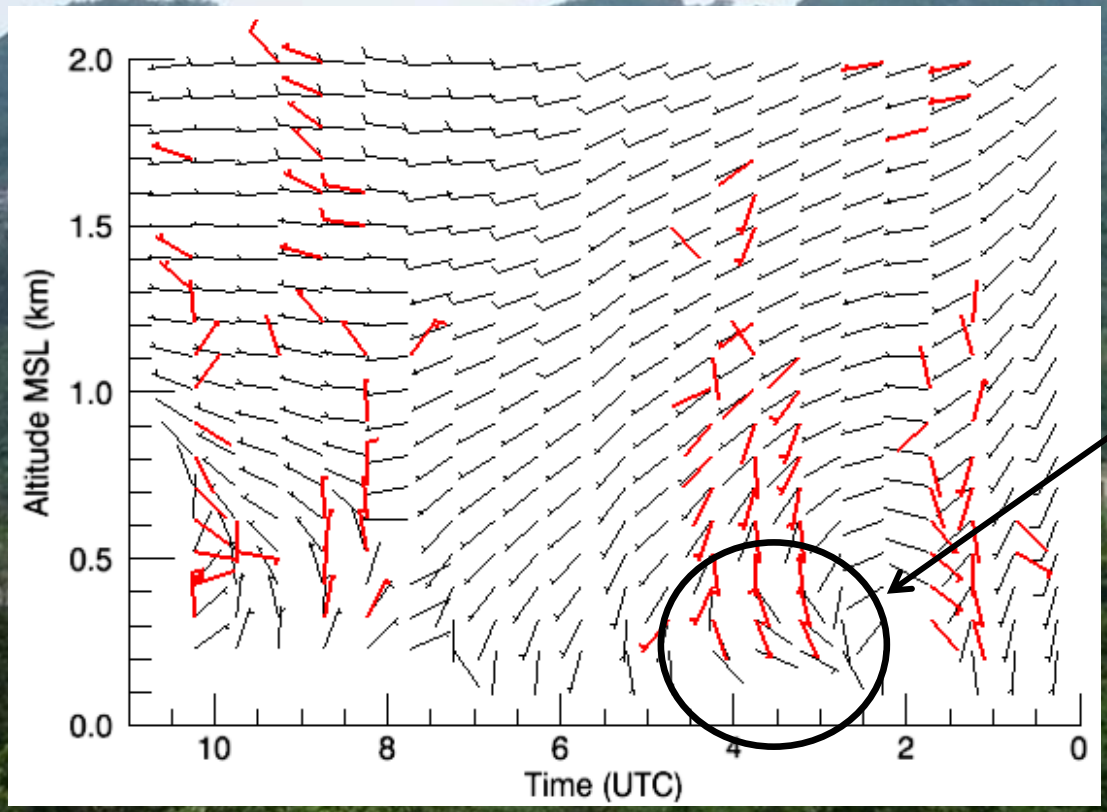

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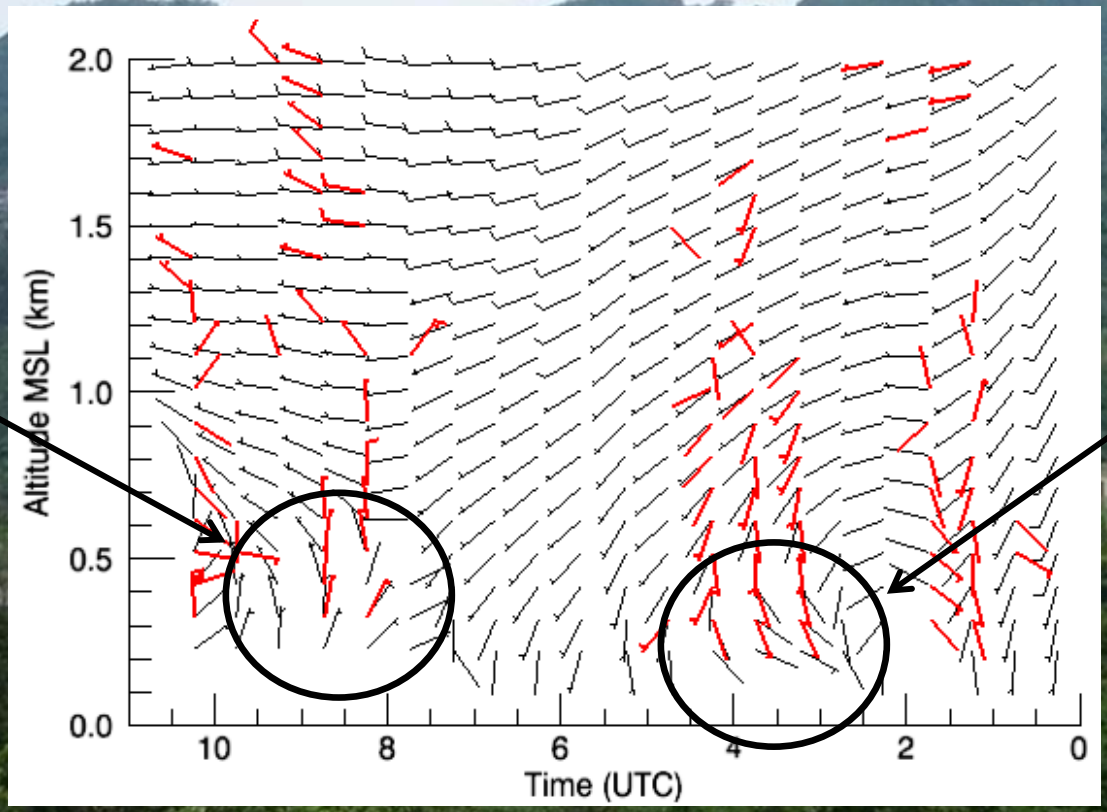
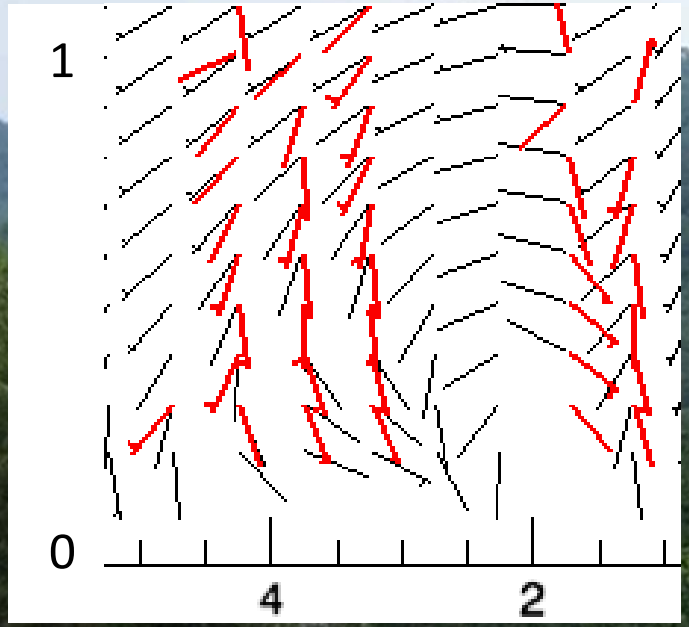
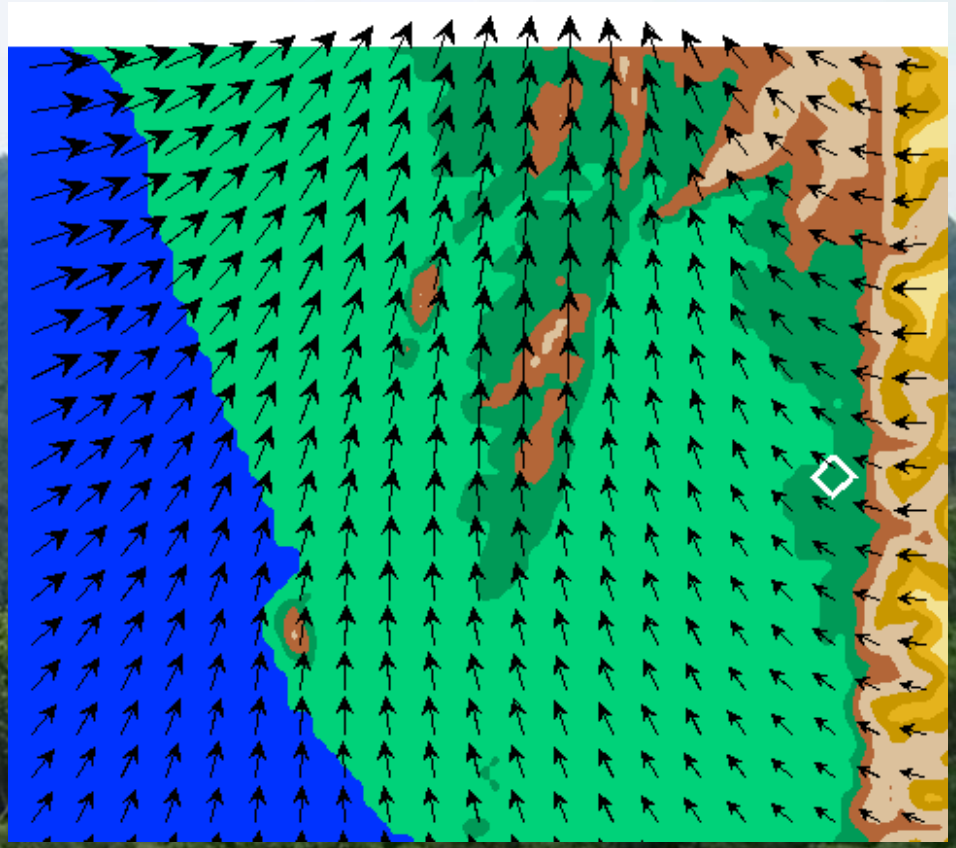


Wind Profiler – VDRAS Easterlies

Stronger easterly component

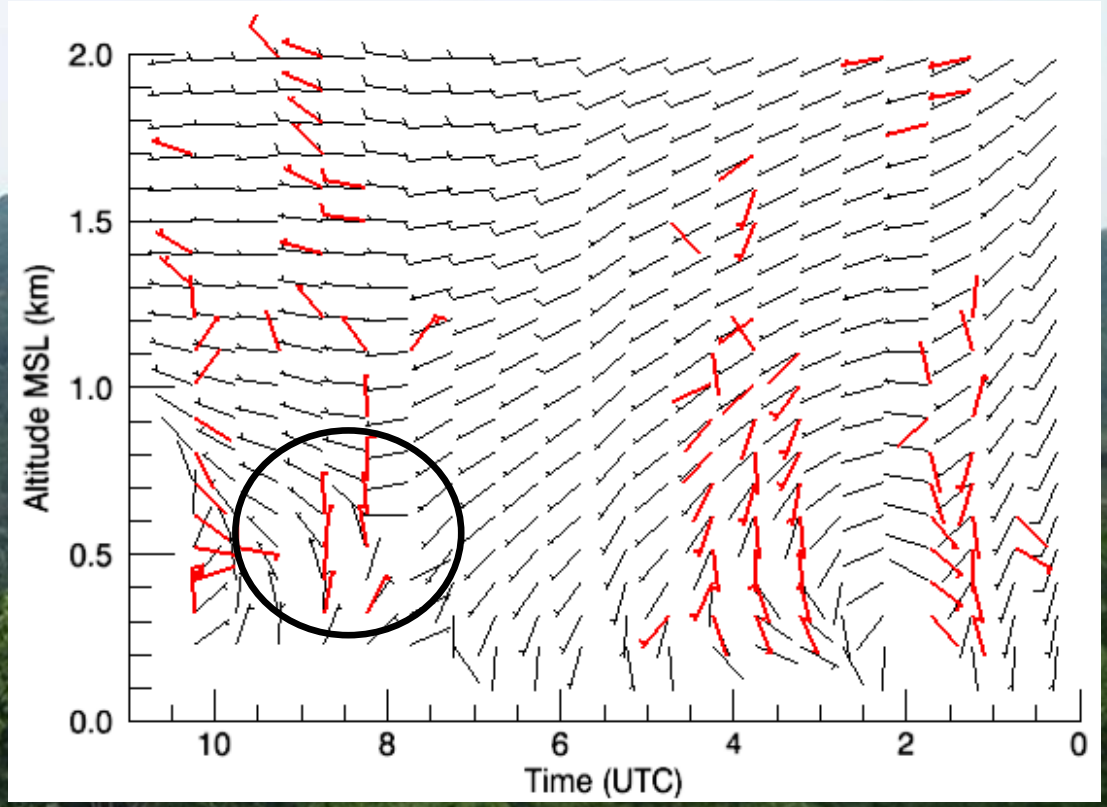


187m plane view VDRAS



Wind profiler – VDRAS Frontal Passage

- VDRAS caught timing for front
- Northerly wind shift not as deep in VDRAS as in wind profiler



Conclusions

- WRF and VDRAS both did reasonable, especially with SW low-level jet
- S-Pol data allowed VDRAS to analyze southeasterly winds and frontal wind shift
  - WRF missed southeasterly winds along foothills
  - WRF was slow on passage of Mei Yu front
- Support to continue researching usefulness of wind profiler
  - Non-synoptically forced cases
  - Ingest into models

References

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