**Projected Applications of a “Weather in a Box” Computing System at the NASA Short-term Prediction Research and Transition (SPoRT) Center**

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What is the NASA SPoRT Center?
- The NASA Short-term Prediction Research and Transition (SPoRT) Center partners with several universities and government agencies to:
  - Improve short-term (0-48 hr) weather forecasts
  - Facilitate and promote the use of Earth Observing System (EOS) satellite data for weather analysis and forecasting
  - Promote the use of unique, advanced NASA modeling and data assimilation techniques applicable to regional forecasting

Mission Statement
- Serve as a focal point and facilitator for the transfer of NASA Earth Science technologies to the operational weather community, emphasizing short-term forecasting.

**SPoRT Contributions to the Weather Research and Forecasting (WRF) Model**

- SPoRT has developed several unique and valuable data products to support high-resolution, short-term weather forecasts:
  - Enhanced Infrared Sounder (AIRS) Profile Assimilation
    - Provides vertical profiles of temperature and moisture with horizontal resolution of 25 km.
    - Supplements soundings network with observations at night.
    - Used in variational assimilation techniques to improve the three-dimensional atmospheric model forecasts.

- Unique NASA research tools
  - 3 km spatial resolution
  - Revisions inputs of radar estimated precipitation and satellite vegetation composites.
  - Outputs high-resolution soil moisture, soil type, and vegetation characteristics.

- NASA Land Information System
  - Unique NASA research tool
  - 3 km spatial resolution
  - Receives inputs of radar estimated precipitation and satellite vegetation composites.
  - Outputs high-resolution soil moisture, soil type, and vegetation characteristics.

**SPoRT “Weather in a Box” Systems**

- SPoRT is acquiring two new modeling systems to support weather forecasting experiments utilizing unique NASA research tools and products:
  - **Research and Development**
    - CRAY CX1 Chassis
    - 8 Compute Nodes
    - Each node contains:
      - 8 Intel Xeon X5550 Cores
      - 2.67 GHz
      - 8 GB RAM
      - 120 GB 7.2k HDD
      - Infiniband connectivity
  - **Real-Time Forecasting**
    - CRAY CX1 Chassis
    - 8 Compute Nodes
    - Each node contains:
      - 8 Intel Xeon X5472 Cores
      - 2.33 GHz
      - 8 GB RAM
      - 120 GB 7.2k HDD
      - Infiniband connectivity

**Research and Development**
- Data Assimilation
- Land Information System
- Model Parameterizations
- Lightning Predictive
- Cloud Skies
- New Diagnostic Fields

**Real-Time Forecasting**
- Box-time Forecast
- New Diagnostic Fields
- Post-Processor
- Ensemble Member Support
- New Validation Metrics
- Participates in NASA Testbeds

**SPoRT “Weather in a Box” Software**

- High-resolution forecasts will be generated using the NASA Unified Weather Research and Forecasting (NU-WRF) modeling suite, which includes:
  - Advanced Research WRF (WRF-ARW)
  - NASA Land Information system (LIS) with internal coupling
  - NCAR Model Evaluation Tools (MET) Package
  - Goddard Chemistry Aerosol Radiation and Transport (GODDART)
  - Goddard Satellite Data Simulator Unit (SDSU)
  - Unique diagnostic fields for severe weather forecasting
  - Lightning forecasting capabilities based upon cloud microphysics
  - WRF Pre- and Post-Processors

**Hypothetical Forecast Cycle Example: June 17, 2010**

- 0000 UTC WRF Forecast
- 0600 UTC WRF Forecast
- 1200 UTC WRF Forecast
- 1800 UTC WRF Forecast

**SSTs, Soil Moisture, and GVF**
- High resolution, accurate surface water temperatures for coastal processes and moisture return.
- Soil moisture and greenness vegetation fractions derived from the NDVI to improve evapotranspiration and land contributions to low level moisture sources.

**AIRS Profile Assimilation**
- AIRS profiles contribute moisture and temperature data above cloud top to adjust model initial conditions.
- Above: Warm colors represent widespread, contribution of AIRS data in cloud-free conditions.
- Available on orbital times between the 00/12 UTC rawinsonde network.

**Summary**
- SPoRT’s new “Weather in a Box” resources will provide weather research and forecast modeling capabilities for real-time application.
- Model output will provide additional forecast guidance and research into the impacts of new NASA satellite data sets and software capabilities.
- By combining several research tools and satellite products, SPoRT can generate model guidance that is strongly influenced by unique NASA contributions.

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