

## ABSTRACT

Soil moisture estimation is a very interesting problem in the context of biophysical parameter estimation from remotely sensed data. Typically, measurements at microwave band are used because of their well known sensitivity to variations in the soil water content. However, also soil roughness and the presence of vegetation affect the microwave signals, thus increasing the complexity of the estimation problem. The latter problem becomes even more complex when we move on mountain areas, such as the Alps, where the high heterogeneity of the topographic condition further affect the signals acquired by remote sensors. In this paper, we explore the use of polarimetric RADARSAT2 SAR images for the estimation of soil moisture content in an alpine catchment. In greater detail, we first exploit field measurements and ancillary data to carry out an analysis on the sensitivity of the SAR signal to the moisture content of soil and other target properties, such as topography and vegetation/land-cover heterogeneity, that characterize the mountain environment. On the basis of the findings emerged from this analysis, we propose a technique for estimating moisture content of soils in these challenging operative conditions. Preliminary results are discussed both in terms of accuracy over point measurements and effectiveness in handling spatially distributed data.

**Keywords:** Soil moisture, Support Vector Regression (SVR), estimation, RADARSAT2, Synthetic Aperture Radar (SAR), Alpine environment, remote sensing.