ABSTRACT

TITLE: Two Topics in Seasonal Streamflow Forecasting: Soil Moisture Initialization Error and Precipitation Downscaling

Authors: Randal Koster, Greg Walker, Sarith Mahanama, and Rolf Reichle
NASA, GODDARD SPACE FLIGHT CENTER, GLOBAL MODELING AND ASSIMILATION OFFICE
Greenbelt, Md. 20771

Continental-scale offline simulations with a land surface model are used to address two important issues in the forecasting of large-scale seasonal streamflow: (i) the extent to which errors in soil moisture initialization degrade streamflow forecasts, and (ii) the extent to which the downscaling of seasonal precipitation forecasts, if it could be done accurately, would improve streamflow forecasts. The reduction in streamflow forecast skill (with forecasted streamflow measured against observations) associated with adding noise to a soil moisture field is found to be, to first order, proportional to the average reduction in the accuracy of the soil moisture field itself. This result has implications for streamflow forecast improvement under satellite-based soil moisture measurement programs. In the second and more idealized ("perfect model") analysis, precipitation downscaling is found to have an impact on large-scale streamflow forecasts only if two conditions are met: (i) evaporation variance is significant relative to the precipitation variance, and (ii) the subgrid spatial variance of precipitation is adequately large. In the large-scale continental region studied (the conterminous United States), these two conditions are met in only a somewhat limited area.