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Differentiation among geomorphological processes in a mountain hydrographic basin by means of soils analyses

Anna Masseroli, Irene Bollati, Manuela Pelfini, and Luca Trombino
University of Milan, Earth Sciences Department, Milano, Italy (anna.masseroli@unimi.it)

Mountains regions are usually characterized, according to their geological and structural setting, by an articulated relief, where gravity and water-driven processes occur with an increasing intensity following glaciers retreat. Denudation processes affecting mountain slopes may vary according to local conditions controlled by different factors (e.g., lithology and structural setting of bedrock, climate, relief features).
The succession of slope stability and instability phases can be registered in the soil record as paleosols or buried surfaces. Therefore, an exhaustive investigation of soils and paleosols could provide information to infer the spatial-temporal variation of the denudation/deposition processes.
The main aim of this study is the reconstruction of the dynamic interplay between erosion and sedimentation that have been characterizing the landscape evolution of the Buscagna Stream hydrographic basin (Veglia-Devero Natural Park, Central-Western Italian Alps) during the Late Holocene. The basin is characterized by an evident asymmetry between the valley slopes in terms of lithology (calcschists on the southeastern slope versus ortogneiss, micaschists and spots of ultramafic rocks on the northwestern slope), and by a structural control on the relief. This differentiation is also responsible for the great landforms variability and the geomorphic dynamics dissimilarities between the slopes.
In order to reconstruct the different dynamics affecting the slopes, 11 soil profiles were investigated by means of field and laboratory (on both mineral and organic constituents) characterizations; the soil profiles were selected in different morphological contexts, along two downslope transects on the two sides of the valley.
The results show that the investigated soil profiles are characterized by different soil units, identifiable by the presence of grain size discontinuities and/or stone lines or buried organic horizons. The presence of different pedological units underlines the occurrence of separate events of pedogenesis alternated to phases characterized by slope instability and intensification of denudation and related degradation/aggradation processes. Moreover, the soils recorded in a different way the instability phases occurred in the two opposite flanks of the hydrographic basins, underlining changes in predominant erosion processes, which are also related to the varying bedrock both in term of lithology and structural settings.
In particular, on the southeastern slope characterized by a calcschists parent material and by less steep slopes i) the gravity erosion processes are less intense; ii) the presence of vegetation cover and a developed soil promote the slope stability. Whereas, on the northwestern slope

characterized by gneiss and micaschists and locally by ultramafic rocks and high relief energy i) the soils have recorded many instability phases in term of sequences of buried surfaces; ii) the presence of coarse slope deposits only partially colonized by vegetation predispose to slope instability. The characterization of soil mineral component underlines the presence of different material sources, linked to action of a variety of agents (e.g., gravity, water, snow, wind), which have contributed to landscape evolution in term of sediment erosion, transport and deposition.
Finally, this research highlights the role of soil as useful archive for retracing the geomorphological processes responsible for high altitude areas landscape evolution.