Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06301, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06301
EGU General Assembly 2008

Validation of a dual-pass microwave land data assimilation system at CEOP Mongolian moisture network

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Soil moisture is one of the most important factors for controlling surface energy budget and land-atmosphere interaction. It is very heterogeneous in semi-arid regions and its estimation is particularly difficult. Using AMPEX (Advanced Earth Observing Satellite II (ADEOS-II) Mongolian Plateau EXperiment for ground truth) data, this paper investigates the ability of upscaling soil moisture with a microwave land data assimilation system (LDAS). The system consists of a revised simple biosphere scheme (SiB2) as the model operator and a microwave radiative transfer equation as the observer operator. The LDAS at first uses low-frequency microwave data (vertical polarization of 6.9GHz and 18.7GHz of AMSR-E) to automatically optimize major system parameters, and then estimates near-surface soil moisture with the same microwave signal by data assimilation. Results show that differences between the LDAS-estimated soil moisture and the observed one at a single station can be quite diverse, because the footprints of the microwave data are far beyond the representative size of observed soil moisture. After average over all stations, however, the LDAS-estimated soil moisture compares well with observed one, while SiB2-modeled soil moisture shows clear biases from observed one. This indicates that the assimilation of microwave signal, compared to a land surface modeling, has effectively improved the estimation of soil moisture.