Mysnowmaps: snow modeling and snow data crowdsourcing

Matteo Dall'Amico (1), Leonardo Perathoner (1), Stefano Tasin (1), Fabrizio Zanotti (1), and Stefano Endrizzi (2)

(1) MobyGIS Srl, Trento, Italy (matteo@mobygis.com), (2) Independent specialist in hydrology, Zurich, Switzerland (stefano.end@gmail.com)

Snow monitoring in the Alps is usually carried out by avalanche warning institutes, which maintain a network of stations where snow depth and meteorological variables are measured at specific points. Such network is usually integrated by manual observations performed by specifically trained people. The collected data are eventually used to produce the avalanche bulletin.

Although this snow dataset is very valuable, it cannot cover all valleys and elevation ranges. In addition, budget constraints keeps the number of stations relatively small. This consideration raises two questions:

1. Given the current dataset, how can spatially distributed snow data be produced and displayed?

2. How can the snow measurement dataset be increased?

In order to address these questions, we created Mysnowmaps (www.mysnowmaps.com), a web/app platform dedicated to off-track snow mountaineers.

Mysnowmaps is one of the first operative portal that calculates snow evolution all over the Alps in form of maps on a daily basis at high resolution (250 m).

The calculation paradigm follows a physically based approach: differently from other modeling approaches where snow maps are derived from a statistical-based spatial interpolation, in Mysnowmaps they are produced by solving the equations of energy and mass conservation (Dall'Amico et al, 2014, Endrizzi et al, 2014). The input is represented by weather forecast simulations in form of grids (5 km resolution, 1 hour aggregation) and by the topographical maps of the domain (elevation, slope, aspect, sky view factor). The model results are later improved by assimilating snow measurements. The advantages of this approach are: 1) accuracy is improved as the topographical characteristics of the domain are totally incorporated; 2) the model may run also in ungauged regions or in period with few measurements (e.g. late spring) as it is not strictly dependent on snow data; 3) it may run also in a prognostic way.

Furthermore, Mysnowmaps is also a valuable Pan-Alpine dataset on snow and water resources. At the moment, thanks to Open Data legislation and to agreements with most alpine avalanche offices, we are able to receive data from more than 1000 stations all over the Alps, 350 of which are snow-gauges. In this way we have overcome the bothersome problem of "regionalization" of snow and water monitoring, creating a consistent and standardized map of snow depth and snow water equivalent all over the Alps.

Finally, Mysnowmaps is a also social platform, as it fosters the outdoor community to share the information on snow (snow depth measures, snow condition reviews) encountered during their excursions. The crowdsourced measurements allow to enlarge the snow dataset, especially in ungauged areas and at high elevations. The engagement of the users and hikers in monitoring water resources responds also to an invitation of EU for Citizen Observatory.