Geophysical Research Abstracts
Vol. 21, EGU2019-5160, 2019
EGU General Assembly 2019

Irrigation mapping using products derived from Sentinel-1 and Sentinel-2 time series over a Mediterranean semi-arid region

Safa Bousbih (1,2), Mehrez Zribi (1), Zohra Lili-Chabaane (2), Nicolas Baghdadi (3), Qi Gao (1,4,5)

(1) CNRS, cesbio, Toulouse, France (mehrez.zribi@cesbio.cnes.fr), (2) INAT, Tunis, Tunisia (safabousbih1@outlook.fr), (3) UMR TETIS, Montpellier, France (nicolas.baghdadi@teledetection.fr), (4) ISARDSAT, Barcelona, Spain (qi.gao@isardsat.cat), (5) Ramon Llull University, Roquetes, Spain

In order to ensure food security, semi-arid Mediterranean regions are largely dependent on irrigated agriculture. Irrigated agriculture in such areas can be highly productive and can also provide congenial living conditions. Because of the high contribution of irrigation, monitoring of it actual state is the major issue in these regions and knowing the spatial distribution and year-to-year variability in irrigated areas could be imperative for water resources management. With the arrival of Sentinel-1 and Sentinel-2 satellite, operational approaches are developed for monitoring surface states at the field scale with high spatial and temporal resolution. This present paper develops a methodology based on high spatial resolution remote sensing data for irrigation mapping. The inputs of the approach are the Normalized Difference Vegetation Index (NDVI) derived from Sentinel-2 data every 10 days, and soil moisture time series produced by the inversion of the Water Cloud Model (WCM) using a synergy of Sentinel-1, radar data in VV polarization and Sentinel-2 optical data every 6 days, over the Kairouan plain, in Central of Tunisia, North Africa.

The first step was to divide an NDVI image into segments to delineate the agricultural fields. Then, a Support Vector Machine (SVM) classification is performed to distinguish between irrigated and non-irrigated areas, using the mean and variance values of soil moisture computed over the training cereal fields. Three cases were used to classify the fields, using a Decision Tree classification. The resulting irrigation maps were validated using ground truth measurements. The first case computed the mean value of NDVI on each segment, using an empirical threshold to delineate between the irrigated and rainfed fields. The overall accuracy of the classification was about 58%, due to the confusion between the two classes. Then, we combined, the mean value of NDVI and the mean and variance of soil moisture to obtain an overall accuracy of approximately 71 %. Finally, we used only the mean and variance values of soil moisture to produce the irrigation map. The best estimation was obtained using only soil moisture parameters with an accuracy of 77 %. This study demonstrates the high potential of combining radar and optical data for soil moisture estimation, which allows the monitoring of irrigation at the field scale.