Geophysical Research Abstracts
Vol. 14, EGU2012-516-1, 2012
EGU General Assembly 2012

Optimal exploitation of AMSR-E signals for improving soil moisture estimation through land data assimilation

L. Zhao (1,2), K. Yang (1), J. Qin (1), and Y. Chen (1)

(1) Institute of Tibetan Plateau Research, Chinese Academy of Sciences, China (yangk@itpcas.ac.cn), (2) Graduate University of Chinese Academy of Sciences, Beijing, China (zhaolong@itpcas.ac.cn)

Regional soil moisture can be estimated by assimilating satellite microwave brightness temperature into a land surface model (LSM). This study explores how to improve soil moisture estimation based on sensitivity analyses when assimilating AMSR-E (Advanced Microwave Scanning Radiometer for Earth Observing System) brightness temperatures. By assimilating a lower and higher frequency-combination, the land data assimilation system (LDAS) used in this study first estimates model parameters in a calibration pass, and then estimates soil moisture in an assimilation pass. The ground truth of soil moisture was collected at a soil moisture network deployed in a Mongolian semiarid area. Analyzed are the effects of different polarizations (horizontal and vertical), satellite overpass times (nighttime and daytime), and different frequency (from 6.9 GHz to 36.5 GHz) combinations on the accuracy of soil moisture estimation by the LDAS. The analyses indicate that assimilating the horizontal polarization underestimates soil moisture and assimilating the daytime signals produces obviously overestimates soil moisture. The former is perhaps due to the high sensitivity of the horizontal polarization to land surface heterogeneity, and the latter is due to the effective soil temperature for microwave emission in the daytime being close to the one at several centimeters soil depth but not to the surface skin temperature. Therefore, assimilating the nighttime vertical polarizations in the LDAS is recommended. A further analysis shows that assimilating different frequency-combinations produces different soil moisture estimates and none is always superior to the others, because different frequency signals may be contaminated by varying clouds and/or water vapor with different degrees. So, an ensemble estimation based on frequency-combinations was proposed to filter off, to some extent, the stochastic frequency-dependent biases. The ensemble estimation performs more robust when driven by different forcing data.