



Airborne Soil Moisture determination at regional level: A data fusion mission approach for Catalan territory

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During the last years the importance of water management has grown considerably. Average temperatures exhibit an increasing pattern (0.77 °C during the last 20 years) that is expected to continue in the next years. These results in a decrease in the hydric resources (15% during the last 20 years for the Catalan territory) being the expectative not very optimist. A tangible consequence was the drought episode that suffers Catalonia. It is within this scenario that the 'Programa Català d'Observació de la Terra' (PCOT) as a unit of the official mapping agency of Catalonia, the 'Institut Cartogràfic de Catalunya' (ICC) has detected the need to develop new tools to improve the management of water resources.

The knowledge of soil moisture across a given region can help to efficiently manage the limited water resources. Present Earth Observations missions such as ESA's SMOS, or the future NASA's SMAP focus considerably their efforts in the estimation of soil moisture. The main drawbacks are the resolutions obtained (40 km for SMOS, 10 km for SMAP), which are not adequate for regional scale and territorial availability such as the case of Catalonia where a spatial resolution in a range between 20-30m. and 100-150m. is desired both for local actuations and to determine hydric soil patterns

In this scenario, PCOT is carrying out an airborne soil moisture mission for the Catalan territory, taking advantage of the availability of ICC aircrafts and of more than 20 years of experience in making aircraft campaigns and operating hyperspectral airborne sensors such as CASI (0.75-1.4 μm) and TASI (8-11.5 μm) to respond to environmental and cartographic end users needs of geoinformation data, products and services. This mission will generate soil moisture maps over the Catalan region that will improve the water management, and will also be used for the study of the hydrological patterns of Catalonia.

Soil moisture determination will be achieved by means of L-band radiometry, using a radiometer designed by the Passive Remote Sensing Group of the 'Universitat Politècnica de Catalunya' (UPC). Spatial resolution enhancement or vegetation cover and surface roughness compensation will be improved by means of data fusion by using the operational CASI and TASI instruments flight simultaneously. Thus, L-band radiometer measurements will be combined with thermal and hyperspectral sensor measurements to obtain surface temperature and vegetation indexes, and thus allow improving the retrieval soil moisture.

This airborne soil moisture mission program is supported by a Torres Quevedo grant awarded by the Spanish Ministry of Science and Innovation as well as by ICC/PCOT as one of the Earth Observation Demonstration Program on the Water Cycle area of activity (named RADERO-Airborne Radiometry) . Running in parallel of technical and operational identification of drivers, RADERO takes into account as a third paramount pillar, to guarantee the usefulness of RADERO, the improvement of awareness and feedback with end users. RADERO mission has set up an advisory board to check the mission analysis and design, under the supervision of the Catalan Agriculture Department among other scientific and potential end users.