IAHS2017-266
IAHS Scientific Assembly 2017

Global Monitoring System for snow mountain areas from a multiple-users approach, SNOWMED-GMS: the experience in Sierra Nevada (Spain)

María José Polo (1), Javier Herrero (2), Rafael Pimentel (1,3), José Ignacio Migallón (1), María José Pérez-Palazón (1), Zacarías Gulliver (1), Cristina Aguilar (1), Marta Egüen (2), and Francisco Javier Bonet (2)

(1) University of Cordoba, Andalusian Institute for Earth System Research, Cordoba, Spain (mjpolo@uco.es), (2) University of Granada, Andalusian Institute for Earth System Research, Granada, Spain, (3) Swedish Meteorology and Hydrology Institute, SMHI, Norrköping, Sweden

Mountain areas in Mediterranean regions constitute singular biodiversity reservoirs and snow provides both nature and society with different ecosystem services, whose value makes these areas highly vulnerable to climate variability and change. Modelling snow influence on the hydrological regime in these regions usually requires a physical approach based on the water and energy balance equations, which is not always feasible to approach from operational grounds. Scale effects usually arise in the modelling due to the abrupt topography in these areas, which collides with the spatial resolution of the different data sources and the requirements of the numerical modelling. The Natural and National Park of Sierra Nevada (PNSN), Spain, is a special environment in the Iberian Penynsula, with high altitudes and annual snowfall occurrence at just 40 km from the Mediterranean coast. Its high and recognized environmental value and the presence of socioeconomic sectors such as mountain sports, rural tourism, hydroelectric energy production, and agricultural, urban and tourism water demands make it complex the hydrological planning downstream, with reservoirs operation highly dependent on the annual regime of snow.

This work shows the development of a Global Monitoring System (GMS) for the evolution of the snow in Mediterranean regions, and its application in the PNSN. The SNOWMED-GMS is capable of i) simulating the snow state on both point and distributed scales, with an adequate spatial resolution, ii) monitoring in quasi-real time the snow state on both scales from remote sensing and ground data, iii) the detection of early states indicating changes in the ecosystem services associated to the snow, and iv) the access and analysis of the information by different users of both water resources and the territory in these areas. This SNOWMED-GMS was designed for open use at different levels: the scientific research based on the snow conditions, the stakeholders involved in water resource and environmental management, and the general public.

SNOWMED-GMS is based on the experience and previous results obtained by the research group at the PNSN and aims at optimizing the dissemination of the state-of –the-art on snow processes on both the scientist and the lay mind. For this, a multilevel classification tree was designed to sort the data and information provided by the system according to different users' profiles. Moreover, the GMS gathers different data sources of information (weather stations, remote sensing, terrestrial imagery, field data) about the snowpack, vegetation, weather conditions, and water flow, and merges all of them to produce assessment on selected services directly and/or indirectly associated to water resources in high mountain regions (radiation, precipitation and temperature spatial patterns, snow distribution maps, vegetation cover and soil moisture distribution and shifts, flow rates, water storage in soil, etcetera), and establishing observed trends in the snow states at different scales for forecasting and operational purposes.

Project CGL2014-58508R, "Global monitoring system for snow areas in Mediterranean regions: trends analysis and implications for water resource management in Sierra Nevada", Spanish Ministry of Economy and Competitiveness – MINECO. https://www.facebook.com/gmsSNOWMED/
This research was developed within the framework of the Working Group on Water and Energy Fluxes in a Changing Environment, Panta Rhei Research Initiative of the International Association of Hydrological Science (IAHS)