HIGH RESOLUTION MAPPING OF SOIL MOISTURE BY SAR: DATA INTEGRATION AND EXPLOITATION OF PRIOR INFORMATION

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The need of systematic and recurrent monitoring of soil moisture has become very important in the last years, especially considering the frequent flooding event occurred in the Italian territory. In order to methodically face this problem, a number of projects have been proposed by Italian researchers and funded by the Italian Space Agency (ASI) with the purpose to implement new procedures and methods for soil moisture mapping by using satellite data. In particular, the use of Synthetic Aperture Radar (SAR) for the generation of high resolution soil moisture maps is one of the most interesting and challenging application.

In this work, we present the results obtained by means of a new approach oriented to the integration of information derived from SAR images, optical satellite images and land classification data. In particular, the proposed methodology aims to taking into account the vegetation effects on SAR measurements. The correction of such effects is based on the adoption of a simple vegetation model which use a vegetation parameter, i.e. the vegetation water content (VWC), extracted from satellite optical image. The VWC can be derived considering its relationship with the well know Normalized Difference Vegetation Index (NDVI). The relationship on its turn depends on the vegetation type. The latter may be provided by land use maps or by a classification map derived from the optical data themselves.

Once the correction is performed, an inversion algorithm is applied. It is based on a Bayesan inversion criterion. In order to improve the accuracy of the soil moisture estimates, the prior information on soil parameters, in particular those characterizing the soil roughness, is provided to the inversion algorithm. Finally, the effect of the speckle in the radar image is mitigated taking advantage again from the available classification maps in order to perform incoherent averaging within homogeneous regions, without deteriorating too much the spatial resolution.

The work has been funded by the Italian Space Agency.