Geophysical Research Abstracts
Vol. 21, EGU2019-3650, 2019
EGU General Assembly 2019

Soil Moisture Retrieval Based on Combined High Resolution Sentinel SAR and Multispectral Images

Chunfeng Ma and Matthew McCabe

King Abdullah University of Science and Technology, Water Desalination and Reuse, Biological and Environmental Science and Engineering, Saudi Arabia (chunfeng.ma@kaust.edu.sa)

Soil moisture plays a key role in climatic and hydrological systems. Synthetic Aperture Radar (SAR) has shown its potential in providing high resolution soil moisture estimates over both watershed and precision agriculture scales. This advantage moves beyond the coarser spatial resolution shortcoming of passive microwave sensors and limited penetrating ability of optical-thermal sensors. However, it remains challenging to estimate soil moisture at ultra-high-resolution based on SAR because of the impacts of surface roughness and vegetation parameters, which can introduce large uncertainty into retrieval algorithms. This study presents a joint retrieval approach for SM and vegetation water content based on the combination of high resolution SAR and multispectral images from European Spatial Agency satellite series (Sentinel-1 and 2A/B). In this approach, a cost function is constructed to invert a coupled backscattering model that integrates the Oh model and water cloud model. Sentinel-2 multispectral imagery is first applied to estimate vegetation water content and provide vegetation optical depth for the model. Then, the soil moisture and surface roughness are simultaneously estimated based on dual-polarized SAR imagery using a global optimization algorithm. The proposed approach is examined using ground-based soil moisture measurements over several climatic regions and various surface types. The result show that the presented approach could lead to accurate soil moisture and vegetation water content estimates and should be useful for monitoring moisture condition of soil and vegetation at precision agriculture scales.