EGU2020-11521
https://doi.org/10.5194/egusphere-egu2020-11521
EGU General Assembly 2020

C band radar crops monitoring at high temporal frequency: first results of the MOCTAR campaign

Pierre-Louis Frison[1], Adnane Chakir[2], Jamal Ezzahar[3,4], Pascal Fanise[4], Ludovic Villard[4], Nadia Ouaadi[2,4], Khaba Said[2,5], Mehrez Zribi[4], Valerie Le Dantec[4], Mohamed Kasbani[4], Salah Erraki[2], and Lionel Jarlan[4]

[1]LASTIG, UGE / IGN, Marne la Vallée, FRANCE
[2]LMME, Department of Physics, Faculty of Science Semlalia, Cadi Ayyad University, Marrakech, Morocco
[3]Equipe de Mathématiques et Traitement de l'Information (MTI), National School of Applied Sciences, Cadi Ayyad University, Safi, Morocco
[4]CESBIO, University of Toulouse, IRD/CNRS/UPS/CNES, Toulouse, France
[5]CRSA, Centre for Remote Sensing Applications, Mohammed VI Polytechnic University (UM6P), Ben Guerir, Morocco

This work deals with crops monitoring in a semi-arid environment, the Mediterranean region, where up to 90% of available water is used for irrigation. In addition to help for yield predictions, temporal monitoring at a regular time basis can help for the optimization of water use. We focused on the daily cycle of the backscattering radar coefficient over two different crop Mediterranean types: olive trees and wheat. With a six-day period between two consecutive acquisitions, the Sentinel-1 mission improves significantly the potential of SAR data for seasonal monitoring of earth surfaces. The available temporal frequency allows for the first time the temporal monitoring of natural surfaces in relation with seasonal changes. However, they are still many issues for better understanding Sentinel-1 temporal signatures and the full potential of these data over crop fields. Indeed, crop fields are characterized by contrasted surface states between bare soils and densely vegetated, with sudden changes due to field works (changing dramatically soil roughness or moisture) or harvests. The MOCTAR experiment consists in the acquisitions of radar fully polarimetric interferometric C-band data acquired continuously at 10 min time step from the top of a tower. The study site is located in the Haouz plain, near the city of Marrakech, in the Chichaoua region, in Morocco. The region is characterized by a semi-arid Mediterranean climate, with an average of 250 mm of yearly precipitation. The region is characterized by two main seasons: wet and dry, extended from October to April and from May to September respectively. Maximum temperatures occur in July-August (average of 27.2 °C) and minimum in January (10.8° C). The study site is composed of two plots of 2.50 ha each, one consisting in olive trees, the other in wheat (Fig. 1). Both are irrigated with drip technique. The study site is documented for more than 10 years, and in situ measurements such as soil moisture, biomass, sapflow sensors (thermal dissipation method) and a micrometric dendrometer are regularly collected.

The radar antennas are fixed on a 20 m height tower, in a similar way than the TropiScat

experiment They have been installed in May 2019. Four L-band antennas, two emitting and two receiving, one in H and the other in V polarizations, are visible on the bottom row. Above, six antennas operating at C band are mounted on two rows: four on the bottom one (two emitting and two receiving in H and V pol.) and above two receiving antennas in H and V pol. This configuration allows for interferometric fully polarimetric acquisitions also called PolInSAR. The acquisitions are made continuously with a 10 min time step.

First results show pronounced daily cycles, with amplitude of about 2 dB. These cycles are likely correlated to diurnal variations of tree water content and sap flow, but need to be further investigated sap flows and dielectric constant measurements made on the trunks. These results will be analyzed by comparison with Sentinel-1 temporal profiles.