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The SPoRT REPORT

Short-term Prediction Research and 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

New SPoRT Web Pages Unveiled

SPoRT recently unveiled a new set of Web pages, reflecting updated and reorganized content. The pages were redesigned and constructed using the latest Web design technology which better accommodates future updates and changes. The overriding goal was to create a user-friendly interface with pages that were easy to navigate. To aid the organization, the Web design team of Brad Zavodsky, Geoffrey Stano, and Erik Reimers implemented an "index card" format to separate the various SPoRT activities. Visitors to the site can select an instrument or project from one of the drop down menus and see a presentation with all of the corresponding items (whether that be products or transition topics) that have been transitioned or are under development at SPoRT. Each index card contains a brief description of the product/project, a sample thumbnail image, and links to the real-time data (if applicable), and a details section outlining the development or background of the product/project. Additionally, products can be viewed directly via the real-time data tab.

The new SPoRT homepage contains both an image of the day and a featured article. The image of the day is linked from a list of interesting pictures related to various SPoRT topics. The featured article will be updated every few weeks with information or results from an ongoing SPoRT activity. In the future posts from the NSSTC Collaborative Weather Blog and the new SPoRT blog will appear on the home page. The NSSTC Collaborative Weather Blog is a joint venture between NASA, the University of Alabama in Huntsville, and the National Weather Service to share local weather pictures and facts with the community. The SPoRT blog will be a forum for an interactive discussion and exchange of research and transition results between SPoRT staff and participating WFOs and partners. The SPoRT blog will be unveiled in January.

The new Web pages have five distinct areas: (1) real-time data, (2) projects, (3) transitions, (4) library of publications and supporting documents, and (5) organization information. Each section can be accessed through the drop down menus across the top of the page. The real-time data section allows users to easily view all of the data and products that SPoRT delivers to collaborating WFOs and its other internal and external partners. The real-time data area includes GOES, MODIS, and AMSR-E data and derived products, and specialized surface parameter analyses. The projects section allows users to browse detailed descriptions of the products and supporting research conducted by SPoRT scientists. Background into the development of different products as well as detailed write-ups of AWIPS-II development, modeling, and data assimilation projects can be found in this section. The transitions section provides information on the products and capabilities that SPoRT has transitioned to the operational weather community. On this page SPoRT partners can access user surveys regarding the use of SPoRT products and view survey input filled out by the users of SPoRT products. This

section, also contains a place where our partners can request support or help with new products. Finally, the users of SPoRT products can find training modules for these products in the transitions section. The library section contains an up-to-date, comprehensive bibliography of the SPoRT team's journal and conference papers. Additionally, this section contains links to presentations and reports submitted to the Science Advisory Committee (SAC), an archive of SPoRT quarterly and other status reports, and technical memos. The last section provides an updated staff listing and organization chart complete with biographies of all SPoRT team members. In addition, the organization section contains links to our NWS and other external partners. This section, also, contains a listing of past and present members of the SAC as well as a section chronicling recent and future updates to the Web site itself.

The SPoRT Web pages will be refreshed regularly as new research projects are implemented and transitioned to the operational weather community. Some of these new transition activities are discussed on the "about" page, providing a roadmap for future additions to the Web site. While the SPoRT Web pages will describe current and advertise future activities, it also embraces SPoRT's past successes. Past projects are highlighted in a "legacy" section, which may aid in developing collaborations by informing current and future partners about areas of SPoRT's expertise. In addition, the new set of pages will contain a "history" section containing highlights of SPoRT's major milestones since its inception. The history and legacy sections are both planned for subsequent versions of the SPoRT Web site.

The new SPoRT Web pages present an exciting opportunity to learn more about the SPoRT program, its team members, products, various ongoing research to transition activities, and its future plans. The new SPoRT pages can be found at the same Web site as before <http://weather.msfc.nasa.gov/sport>.

Recent Publications

Peer-Reviewed Publications

Accepted/Published:

Case, J.L., W.L. Crosson, S.V. Kumar, W.M. Lapenta, and C.D. Peters-Lidard, 2008: Impacts of high-resolution land surface initialization on regional sensible weather forecasts from the WRF model. J. Hydrometeor., 9, 1249–1266.

McCaul, E.W., Jr., S.J. Goodman, K.M. LaCasse, and D.J. Cecil, 2008: Forecasting lightning threat using cloud-resolving model simulations. Accepted for publication in Wea. Forecasting.

Visitors

- October 22, 2008: Dr. Haig Iskenderian from MIT Lincoln Labs to discuss aviation weather applications and possible partnerships with SPoRT, UAH, and MIT.
- November 12, 2008: Dr. Chieh-san Cheng, John Chehansky, and Celeste Jarvis (GST) — future SPoRT collaborations
- November 19, 2008: Met with Kevin Scharfenberg from NSSL about potential collaborations.
- December 8, 2008: Mr. Bob Gillen and Mr. Kevin Pruett of ENSCO, Inc. to discuss future SPoRT collaborations

Recent Accomplishments

LIS/WRF Studies
Jon Case established a methodology for an experiment to compare LIS- and MODIS-initialized WRF simulations over the Southeastern U.S. using the latest version of WRF (v3.0.1.1) versus Control simulations using the NCEP North American Mesoscale (NAM) model to initialize all WRF fields. The primary goal of this follow-on study to the Florida experiment published in the Journal of Hydrometeorology is to focus on the impacts of NASA high-resolution land and water initialization fields on the predictions of typical summertime air-mass convection from the WRF model. A secondary objective is to utilize the NCAR Model Evaluation Tool's (MET) object-identification techniques for precipitation to develop more meaningful verification statistics that can be used to judge which model configuration is more skillful in predicting air-mass convection. Daily 27-hour simulations initialized at 0300 UTC were made for both the Control and LIS+MODIS-initialized WRF runs from June 1, to August 31, 2008 in order to analyze the differences and potential improvements resulting from the high-resolution surface and soil initialization. Preliminary results from these simulations will be presented at the 2009 annual American Meteorological Society (AMS) meeting in Phoenix, AZ.

Lightning Forecasting
During the fourth quarter of 2008, SPoRT Lightning Forecasting researchers, led by Eugene McCaul, responded to reviews of their full-length article entitled "Forecasting Lightning Threat Using Cloud-resolving Model Simulations." The revised manuscript was subsequently reviewed by Weather and Forecasting and accepted formally for publication. The exact publication date will be sometime in 2009. Research is underway to apply the WRF lightning threat algorithm to an ensemble of WRF simulations for a prototype day from the Spring 2008 storm season. Application of the methods to an ensemble of convective forecasts will help circumvent the uncertainties associated with storm timing and location in individual WRF forecast runs.

The Lightning Warning Product
Preliminary work for the Lightning Warning Product has been presented at the National Weather Association Annual Meeting, held in Louisville, KY October 11-16, 2008 (presentation entitled "The NALMA Lightning Threat Product"). This product uses total lightning data from NALMA to develop short term gridded lightning probability maps. The maps provide the probability of lightning occurrence at 10 km by 10 km resolution within the next 5, 10, 15, 20, 25, and 30 minutes of the current time. The product will also be able to use total lightning observations from the Geostationary Lightning Mapper (GLM), which is due to be launched in 2015.

Microphysical Adjustments in WRF Using CloudSat
Several observational campaigns have revealed characteristics of snow crystal distributions that may be related to temperature, which guides the development of temperature-based distribution parameters for implementation within a single-moment, bulk water microphysics scheme. In particular, the slope of the prescribed exponential distribution has been fit to temperature and utilized by various researchers. Others provide fits of mean snow density to the slope parameter for both synoptically forced and more discrete convective events. Although many of these observations are related to a specific crystal habit or cloud type such as high-level cirrus, in principle, inclusion of these properties should produce a more physically based representation of ice processes within simulated clouds. Within SPoRT, the framework has been laid for the inclusion of these temperature-based parameterizations, with great flexibility regarding the specific equations to be utilized. Furthermore, the Canadian CloudSat/CALIPSO Verification Project (C3VP) provides aircraft measurements of snow distribution properties, estimates of total ice water content, and a high-resolution temperature profile for a synoptic-scale snowfall event on January 22, 2007. These data have been examined and are reasonably fit by past parameterizations, and therefore, the aforementioned properties of slope and density seem reasonable. Currently, one real data case (February 13, 2007) has been simulated with the NASA Goddard scheme and a modified version, and results are being analyzed. Future work will likely include a simulation of the C3VP event using a modified version of the Goddard scheme, as the C3VP observation period provides a large quantity of high-quality data for verification.

The MODIS False Color Product Assessment
SPoRT's partners at the Great Falls, Montana NWS were busy evaluating the MODIS false color product this past winter and early spring. In an effort led by Service Hydrologist Gina Loss, the Great Falls NWS has monitored snowfall and river ice with the false color product. Early results have been presented at the NWS Western Region's Great Divide Workshop in October. Another presentation will be made at this year's American Meteorological Society Conference meeting in Phoenix. The main purpose of this product is to help improve assessments of flooding potential after snow and ice events where rapid melting and runoff are anticipated. While MODIS passes are limited in number, and cloud cover can mask what is occurring at the surface, the evaluation has several positive results.

First, the false color product provides an easier visual reference of where snow cover and ice are located compared to standard GOES visible imagery with the color enhancements. This leads to a complete overview of the extent of snow cover. When this is combined with snow depth data, the areas of greatest concern are highlighted. Additionally, the speed and extent of snow cover retreat seen in the MODIS False Color imagery combined with the hydrograph (i.e., stream gage) data can provide insight to flooding concerns. Lastly, the product indicates where rivers and streams have iced over. All of these features combined assist in the decision making process of the Great Falls NWS.

National Weather Service Huntsville Office
WFO HUN forecaster Brian Carcione has been working with SPoRT collaborators Kevin Fuell and Geoffrey Stano on a MODIS LST study. The goal of the study is to ingest the MODIS LST data into the AWIPS Graphical Forecaster Editor (GFE) to utilize as a comparison field with official NWS gridded forecasts and ground truth

observations. The necessary scripts have been automated on the NWS side, and we are currently working with SPoRT to make the necessary modifications to the MODIS netCDF files to automate the entire process.

North Alabama Lightning Mapping Array Updates

New software for the North Alabama Lightning Mapping Array (NALMA) was implemented for real-time processing of lightning data. This is the same code that has been successfully used in the Washington, D.C. LMA and standardizes the processing for the two networks. A new page display for was also added for the NALMA data. The total lightning data processed with this new software is available to NWS forecasters on their AWIPS workstations.

NSSL Collaboration

Jon Case collaborated with Jack Kain (NSSL) on his invited talk at the AMS Severe Local Storms conference in Savannah, GA during the last week of October, providing some contributions to the paper related to SPoRT modeling activities. He also proposed to Jack Kain the idea of using both the SPoRT MODIS SSTs and LIS land surface initialization fields for either the current operational NSSL WRF runs and/or ensemble WRF simulation members for the upcoming 2009 Spring Experiment. Jon prepared a brief document for NSSL that described the improvements SPoRT has found in using MODIS SSTs and high-resolution LIS initialization fields in WRF simulations over the Florida area and surroundings coastal waters. The document also summarized the simple steps in acquiring and preprocessing the SPoRT MODIS SST composites for initializing WRF simulations.

SPoRT at AMS

SPoRT scientists are authors or co-authors on ten conference papers and presentations at the 89th AMS Annual Meeting held on January 12–16, 2009 in Phoenix, Arizona. A complete list of the papers can be viewed on the SPoRT Web site and in the individual AMS conference proceedings. NASA/MSFC's Earth Science Office and SPoRT will once again sponsor a table at the Career Fair, which is part of the Student Conference on the preceding Saturday. Announcements for both student opportunities and new NASA scientist positions will be posted at the table through Tuesday of AMS week. Everyone is encouraged to stop by and say hello, pick up a current give-away, and chat about research opportunities with SPoRT.

Training and Assessment Initiatives

SPoRT continues to expand and enhance the training products available to our partners. The two newest training modules will include a general overview of the more popular MODIS products provided by SPoRT and the operational uses of the NALMA. Both of these have been presented, in draft form, to our partners in face-to-face office visits or the October NWS/SPoRT coordination call. This training will support two new assessment periods. The first effort will involve the NALMA during this spring's severe weather season. The second assessment is a follow-up evaluation to 2008's successful work with the Great Falls, Montana NWS and the MODIS false-color product. Both of these evaluations will involve the existing surveys and new survey questions to gather more specific information on the utility of these products to the NWS. Lastly, a third evaluation will be resumed this January. In late August and early September (2008), SPoRT conducted an evaluation of the GOES Fog Depth and Low Cloud Base products with the local NWS offices of Morristown and Nashville, Tennessee along with Birmingham and Huntsville, Alabama. This January, the project resumes with the remaining SPoRT partners, particularly along the Gulf Coast. The timing for this tries to correspond near the climatological maximum frequency of low visibility conditions in this region, where fog is likely the cause.

WRF/SST Collaborative Work With NWS Miami, FL

SPoRT staff finalized instructions that document how to obtain and use the SPoRT MODIS SSTs for initializing the WRF model within the Environmental Modeling System (EMS) software. This document was distributed along with some modified EMS scripts and necessary configuration files to the NWS Miami, FL and Mobile, AL offices for testing within their WRF EMS installations.

Jon Case and Kevin Fuell also continued their collaboration with FIT scientists on a study that involves examining the impacts of Lake Okeechobee SSTs on subsequent convective development around the lake. SPoRT and FIT initially examined a case from May 7, 2007 that had widely varying convective development using the high-resolution SPoRT MODIS SSTs versus the Real-Time Global SSTs, holding the SSTs constant in the 27-hour simulations (which is how all simulation comparisons using MODIS SSTs have been handled in SPoRT experiments to date). The WRF simulations behaved markedly different, depending on the time of the model initialization and MODIS SSTs. Further examination of the four-times-per-day MODIS composites revealed a substantial diurnal variation up to 8 °C on several different days in early May 2007. These MODIS SST diurnal variations were fairly consistent with independent readings from GOES skin temperature measurements and in situ observations of SSTs from a site on Lake Okeechobee (LZ40). Therefore, a simulation experiment was formulated to integrate WRF with time-varying MODIS SSTs for the lower boundary condition. FIT created a test set of hourly MODIS composite files that were based on the "anchor and drift" methodology. The MODIS was anchored to the Lake Okeechobee LZ40 site lake temperature at a time when both were available, and then the new composite was allowed to drift with the LZ40 data until a new MODIS composite was available. Only SSTs over Lake Okeechobee were allowed to vary in order to isolate the contributions of the varying SSTs from the lake and not oceanic regions. These new MODIS composites were initially incorporated into WRF at 3-hourly intervals, consistent with the boundary condition interval for atmospheric fields. Preliminary results from WRF simulations using the time-varying SSTs over Lake Okeechobee versus static MODIS SSTs will be presented at the upcoming AMS meeting.

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