



Climate change and its effects on glacial reduction and periglacial landforms formation in the Hohsand Basin (North Western Italian Alps)

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High altitude areas in the Alps are characterised by glacial and periglacial environments, which are currently susceptible to significant transformations due to climate change. Climate warming and its impact on periglacial environment is a research topic of increasing importance, due to the growing concern of warming-induced permafrost degradation and modifications of geomorphological characteristics of alpine landscapes.

This work has been carried out in the Hohsand Basin which is located in Formazza Valley (Ossola Valley, Lepontine Alps, Italy). In this area there are a storage pond (1.226 km²) and several temperate glaciers; the main glaciers are the Northern Sabbione Glacier and the Southern Sabbione Glacier (ca. 3.8 km² of total covered area, year 2007).

With the aims to define the framework of previous knowledge and to assess the morpho-climatic characteristics of the study area a multidisciplinary approach has been applied; in particular, climatological and geomorphological studies have been conducted. Furthermore, literature data review, photographic interpretation and historical maps have been used to reconstruct the glacial evolution since the end of the Little Ice Age (LIA).

The data extracted from meteorological stations located within the basin (Formazza and Sabbione stations) have been analysed, using Excel, RCLimDex (Sneyers, 1990; 1992; Zhang & Yang, 2007) and AnClim (Stèpànek, 2007) softwares. Local climate of the study area has been characterised to verify conditions for the development of cryotic processes and to investigate the morpho-climatic evolution of the basin, considering the transition from glacial to proglacial/paraglacial and periglacial environments.

A detailed geomorphological map (scale 1:10000) has been realised from the aerial photographic interpretation of multitemporal images and digital orthoimages (from 1955 to 2010) in order to describe the geomorphological characteristics of the basin and to understand the evolution of the recently deglaciated areas. Geomorphological mapping of periglacial and permafrost landforms (such as active rock glaciers) has been used to help the mapping of permafrost distribution. Moreover, field surveys have been conducted with the aim to identify micromorphological forms resulting from cryotic remodelling processes on debris deposits (e.g. patterned ground, cryoturbation, etc.).

To determine the potential distribution of permafrost PERMAROCK mod. (Guglielmin, 2009), APMOD (Boeckli et al., 2012) and Swiss Permafrost Map 1:50000 (BAFU, 2005) models, already available for the studied area, have been used. Finally, in order to validate modelled data, these results have been compared with cryotic landforms distribution.