Hypothesis and Objectives

- **Hypothesis:** High-resolution land and water datasets from NASA utilities can lead to improvements in simulated summertime pulse-type convection over the S.E. U.S.
- **Experiment objectives:**
  - Use NASA Land Information System (LIS) to provide high-resolution land surface initializations
  - Incorporate SPoRT MODIS composites for detailed representation of sea surface temperatures (SSTs)
  - Demonstrate proof of concept in using these datasets in the Weather Research and Forecasting (WRF) model
  - Provide opportunity to optimize future models

Methodology and Data

- **LIS/Noah 4-km LSM run:** 1/1/2004 to 9/1/2008
  - Same soil and vegetation parameters as in WRF
  - Atmospheric forcing from GDAS + Stage IV analyses
  - Run long enough for soil to reach equilibrium state
  - Output GRIB files initialize WRF land surface variables
- **Bring LIS data into WRF initial conditions:**
  - Modifications to WRF Preprocessing System (WPS):
    - Created Variable LIS: added LIS fields into METGRID.TBL file
    - Soil moisture/tempr, skin temp, anse-water, land-sea mask
  - LIS data over-write NAM land surface data
  - MODIS SSTs over-write NAM / RTG SSTs in WPS

Run parallel WRF simulations

- Once daily 27-h simulations, initialized at 0600 UTC
- 81 total forecasts (Jun – Aug 2008)
- 11 missing dates due to missing/ corrupted MODIS SSTs
- LISMOD: Same as Control, except:
  - Replace land surface data with LIS output fields
  - Replace SSTs with SPoRT MODIS composites

Evaluation and Verification

- Graphical and subjective comparisons
- **Meteorological Evaluation Tools (MET) package**
- Method for Object-Based Diagnostic Evaluation (MODE): object-oriented, non-traditional verification method

Use of MET/MODE for Precip Verification

- **Stage IV analyses used as validation for traditional precip stats and MODE**
- Traditional grid point verification
  - Bias, Threat Score, Heidke Skill Score (HSS)
  - P10, P25, P50, P75, P90

- **MODE object classification**
  - Resolves objects through convolution thresholds:
    - Filter function applied to raw data using a tunable radius of influence
    - Filtered field thresholded (tunable parameter) to create mask field
    - Raw data restored to objects where mask meets/exceeds threshold
  - Attributes computed for “matched” objects

Soil Moisture Comparison: 10 June 2008

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**Summary:**
- Use of LIS as initial condition for WRF run
- Demonstration of improved performance over traditional methods