



Inventory of large landslides and rock avalanches in the European Alps

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Large deep-seated landslides include a broad range of instability phenomena (e.g. rockslide, rock slump, lateral spread, rock mass creep and sackung, rock avalanche) which in some cases can be found as combined or sequential processes, representing the progressive evolution of a complex slope instability. Complementing the orogen-scale inventory of DSGSD that has been recently presented for the European Alps (Crosta et al 2008, Agliardi et al 2012), we created an orogen scale inventory of large landslides (mainly rockslides) and rock avalanches. The inventory includes 1701 large landslides ranging in area between 0.1 and 17 km², and 81 rock avalanches ranging between 0.09 and 15.5 km². The inventory covers an area of about 110,000 km² extending over the alpine territories of Italy, France, Switzerland, and Austria, and was prepared by using available satellite imagery (multi-temporal, Google Earth, Google, Inc.) and topographic data at different resolutions (DEMs from 1 m x 1m up to 20 m x 20 m for different areas). The inventory was validated against local or regional landslide inventories already available at different scales prepared by different subjects and using different means.. Geometrical features and geomorphological parameters have been collected and related to the different phenomena and local settings. The frequency-area relationship for the mapped features is presented. The inventory shows that large landslides are widespread in the Alps. Their spatial distribution has been analysed through bivariate and multivariate analysis (mainly Principal Component Analysis and Discriminant Analysis) against a variety of factors, including: lithology, proximity to tectonic structures, seismicity, uplift and exhumation rates, position within the mountain belt and along main and tributary valleys, slope morphometry (e.g. relief, elevation, gradient, etc.), ice thickness of glaciers during LGM, and mean annual rainfall. The analysis allowed a preliminary assessment of conditions favourable to the onset and development of large landslides. Finally, the distribution of large landslides and rock avalanches is compared with the distribution of DSGSD in the Alps.