

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

Utilization of AMSR-E Products at WFOs

The Advanced Microwave Scanning Radiometer for EOS (AMSR-E) is a passive microwave radiometer on the Aqua polar orbiting satellite.



An AMSR-E rain rate product displayed in AWIPS D2D software package indicating rain intensity of an off-shore tropical system.

It measures radiation reaching the instrument at six frequencies (6.925 - 89.0 GHz) which are ideal for studying many atmospheric and surface phenomena. Unlike passive infrared measurements, radiation at some of these microwave frequencies are not significantly affected by clouds, allowing a more contiguous observation of the ocean surface or precipitation within the clouds.

Currently five products (rain rate, convective percent, water vapor, wind speed, and sea surface temperature) derived from the AMSR-E satellite data are being sent in near real-time to several NWS forecast offices (Miami, Huntsville, and Mobile) for evaluation and use. The products are ingested into AWIPS at the Huntsville, Mobile, and Miami weather offices and used by the forecasters for diagnostic analysis and forecast preparation. These products are especially useful over regions void of more conventional land- and satellite-based. Forecasters regularly comment about the value of monitoring offshore weather systems beyond land-based radar coverage.

This article was written by SPoRT scientists Frank LaFontaine and Gary Jedlovec.

WRF forecasts with the Miami WFO

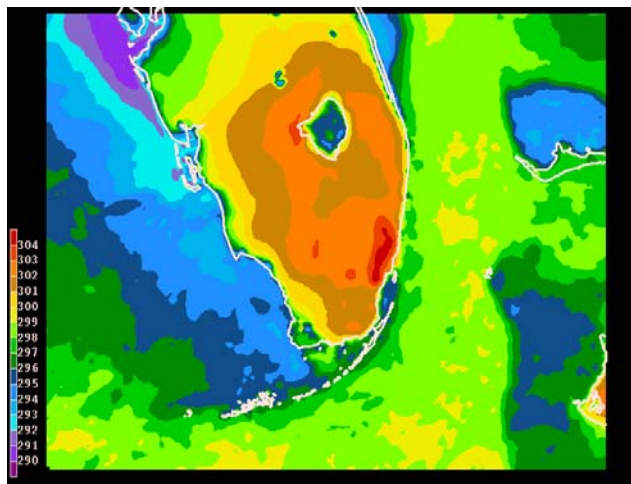
Over the last few years, research at the SPoRT Center has suggested that the use of high-resolution MODIS SST data in regional weather forecast models can have a significant impact on short-term weather

forecasts in coastal regions. In fact, the recent paper by LaCasse et al. (2007) highlights lower atmospheric differences over the ocean from a May 2004 case study period. To help quantify the value of this impact on the WFOs, the SPoRT Center and the Miami National Weather Service Forecast Office (MIA) have begun a project to investigate the impact of using high-resolution MODIS sea surface temperature (SST) fields within the Weather Research and Forecasting (WRF) prediction system. The scientific hypothesis to be tested is: Accurate specification of the lower-boundary forcing within WRF will result in improved land/sea fluxes and hence, more accurate evolution of coastal mesoscale circulations and the sensible weather elements associated with them.

MIA is currently running the WRF system, with the Nonhydrostatic Mesoscale Model dynamic core, in real-time in support of daily forecast operations. Twenty-seven hour forecasts are initialized at 03, 09, 15, and 21 UTC using analyses created by the Local Analysis and Prediction System (LAPS) with the diabatic "hot-start" option. The sea surface temperatures are initialized with the NCEP Real-Time Global (RTG) analyses at 1/12° resolution.

SPoRT will conduct parallel WRF runs that are identical to those executed at MIA in every way except for the use of MODIS SST composites in place of the RTG product. A comparison of the SPoRT and Miami forecasts is planned for Spring 2007.

This will include quantitative verification of near-surface temperature and wind forecasts using surface observations. In addition, particular days of interest will be subjectively analyzed to determine the impact on clouds and precipitation.



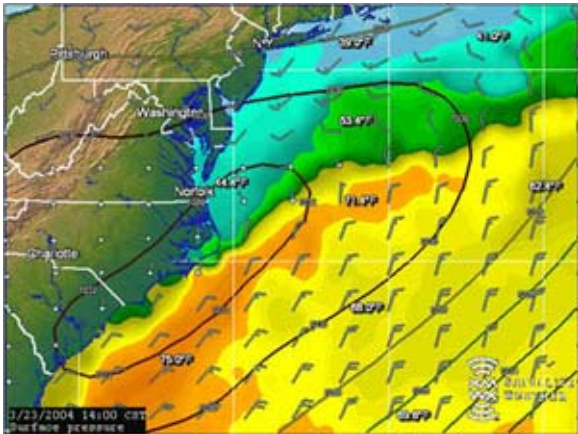
Surface skin temperature (K), including the MODIS SST composites, mapped to the 4-km WRF domain valid 21 UTC 10 February 2007.

This article was written by SPoRT scientist Kate LaCasse.

MODIS SST Data for the Marine Weather Community

The coastal NWS forecast offices provide a variety of weather information to the local marine community. Private weather firms provide customized weather information to the community as well, often complementing that provided by the WFOs. A product which has a variety of applications to the marine community is a map of the sea surface temperature (SST). The SPoRT program has recently partnered with WorldWinds, Inc., a minority owned business in southern Mississippi, to disseminate a real-time MODIS SST map to serve this need.

SPoRT has developed a near real-time high-resolution composite SST product (Haines et al. 2007) which provides spatially continuous SST values for the Gulf of Mexico and coastal regions on the east coast of the U.S., from Florida to the New England. The product provides day and night estimates of



The figure portrays typical atmospheric and ocean information disseminated by WxWorx to the marine community via XM radio. The SPoRT composite SST data are included in the analysis.

ocean surface temperature at spatial resolutions of 1 km. Originally developed to provide high resolution initial conditions for regional weather forecast models (LaCasse et al. 2007), the SST product has captured the interest of the marine weather community. SPoRT acquires the real-time MODIS SST data from the University of South Florida. SPoRT removes clouds from the imagery and applies a compositing technique to blend current and past observations to produce a continuous map of SST values.

WorldWind, Inc. is a value added provider of weather information. They run various atmospheric and ocean models and combine the output with the SPoRT SST maps to produce a suite of products for the marine users. They have also partnered with WxWorx, an affiliate of Baron Services, to disseminate this marine weather information to over 8000 customers in the boating community via XM satellite radio (for the last few years, XM Satellite Radio has been providing satellite bandwidth to data providers). Boaters can receive this XM satellite marine weather information via their laptop computers or with a variety of hand-

held GPS devices. SPoRT and WorldWinds are looking for other opportunities to disseminated value-added information from NASA satellites to the marine community. *This article was written by SPoRT scientist Gary Jedlovec.*

Recent Accomplishments

- Assimilation of CloudSat Information into Weather Models (Jedlovec)
CloudSat data has been used to validate the detection of cloud-contaminated radiances with the CO2 sorting scheme. This method optimizes the number of channels available for assimilation into the WRF model.
- Collaboration with Miami WFO (LaCasse)
A work plan was developed for collaboration with the Miami WFO. SPoRT will run a parallel version to Miami's WRF forecasts but include MODIS SST composites. These forecasts will be evaluated Spring 2007.
- LIS Simulations (Case)
Completed offline LIS spin-up simulations over Florida using the Noah LSM. Also, successfully ran coupled LIS/WRF simulation for 31 May 2004. Preliminary results from this run were prepared for the 2007 AMS annual meeting.

Publications and Presentations

Peer-reviewed

- Carrier, M., X. Zou, and W. L. Lapenta, 2006: Maximizing the Number of Clear-Sky Radiances from the AIRS Sounder Based on Cloud Top Pressure and Weighting Functions. Submitted to *Mon. Wea. Rev.* November 2006.
- Haines, S. L., G. J. Jedlovec, and S. M. Lazarus, 2006: "A MODIS Sea Surface Temperature Composite for Regional Applications". *IEEE Transactions on Geoscience and Remote Sensing*, under review.
- 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.*

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Conferences

Goodman, S., R.J. Blakeslee, J. Hall, P. Krehbiel, B. Rison, S. Zubrick, 2006: First Results from the Washington D.C. Metropolitan Area Lightning Mapping Demonstration Project. 2006 Fall American Geophysical Union Meeting, San Francisco.

Jedlovec, G., S. Goodman, M. Goodman, and B. Lapenta, 2006: Use of Earth Observing System Data in Weather Forecasting. IEEE Geosciences and Remote Sensing Society (IGARSS) 2006, Session 082 - Integrated Earth Observations for GEOSS Societal Benefit, Denver.

McCaul, Jr., E. W., K. LaCasse, S. J. Goodman, and D. Cecil, 2006: Use of high-resolution WRF simulations to forecast lightning threat. 23rd Conference on Severe Local Storms, St Louis, AMS, CDROM.

Presentations

Jedlovec, G. - NASA Products to Improve NWS Warnings and Forecasts. Southeast Weather Partners Workshop, October 5, Huntsville, Alabama.

McCarty, W. - AIRS Data Assimilation at the SPoRT Center, AIRS Science Team Meeting, September 26-29, 2006, Greenbelt, MD.

Zavodsky, B. - An update on regional profile assimilation and near-real time modeling plans. AIRS Science Team Meeting, September 26-29, 2006, Greenbelt, MD.

Meetings and Special Events

Johnson Space Center Weather Users Forum, October 30, 2006, Houston, Texas, attended by Gary Jedlovec.

SPoRT Team Member Highlight

Ms. Kate LaCasse (Research Associate with UAH) joined the SPoRT team in January of 2004 to assist in the development of SPoRT modeling activities using the Weather Research and Forecasting (WRF) model. She has six years of experience in mesoscale modeling and data assimilation. Kate is involved in a collaborative project with the National Weather Service (NWS) Miami office and will provide GOES aviation training for the NWS Huntsville forecasters in February.

Visitors

- Mr. Kevin Pruett (Division Manager) and Mr. Bob Gillen - Aerospace Sciences and Engineering

Division_ENSCO Inc. - Visit to SPoRT and business interchange

- Dr. Don Anderson - Modeling and Analysis Program Manager, NASA Headquarters – Discuss synergy of MAP program to SPoRT

Calendar of Events

- **October 31, 2006** - JSC Weather Users Forum - Houston, Texas.
- **November 6-10, 2006** - St Louis, MO. -- 23rd Conference on Severe Local Storms- lightning forecast presentation
- **December 11-15, 2006** – San Francisco, CA. -- Fall Meeting of the American Geophysical Union- DC Metro Lighting Mapping Array demonstration first results
- **January 14-19, 2007** - San Antonio, Texas. -- AMS Annual Meeting and associated conferences - various SPoRT presentations
- **February 16, 22, 2007** – Huntsville, Alabama -- 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

SPoRT Points of Contact

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