

Comparison and validation of a downscaled remote sensing soil moisture product (SMOScat) and the land surface model SURFEX over Catalonia.

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Soil moisture is a critical variable in many kinds of applications including agriculture, water management, meteorology or climatology. This is especially true in the Mediterranean context, where soil moisture plays an important role in water resources and hydrometeorological risks such as floods and droughts. Unfortunately, this variable is not widely observed in situ, so we lack data on its time evolution and spatial structure. However, recent developments in remote sensing allow us to estimate this variable in the first few centimeters of the soil. The SMOS (Soil Moisture and Ocean Salinity) mission is providing a global mapping of soil moisture every 2 or 3 days with a spatial resolution of about 40 km. However, this scale is too coarse in order to study most of the relevant processes at the interface between soil, vegetation and atmosphere. Therefore, it is necessary to downscale these data.

The SMOScat project is developing an operational system which will provide soil moisture at 1 km resolution, or better, over Catalonia (Spain). A downscaling algorithm is applied to 40 km resolution L2 SMOS soil moisture product using 1 km resolution MODIS (MODerate resolution Imaging Spectroradiometer) data. In order to validate the downscaled product, monthly in situ measurements on dryland and irrigated areas have been done. However, these measurements are spatially limited. In order to validate the large scale patterns (over the whole Catalonia), we have realized a land surface simulation at a resolution of 5 km using the SAFRAN-SURFEX (ISBA-3L) modeling framework and compared it to the SMOScat product.

The comparison shows good agreement on the temporal series simulated over flat, non irrigated areas which are not close to the sea. This result gives us confidence, as both methods of estimating the soil moisture (simulation and remote sensing) are very different. However, the comparison also shows the limitations of both products. On the one hand, the remote sensing method has difficulties in areas close to the sea and in areas with steep relief. On the other hand, the model is not able to simulate non natural processes such as irrigation. Therefore, these comparisons, not only are useful for validation purposes, but also to define the priorities of improvement of both products in our area of study.