



## A new rock glaciers inventory in the North-Western Alps

Michèle Curtaz (1), Marco Vagliasindi (1), Stéphanie Letey (2), Umberto Morra di Cella (2), and Paolo Pogliotti (2)

(1) Fondazione Montagna sicura, Courmayeur, Italy (corresponding author: mcurtaz@fondms.org), (2) Agenzia Regionale per la Protezione dell'Ambiente della Valle d'Aosta, Saint-Christophe, Italy

The Aosta Valley is a small alpine region in the Alps in the North West of Italy, at the corner with France and Switzerland. Its surface (about 3300 km<sup>2</sup>) is prevalently mountainous with more than 50% of the territory above 2000 m asl and about 5% of glaciated areas. In such a high altitude region periglacial environment and permafrost territories are important; a permafrost probable distribution map is under realisation in the frame of the project PermaNET - Permafrost long-term monitoring network, a project part of the European Territorial Cooperation and co-funded by the European Regional Development Fund (ERDF) in the scope of the Alpine Space Programme [www.alpine-space.eu](http://www.alpine-space.eu). In the frame of the same project a new rock glaciers inventory of Aosta Valley was done. Some data already exist in the Rock Glacier Inventory of the Italian Alps (data collection of the Italian Glaciological Committee, edited by Smiraglia and Guglielmin, 1997), but a census based on the new cartographic products available has been performed for the entire region. The rock glacier identification was carried out by the analysis of aerial photographs (orthophotos 0,5 m resolution), DTM (Digital Terrain Model, 2 m grid) and IRFC (Infrared False Colour Images, 15 cm resolution). Each deposit was manually bounded inside a GIS environment crossing the visual information coming from the stereoscopic vision of IRFC images, hillshade effect derived from DTM and orthophotos. Main geomorphic parameters (area, length, width, slope, aspect, elevation of the front, elevation of the upper part and altitude of the relief from which they originate) were automatically calculated using the DTM. Other data were collected in a detailed table filled for each rock glacier. The fields were chosen on the example of existing rock glaciers inventories and on PermaNET Evidences Database guidelines, in order to make the results comparable: (i) state of activity (classified in intact, that includes active and inactive rock glaciers, and relict), (ii) geometry (lobate, tongue shaped or equi-dimensional), (iii) shape (simple or complex, with the specification of complexity typology: multipart, multiroot, multilobe, multiunit), (iv) alimentation (morainic-derived or talus-derived), (v) location, (vi) relations with glacial forms and with vegetation limits, (vii) morphological features, such as longitudinal or transverse ridges, swollen or hollow body, presence of conic pits, and (viii) surveying or monitoring activities. In addition possible interferences with human structures (e.g. cableways, roads, ski tracks, huts, etc) and potentially dangerous positions of the deposits in relation to the inhabited valley floors were mentioned, for the analysis of risks deriving from permafrost degradation. Furthermore quality of the information, derived from photointerpretation, was evaluated: the uncertainty in the deposit boundaries, in the definition of the state of activity and in the detection of morphological features is marked. Geostatistics analysis were performed in order to assess which are the main characteristics of the rock glaciers in Aosta Valley and to evaluate the distribution of such deposits in relation to topography. More than 900 rock glaciers were identified for a density of 2,7 per 10 km<sup>2</sup> and a total surface of 2% of the region, that demonstrate the importance of permafrost and periglacial environment in this territory.

The inventory is part of Aosta Valley Glaciers Inventory and it is published online at <http://catastoghiacciai.regione.vda.it/Ghiacciai/MainGhiacciai.html>.

### References

- Seppi, R., Carton, A., Baroni, C. 2005, Proposta di una nuova scheda per il censimento dei rock glaciers da fotografie aeree: applicazione sull'Alta Val d'Ultimo (Gruppo Ortles-Cevedale), Geogr. Fis. Dinam. Quat. Suppl.VII
- Guglielmin, M., Smiraglia, C. (eds.) 1997, Rock glacier inventory of the Italian Alps, Arch. Comit. Glaciol., GNGFG., 3, Torino