Background

SPoRT runs the NASA Land Information System (LIS) in real-time to support local modeling and diagnosis at NOAA/National Weather Service (NWS) weather forecast offices (WFOs)

- Current domain covers the Southeast half of the Continental U.S. (CONUS) due to limitations in the Stage IV precipitation grids driving the Noah land surface model (LSM) integration in LIS
- This past year, SPoRT added a new real-time run over a full CONUS domain
- Enables expansion of LIS applications to NOAA/NWS partners outside Southern Region
- Sets stage for future soil moisture data assimilation activities

Poster objectives

- Provide summary of real-time activities at SPoRT
- Compare/contrast real-time LIS over SE U.S. with full CONUS-LIS
- Map out future direction of LIS applications

Modeling System and Capabilities

NASA Land Information System (LIS)

- High-performance land surface modeling & data assimilation framework
- Can run a variety of LSMs (Noah, SIM, Catchment, etc.)
- Supports several static databases for land use and soil classification
- Able to run up to global domains at 1 km grid spacing
- Land surface data assimilation
  - Ensemble Kalman Filter (EnKF) or Direct Insertion (Di)
  - Soil moisture, land temperature, snow fraction/depth/THM
- Kumar et al. 2009 (J. Hydromet; soil moisture); Ji et al. 2013 (JAS; Water Arc, snow)
- Optimization and Uncertainty Estimation (Sarnthein et al. 2013; J. Hydromet)

LIS modes of operation

Development of LIS Training Module for Situational Awareness Applications

SPoRT-LIS for Drought Monitoring

Examine soil moisture conditions for the next several weeks, while also showing other variables such as precipitation, soil temperature, and soil moisture

SPoRT-LIS for Assaying Flooding Potential

SPoRT-LIS for Assaying Flooding Potential

Contrasting extreme soil moisture conditions likely played a strong role in the different outcomes

Poster References


Issues Documented with MRMS Precipitation Dataset

Beam blockage due to terrain / physical impediments
- Not just concern in Rocky Mountains
- Columbus, MS radar: Rapidly growing trees have blocked beams over time or certain azimuths
- Spatial patterns are more apparent in integrated soil moisture fields
- LIS is a good tool to identify problems in QPE through long-term integrations

Edge of radar networks and non-overlapping radars
- Especially a problem in central CA, NE, Mexico
- Recommend that end-users do not utilize CONUS-LIS output in these problem regions
- Better blending of precipitation forecast and/or soil data assimilation needed to improve spatial continuity

Periodic drop-outs of regional tiles (fixed Oct 2013)
- Numerous days in late Summer / Autumn 2013
- Instead of prior assigned as missing, entire regional tile was filled with "0" values
- Lead to artificial problems in soil moisture in portions of domain when active precipitation occurs at the boundary
- Points with no input data assigned a "0" (fixed Feb 2013)
- Instead of a missing data flag, grid points with no input radar or gauge data were set to "0" (a legitimate value)
- Led to artificially dry soil, esp. in Canada and Mexico

Future Direction

- Upgrade to LISv7 and utilize LIS Validation Toolkit
- Validate LIS against soil moisture observations and field campaign data
- Assistive satellite-based soil moisture from SMOS and SNAP

Sample Results / Comparison between SE U.S. LIS and CONUS LIS

Current Applications of SPoRT-LIS

LIS LSM fields in local modeling applications (i.e., WRF model)
- Supported option in the WNOSS Sciences and Resource Center’s Environmental Modeling System (EMIS. http://www2.wrcc.dram.ars/EMIS/)
- LIS GRIB output files uploaded to ftp server in real-time
- EMIS users over SE U.S. can initialize with LIS LSM fields in place of coarser-resolution, large-scale model fields

Comparison Between SE U.S. and CONUS SPoRT-LIS Configurations

Current SE LIS domain with Stage IV
- New full CONUS domain with MRMS

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