Geophysical Research Abstracts
Vol. 13, EGU2011-11125, 2011
EGU General Assembly 2011
© Author(s) 2011

Developing a Dual Assimilation Approach for Thermal Infrared and Passive Microwave Soil Moisture Retrievals

Christopher Hain (1), Wade Crow (2), Martha Anderson (2), John Mecikalski (3), and Thomas Holmes (2)

(1) I.M. Systems Group at NOAA / NESDIS, Camp Springs, MD, USA, (2) Hydrology and Remote Sensing Laboratory, USDA Agricultural Research Service, Beltsville, MD, USA, (3) Atmospheric Science Department, University of Alabama in Huntsville, Huntsville, AL, USA

Soil moisture plays a vital role in the partitioning of sensible and latent heat fluxes in the surface energy budget and the lack of a dense spatial and temporal network of ground-based observations provides a challenge to the initialization of the "true" soil moisture state in numerical weather prediction simulations. The retrieval of soil moisture using observations from both satellite-based thermal-infrared (TIR) and passive microwave (PM) sensors has been developed (Anderson et al., 2007; Hain et al., 2009; Hain et al. 2010; Jackson, 1993; Njoku et al., 2003). The ability of the TIR and microwave observations to diagnose soil moisture conditions within different layers of the soil profile provides an opportunity to use each in a synergistic data assimilation approach towards the goal of diagnosing the "true" soil moisture state from surface to root-zone. TIR and PM retrievals of soil moisture are compared to soil moisture estimates provided by a retrospective Land Information System (LIS) simulation using the NOAH LSM during the time period of 2003 - 2009. The TIR-based soil moisture product is provided by a retrieval of soil moisture associated with surface flux estimates from the Atmosphere-Land-Exchange-Inversion (ALEXI) model (Anderson et al., 1997; Mecikalski et al., 1999; Hain et al., 2009). The PM soil moisture retrieval is provided by the Vrijie Universiteit Amsterdam(VUA)-NASA surface soil moisture product. The VUA retrieval is based on the findings of Owe et al. (2001; 2008) using the Land Surface Parameter model (LPRM), which uses one dual polarized channel (6.925 or 10.65 GHz) for a dual-retrieval of surface soil moisture and vegetation water content. In addition, retrievals of ALEXI (TIR) and AMSR-E (PM) soil moisture are assimilated with the LIS and the NOAH LSM. A series of data assimilation experiments are completed with the following configuration, (a) no assimilation, (b) only ALEXI soil moisture, (c) only AMSR-E soil moisture, and (d) ALEXI and AMSR-E soil moisture. The relative skill of each assimilation configuration is quantified through a data-denial experimental design, where the LSM is forced with an inferior precipitation dataset (in this case, the TRMM 3B42RT precipitation dataset). The ability of each assimilation configuration to correct for precipitation errors is quantified through the comparison of the results with a single simulation over the same domain with a high-quality (NLDAS) precipitation dataset. Additionally, future applications of ALEXI surface flux estimates and soil moisture will be addressed.