A Mission Simulation and Evaluation Platform for Terrestrial Hydrology using the NASA Land Information System (LIS)

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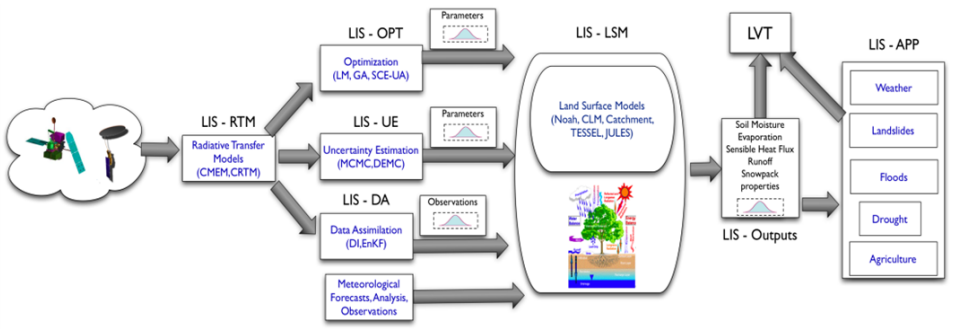
Objective

Develop a mission simulation and evaluation platform for terrestrial hydrology missions by creating an end-to-end observation system simulation experiment (OSSE) platform to:

- Quantify the impact of observations through a variety of OSSE configurations and evaluation metrics related to terrestrial hydrologic science and applications
- Improve the use of products for end-use applications and science, and quantifying the mission risks for GPM and GRACE-like missions
- Add a new data assimilation-based capability for extracting information from observations provided by Earth-Observing Satellites to mitigate model error and bias



Infrastructure of the OSSE platform, a mission simulation and evaluation platform using the NASA Land Information System and Land surface Verification Toolkit (LVT)

Accomplishments

- Developed a mission simulation and evaluation platform for terrestrial hydrology missions using end-to-end OSSEs, and validated it on full-scale, realistic problems:
  - A SMAP-relevant OSSE with end-to-end capabilities (connecting raw observations to actual end use application) to demonstrate the use of decision theory based analysis for quantifying the cost of satellite observations versus loss for droughts and floods.
  - GPM-relevant landslide OSSE experiments to determine how useful satellite-based products could be (using actual data from Tropical Rainfall Measuring Mission (TRMM) and simulated data from the GPM mission) for improving landslide model predictions.
  - A suite of OSSEs to assist development of future GRACE missions, working directly with the GRACE SDT, to compare three mission configurations (GRACE, GRACE-FO and GRACE-like missions) with simulated products from JPL and GSFC to estimate their impact on estimates of terrestrial water storage changes.
- Developed a proof-of-concept system identification strategy to reduce errors in land surface models and improve long-term predictions of soil moisture by using satellite observations of soil moisture to correct structural errors in the models themselves.

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$TRL_{in} = 2$ $TRL_{out} = 6$