EGU21-4458, updated on 03 Jul 2022
https://doi.org/10.5194/egusphere-egu21-4458
EGU General Assembly 2021

Exploiting Sentinel-1 polarized data for the classification of areas and time intervals where coherently apply a change detection method for the retrieval of superficial soil moisture at the field scale

Giulia Graldi and Alfonso Vitti
University of Trento, Department of Civil, Environmental and Mechanical Engineering, Trento, Italy (giulia.graldi@unitn.it)

The estimation of superficial soil moisture is performed with a Change Detection (CD) method applied over an agricultural area in Spain, in the basin of the Duero river. The CD method is applied on Sentinel-1 SAR images over a time period of three years. For the period and area of interest are available in situ soil moisture measurments of the REMEDHUS network belonging to the International Soil Moisture Network (ISMN). Two years of data are used for the calibration procedure (2018 and 2019), one year (2020) for validation purposes.
According to the Corine Land Cover classification of 2018, the agricultural area is mainly coverd by low vegetation. The backscatterd SAR signal is indeed modelled as the inchoerent sum of the volumetric contribution of the canopy, and the soil attenuated contribution.
The Sentinel-1 VH polarized band is used for the classification of the areas with homogeneous volumetric contribution, where the condition of constant vegetation contribution is respected in order to apply the CD method. Furthermore, those areas will be identified exploiting the bimodal distribution of the VH band histogram in the upper phase of the vegetative stage of the crop.
The soil roughness contribution to the superficial component of the backscattered signal couldn't be neglected due to agricultural practices such as tillage and harvesting. Furthermore the data are processed at a very high resolution, in order to exploit the full spatial resolution of the SAR data. The VV polarized band will be used to identify the variations of the SAR signal due to changes in the soil roughness, and time periods with constant roughness contribution will be identified in order to apply the CD method. It is expected that the variations of the VV backscattering coefficient due to changes in soil roughness are higher than the ones caused by soil moisture changes, except for meteoric events.
The CD is thus applied on areas and time intervals where only soil moisture content is supposed to vary, and the maximum variation is calculated in each time interval. Finally, the calculation of the soil moisture is performed by scaling the maximum difference of SAR signal with the maximum difference of the in situ data.
In previous studies performed on the same area, a SAR vegetation index was used to classify homogeneous volumetric contribution, and soil rougness was neglected. Even if the trend of the solution fits well the precipitation events and the trend of the in situ data (RMSE=0.096m^3/m^3, R=0.583m^3/m^3), the results presented singularities. The above presented method for the

superficial soil moisture calculation is expected to smooth the singularities present in the results of our previous studies.