MODIS images and avalanche: operational use of satellite images in forecasting avalanche Hazard.

Mauro Valt¹, Rosamaria Salvatori², and Roberto Salzano³

¹ARPAV-Avalanche Center Arabba, Snow and Avalanche, Arabba, Italy (mauro.valt@arpa.veneto.it)
²National Research Council of Italy - Institute of Polar Sciences, Via salaria km 29,300, 00015 Monterotondo (Roma), Italy
³National Research Council of Italy - Institute for Atmospheric Pollution Research, via Madonna del Piano 10, 50019 Sesto Fiorentino (FI), Italy

The avalanche hazard is a critical task for the regional services in the Alpine region. For this reason, the characteristics of surface snow are continuously monitored in terms of micro-physics and metamorphism. The spatial distribution of the different types of snow covers (fresh snow, drift snow, melted snow, surface hoar, rain crusts, wet snow, dry snow) are used in the models aimed to forecast the avalanche hazard.

Satellite data are very important for routinely monitoring the snow cover and data provided by the Moderate Resolution Imaging Spectroradiometer (MODIS), onboard on the Terra and Aqua platforms, are an useful source of information for a modern avalanche assessment service.

More than one hundred MODIS images were processed, in the 2013-2020 period, for 2 areas located in the Dolomites, between Marmolada and Pale di San Martino groups (Veneto Region, Italy). The two training sites were used for the definition of a workflow useful for discriminating different types of snow surface. The defined workflow, based on the average radiometric values of bands 4, 5 and 6, were applied on the reflectances derived by the daily product MOD02HKM, with a spatial resolution of 500m. While band 4 and 5 (respectively visible radiation at 550nm and short-wave infrared at 1240nm) support the discrimination of different snow surfaces, the band 6 (short-wave infrared at 1630nm) is linked mainly to the presence of dry or wet snow on the surface.

The proposed workflow provided classification maps that were validated using observations recorded at the meteorological stations located in the test areas and by field surveys carried out by snow scientists. These results support the availability of a reliable tool based on remotely-sensed data, evidenced by the good agreement with field observations, which can be an optimal input for avalanche forecasting.