8th IAG International Conference on Geomorphology - August 27th to 31st, 2013

Session S25: Cold region geomorphology including: / S25B - Permafrost and periglacial geomorphology (in coop. with IPA)

Poster Presentation

3D geophysical imaging to study the evolution of a debris covered glacier in the Dolomites (South-Eastern Italian Alps)

ZANONER T.(1), FRANCESE R.(2), BONDESAN A.(1), GIORGI M.(2), CARTON A.(1), SEPPI R.(3), NINFO A.(1), ZUMIANI M. (4)
(1) University of Padova - Department of Geosciences, PADOVA, ITALY; (2) National Institute of Oceanography and Experimental Geophysics (OGS), TRIESTE, ITALY; (3) University of Pavia - Department of Earth and Environmental Sciences, PAVIA, ITALY; (4) Geological Survey - Autonomous Province of Trento, TRENTO, ITALY

The Cima Uomo glacier is located in the upper San Nicolò Valley (Dolomites, Italy) between 2200 m and 3000 m a.s.l. It was a cirque glacier fed by avalanches and, during the 50s, it was initially classified as a clean glacier. Later it evolved into a debris-covered glacier and it is currently developing in a rock glacier-like landform.
The internal structure of the ice-debris mass and the morphology of the bedrock were investigated using a 3D resistivity imaging and 2D radar profiling. Field data were collected with 48-electrode Syscal R1 Georesistivimeter and with a GSSI SIR-2000 radar system equipped with an unshielded 75 MHz antenna. The resistivity spread was 48-electrode, 3 m electrode spacing longitudinal profile recorded both in pole-dipole, using 6 remote poles, and Wenner mode. The radar scan was also a longitudinal profile of about 350 m of length. The stations were georeferenced conducting a DGPS and total station survey.
Data processing was not straightforward as the electrical field was severely distorted due to the surface morphology and the difficulties in coupling the radar antenna with the ground.. After a comprehensive processing with the removal of about 10% of noisy values and a careful selection of the modelling parameters, electrical data turned out to be good quality. To improve radar data quality some specific processing routines were coded.
Subsurface geophysical images show a close correspondence, indicating the existence of a thick ice layer ranging from few tens of decimetres below the surface to a depth larger than 10 m. The ice body has a complex shape with two distinct frontal lobes and a clear physical continuity from its front to the back part located at higher altitude. The radar signature in the higher portion of the ice-debris mass seems to be quite different with a sudden increase in the amplitude decay function, probably due to a major percentage of the silty matrix in the uppermost layers.