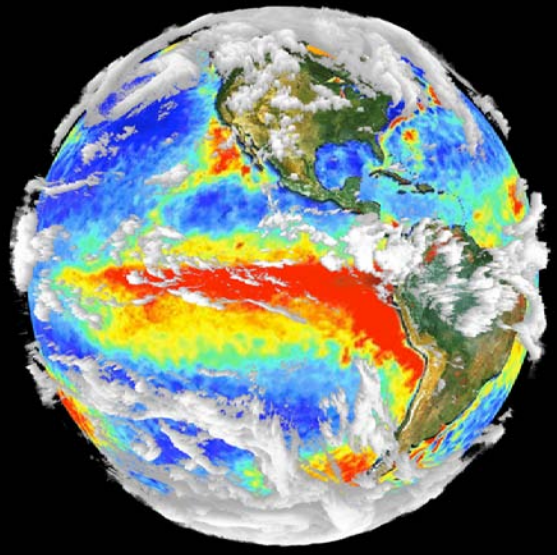
UCLA JIFRESSE JPL

Update on Data Assimilation in Support of Evaluation of Fast Processes in Climate Models:



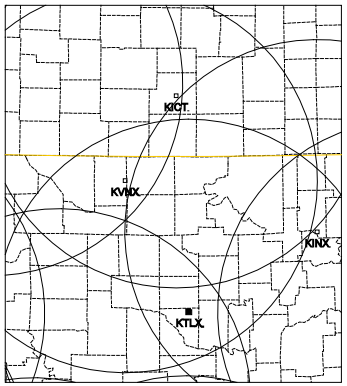
Zhijin Li

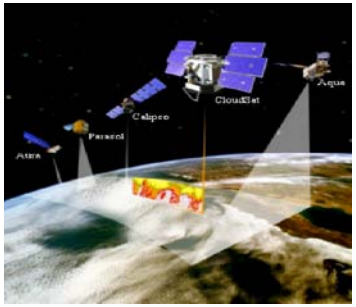
ASR Meeting, FASTER Breakout, March 15, 2010

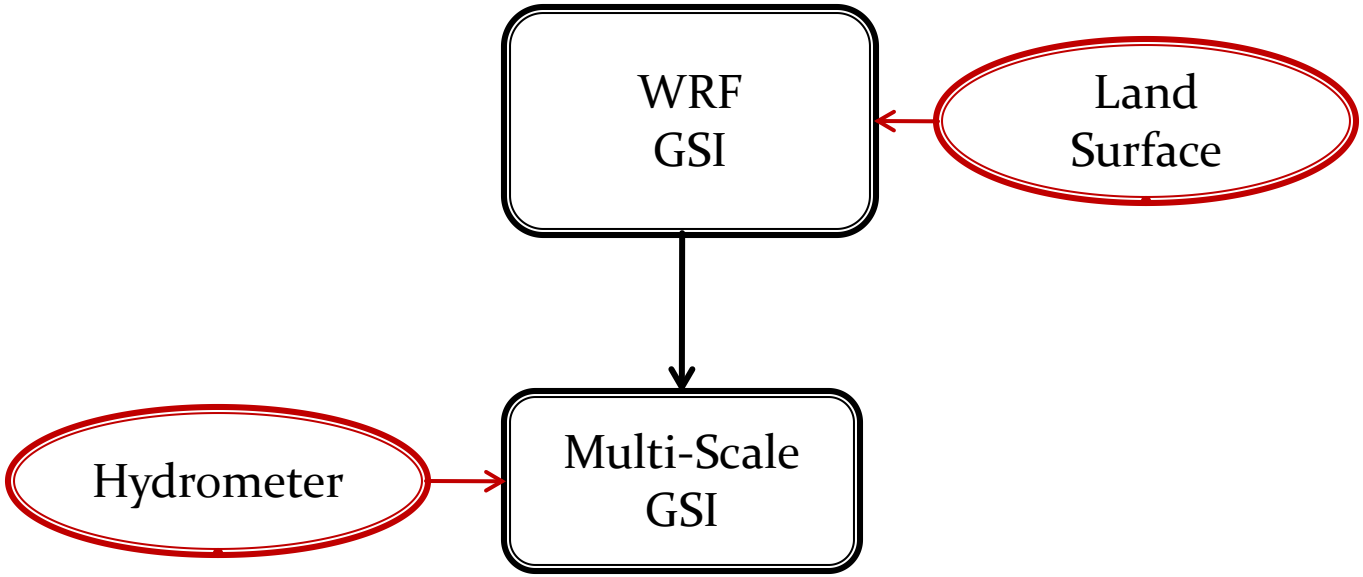
Outline

1. Road map for data assimilation system development
2. Testing WRF GSI data assimilation system
3. Land surface data assimilation
4. Satellite instrument simulator
5. Summary

Data assimilation: Augumented WRF GSI





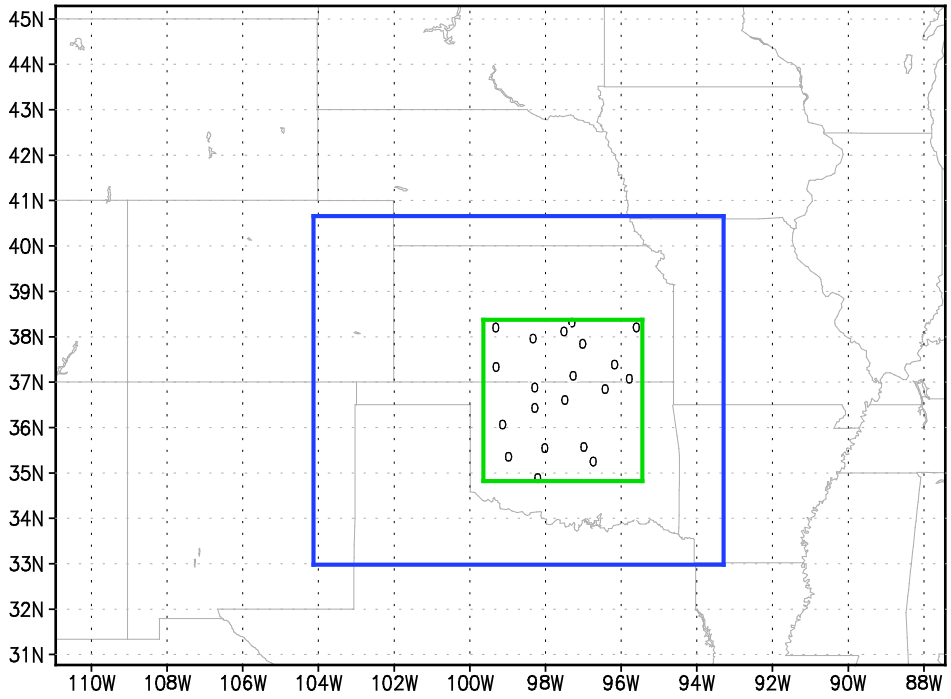


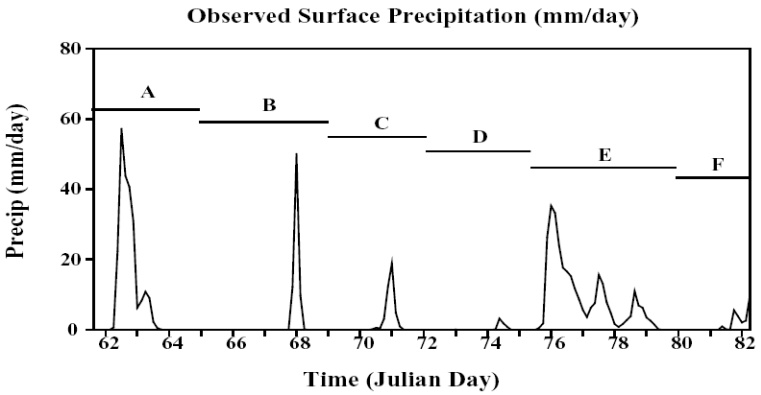
Features of GSI (Grid Space Intepolation)

1. A 3DVAR scheme developed by NCEP with the latest release last Month
2. Capability of assimilating a variety of satellite clear radiances
3. A package for computing hydrometeors from Doppler radars

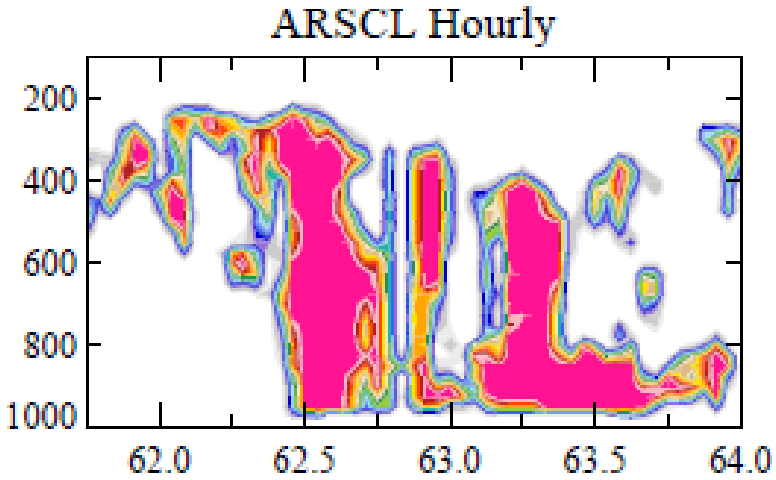
Model Domains and Warm-Up Cases

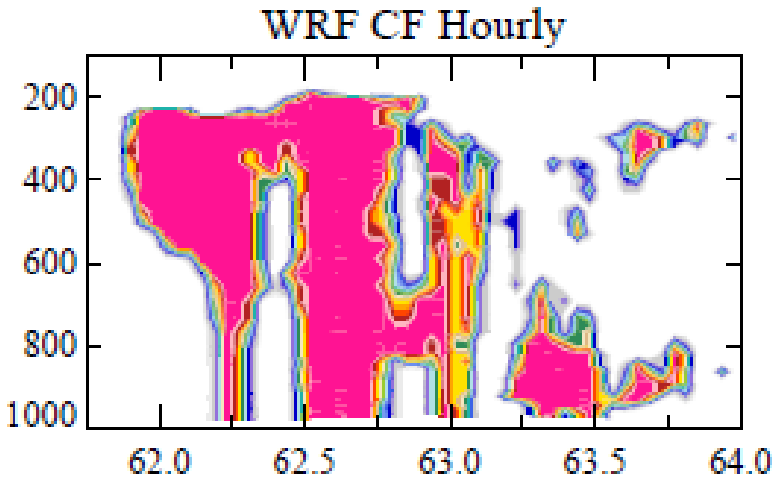
Model Domains

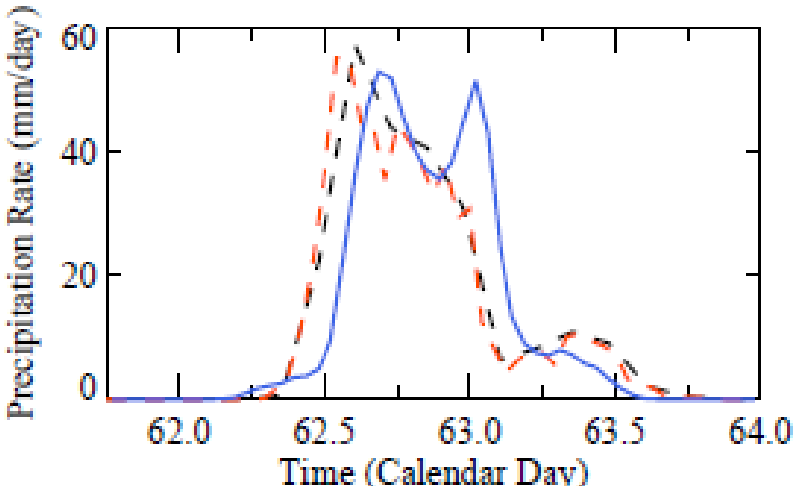


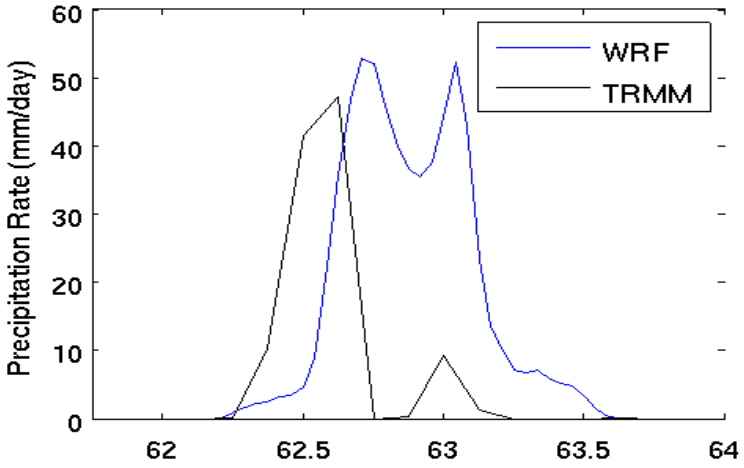


Cloud Fractions and Precipitation







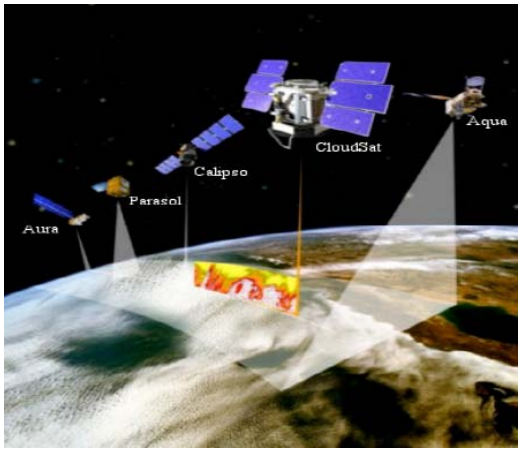


Test TRMM instrument simulators

1. Precipitation radar reflectivities (5km): precipitating liquid water and large frozen condensates

2. Microwave bright temperatures (5km): small precipitation-sized ice particle

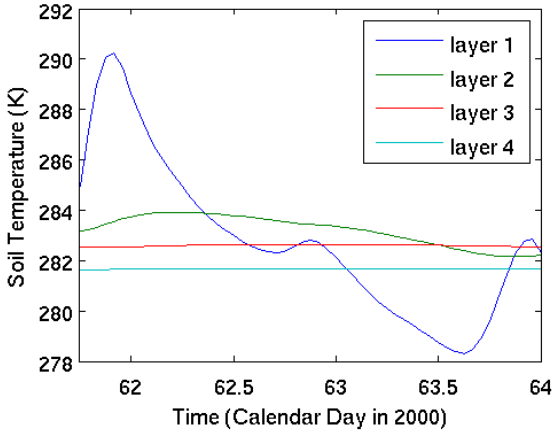
3. Infrared bright temperatures (2.2km): cloud top

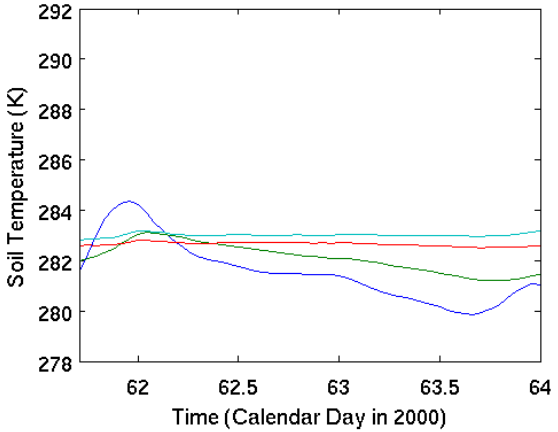


WRF Soil Surface Temperature and Moisture with ARM SWATS Observations

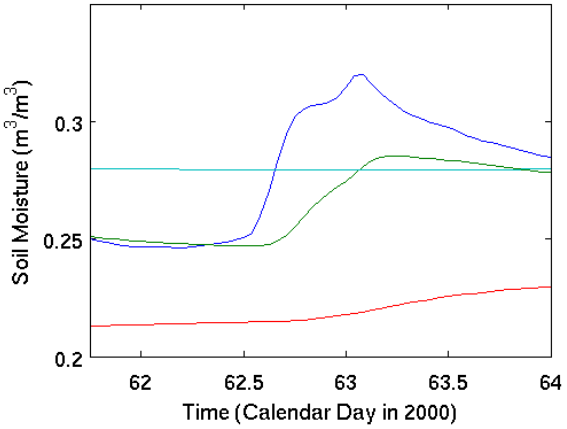
WRF **Observation**

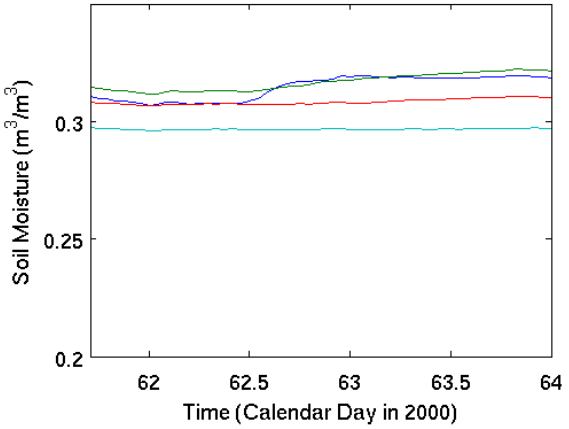
Temperature



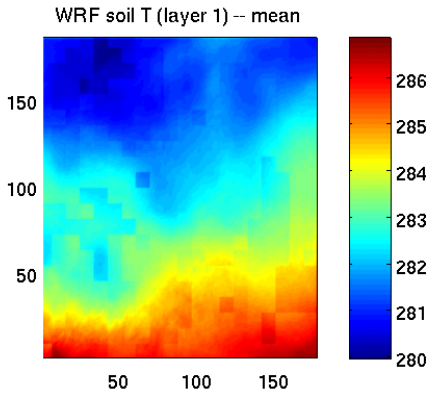


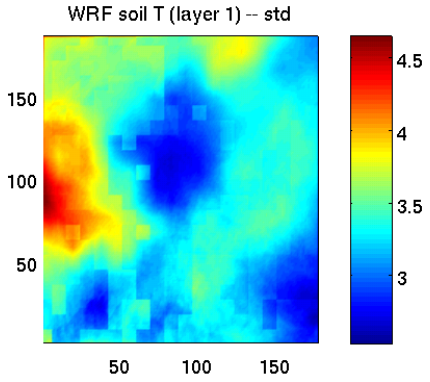
Moisture

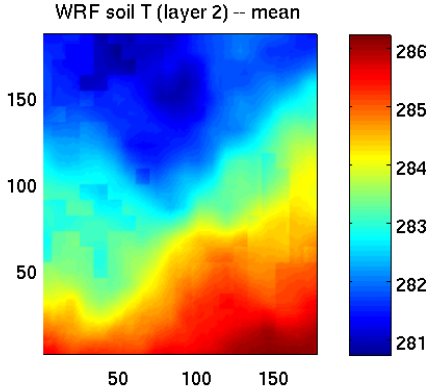


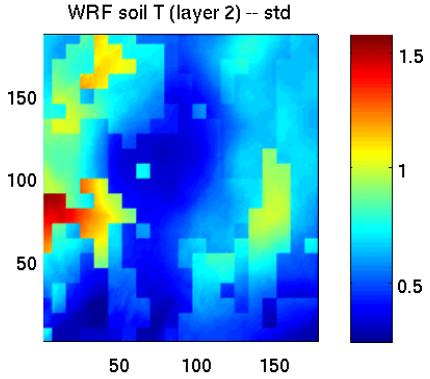


WRF land surface Temperature and Moisture



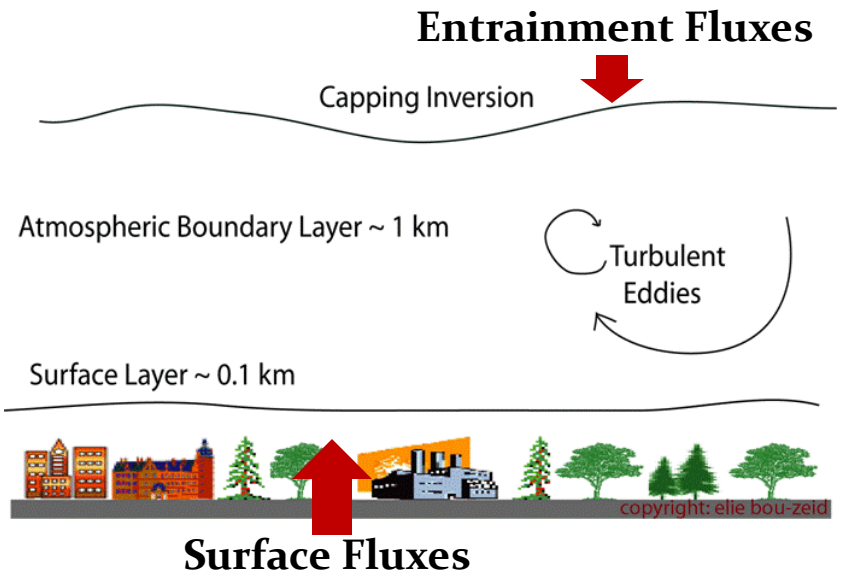






Develop Land Surface Data Assimilation

1. ARM exceptional observations
2. A supplementary analysis system to GSI
3. Alapaty (2008) flux adjusting scheme



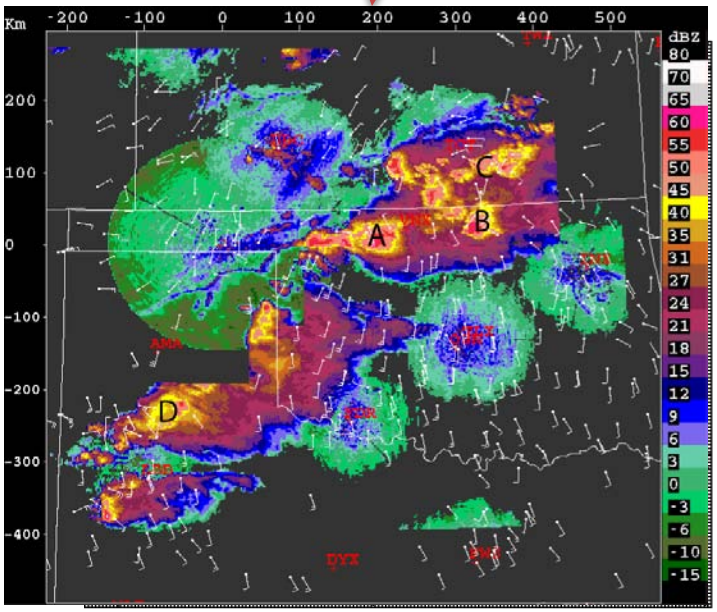
Summary

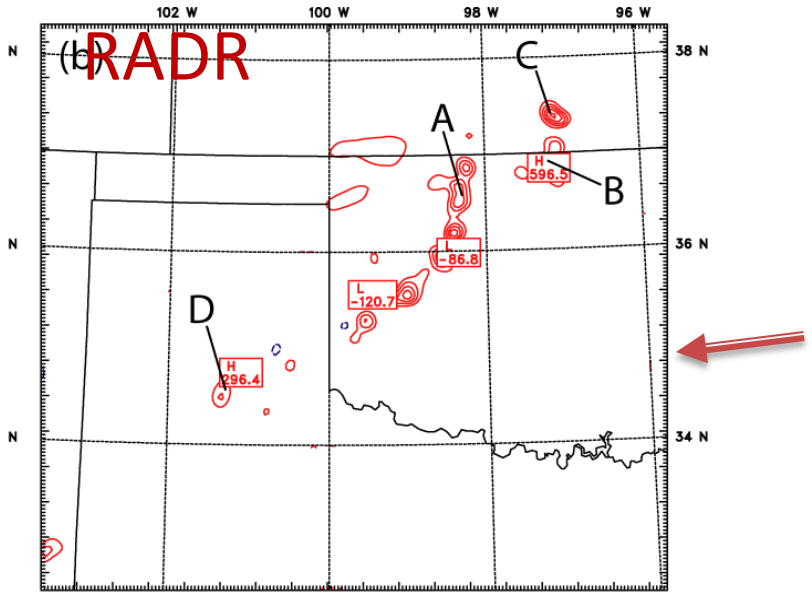
1. A model ready for implementation of data assimilation
2. Characterizing model errors
3. Testing GSI on-gong
4. Implementation of TRMM instrumental simulators leveraging a JPL group

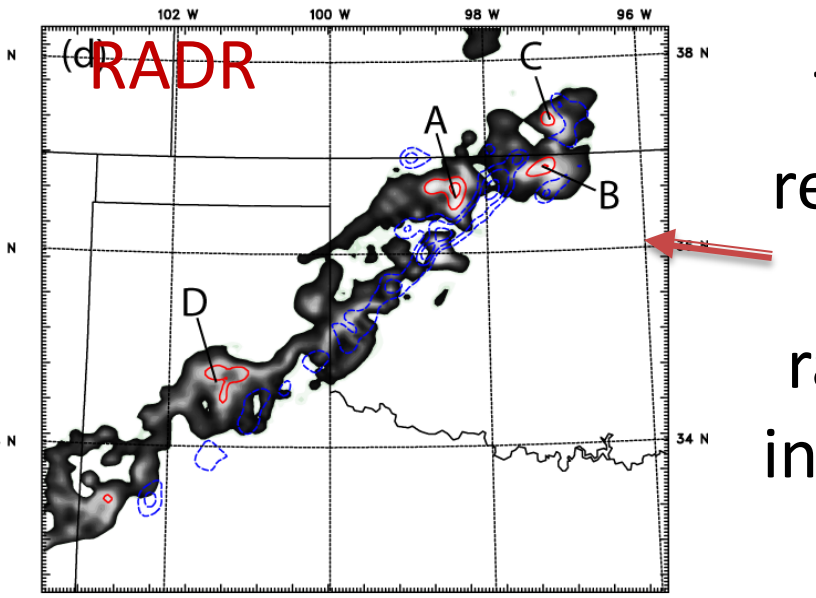
Backup

Assimilation of Doppler Radars Observations

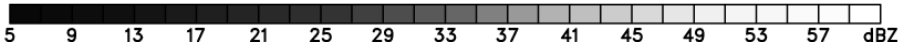
OBS







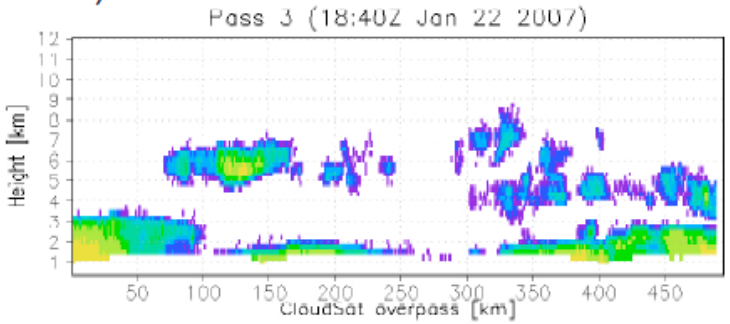
700 hPa reflectivity and rainwater increments



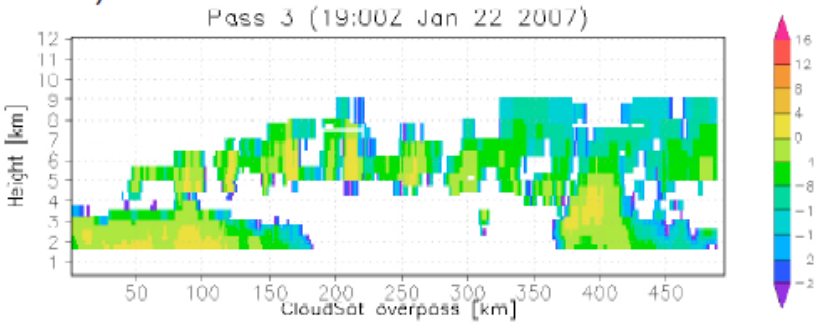
(Xiao and Sun 2007 in *Mon. Wea. Rev.*)

Leverage on the JPL Instrument Simulator Suite for Atmospheric Remote Sensing (ISSARS) Project

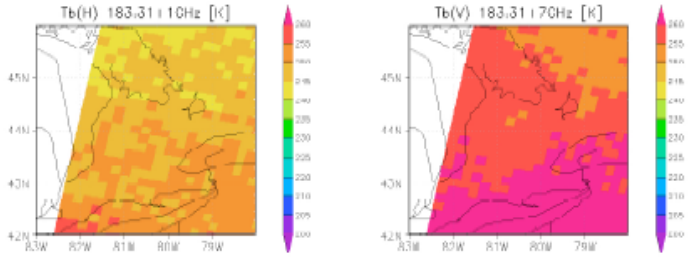
a) CloudSat observation



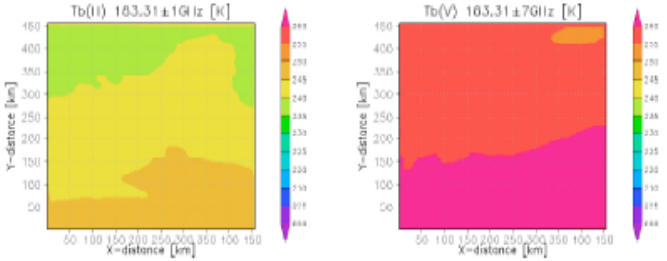
b) WRF-simulated CloudSat



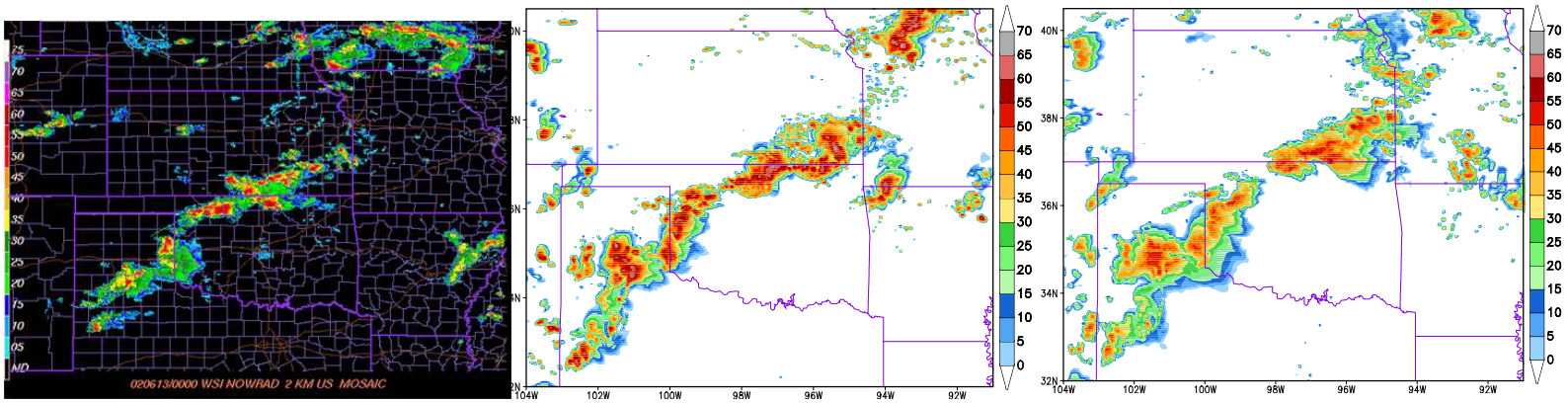
c) AMSU-B observation



d) WRF-simulated AMSU-



Simulation



Simulated radar reflectivity (in dBZ) for the IHOP case. (left) represents the observed WSR-88D reflectivity at 00UTC 13 June 2002 (Source: NOAA/NESDIS Satellite and Information Service). Note that these images are a vertical composite of reflectivity and depict the highest reflectivity measured over each point on the Earth's surface. (middle) and (right) are from the WDM6 and WSM6 experiments, respectively. The reflectivities were calculated from model-simulated precipitation particles (rain, snow and graupel). The results plotted are from the 2nd domain (i.e., 3-km resolution) in order to show the full aerial extent of the convective system.