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Analysis of Rutor glacier recent evolution: a quantitative approach

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Alpine glaciers dynamics may serve as an indicator of Climate Change. In the Alps glaciers are strongly related to environmental and economic factors, but also to touristic ones. Since some years, a geodatabase containing data related to some test glaciers evolution since Little Ice Age to present day in the Western Italian Alps, is being developed by the Authors. In particular, a main attention has been given to Rutor glacier. It is one of the ten biggest glaciers in the Italian Alps, it is located in Aosta region, on the French border of the Western Alps. The analysis of its evolution since the Little Ice Age (LIA) maximum (1850 ca.) has been carried out on different levels: starting from morphological reconstructions, GPS surveys, cartographic analysis, orthophoto, old surveys made by different authors, and the Italian Glaciological Committee data series (used as control data), a planimetric dataset with 17 frontal positions since LIA to present day has been reconstructed. These data show a linear retreat of 2 km, a surface reduction of about one third and the terminus behaviour in the two "cold" period of advance (the Twenties and the Eighties). Some surface models have been created to analyse the mean mass balance and the ablation rate in some time periods. The surface models derives mainly from digital cartographies of from aerial photogrammetric restitution based on a common GCPs net realised in 2006. Differently, the LIA maximum surface model has been generated on geomorphological basis, so its accuracy has a different order of magnitude. Differences between surface models allow to quantify the mean mass balance in the time period and in relation to the altitude, and to evaluate the morphological evolution on the glacier surface; these data are strongly dependent on the evolutive situation of the glacial body. When aerial photos are not available GPS surveys can serve as an integration of the dataset. Finally, a georadar survey was carried out in July 2006, to complete an analogous survey made in 1996.

The study is aimed at obtaining a DEM of the bedrock in order to quantify the ice volume of the glacier, thus allowing to analyse its evolution and not only its variation in the considered periods. Some interesting results are rising from these data that show the morphological structures which control the surface evolution and the main flux lines.

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