Combining Sentinel-1 and ALOS-2 observations for soil moisture retrieval

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One of the limitations of presently available Synthetic Aperture Radar (SAR) surface soil moisture (SSM) products is their moderated temporal resolution (e.g., 3-4 days) that is non optimal for several applications, as most user requirements point to a temporal resolution of 1-2 days or less. A possible path to tackle this issue is to coordinate multi-mission SAR acquisitions with a view to the future Copernicus Sentinel-1 (C&D and Next Generation) and L-band Radar Observation System for Europe (ROSE-L).

In this respect, the recent agreement between the Japanese (JAXA) and European (ESA) Space Agencies on the use of SAR Satellites in Earth Science and Applications provides a framework to develop and validate multi-frequency and multi-platform SAR SSM products. In 2019 and 2020, to support insights on the interoperability between C- and L-band SAR observations for SSM retrieval, Sentinel-1 and ALOS-2 systematic acquisitions over the TERENO (Terrestrial Environmental Observatories) Selhausen (Germany) and Apulian Tavoliere (Italy) cal/val sites were gathered. Both sites are well documented and equipped with hydrologic networks.

The objective of this study is to investigate the integration of multi-frequency SAR measurements for a consistent and harmonized SSM retrieval throughout the error characterization of a combined C- and L-band SSM product. To this scope, time series of Sentinel-1 IW and ALOS-2 FBD data acquired over the two sites will be analysed. The short time change detection (STCD) algorithm, developed, implemented and recently assessed on Sentinel-1 data [e.g., Balenzano et al., 2020; Mattia et al., 2020], will be tailored to the ALOS-2 data. Then, the time series of SAR SSM maps from each SAR system will be derived separately and aggregated in an interleaved SSM product. Furthermore, it will be compared against in situ SSM data systematically acquired by the ground stations deployed at both sites. The study will assess the interleaved SSM product and evaluate the homogeneous quality of C- and L-band SAR SSM maps.
References
