Project 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 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:

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

Surface Temperature Composites
- Normalized Difference Vegetation Index (NDVI) Composites
  - Daily composites at 1 km resolution, derived from MODIS, to serve as a proxy for vegetation cover and greenness fraction.
  - Replaces coarse climatology fields in model forecasts.

Advanced Infrared Sounder (AIRS) Profile Assimilation
- Provides vertical profiles of temperature and moisture with horizontal resolution of 50 km.
- Supplements sounding network with observations at altitude.
- Used in variational assimilation techniques to improve the three-dimensional atmospheric analysis.

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
- CRAW CISI Chassis
- 8 Computer Nodes
- Each node contains:
  - 2 Intel Xeon E5520 @ 2.27 GHz
  - 32 GB RAM
  - 250 GB SSD
- INFRA Band connectivity

Real-Time Forecasting
- CRAW CISI Chassis
- 4 Computer Nodes
- Each node contains:
  - 8 Intel Xeon X5472 @ 3.00 GHz
  - 32 GB RAM
  - 120 GB 7.25 HD
- INFRA Band connectivity

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 (GOCART)
  - Goddard Satellite Data Simulator Unit (GSDSU)
  - 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

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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