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Deriving Surface Soil Moisture from Medium Resolution VNIR/TIR Earth Observation Data combined with 1D simulation process model

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Earth Observation (EO) has played an imperative role in extending our abilities for obtaining information on the spatio-temporal distribution of surface soil moisture (SSM). A wide range of techniques have been proposed for this purpose, utilising spectral information acquired from remote sensing instruments operating in different regions of the electromagnetic spectrum. Some of these methods have been based on the integration of satellite-derived estimates of Fractional Vegetation Cover (Fr) and Land Surface Temperature (Ts) in the form of a scatterplot domain, often combining simulations from land surface process model.
In this work we present results from the evaluation of one such technique implemented using ENVISAT's Advanced Along Track Scanning Radiometer (AATSR) medium resolution sensor imagery and SimSphere land surface model. Validation of the derived SMC maps was undertaken in different sites in Europe representing a variety of climatic, topographic and environmental conditions, for which validated in-situ observations from diverse operational ground observational networks were available.
Our results indicated a generally close agreement between the inverted SMC maps and the in-situ observations, with accuracies often comparable to previous studies implemented using different types of EO data. Comparisons of the derived SMC maps regionally against other satellite-derived products also showed largely an explainable distribution of SMC in relation to surface heterogeneity.
The present work was conducted in the framework of the PROgRESSIon (Prototyping the Retrievals of Energy Fluxes and Soil Moisture Content) project, funded by the European Space Agency (ESA) Support to Science Element (STSE). The project aims at exploring the development of a series of prototype products for the estimation of turbulent heat fluxes and SMC derived from the synergy of SimSphere land surface model with EO observations from advanced technologically designed medium resolution ESA-funded or co-funded instruments.

KEYWORDS: surface soil moisture, remote sensing, triangle, SimSphere, AATSR.