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Use of geostatistics for the processing of LiDAR data and the characterisation of landforms in a small basin in the Dolomites (eastern Italian Alps).

S. Trevisani, M. Cavalli and L. Marchi
CNR-IRPI Padova, Italy (s.trevisani@irpi.cnr.it)

Topographic data sets derived from aerial LiDAR, despite their high spatial sampling density, need to be analyzed and interpolated carefully in order to get accurate high resolution (cell size $<=1m^2$) digital terrain models. Geostatistical methods permit to evaluate the quality of available data and maximize their informative content. Moreover, statistical and spatial continuity indexes, coupled with classical morphological indexes, such as slope, curvature and flow accumulation, give an important contribution to the recognition of landforms and to the characterisation of hydro-geological processes.

The study area is the upper part of a small basin in the Dolomites (eastern Italian Alps). Two main morphological units are present in the study area: rocky outcrops, entrenched by steep couloirs, and scree slopes located at the base of the rocks. In the scree belt, a prominent feature are debris cones whose apex is located at the outlet of couloirs which cut the superjacent rock slope. Three main classes of processes influence sediment dynamics on scree slope and cones and contribute to their complex morphology: gravitational accumulation of weathered rock fragments, snow avalanches, and debris-flows.

The spatial sampling density of the LiDAR-derived topographic dataset is quite high: raw data have a mean nearest neighbour spacing of about 0.16 m, permitting to derive high resolution digital elevation models. The absence of vegetation in the study area permits to keep a high density of data even after the filtering process. On the contrary, the rugged morphology and the presence of subvertical cliffs pose challenging problems in the analysis of LiDAR-derived topographic data. The attention of this study is mainly focused on the spatial characterisation and comparisons of the morphologies of the main landforms.