SPoRT Report

Science Mission Directorate
National Aeronautics and Space Administration

Short-term Prediction and Research Transition (SPoRT) Center
NASA, Marshall Space Flight Center (MSFC), Huntsville, AL
http://weather.msfc.nasa.gov/SPoRT/

The SPoRT Center is a NASA funded project to transition unique observations and research capabilities to the operational community to improve short-term weather forecasts on a regional scale. While the direct beneficiaries of these activities are selected Weather Forecast Offices (WFOs) in the Southern Region, the research leading to the transitional activities benefits the broader scientific community.

Quarterly Highlights

Land and Atmosphere Sensitivity Experiments using the Land Information System (LIS) and Weather Research and Forecasting (WRF) models

The SPoRT Center is conducting experiments using the NASA Goddard Space Flight Center LIS software coupled to the WRF model in order to evaluate the impacts of high-resolution lower boundary data derived from NASA systems and tools on regional short-term NWP guidance (0–24 hours). The LIS is a software framework that integrates satellite-derived datasets, ground-based observations, and model reanalysis data to force a variety of land surface models (LSMs). The LIS can be run by itself offline, or in a coupled mode with WRF to integrate surface and soil quantities using numerous available LSMs.

The SPoRT experiments are designed to measure the potential benefits of using the LIS/WRF coupled system versus a control WRF configuration (that uses the NCEP Eta model for initial soil conditions) over the Florida peninsula during May 2004. This month experienced relatively benign weather conditions, which allow the experiments to focus on the local and mesoscale impacts of the high-resolution datasets and optimized soil and surface initial conditions on predictions of surface temperature, dewpoint, wind, and fluxes.

The differences between the 0–10 cm layer soil moisture from the 40-km Eta model and that generated by LIS on a 3-km WRF grid are depicted in Figure 1. The fields are qualitatively similar with respect to the areas of dry and moist soils. However, the LIS spin-up produces a soil moisture field consistent with the resolution of the WRF grid showing much more detail and structure based on the horizontal variations in land characteristics and prior observed rainfall.

A verification at 70 surface stations across Florida and southern Georgia was conducted to quantify the differences between the control WRF and coupled LIS/WRF predictions, both on the domain shown in Figure 1. Preliminary results during May 2004 (Figure 2) suggest that the LIS/WRF simulations improve the nocturnal (i.e. 0–11 hours) warm bias of WRF-predicted 2-m temperature by ~0.5–1.0°C and the daytime (15–23 hours) cool bias by a few tenths of a degree. Additional investigation should reveal the physical mechanisms behind these differences

between the control and LIS/WRF simulations.

This article was written by SPoRT scientist Jonathan Case.

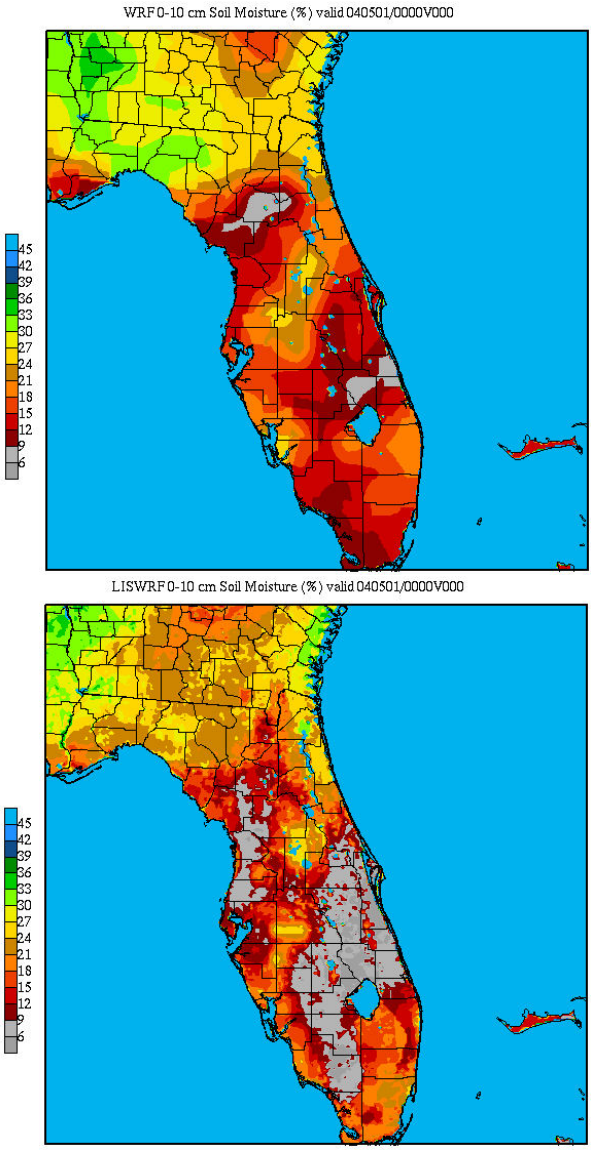

Figure 1. Comparison of the 0–10 cm layer volumetric soil moisture (%) between the control WRF (top panel), and LIS/WRF (bottom panel), valid at 0000 UTC 1 May 2004. The control WRF soil moisture was interpolated from the 40-km Eta model onto the 3-km experimental WRF grid, while the LIS soil moisture was generated by a 2-year spin-up run of LIS beginning 1 May 2002.

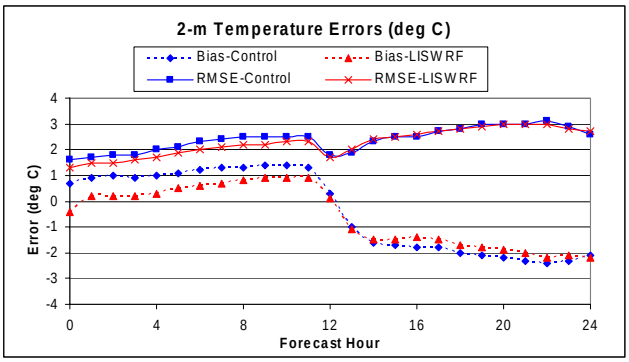

Figure 2. Composite 2-m temperature bias (dash lines) and root mean square error (RMSE, solid lines) for the control WRF runs (blue) and coupled LISWRF runs (red) for all simulations during May 2004, validated at 70 surface stations across Florida and southern Georgia.

SPoRT Program says Good-bye to Principal Investigator Steve Goodman

Steve Goodman, former manager of the Earth Science Office at NASA's Marshall Space Flight Center and one of the SPoRT Principal Investigators specializing in the Nowcasting area, has accepted a new position with the National Oceanic and Atmospheric Administration (NOAA) / National Environmental Satellite Data Information Service (NESDIS). He is now the Deputy Director of the Center for Satellite Applications and Research in Camp Springs, Maryland.

SPoRT External Collaborators

SPoRT collaborates with the atmospheric science community in transitional activities to the operational weather community. Here is a listing of those partners and their involvement.

- NOAA/NESDIS/STAR - transitional activities, data source, product development, GOES and AIRS products
- Joint Center for Satellite Data Assimilation (JCSDA) – use of GSI/WRF for AIRS radiance assimilation, computational resources
- National Severe Storms Laboratory (NSSL) - real-time WRF model forecasts
- NWS Southern Region Headquarters - data dissemination, WFO interface

- University or Wisconsin / CIMSS - real-time MODIS, AMSR-E, and AIRS data and products
- Jet Propulsion Laboratory - AIRS data and products
- University of Alabama - Huntsville - radar and atmospheric electricity applications
- University of South Florida - real-time MODIS data and products, ocean color expertise
- WorldWinds, Inc. – product development and dissemination to the marine weather community
- Florida State University – 4d variational data assimilations studies
- University of Oklahoma – AIRS data assimilation studies
- Naval Research Lab – data, product development, and transitional activities
- UCAR/COMET – training module development
- Florida Institute of Technology - WRF case study analysis, coastal meteorology

Recent Accomplishments

GOES Aviation Products - GOES aviation products are now going to Huntsville National Weather Service (NWS) office via the Local Data Manager (LDM).

Atmospheric InfraRed Sounder (AIRS) Imagery and Products - AIRS imagery of select channels and AIRS products now being generated operationally

Demonstration of Data Transfer to Southern Region Headquarters - Successfully demonstrated the use of the Local Data Manager (LDM) software and transfer protocols to send data to Southern Region Headquarters for dissemination to WFOs. This process will significantly reduce the latency of the products to the WFOs.

Aviation Training Module - Developed aviation training module for NESDIS GOES products disseminated by SPoRT to SR WFOsPowerPoint module made available to other SR WFOS for use.

COMET Program Webcast Development - A SPoRT webcast was developed in conjunction with the UCAR/COMET program and the IPO. The webcast presents an overview of NASA's SPoRT program.

Joint Center for Satellite Data Assimilation Workshop

- Mr. Will McCarty (SPoRT Ph.D. candidate) has been invited to participate in the Joint Center for Satellite Data Assimilation (JCSDA) Workshop on the Application of Remotely Sensed Observations in Data Assimilation to be held at the University of Maryland, College Park, MD, on July 23 – August 10, 2007

Weather Research Forecasting (WRF)/Land Information Systems

- Produced a complete set of control WRF simulations and coupled LIS/WRF simulations, both using the same land surface model and static surface/land characteristics for a regional case study.
- Generated surface verification statistics for both the control and coupled LIS/WRF runs at standard METAR surface stations and the Florida Automated Weather Network locations. Preliminary results suggest that the LIS/WRF runs improved the WRF warm 2-m temperature bias at night and the cold bias during the day.

Convective Initiation Status - Accuracy assessments research for convective initiation have been completed.

WRF Simulations - Real-time WRF simulations for WRF/MODIS SST project with the Miami WFO have begun.

Publications and Presentations

Peer-reviewed

LaCasse, K. M., M. E. Splitt, S. M. Lazarus, and W. M. Lapenta, 2007: The impact of high resolution sea surface temperatures on short-term model simulations of the nocturnal Florida marine boundary layer. Mon. Wea. Rev., submitted January 2007.

Carrier, M., X. Zou, and W. M. Lapenta, 2007: Identifying Cloud-uncontaminated AIRS Spectra from Cloudy FOV Based on Cloud Top Pressure and Weighting Functions. Accepted for publication in Mon. Wea. Rev.

Haines, S. L., G. J. Jedlovec, and S. M. Lazarus, 2007: A MODIS Sea Surface Temperature Composite for Regional Applications. *Trans. Geo. Rem. Sens.*, IEEE, accepted March 2007.

Conferences

Case, J. L., K. M. LaCasse, J. A. Santanello Jr., W. M. Lapenta, and C. D. Petars-Lidard, 2007: Improved Modeling of Land-Atmosphere Interactions using a Coupled Version of WRF with the Land Information System. 21st Conference on Hydrology, CDROM, AMS, San Antonio.

Chou, S-H., B. Zavodsky, G. J. Jedlovec, W. Lapenta, 2007: The Impact of Atmospheric InfraRed Sounder (AIRS) Profiles on Short-term Weather Forecasts. 11th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Ocean, and Land Surfaces (IOAS-AOLS), CDROM, AMS, San Antonio.

Darden, C., J. Burks, G. Jedlovec, and S. Haines, 2007: The Transition of NASA EOS Datasets to WFO Operations: A Model for Future Technology

Transfer. Third Symposium on Future National Operational Environmental Satellite Systems - Strengthening our Understanding of Weather and Climate, CDROM, AMS, San Antonio.

McCarty, W., G. J. Jedlovec, and J. LeMarshall, 2007: An Investigation of the Characterization of Cloud Contamination in Hyperspectral Radiances. 11th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Ocean, and Land Surfaces (IOAS-AOLS), CDROM, AMS, San Antonio.

Zavodsky, B., S-H. Chou, G. J. Jedlovec, and W. Lapenta, 2007: The Impact of Atmospheric InfraRed Sounder (AIRS) Profiles on Short-term Weather Forecasts. Preprints, SPIE Conference on Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XII, International Defense and Security Symposium, 9-13 April 2007, Orlando Florida

Presentations

Case, J. - Improved Modeling of Land-Atmosphere Interactions using a Coupled Version of WRF with the Land Information System. AMS Meeting, San Antonio, TX, January 14-19.

Darden, C. - The Transition of NASA EOS Datasets to WFO Operations: A Model for Future Technology Transfer. . AMS Meeting, San Antonio, TX, January 14-19.

Jedlovec - AIRS data from regional forecasting at the SPoRT Center. AIRS Science Team Meeting, Pasadena, CA. March 29.

Jedlovec, G. - The SPoRT Center - Infusing NASA technology into the NWS WFOs. NRL Visit, Pasadena, CA, March 29.

Jedlovec, G. - SPoRT Overview - briefing to Robert Hokpins (NASA HQs), Huntsville, AL, February 27, 2007.

LaCasse, K. M. - Conducted training sessions with Huntsville WFO for GOES Aviation products (Feb. 16 and 22)

McCarty, W. - An Investigation of the Characterization of Cloud Contamination in Hyperspectral Radiances. . AMS Meeting, San Antonio, TX, January 14-19.

Zavodsky - AIRS data assimilation at the regional scale. AIRS Science Team Meeting, Pasadena, CA. March 29.

Zavodsky, B. - The Impact of Atmospheric InfraRed Sounder (AIRS) Profiles on Short-term Weather Forecasts. . AMS Meeting, San Antonio, TX, January 14-19.

SPoRT Team Member Highlight

Mr. Brad Zavodsky (Research Associate with UAH) joined the SPoRT team in 2005 to support the Atmospheric InfraRed Sounder (AIRS) profile assimilation activity. The primary objective of this activity is to use satellite observation data from the AIRS instrument to improve the short-term temperature and moisture forecasts. The instrument data is processed and distributed to local weather forecasting offices through the SPoRT Center.

Visitors

Drs. Steven Lazarus and Mike Splitt, - Florida Institute of Technology - Discuss future collaborations, including the WRF/MODIS SST project with the Miami WFO

Mr. Geoffrey Stano – Florida State University – learn about SPoRT

Mr. Robert Hopkins – NASA HQ, Mission Office of Strategic Communications, Assistant Administrator of Communications Planning – received briefing on SPoRT

Calendar of Events

- **January 14-19, 2007** - San Antonio, Texas. -- AMS Annual Meeting and associated conferences - various SPoRT presentations
- **February 16, 22, 2007** – GOES Aviation Product Module Training Session with the Huntsville National Weather Service Office
- **March 27-30, 2007 –** Pasadena, CA – AIRS Science Team Meeting
- **April 7, 2007** – Scheduled delivery of the Weather Event Simulator (WES) training Module, tornado outbreak (includes LMA data) to Southern Region
- **April 9-13, 2007 –** Orlando, Florida – The Society of Optical Engineering (SPIE) Defense and Security Symposium – AIRS Profile Presentation
- **May 7-10, 2007** – Boulder, Colorado - National Polar-orbiting Operational Environmental Satellite System (NPOESS) Training Development Workshop
- **June 12-14 –** Huntsville, Alabama – SPoRT Science Advisory Committee (SAC) Meeting
- **July 23-August 10** – College Park, Maryland - Center for Satellite Data Assimilation (JCSDA) Workshop

SPoRT Points of Contact

Principal Investigators:
Gary Jedlovec - gary.jedlovec@nasa.gov
Bill Lapenta - bill.lapenta@nasa.gov

NASA Headquarters:
Tsengdar Lee - tsengdar.lee@nasa.gov