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Using the NASA Land Information System to integrate Earth science data for water cycle applications

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The NASA Land Information System (LIS) integrates multiscale spatial and temporal data with an ensemble of land surface models (e.g., Community Land Model, Noah, and Variable Infiltration Capacity) to provide water states (e.g. snowpack and soil moisture) and fluxes (e.g. evaporation, transpiration and runoff) for addressing various water cycle applications (http://lis.gsfc.nasa.gov). LIS builds upon the weather and climate model initialization capabilities of the North American Land Data Assimilation System (NLDAS) and the Global Land Data Assimilation System (GLDAS) {http://ldas.gsfc.nasa.gov} to a one km and finer spatial resolution, and at one hour and finer temporal resolution. LIS features high-performance computing with a flexible and portable design and provides infrastructure for data integration and assimilation. Meteorological forcing for all of the LIS models are provided by satellite-, radar- and gauge-based observations of precipitation (e.g., Climate Prediction Center Merged Analysis of Precipitation - CMAP; NOAA CPC Morphing Technique - CMORPH; Tropical Rainfall Measuring Mission Multi-Satellite Precipitation Analysis - TRMM MPA) and by satellite-based observations of radiation (e.g., GOES, AGRMET). Land model parameterization may rely on satellite-derived products such as those retrieved from Terra and Aqua MODIS (i.e., land surface temperature, LAI, land cover, surface albedo) and AMSR-E (i..e., soil moisture and snow water equivalent). LIS also may use surface forcing and parameters from field experiments or operational station data through model inputs. A key feature of LIS is its data assimilation capability (e.g., extended and ensemble Kalman filtering, optimal insertion techniques), which combines land surface modeling with satellite and ancillary observational data (e.g., station snow water equivalent and site soil moisture) to produce optimal land surface states. This capability will enable LIS to ingest satellite data, surface observations and

model-based data to supply spatially and temporally consistent fields. LIS may be run either in an uncoupled land mode to reduce typically strong biases (e.g., soil moisture) or in a coupled land-atmosphere mode. Examples of LIS water availability estimates, within the context of water cycle applications, will be presented.