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Glacial and periglacial "dynamic" geodiversity in a high altitude alpine basin (Hohsand Basin, Italy)

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On high altitudes climate changes interact with glacial processes and dynamics causing important modifications on the alpine morphology. These transformations lead to a gradual evolution of the geosphere and cryosphere. Growing concern of warming-induced permafrost degradation and modifications of geomorphological characteristics of alpine landscapes increases importance of researches on high mountain dynamic geodiversity.
Within this framework, work field studies have been carried out in the Hohsand Basin of the Formazza Valley (Lepontine Alps, NW-Italy). This high alpine catchment is characterised by the major alpine glaciated area (even if in strong regression) of the Piemonte Region and by one of the largest hydroelectric reservoir of this area.
Climatological studies have been carried out to analyse the local climate, to identify the trends of the main climatic parameters, to verify the existence of climatic conditions for the development of cryotic processes and to investigate the morpho-climatic evolution of the basin since the 1950s.
The geomorphological analysis has been conducted in order to describe the landform geodiversity of the basin and to understand the evolution of the recently deglaciated areas with related glacial landforms. The data, derived from photographic interpretation (aerial images of the years 1955, 1977, 1983, 1989, 1999, 2001 and digital orthoimages of the years 1988-1989, 1994-1998, 2000, 2007, 2009, 2010) and field surveys carried out in summer 2012, have been digitized in open source GIS environment. Through these data and methods, morphometric elaborations have been carried out, geomorphological maps (scale 1:10000 and details at 1:3000) and a glacial deposits map (scale 1:25000) of the basin have been also realised. Periglacial micromorphological forms (e.g. patterned ground) have been investigated during detailed field surveys. Periglacial and permafrost landforms have been used for tracing changes in the permafrost distribution too.
Finally, to model the potential spatial distribution of mountain permafrost three different permafrost model outputs have been analysed: Swiss Permafrost Map 1:50000 (BAFU, 2005), PERMAROCK mod. (Guglielmin, 2009) and APMOD (Boeckli et al., 2012). Modelling results have been compared with the geomorphological map for assessing scenarios of changing landform geodiversity resulting from surface cryotic processes.