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Cross-country assessment of H-SAF snow products by Sentinel-2 imagery validated against in-situ observations and webcam photography

Gaia Piazzi (1,5), Zuhal Akyürek (2), Ali Nadir Arslan (3), Simone Gabellani (1), Semih Kuter (2), Silvia Puca (4), Burak Simsek (3), Matias Takala (3), Cemal Melih Tanis (3), and Alexander Toniazzo (4)

(1) CIMA Foundation, Hydrology and Hydraulics, Savona, Italy (simone.gabellani@cimafoundation.org), (2) Department of Civil Engineering, Middle East Technical University, Ankara, Turkey, (3) Finnish Meteorological Institute (FMI), Helsinki, Finland, (4) National Civil Protection Department, Rome, Italy, (5) IRSTEA, Hydrology Research Group, UR HYCAR, Antony, France

Information on snow properties is of critical relevance for a wide range of scientific studies and operational applications, mainly for hydrological purposes. However, ground-based monitoring of snow dynamics is a challenging task, especially over complex topography and under harsh environmental conditions. Remote sensing is a powerful resource providing snow observations at large scale. This study addresses the potential of using Sentinel-2 high-resolution imagery to validate moderate-resolution snow products, namely H10 – Snow detection (SN-OBS-1) and H12 – Effective snow cover (SN-OBS-3) supplied by the Hydrological Satellite Facility (HSAF) Project of EUMETSAT. With the aim of investigating the reliability of reference data, the consistency of Sentinel-2 observations is assessed against both in-situ snow measurements and webcam digital imagery. The study area encompasses three different regions, located in Finland, Italian Alps and Turkey to comprehensively analyze the selected satellite products over both mountainous and flat areas having different snow seasonality. The results over winter seasons 2016/17 and 2017/18 show a satisfying agreement of Sentinel-2 data with ground-based observations, both in terms of snow extent and fractional snow cover. HSAF products prove to be consistent with the high-resolution imagery, especially over flat areas. Indeed, while vegetation only slightly affects the detection of snow cover, the complex topography more strongly impacts product performances