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Field and basin scale analyses of ASAR imagery for soil moisture estimation in the Campidano plain, Sardinia

I. Gherboudj (1), R. Filion (1), C. Paniconi (1), M. Bernier (1), M. Melis (2), A. Soddu (2)

(1) INRS-ETE, Université du Québec, Canada (claudio.paniconi@ete.inrs.ca), (2) CRAS (Centro Regionale Agrario Sperimentale), Cagliari, Italy

The island of Sardinia (Italy) faces acute water management problems due to its susceptibility to long-term droughts and the possibility that this may be exacerbated by climate change. There is thus a strong interest in assessing the potential of space-based monitoring and mapping of state variables that are critical to hydrological and agricultural applications. Our study consists of the acquisition of ASAR imagery in single and alternating polarization modes over the Campidano plain in south-central Sardinia, the island's most important agricultural region. In tandem to image acquisition, ground data (surface soil moisture and roughness) is being collected at two small fields situated in CRAS' agricultural research station near the town of Ussana. We will describe the analyses being conducted at both the large-scale (Campidano) and small-scale (field) sites. At the field scale, ground data and imagery from the period Jun-Nov 2005 are being used to validate an empirical model for surface soil moisture and roughness inversion from the radar signal. At the Campidano scale, classification techniques are being applied to ASAR imagery acquired over the period 2003-2006, supplemented with rainfall, digital terrain, irrigation, land use, and other data. In this more qualitative analysis, the aim is to determine whether the trends and other changes detected in the sequence of images match those observed from field data sources, and whether these can be attributed to soil moisture variations. These efforts tie in with ongoing research on adapting data assimilation techniques for a catchment-scale hydrological model. Periodic observations of surface soil moisture can be used to update the model's boundary conditions that drive surface and subsurface partitioning of water and energy fluxes.