EGU2020-21078
https://doi.org/10.5194/egusphere-egu2020-21078
EGU General Assembly 2020

Examination of Dielectric Models in AMSR2 Soil Moisture Estimation Algorithm for Japanese and Cambodian Soils

Kumiko Tsujimoto and Tetsu Ohta
Okayama University, Japan (tsujimoto@okayama-u.ac.jp)

The Advanced Microwave Scanning Radiometer 2 (AMSR2) onboard the Global Change Observation Mission – Water (GCOM-W) satellite provides global surface soil moisture as well as other water-related variables over the earth. With its brightness temperature observations at 10 and 36 GHz, the global soil moisture product is operationally created by the Japan Aerospace Exploration Agency (JAXA) based on the Koike's algorithm (Koike et al., 2004) using the Polar Index (PI) and the Index of Soil Wetness (ISW). A land data assimilation system, LDAS-UT, has been also developed by Yang et al. (2007) to retrieve the optimized soil moisture estimates using both the brightness temperature observation and a land surface model.

In this study, we applied the distributed hydrological model, WEB-DHM (Wang et al., 2009), which incorporates the same land surface model with LDAS-UT, to a river basin in Cambodia and then calculated the brightness temperature at 6.9GHz from the simulated soil moisture distribution, using the same forward model as LDAS-UT. The temporal and spatial distribution of soil moisture was calibrated and validated against in-situ observation through river discharge using WEB-DHM, and the calculated brightness temperature was compared with the AMSR2 observation at 6.9 GHz. In addition to the dielectric mixing model by Dobson (Dobson et al., 1985) which is originally used in the LDAS-UT as well as in the JAXA's soil moisture retrieval algorithm, the performance of the Mironov model (Mironov et al., 2004) was examined as an alternative for the dielectric mixing model in the forward calculation and the calculated results from the two models were compared.

Along with the hydrological simulation, field measurements and laboratory experiments were conducted in Cambodia and Japan to evaluate the dielectric behavior of wet soils with different soil water content at a point scale. A ground microwave radiometer was temporally installed over a paddy field in Japan to measure the brightness temperature at 6.9GHz directly from the near surface. Soil samples were also taken from this field as well as several other locations in Japan and Cambodia to measure the permittivity with different soil moisture content with a network analyzer in the laboratory, in order to examine the dielectric behavior of wet soils for different soil textures. The measured results were then compared with the Dobson and Mironov models to evaluate their performance for Asian soils.