COMPARISON OF DIFFERENT SENSORS (AND ALGORITHMS) FOR SOIL MOISTURE RETRIEVAL FROM SPACE

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ABSTRACT

Soil moisture is widely recognized a key parameter in the mass and energy balance between the land surface and the atmosphere. Nowadays, remote sensing represents the unique tool to monitor soil moisture over large spatial scales and, recently, with a nearly daily temporal resolution that is required for many applications as, for instance, flood or drought forecasting and numerical weather prediction. Apart from specific satellite missions dedicated to soil moisture estimation, like the recently launched SMOS mission, three satellite sensors, operating in the microwave region, are potentially able to provide soil moisture estimates at global scale: 1) the AMSR-E radiometer, 2) the WINDSAT radiometer and 3) the ASCAT Scatterometer. Moreover, different algorithms were developed also by using the same sensor (mainly for AMSR-E) providing quite different soil moisture estimates.

The great availability of different sensors and algorithms for soil moisture retrieval from space requires consistent methodologies for a robust validation and, hence, the assessment of their performance for varying climate, vegetation, soil and topographic conditions. In fact, by combining the information coming from different satellite sensors such limitations might be reduced or overcome, just exploiting the best characteristics of each single sensor.

This study investigates the reliability of the different soil moisture estimates from satellite sensors, and specifically considering the ASCAT sensor, by using soil moisture observations, that were used as benchmark, for several sites across Europe and located in Italy, France, Spain and Luxembourg. With the end to perform a robust analysis, an extensive and long-term period was investigated and both in-situ observations and ground modeled data were used for the comparison. The application of an exponential filter, to take account of the difference between the soil layer depth investigated by the satellite sensors and the one used as a benchmark, was also discussed. Finally, a cross-comparison between the different satellite sensors was also carried out. Results showing the main differences between sensors for soil moisture retrievals and highlighting relative advantages and drawbacks across different climatic regions, are presented and discussed.