# TiMREX to Operations

## The Vision Unfolding

Jim Wilson , NCAR

# These two guys had a vision??

**For a field project to study Taiwan heavy rains to improve heavy rain forecasting**

# Vision - Includes CWB, Taiwan Universities and NCAR Collaborating to Develop a Heavy Rain Nowcasting System for Taiwan.

**Initial Focus – 30 and 60 min forecasts of precipitation rate on the township scale (few km)**

**- non-synoptic forced afternoon convective rainfall**

**- build on the NCAR Auto-Nowcaster**

**- new for CWB**

**Later – synoptically forced and > 60 min**

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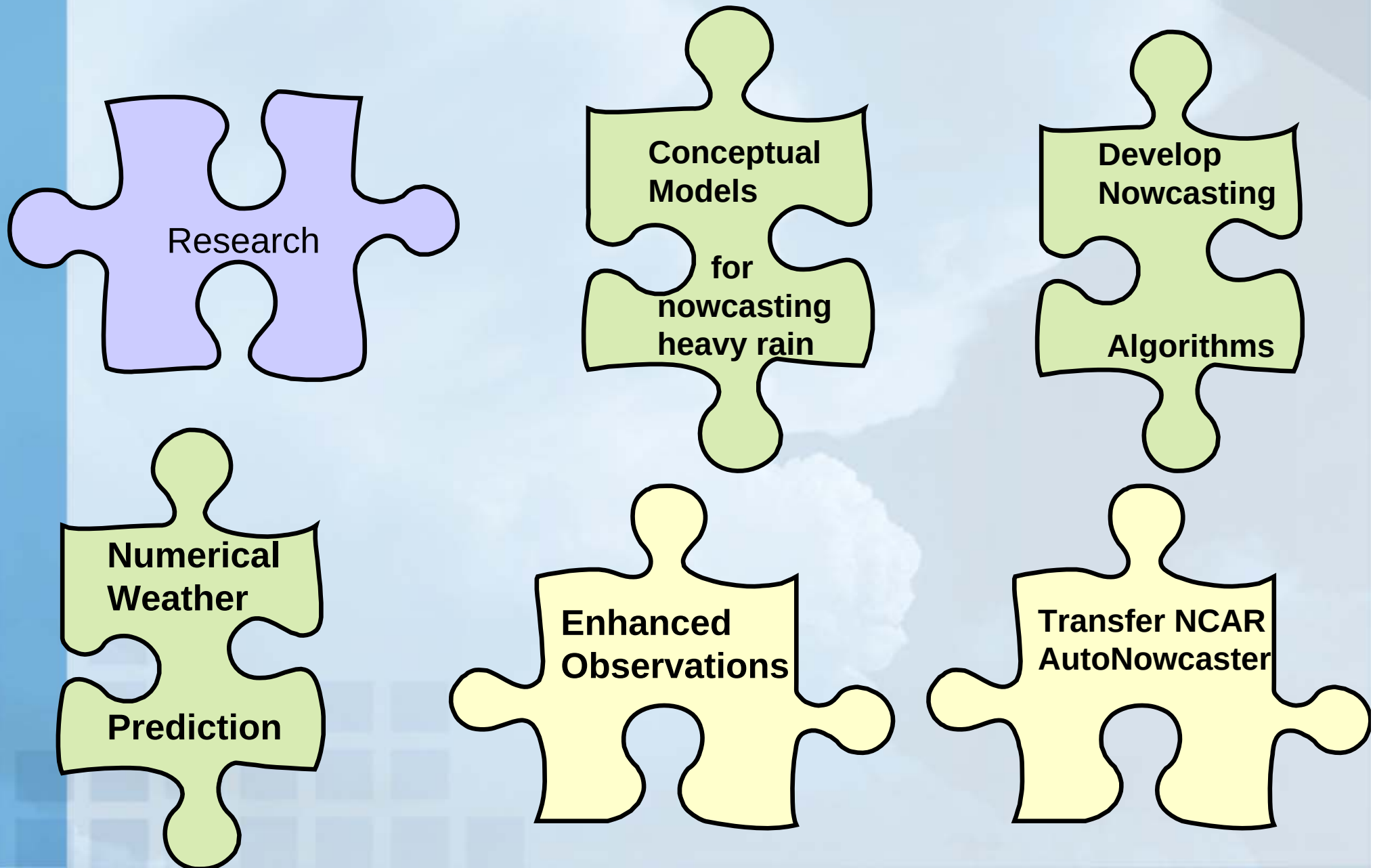
**Forecasting on this time and space scale requires**

- **High resolution observations**
- **Meteorological understanding**
- **Conceptual models**

# Necessary Activities to obtain goal



## Research Activities Leading to Conceptual Models and Nowcast Predictors..

- *Non-synoptic forcing of afternoon deep convection*
  - rainfall distribution and intensity vs wind velocity, island blocking of airflow, sea breeze, anabatic winds, upslope winds.
  - longevity and motion of mountain storms

- *Synoptic forcing*
  - rainfall distribution and intensity vs wind velocity
  - Understand when rainfall will decrease or intensify when moving from water to land.
  - Understand when rainfall will decay or grow when moving from plains to mountains.
  - Understand the utility of echo extrapolation on time scales less than 1 hour over ocean, plains, mountains

- *Observation issues*
  - use of refractivity
  - clutter filtering on radars
  - radiosounde coverage and QC
  - profiler utility
  - surface station coverage and QC
  - radar coverage and QC

- *Numerical methods*
  - Utility of VDRAS to diagnose the 3-D wind field and CAPE and CIN
  - Utility of rapid update, high resolution models

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# Many Groups collaborating

**Taiwan Universities**

- **Chinese Culture University**
- **National Taiwan University**
- **National Central University**

**NCAR STEP Program**

- EOL
- MMM
- RAL

**U. S. Universities**

- Colorado State U
- U of Utah
- U of Calif at LA

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# National Taiwan University

*Rong-Kuang (Radian) Hsiu -- S-Pol boundaries and storm initiation

Wen-Ming Lex Chang – Sounding quality control

*Tzu-Chin (Tina) Chen – Precipitation Microphysics with S-Pol and Super Site

*Chong-Chi (Nick) Tong – Rainfall climatology's and environment regimes

# Rong-Guang (Radian), Hsiu

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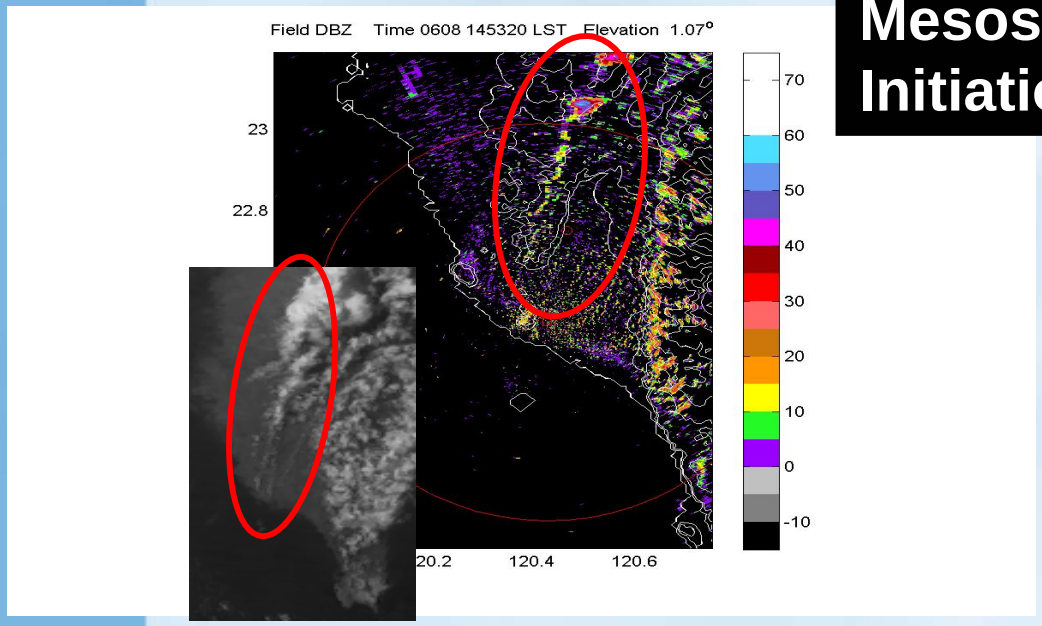
## Mesoscale Boundaries and Thunderstorm Initiation (TiMREX/SoWMEX)




Boundary Characteristics and Storm Initiation

| Classification | Number | Average. Lifetime | Percentage of initiating storm |
|---|---|---|---|
| Sea-Breeze Front | 26 | 04:30 | 38 |
| Land-Breeze Front | 7 | 02:02 | 0 |
| Gust Front | 24 | 01:45 | 75 |
| Terrain Convergence Line | 9 | 02:52 | 78 |
| Sea Convergence Line– Advection | 27 | 04:15 | 85 |
| Sea Convergence Line– Initiation | 23 | 03:05 | 48 |
| Unknown overland | 30 | 01:55 | 30 |
| Total | 146 | 02:52 | 54 |

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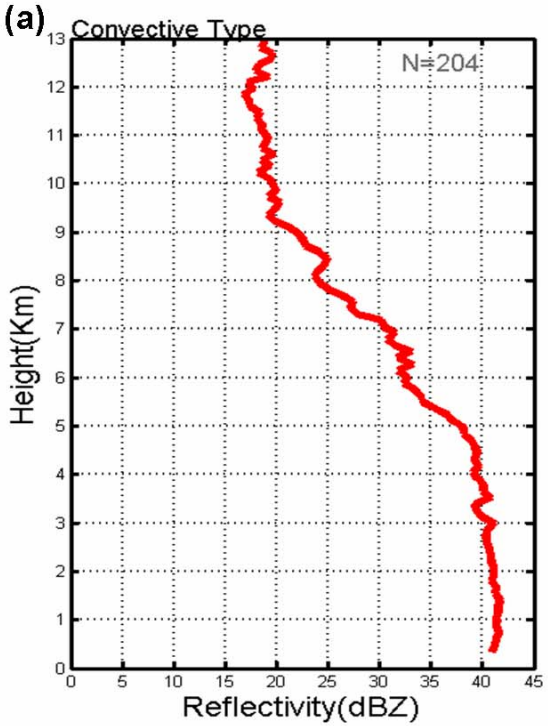
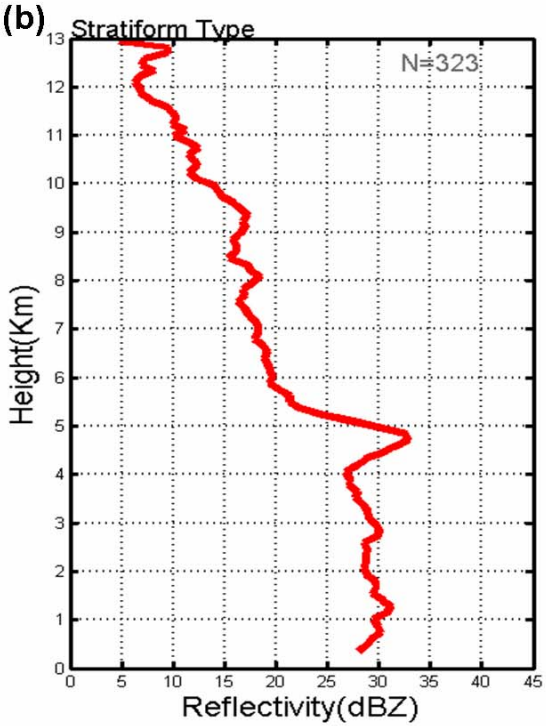
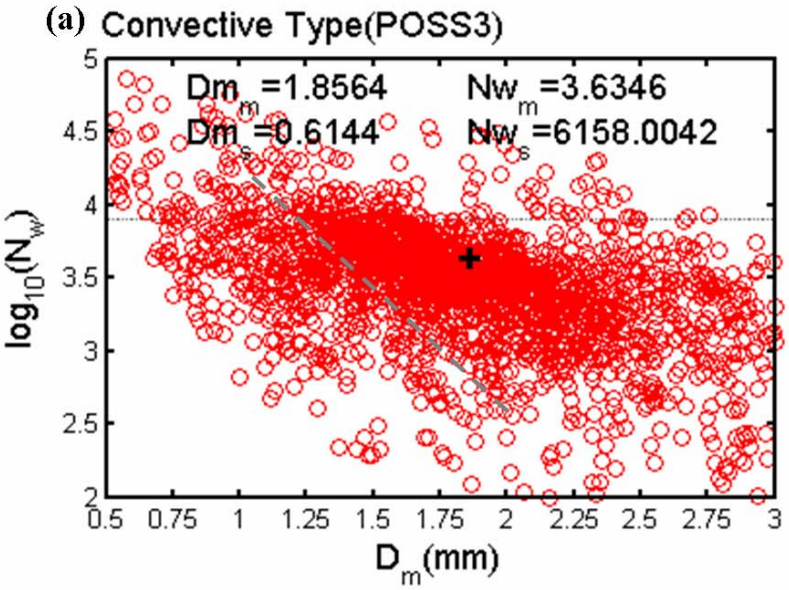
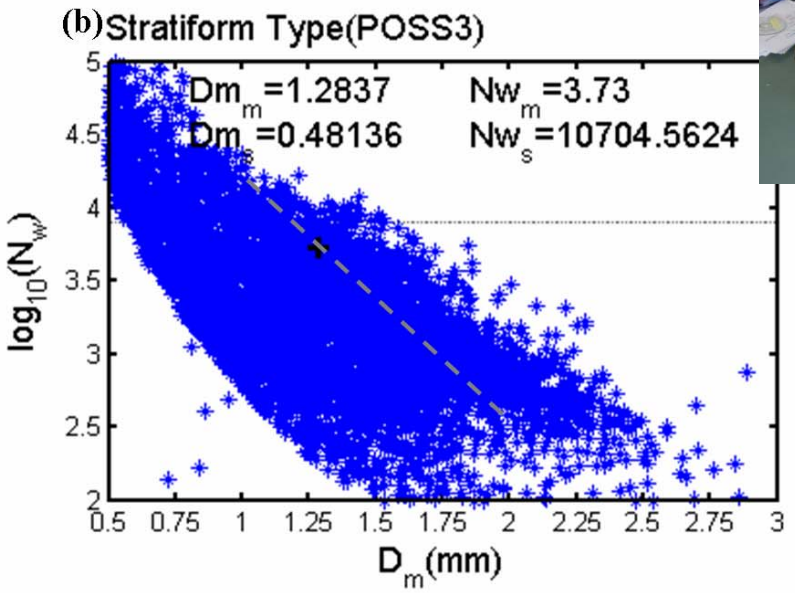
# Tzu-Chin (Tina) Chen




## Statistical Characteristics of Raindrop Size Distribution during SoWMEX.



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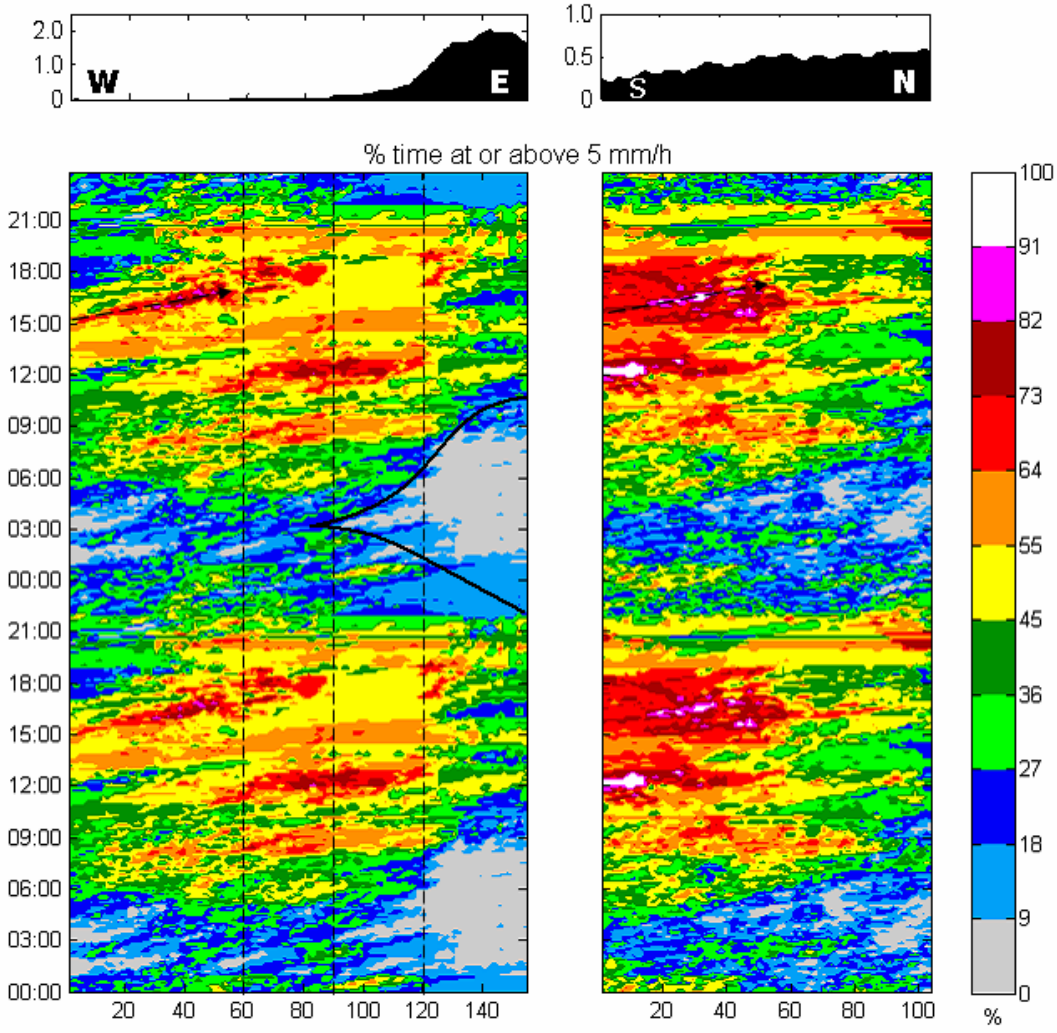
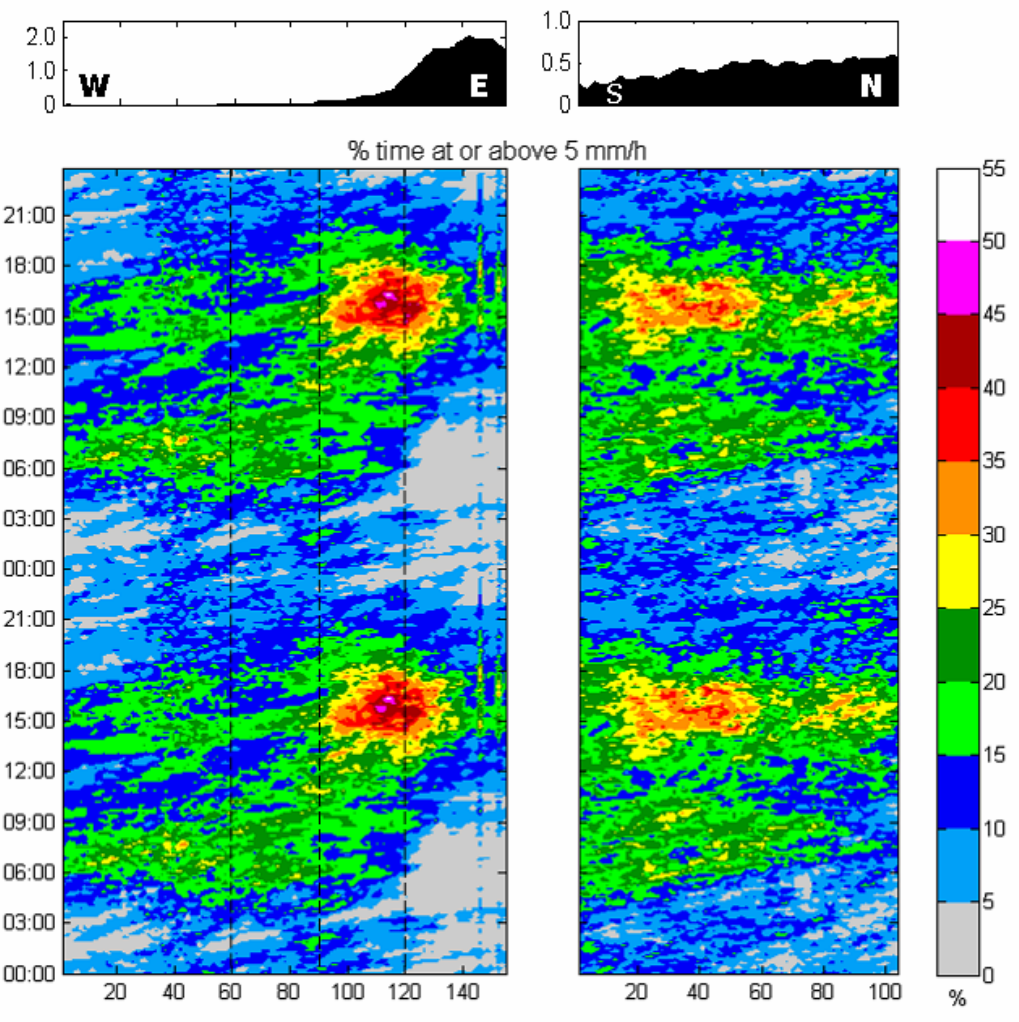
# Chong-Chi (Nick), Tong

## Precipitation Characteristics and associated Environment Regimes during SoWMEX/TiMREX

### Synoptic forcing




### Diurnal heating



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## National Central University

*Ya-Chien Feng – Radar refractivity with S-Pol

*Wei-Yu Chang – Team R calibration and attenuation correction

## Chinese Culture University

*Shao-Chin Hwang – Sounding quality control

Ya-Chien, Feng

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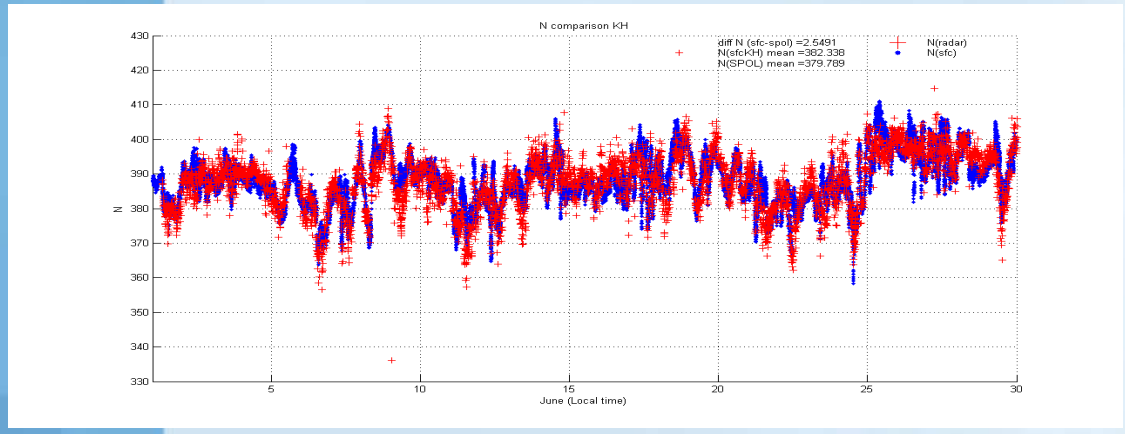
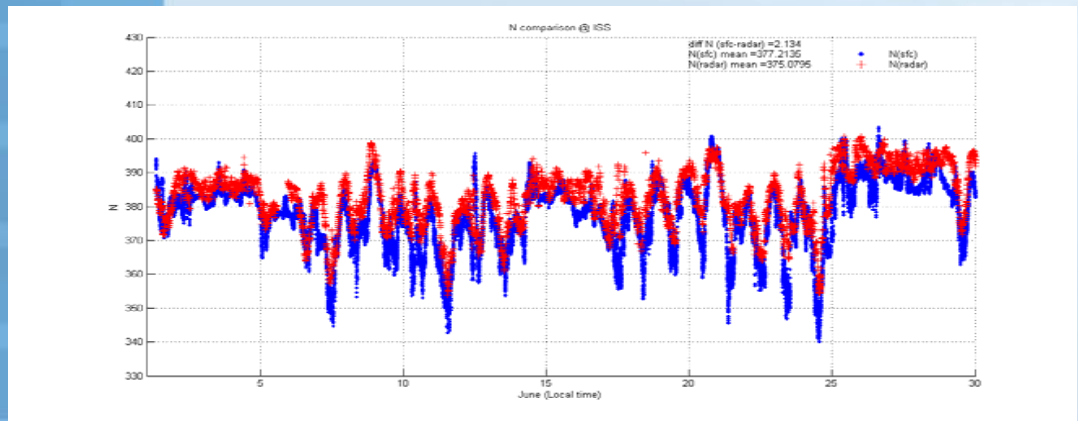
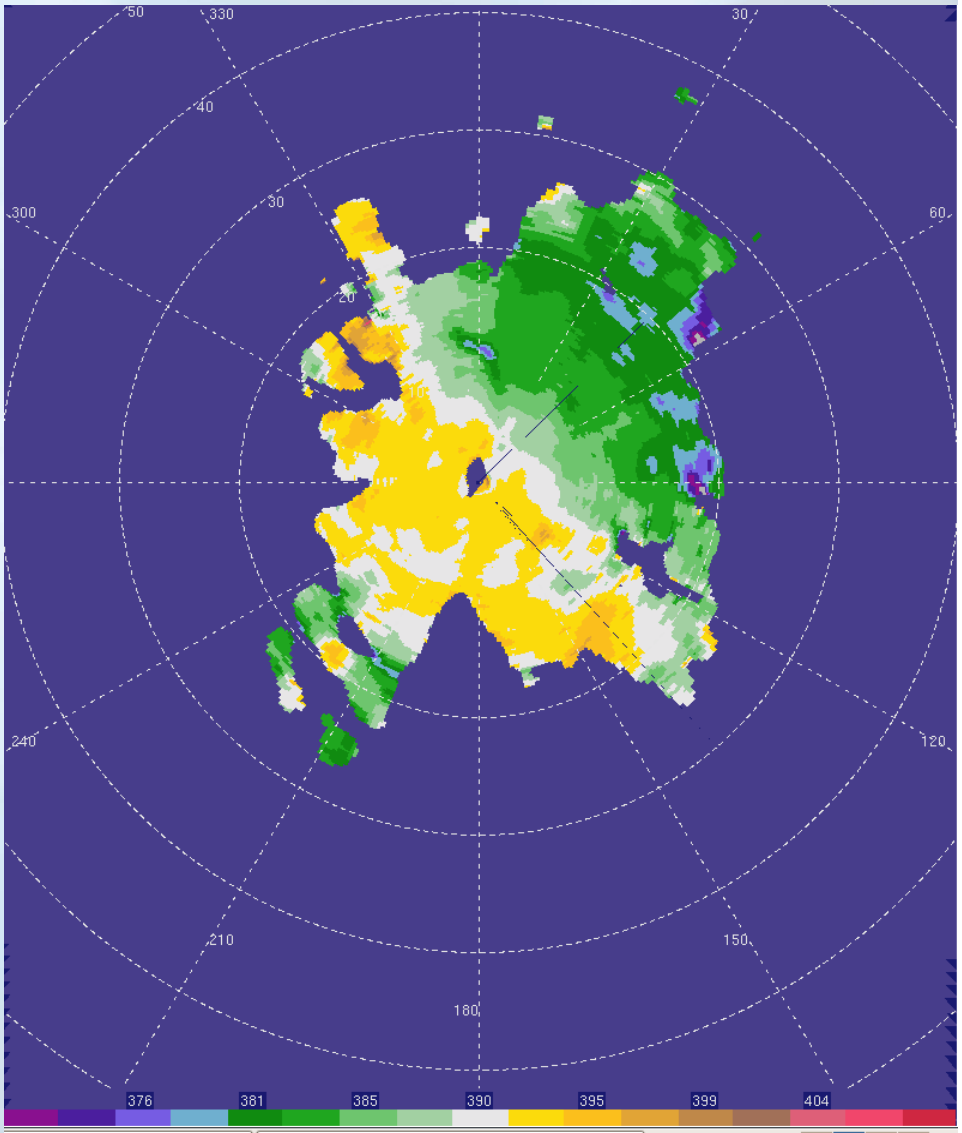
# Refractivity retrieval

## Comparison to stations



# NCAR STEP PROGRAM

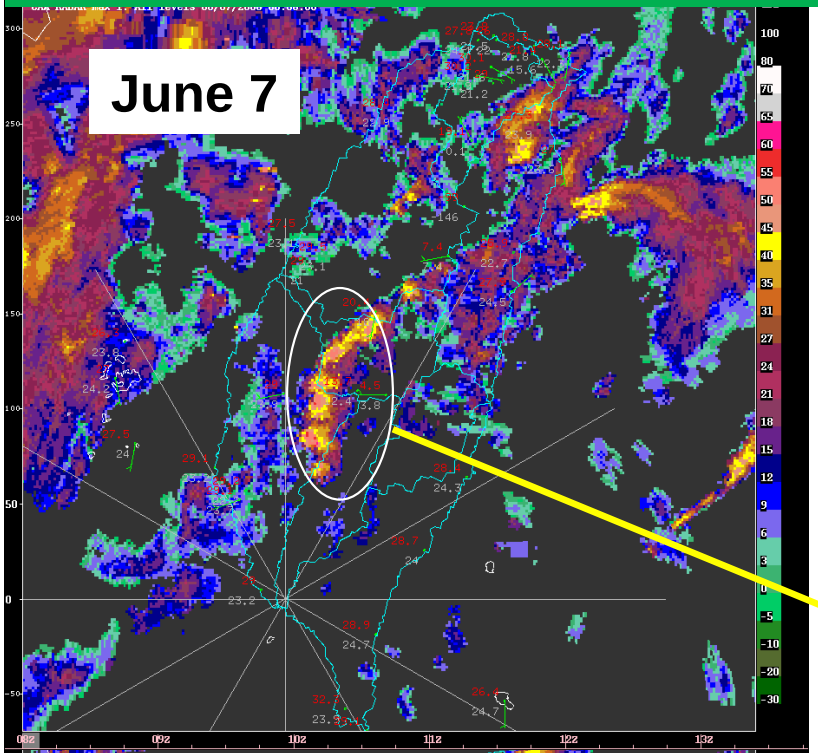
A priority - orographic convective precipitation with emphasis on Taiwan

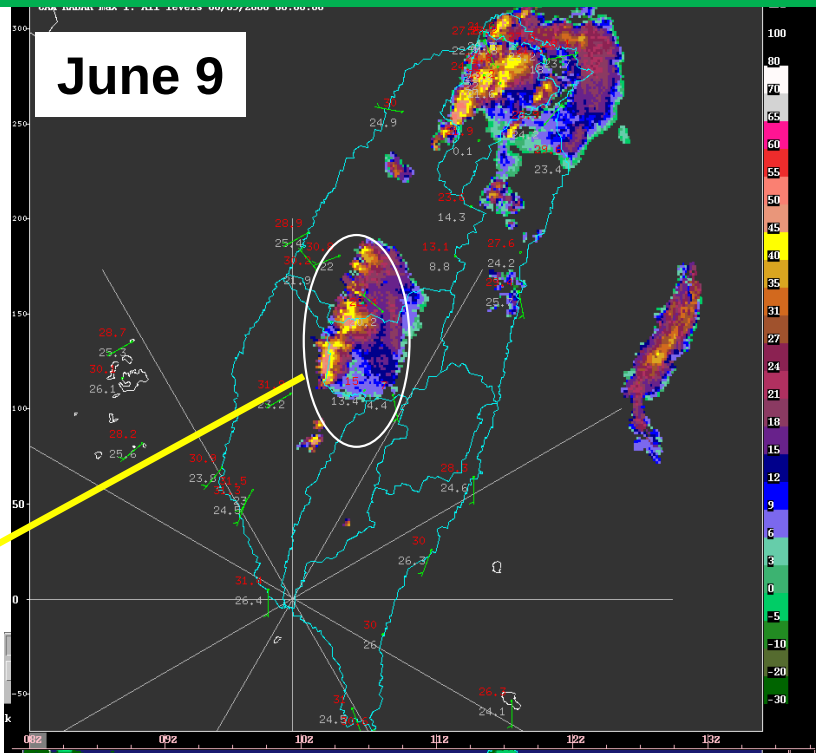
Chris Davis - Dependence of rainfall location and intensity on environmental parameters and mesoscale flow features

Jim Wilson and Tammy Weckwerth - Understand meteorological conditions that produce heavy rain over Taiwan

Rita Roberts and Jenny Sun – Develop analysis tools and conceptual models for nowcasting heavy rain over Taiwan

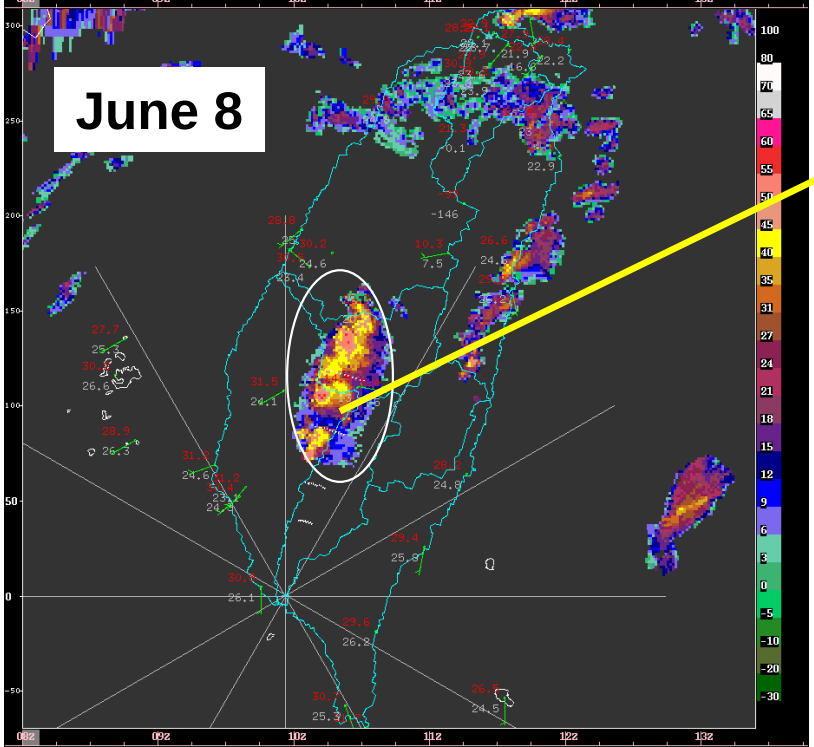
# Understanding

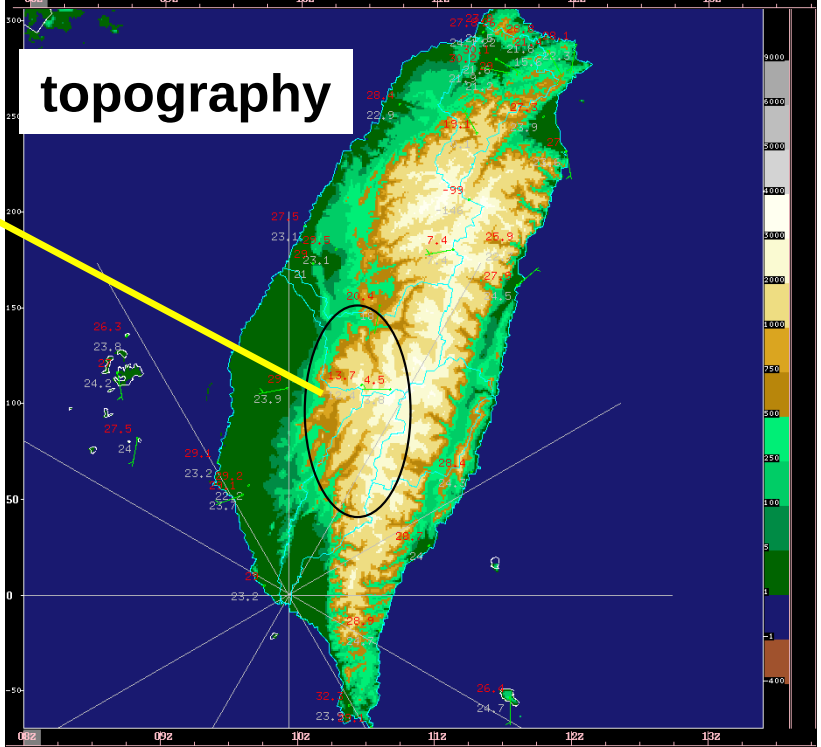



S-Pol
Radar
Reflectivity

**08 UTC**
**Same Place**

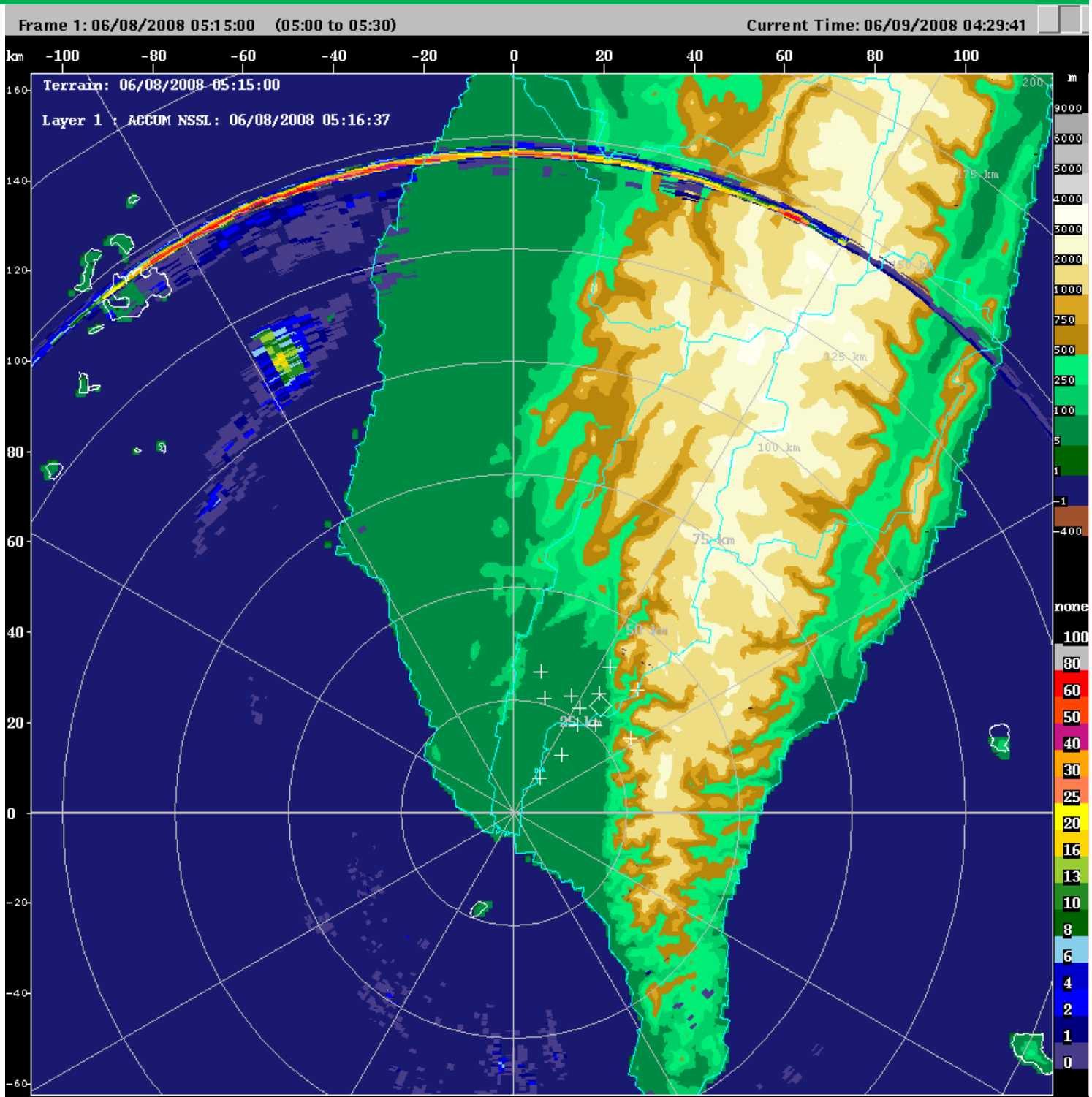


# Observation Tools

NSSL Precipitation Accumulation

Low level winds are south south west



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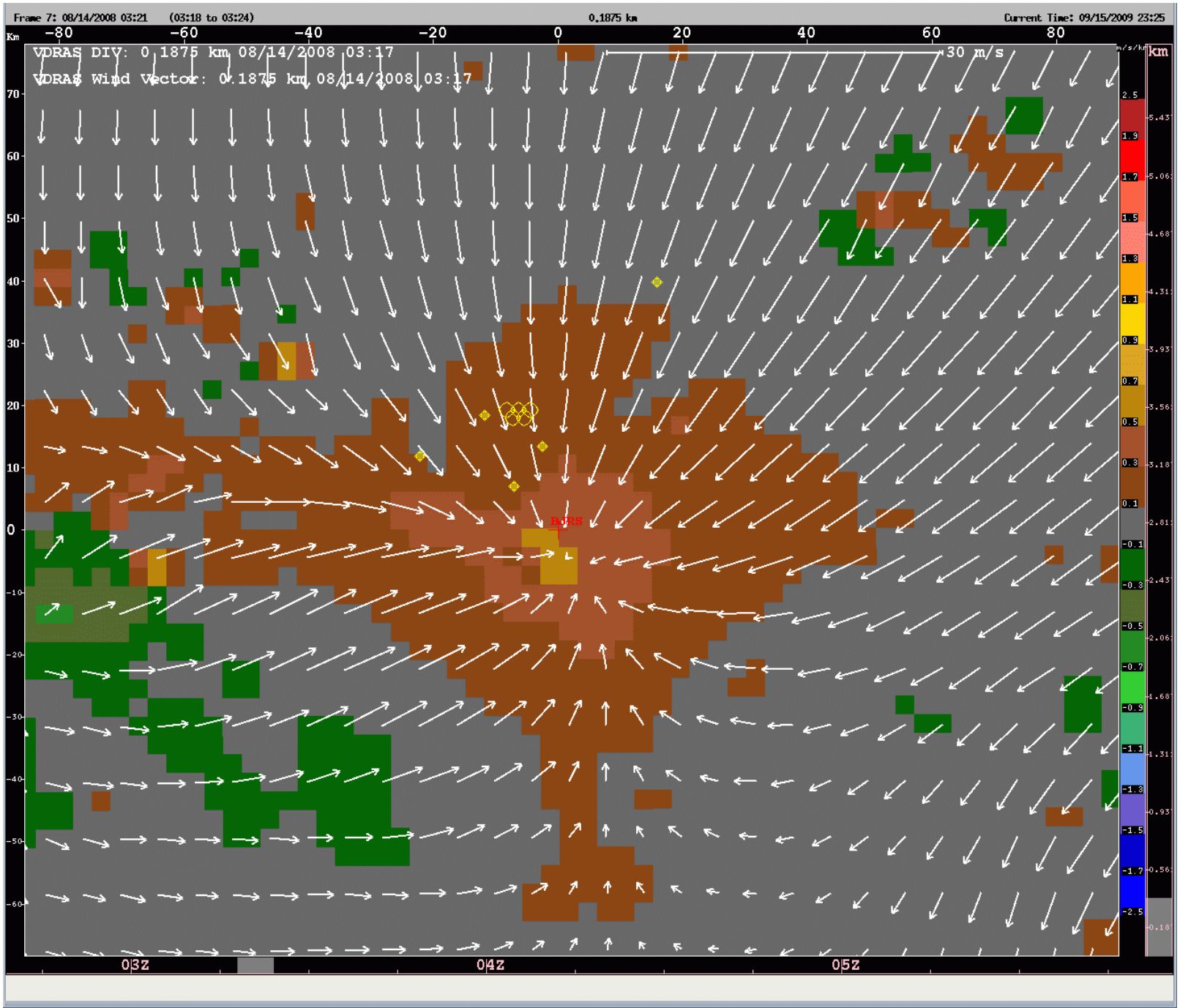
# Observation Tools

## VDRAS Divergence field from Beijing at 1117 local 14 Aug 2008

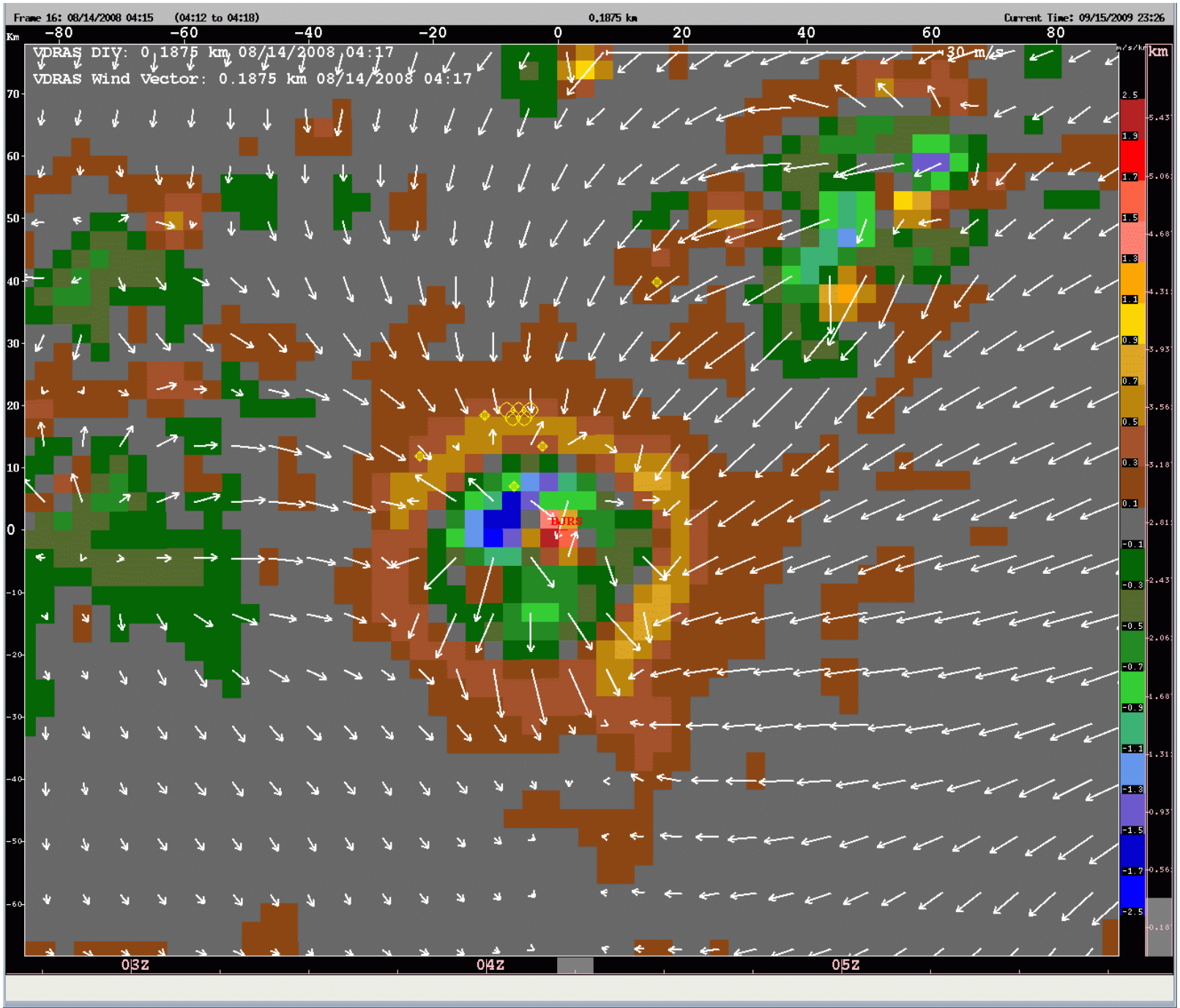
Browns are convergence



# Observation Tools

## VDRAS Divergence field one hour later

Greens and blues divergence



# Collaboration

## CWB

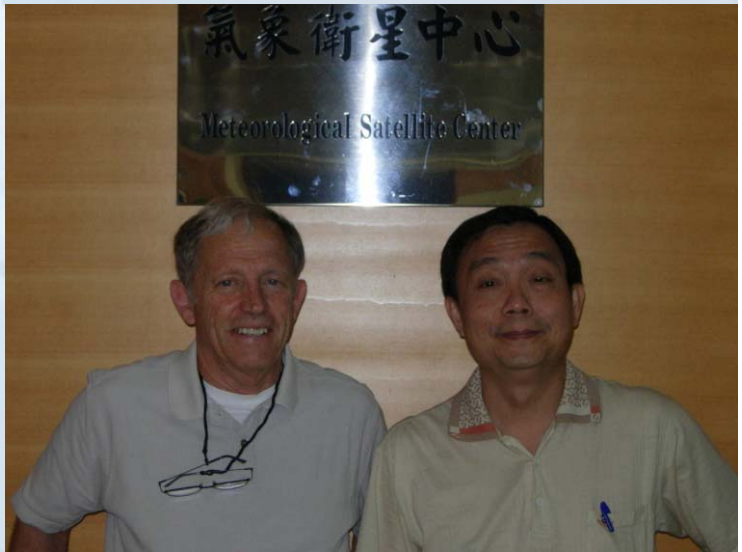
## NCAR

**Visited NCAR for 1 month during summer**

Pao-Liang Chang
Meteorological Satellite Center

Fu-Tien Tsai
Meteorological Forecast Center

**Visited CWB for week in June**



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# Visit to Melbourne Florida National Weather Service Forecast Office


Also visited - National Hurricane Center
- Denver National Weather Service Forecast Office

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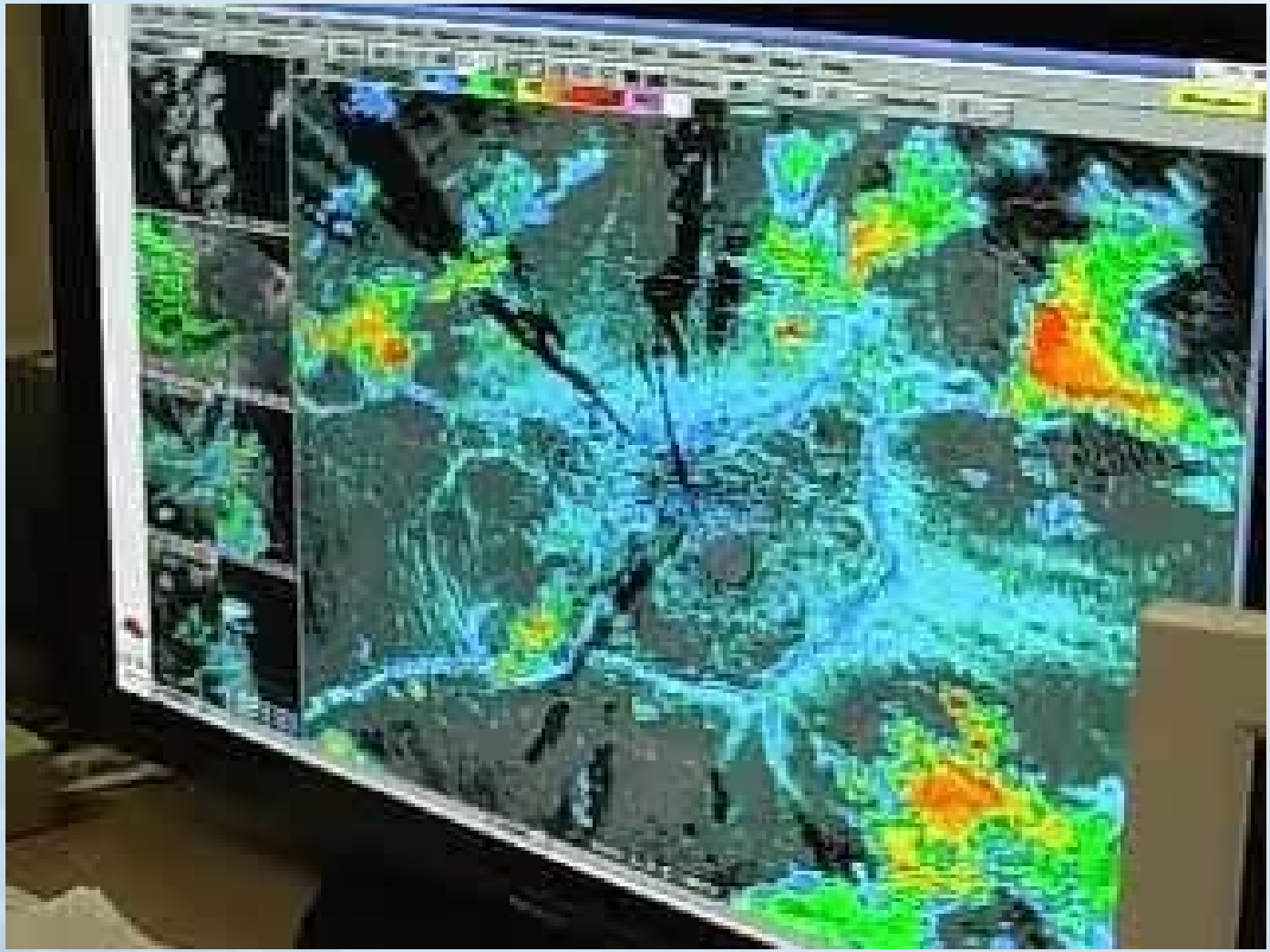
# A Day in the Life of a Florida Forecaster



# Summary

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## Success requires:

High resolution, high quality observations
High resolution, high quality observations
High resolution , high quality observations

Meteorological understanding
Meteorological understanding
Meteorological understanding

Training
Training
Training

# DOESHA (Xie xie)