ABSTRACT

Contributions of precipitation and soil moisture observations to the skill of soil moisture estimates in a land data assimilation system

Authors:

Rolf H. Reichle, Presiding
NASA/GSFC, Greenbelt, MD 20771

Qing Liu, Rajat Bindlish, Michael H.Cosh, Wade T. Crow, Richard de Jeu, Gabrielle J.M. DeLannoy, George J. Huffman, and Thomas J. Jackson

The contributions of precipitation and soil moisture observations to the skill of soil moisture estimates from a land data assimilation system are assessed. Relative to baseline estimates from the Modern Era Retrospective-analysis for Research and Applications (MERRA), the study investigates soil moisture skill derived from (i) model forcing corrections based on large-scale, gauge- and satellite-based precipitation observations and (ii) assimilation of surface soil moisture retrievals from the Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E). Soil moisture skill is measured against in situ observations in the continental United States at 44 single-profile sites within the Soil Climate Analysis Network (SCAN) for which skillful AMSR-E retrievals are available and at four CalVal watersheds with high-quality distributed sensor networks that measure soil moisture at the scale of land model and satellite estimates. The average skill (in terms of the anomaly time series correlation coefficient R) of AMSR-E retrievals is R=0.39 versus SCAN and R=0.53 versus CalVal measurements. The skill of MERRA surface and root-zone soil moisture is R=0.42 and R=0.46, respectively, versus SCAN measurements, and MERRA surface moisture skill is R=0.56 versus CalVal measurements. Adding information from either precipitation observations or soil moisture retrievals increases surface soil moisture skill levels by ÎDDeltaR=0.06-0.08, and root zone soil moisture skill levels by DeltaR=0.05-0.07. Adding information from both sources increases surface soil moisture skill levels by DeltaR=0.13, and root zone soil moisture skill by DeltaR=0.11, demonstrating that precipitation corrections and assimilation of satellite soil moisture retrievals contribute similar and largely independent amounts of information.

Rolf Reichle
NASA Goddard Space Flight Center, Code 610.1, Bldg 33, Rm F-206
Greenbelt Road, Greenbelt, MD 20771, USA
Tel. +1-301-614-5693, FAX +1-301-614-6246 (NEW!)
http://userpages.umbc.edu/~reichle