Land surface modeling and data assimilation

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Abstract

Hydrologic processes, such as evapotranspiration, surface and subsurface runoff, groundwater recharge, surface water and groundwater interactions, snow, and river network routing, are critical components of the land surface water and energy budgets. Realistic simulations of these processes in climate and hydrologic coupled models are essential for correctly representing land-atmosphere feedback, providing accurate climate predictions (such as flood, drought), understanding global water cycle, planning and managing water resources, and studying environment sustainability. Past applications of land surface modeling in the land-atmosphere system have not always been successful. Challenges arise from identifying and representing dominant hydrologic processes for applications over large spatial domains, and from considering subgrid spatial variability associated with the hydrologic processes. In this talk, several steps towards addressing these challenges will be discussed. These steps are grouped into two categories (1) representations of important hydrologic processes, and the consideration of subgrid spatial variability associated with these processes; and (2) utilization of remote sensing observations in conjunction with model simulations through a new approach of data assimilation. This new data assimilation approach explicitly considers spatial correlation structures, error propagation, and dissimilar spatial resolutions. Significance of these steps will be presented through examples.