Studies of the Land Surface Hydrological Cycle using Modeling, Observations and Remote Sensing

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Land surface hydrology is a spatially distributed and a temporally varying complex processes. Precipitation is partitioned into infiltration and runoff depending on antecedent soil moisture conditions, the properties of the soil and its abilities to conduct water away from the surface, the slope of the land surface and the amount of atmospheric demand for evapotranspiration. The observed radiation is used to drive the energy budget and evapotranspiration. However in reality the spatial variability both the land surface properties (soil and vegetation) as well as the meteorological inputs (precipitation and radiation) are not accurately known. This incurs errors in the simulations of water and energy budgets. Satellite remote sensing has broad spatial view of the land surface and is able to observe the heterogeneities and provide data for use in hydrology such as soil moisture, surface temperature and vegetation density.

In the first part of my talk, I will use an established land surface model (Variable Infiltration Capacity) to study the simulations of the vertical profile of the land surface soil moisture and the surface temperature on a 1/8 degree grid in the Upper Mississippi River Basin over a period of 50 years from 1950-1999 on a daily time step. I have used vegetation densities from the Advanced Very High Resolution Radiometer (AVHRR) instrument. The hydrological balance is compared to the observed stream flows at the various gauging stations and the distributed model response of surface temperature is compared to the surface temperature derived from the TIROS Operational Vertical Sounder (TOVS).

In the second part, I will use the comparisons of the satellite surface temperature to reset the model computed surface temperature in a data assimilation mode so as to achieve better simulations of soil moisture in the presence of incorrect inputs. This is specifically needed in regions with inadequate spatial coverage of rain gages (for precipitation input) and/or absence of precise radiation input. The tremendous spatial variability of these two meteorological variables coupled with variability in soil type and vegetation necessitates use of the data assimilation technique in land surface hydrology.

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2:00PM – 3:30PM
Tech Room LR3