EGU22-9883
https://doi.org/10.5194/egusphere-egu22-9883
EGU General Assembly 2022

Assessing the impact of land cover type on Sentinel-1 soil moisture retrievals

Samuel Massart, Mariette Vreugdenhil, Bernhard Bauer-Marschallinger, Claudio Navacchi, Felix David Reu, Raphael Quast, and Wolfgang Wagner
TUWien, Faculty of Mathematics and Geoinformation, Department of Geodesy and Geoinformation, Wien, Austria (samuel.massart@tuwien.ac.at)

Active microwave remote sensing satellites allow to retrieve surface soil moisture (SSM) consistently and independently from sun illumination or cloud cover. The current generation of Synthetic Aperture Radars (SAR) on-board of the Sentinel-1A and 1B satellites, launched in 2014 and 2016 respectively, provide backscatter observations in their interferometric wide swath mode at 20 x 22 m resolution. These data are being used by the Copernicus Global Land Service (CGLS) for generating SSM data at kilometre-scale resolution using a change detection approach. The data are operationally and freely available from https://land.copernicus.eu/global/. The goal of this study was to assess the quality of the CGLS SSM retrieval algorithm over different land cover types and crop species. For this purpose, we compared the satellite retrievals against in-situ SSM from the International Soil Moisture Network (ISMN). The stations analyzed are located in France and Austria (SMOSMANIA and HOAL) and cover a wide range of land cover types, from cropland and grassland to forested areas. For each station, backscatter at 20m resolution was averaged over fields containing the ISMN station using Land Parcel Identification System (LPIS) data. The resampled field backscatter, which covers one specific land cover or crop type, was then used as input for the change detection model and compared to the in-situ SSM from ISMN. The study shows that the temporal correspondence of the resulting SSM with in-situ data is strongly varying between crop species and land cover type. The results suggest that crops with seasonal variations in vegetation structure (e.g. winter wheat stem elongation and heading), have a negative impact on the performance of the model. In comparison, the retrieved SSM is better correlated to in-situ data over land cover such as grasslands or maize fields with more homogeneous vegetation development. This study explores the potential and challenges posed by the high resolution of Sentinel-1 backscatter data for SSM retrieval. It demonstrates the effect changes in vegetation structure can have on S1 backscatter, which is important information to all retrieval algorithms for S1 SSM retrieval. It also provides a first path forward to improve SSM using the TUWien change detection from Sentinel-1.