

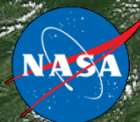
The NASA Short-term Prediction Research and Transition (SPoRT) Center: Opportunities for Collaboration in the Great Lakes Region

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transitioning unique NASA data and research technologies to operations



The SPoRT Center

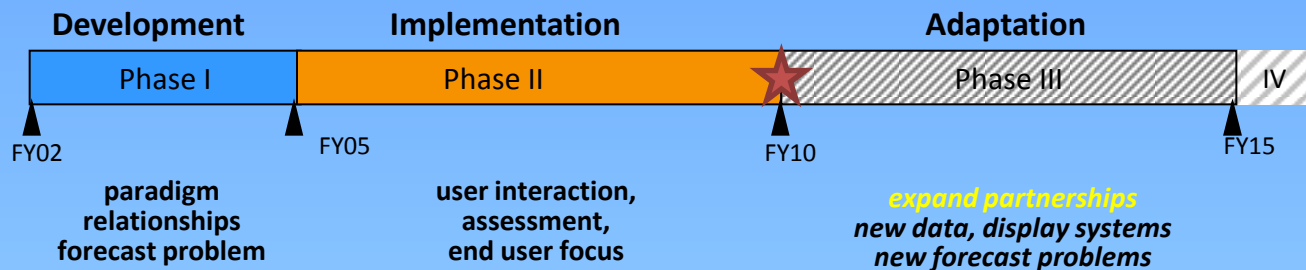
- SPoRT is a NASA project to transition unique observations and research capabilities to the operational weather community, to improve short-term forecasts on a regional scale.
- Located at NASA Marshall Space Flight Center
 - Huntsville, Alabama
 - Within the MSFC Earth Science Office
 - Collocated with the NWS WFO in Huntsville, AL, the University of Alabama in Huntsville (UAH).
 - Combination of NASA scientists, UAH employees, contractors, graduate students and staff.



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History and Future of SPoRT



Phase I: Development

- Partnership with WFO Huntsville to identify local forecast problems, relevance of NASA data, and best means of integrating within forecast operations.

Phase II: Implementation

- Expansion within Southern Region, integration of NASA data within local forecast models, extensive development of product training and assessments.

Phase III: Adaptation

- Currently, SPoRT is expanding beyond NWS Southern Region, seeking new collaborations with operational forecasters where NASA data can provide value.
- Met with SSD regional chiefs and hosted a WFO workshop for Southern Region.
- SPoRT is currently exploring opportunities in the Great Lakes region.

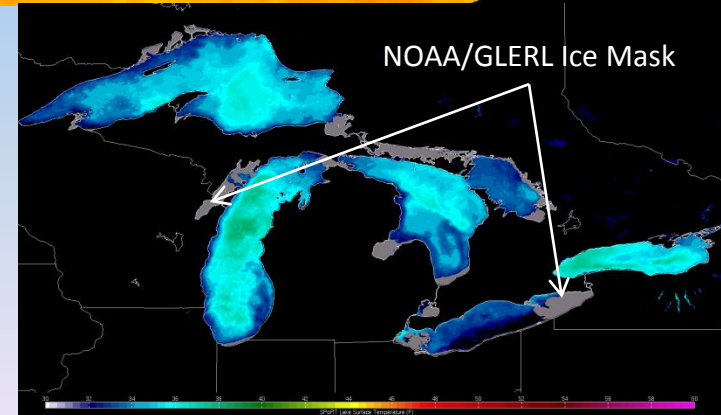
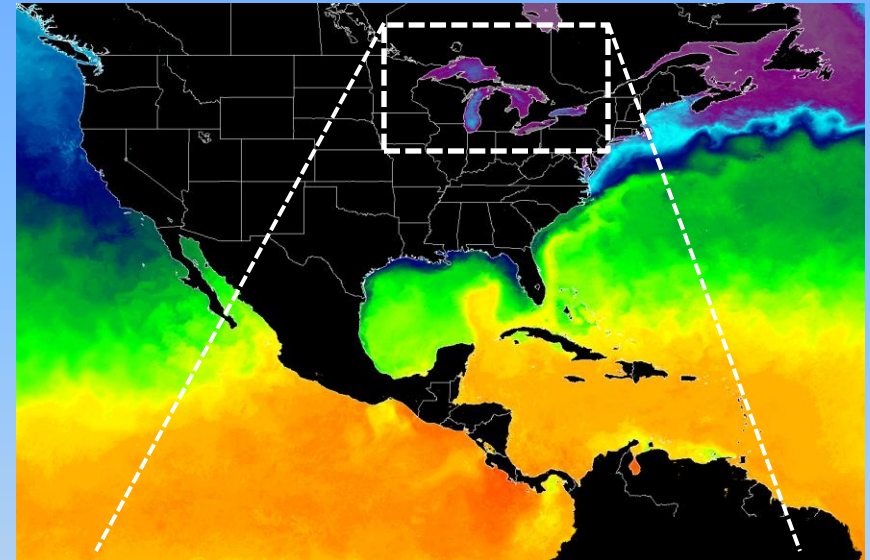


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Great Lakes Applications

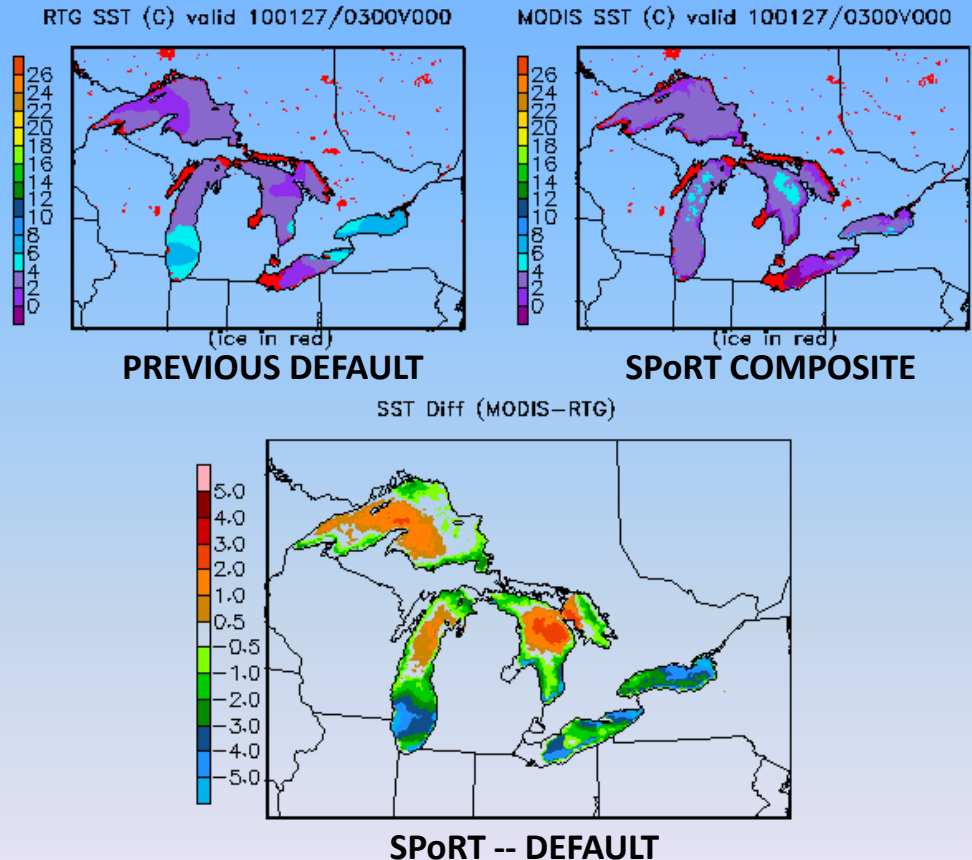
- SPoRT currently produces a Great Lakes surface temperature composite.
 - Incorporates MODIS, AMSR-E and other thermal infrared imagery as available.
 - Resolution of 1 km.
 - Latency varies with cloudiness but typically less than 7 days.
- The SPoRT SST product is the **current default** within the latest WRF-EMS release.
- Download the WRF-EMS, install, and run.
 - Data provided online via the SPoRT FTP.
- SPoRT has contributed code changes to allow for the inclusion of the Great Lakes product.
 - Includes the NOAA/GLERL ice mask for a complete physical representation of Great Lakes surface characteristics.



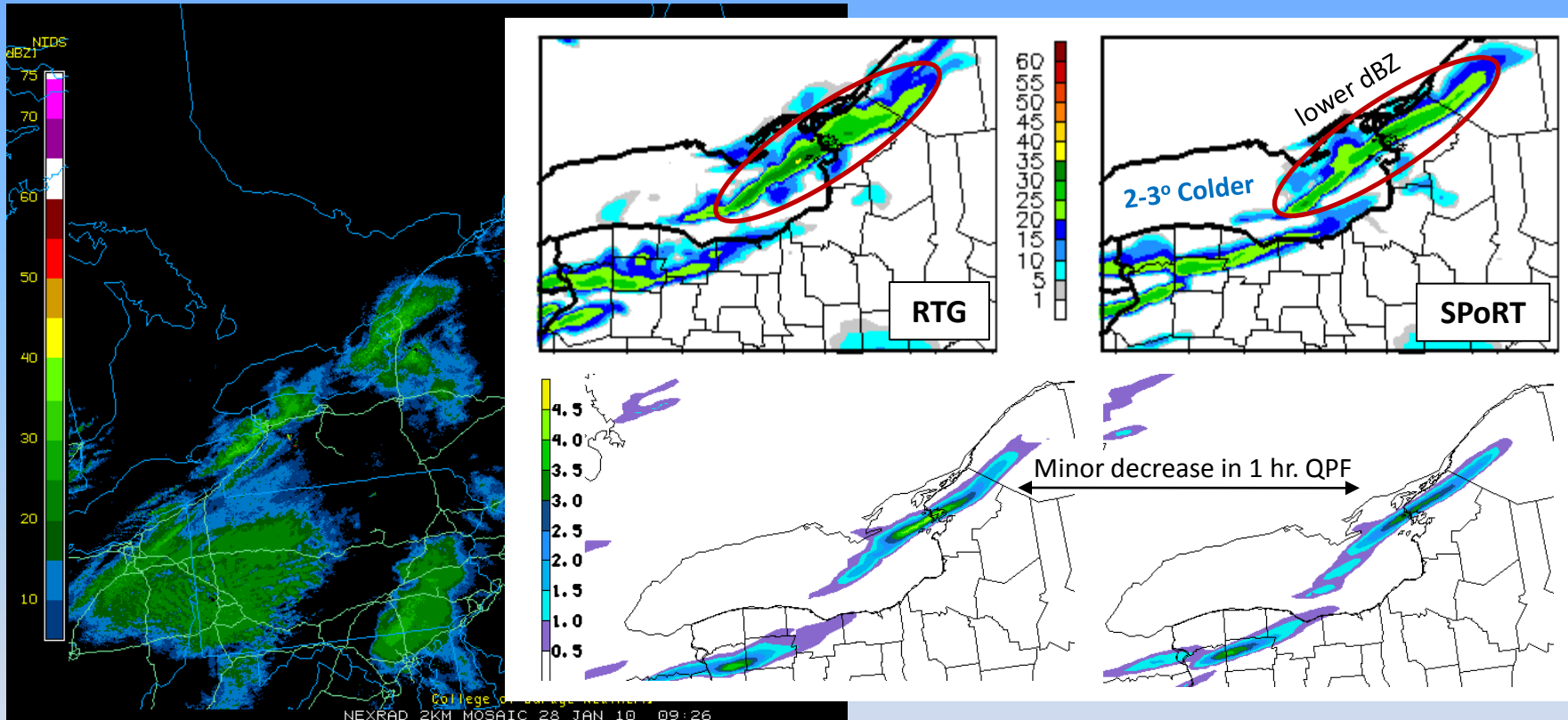
Great Lakes Forecasting Issues

- The SPoRT paradigm:
 - Forecasters identify their local challenges.
 - SPoRT researchers pursue NASA data relevant to their needs.
- Forecast challenge:
 - Lake effect precipitation
- SPoRT Solution:
 - Incorporate high resolution lake temperature and ice fields within the WRF-EMS.

January 27-28, 2010: “Lake Effect Storm Echinacea” WFO Buffalo, NY



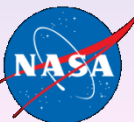
Applications to the WRF-EMS



January 28, 2010: “Lake Effect Storm Echinacea”
1/28 NEXRAD at 0930 UTC vs. 6-Hr. WRF Forecast

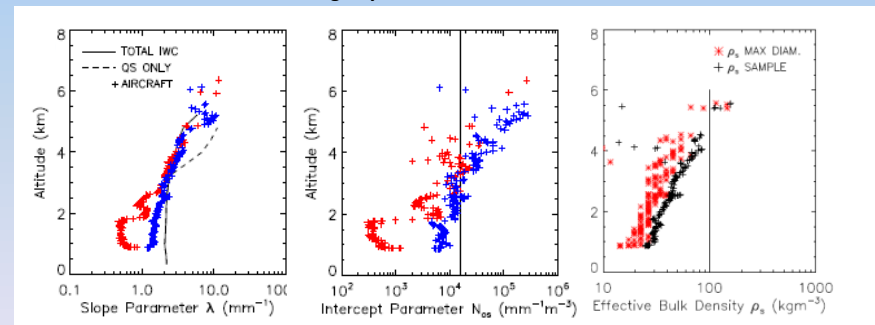
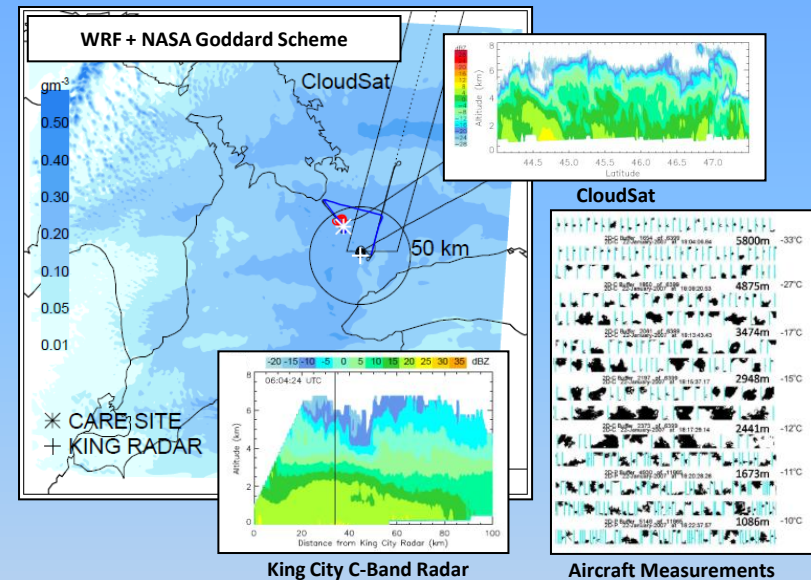
Application of NASA Data:
Implement MODIS temperatures
within high resolution WRF forecasts.

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Precipitation Science

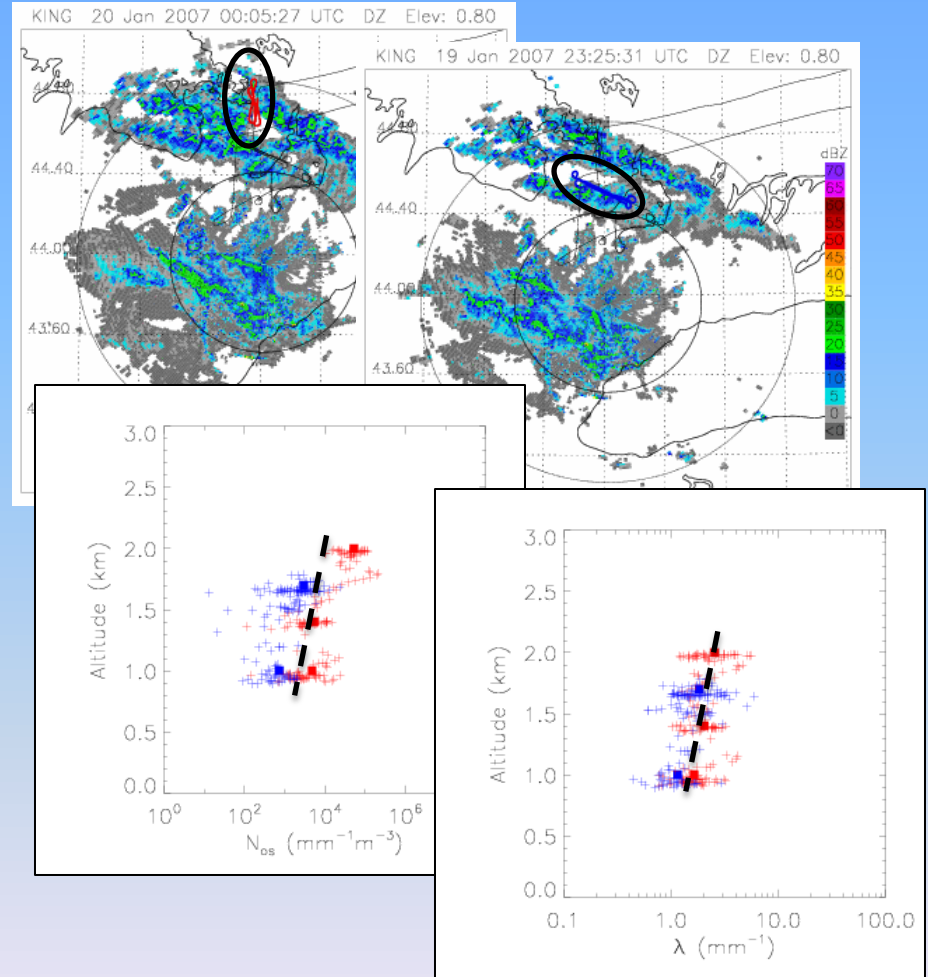
- SPoRT has also leveraged NASA participation in field campaigns to explore the assumptions of cloud microphysics schemes.
- Canadian CloudSat/CALIPSO Validation Project (C3VP)
 - Obtained aircraft observations of snow crystals and sizes
 - Determine capabilities of NWP in representing ice water content, size distribution
 - Evaluation via radar remote sensing and other instruments
 - Observations from synoptic and lake effect cases



Snow Crystal Size Distributions and Bulk Density vs. Assumptions

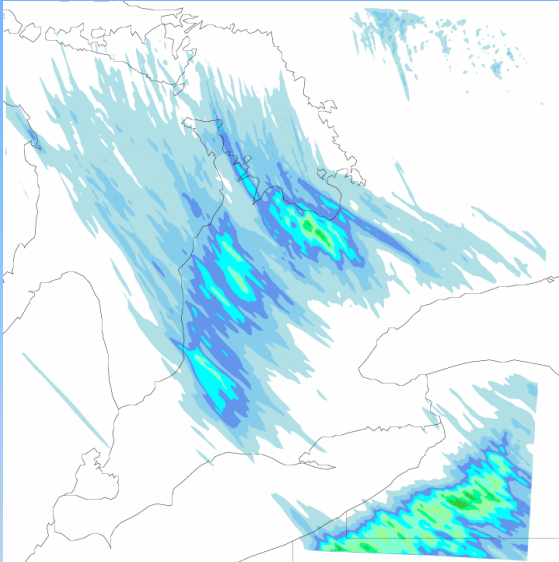
Lake Effect Precipitation

- C3VP data are also available for lake effect snowfall cases.
- Challenge:
 - Significant variability within and along the sampled bands.
 - Less likelihood of an along-track sampling by CloudSat.
- Field campaign data can be leveraged to:
 - Guide selection of a representative scheme.
 - Modify schemes based on new data when appropriate.

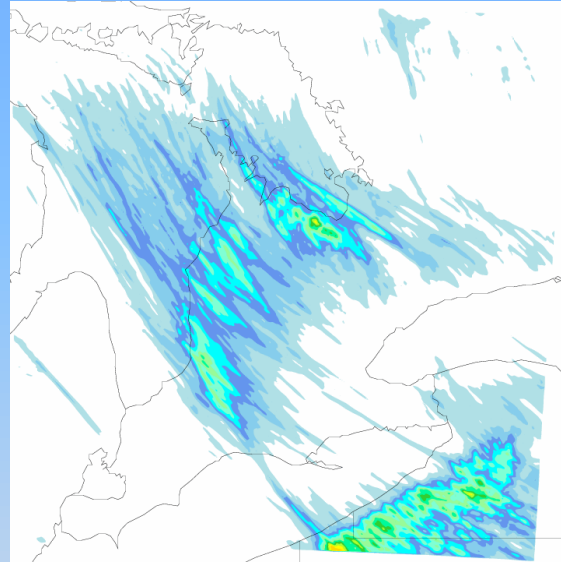


Sensitivity to Microphysics

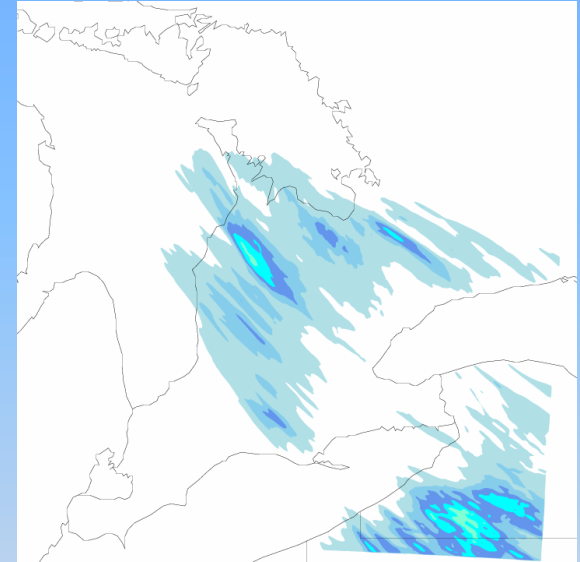
Storm total precipitation (mm) for a 36-hr. simulation of the C3VP Lake Effect event.



NASA Goddard Scheme



WRF Scheme (WSM6)



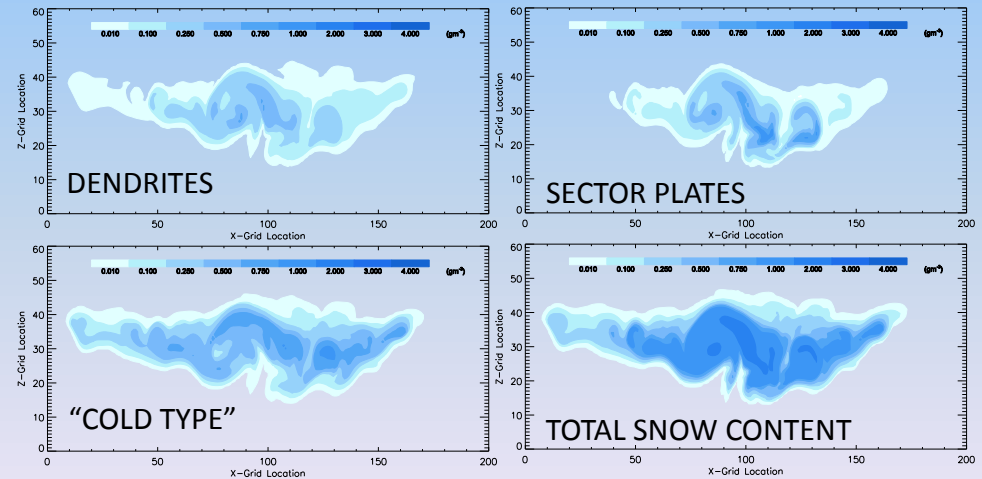
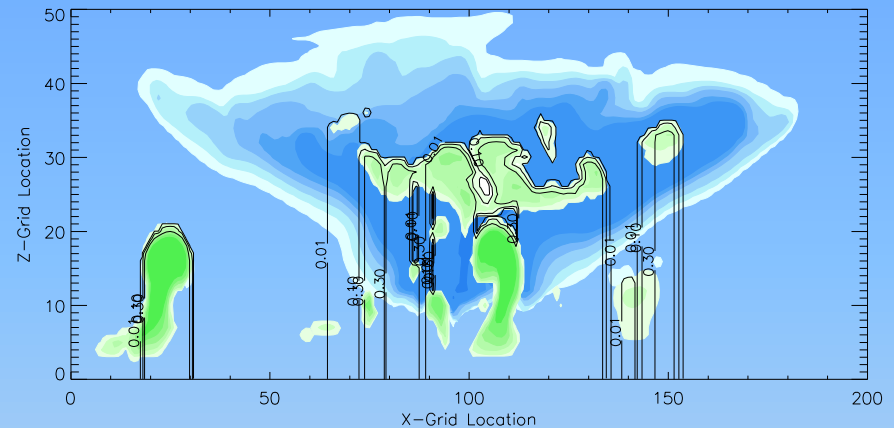
Thompson Scheme

Pending research questions:

- Which scheme(s) best represent particle size distributions, fall speeds, and QPE?
- How does the length of individual bands or inland penetration vary with LST?

Exploring New Schemes

- SPoRT seeks to evaluate additional schemes within the community.
- SUNY Stony Brook
 - Lin and Colle 2009
 - Incorporates riming effects where snow and cloud water are present.
- University of Washington
 - Woods et al. 2008 and McCormick 2009
 - Habit prediction (up to 7) and special handling of riming for contributions to snow or graupel.

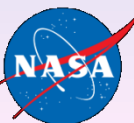


Opportunities for Collaboration

- SPoRT develops partnerships with WFOs and research groups.
 - Identify a forecast challenge, then applicable NASA data.
 - Develop a method to assess the product impact on the forecast or process.
 - Iterate to improve upon the utilization of NASA data.
 - Share results with the community via presentations or publications.
- Potential collaborations:
 - Utilization of Great Lakes temperatures in local NWP or regional ensemble efforts
 - Investigate sensitivities of QPF to model microphysics
 - Explore impact of lake temperatures on simulated lake breezes, convergence, and convective initiation.
 - Transition of additional NASA data to partner WFOs through AWIPS

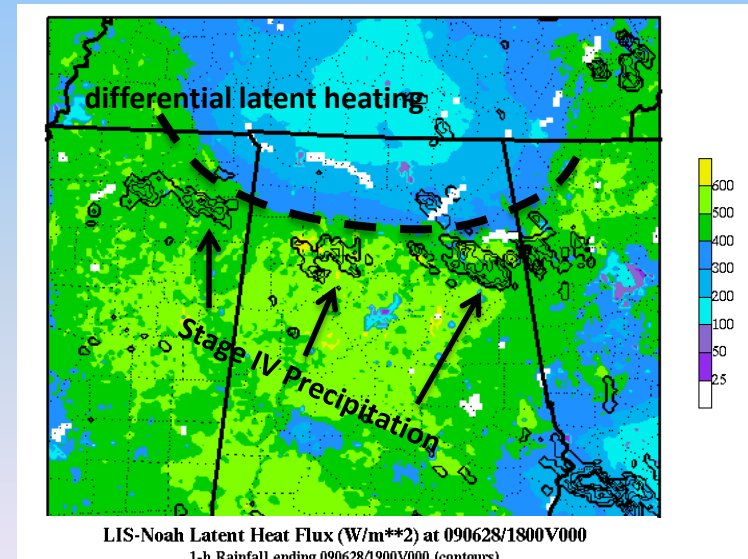
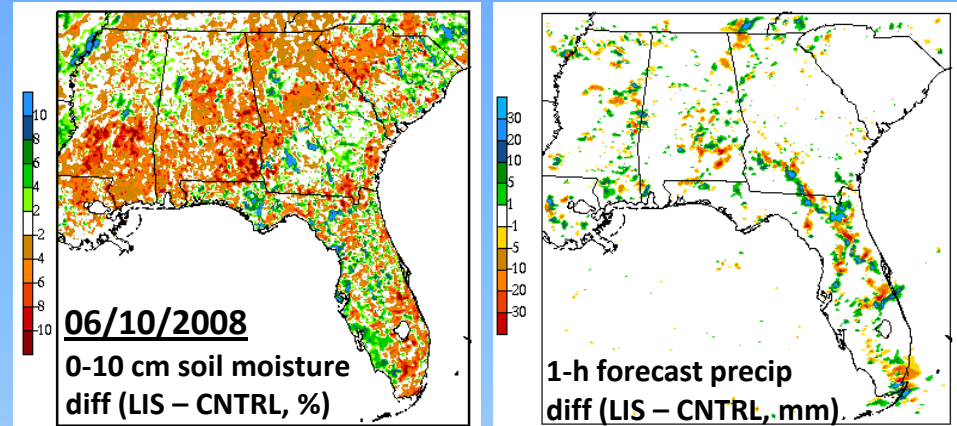


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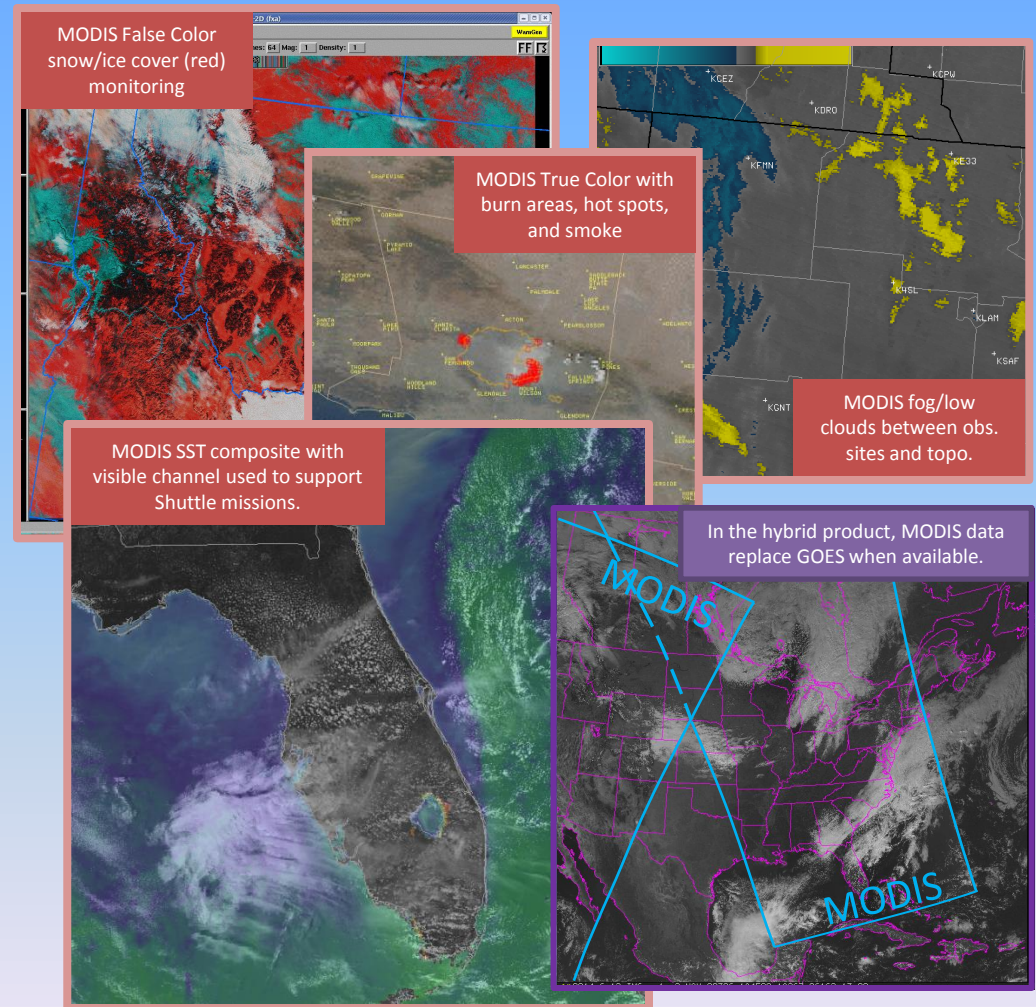
SPoRT Research and Development

- NASA Land Information System (LIS)
 - Provides high resolution depiction of soil moisture and vegetation characteristics.
 - Incorporates observed precipitation (Stage IV) or model QPF to improve land surface depiction for NWP applications.
 - Output fields available within AWIPS for diagnostic display.
 - Future plans to incorporate a MODIS vegetation composite.



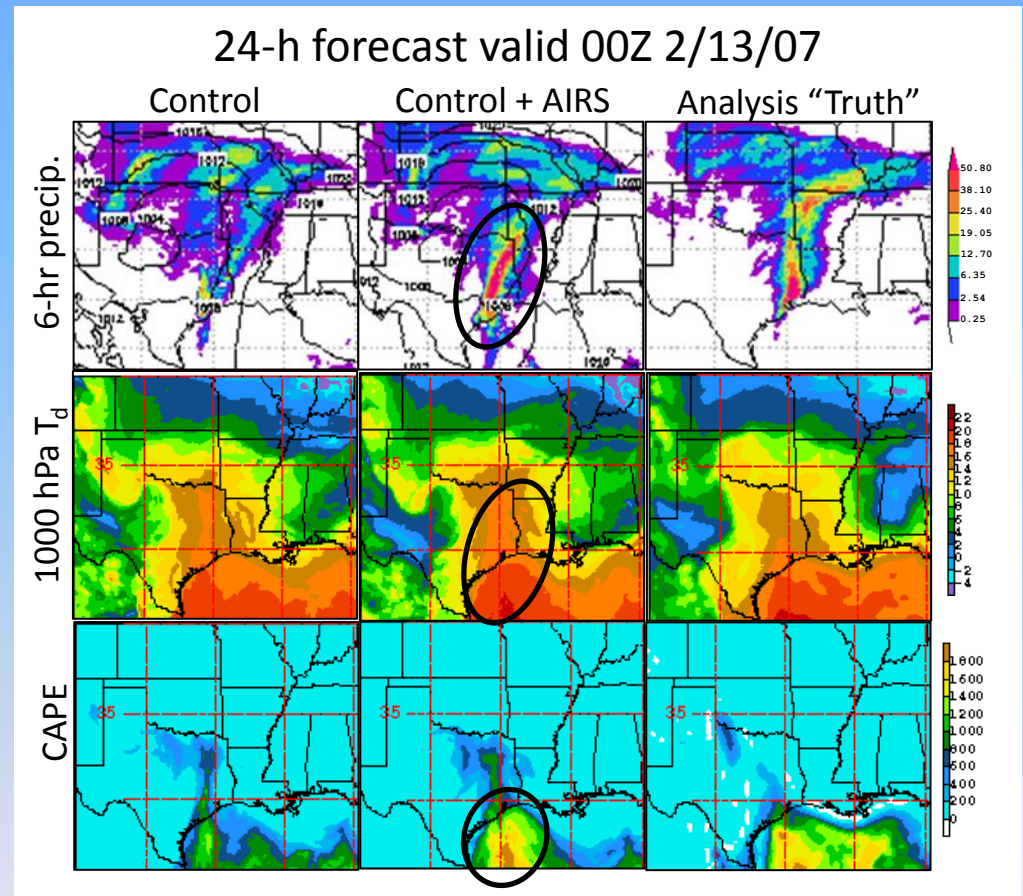
SPoRT Research and Development

- SPoRT provides several MODIS products to WFOs.
- Identifying ways for partner WFOs to utilize polar orbiting data.
 - High spatial resolution
 - Low temporal resolution
- Incorporating within AWIPS for use with other data.
- Hybrid product replaces GOES with MODIS when available.



SPoRT Research and Development

- Atmospheric profiles of temperature and moisture from hyperspectral sounders such as AIRS, IASI.
- These instruments can provide a three dimensional analysis
 - Estimate conditions between balloon soundings
 - Use to initialize forecast models
- In this case, AIRS improves the simulation of moisture return in TX/LA, resulting in an improved simulation of convection.

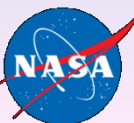


Summary

- The mission of SPoRT is to transition unique NASA data and research technologies to the operational forecasting community.
- Paradigm:
 - Data is not just “thrown over the fence”, we collaborate with partner WFOs to identify focused research projects where NASA data provides value.
- Several ongoing projects are relevant to the Great Lakes region and other regional forecast problems.



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Questions?

- Contact information:
 - andrew.molthan@nasa.gov
- SPoRT web page:
 - <http://weather.msfc.nasa.gov/sport>
- “The Wide World of SPoRT” collaborator blog:
 - <http://www.nsstc.uah.edu/sportblog>



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