Geophysical Research Abstracts
Vol. 17, EGU2015-7626, 2015
EGU General Assembly 2015

On the Problem of Re-scaling Short-term Satellite Data Records

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Satellite data have been proven valuable source of information for model improvement through data assimilation over the past decade. The US Department of Agriculture (USDA) Foreign Agricultural Services (FAS) crop prediction system currently relies on root-zone soil moisture (SM) estimates developed using an enhanced version of the Palmer Model (PM), where satellite SM estimates derived from the Advanced Scanning Microwave Radiometer (AMSR-E), in the past, and the Soil Moisture and Ocean Salinity mission, at present, are ingested on an operational basis. It is planned that the USDA FAS system is further improved using observations from the Soil Moisture Active Passive (SMAP) mission as data become available. SMAP offers a number of improvements over AMSR-E and SMOS, the major one being enhanced spatial resolution.

Important issue with data assimilation is that the satellite soil moisture and the modeled output typically show systematic differences (i.e. bias in the mean, for example), which usually are recommended to be accounted for prior to assimilation. The current re-scaling techniques that allow to take care of these predefined differences, such as Histogram and CDF matching, need relatively long-term of record to properly derive the necessary for the re-scaling statistics. SMAP is scheduled for launch on January 29th, 2015. We face the challenge of computing representative statistics for SMAP under the conditions of limited availability of satellite data records. Therefore, the main focus of this paper is to try to evaluate the impact of the data record window used to perform the re-scaling step on the enhanced modeled estimates. Assessment will be carried out using the above described PM-based data assimilation system. Most importantly, the long-term availability of AMSR-E allows us to examine the problem using actual satellite data. Results from this evaluation exercise will be presented and discussed.