isardSAT

Proposal of Industrial Doctorate 2015/2016

Title of the topic	Towards soil moisture retrieval at 100 m spatial resolution every 3 days: an original combination of readily available multi-sensor data
Host	isardSAT (http://www.isardsat.cat/en.html)
Responsible	Maria Jose Escorihuela
Financial Framework	**MICINN Industrial Doctorate** **Co-funding supported** by H2020 REC project (2015-2019) : « Root zone soil moisture Estimates at the daily and agricultural field scales for Crop irrigation management and water use impact – a multi-sensor remote sensing approach »
Profile of applicant	Engineering school, Master degree in Remote Sensing
Short description of the topic: context, applied methodology, expected results.	Agriculture is an important pressure on water resources, especially in the Mediterranean countries where irrigation represents up to 80% of the consumptive uses of water. It now becomes necessary to improve on-farm irrigation management by adjusting water supplies to crop water requirements along the growing season. Modern irrigation agencies rely on in situ root zone soil moisture measurements to detect the onset of crop water stress and to trigger irrigations. However, in situ point measurements are generally not available over extended areas and may not be representative at the field scale. The H2020-funded REC project proposes a remote sensing-based solution to the need of root-zone soil moisture at the crop scale for irrigation management. The methodology relies on the coupling between a surface model representing the water fluxes at the land surface atmosphere interface, and remote sensing data composed of land surface temperature (thermal infrared), surface reflectances (visible and near infrared) and near-surface soil moisture (passive and active microwaves). Currently, the near surface soil moisture (NSSM) data sets available at global scale have a spatial resolution much coarser than the typical size (several ha) of crop fields. Especially, the NSSM retrieved from SMOS (Soil Moisture and Ocean Salinity) and from the recently launched SMAP (Soil Moisture Active and Passive) L-band data have a spatial resolution of about 40 km and 10 km, respectively. In this context, a downscaling methodology (DISPATCH) has been developed to improve the spatial resolution of readily available NSSM data. DISPATCH estimates the NSSM variability within a 40 km/10 km resolution SMOS/SMAP pixel at the target 100 m resolution using MODIS/Sentinel-3 (1 km) and Landsat-8 (100 m) data. At the same time, Sentinel-1 is providing C-band SAR (Synthetic Aperture Radar) data at a spatial resolution of about 20 m with an unprecedented repeat cycle of 6 days by combining both ascending and descending overpasses (3 days by combining the two satellites). Although SAR data have potential to monitor NSSM, there is currently no operational product at such fine resolution. This is notably due to the difficulty to model in time and over extended areas the impact of vegetation cover/structure and soil roughness on the backscatter signal, and thus the need for site-specific calibration. In this PhD program, we propose to combine the NSSM obtained on clear-sky days by DISPATCH, with all-weather Sentinel-1 SAR data to derive a NSSM product at high spatio-temporal resolution. The PhD candidate will be mainly based at isardSAT (Barcelona), will participate in field campaigns over two irrigated areas in Spain and Morocco, and will have secondment opportunities (up to 12 months) to the partner organizations of REC (France and Morocco). A top-up allowance of 2000€ per month will be payed to the PhD student during the mobility periods.
Application	To apply send an application package containing: • Cover letter • Academic CV • Name and contact of three referees who can comment on the applicant capacities and abilities (please inform them that, if you are shortlisted, we might contact them asking for a reference) To: info@isardSAT.cat Deadline for receiving the documents is 6 March 2015