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SMOS Cal/Val activities over Valencia Anchor Station: interest of using the PERSIANN database into hydrological applications

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The primary goal of SMOS (Soil Moisture and Ocean Salinity) mission is to deliver global fields of sea surface salinity and surface soil moisture using L-band (1.4 GHz) radiometry. Within the context of the preparation for this mission over land, the Valencia Anchor Station (VAS) experimental site, in Spain, was selected to be one of the main test sites in Europe for the SMOS Calibration/Validation (Cal/Val) activities.

This study presents the interest of using the PERSIANN database into hydrological applications with the goal of having access to the spatial and temporal distribution of precipitation over a significant area (typically here an area equivalent to a SMOS pixel). The PERSIANN database is an automated system for Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks. The advantage of using satellite rainfall estimates as well as the influence that the precipitation events can induce on the modelling of the water content in the soil is presented here.
In this framework, a Soil Vegetation Atmosphere Transfer (SVAT) model - ISBA (Interactions between Soil Biosphere Atmosphere) was used. At SMOS pixel scale (50x50 km^2) soil moisture variability is mostly driven by atmospheric forcing effects, thus mainly being influenced by climatic conditions at large scale and precipitation. Having an accurate estimation of the amount and temporal/spatial distribution of precipitation is a critical issue so as to have a faithful representation of the soil moisture distribution.
Valencia Anchor Station is characterized by an extensive set of measurements at different levels in the atmosphere and in the soil. Over the 50x50 km^2 area 22 meteorological stations, 4 fully equipped and 18 rain gauges, are randomly and not uniformly distributed. The SVAT model was driven by the spatialized (IDW) in situ atmospheric forcing so as to achieve a homogeneous sampling of the soil moisture over the entire VAS area. The PERSIANN database used is at a spatial resolution of 0.04x0.04° so the VAS area covers 221 PERSIANN points, to be compared to the 22 of the current system. Used as inputs for the SVAT model, 221 soil moisture points were obtained over the 50x50 km^2 area. Results of this simulation are compared to the spatialized soil moisture (obtained using meteorological stations) as well as remotely sensed data (AMSR-E). We show that useful information at temporal at spatial scales are provided in the context of soil moisture retrieval.

The satellite derived rainfall estimates do seem to have potential to contribute to extending model simulations and water resource estimations into the future.