

Investigation of rock slope failure processes in the Southern Swiss Alps

Alessandro De Pedrini^{1,2}, Cristian Scapozza¹, Christian Ambrosi¹, Federico Agliardi⁴, Andrea Manconi^{2,3}

¹ Institute of Earth Sciences, University of Applied Sciences and Arts of Southern Switzerland, Via Flora Ruchat-Roncati 15, CH-6850 Mendrisio, Switzerland (alessandro.depedrini@supsi.ch)

² Department of Earth Sciences, Swiss Federal Institute of Technology, Sonneggstrasse 5, CH-8092 Zürich, Switzerland

³ Climate Change, Extremes and Natural Hazards in Alpine Regions Research Center CERC WSL Institute for Snow and Avalanche Research SLF, CH-7260 Davos Dorf, Switzerland

⁴ Department of Earth and Environmental Sciences DISAT, University of Milano-Bicocca, Piazza dell'Ateneo Nuovo 1, IT-20126 Milan, Italy

The evolution of rockslide processes towards failure events depends on the combination of geological and geomorphological properties, structural setting, and the glacial history of each site. The identification and analysis of the dominant factors affecting the spatial distribution and the temporal evolution of such massive phenomena are relevant not only for scientific purposes but also have large impacts on hazard assessments. Several large rockslide phenomena are located between five valleys north of Bellinzona, southern Swiss Alps, including the Riviera, Leventina and Blenio valleys in Canton Ticino, and the Calanca and Mesolcina valleys in Canton Grisons. The distribution of such phenomena is highly variable, and appears to be higher along the eastern side of the Leventina valley and the western side of the Blenio valley rather than in the rest of the region. Furthermore, the observed failure events range from 13.50 ka cal BP to 2002 CE, and many rockslides have not yet collapsed despite visible signs of surface deformation. The reasons for these differences in spatial and temporal distribution are yet unknown.

Our research aims to define the influence and relationship of regional and local factors on the spatial and temporal rockslides distribution in this study area. We rely on an exceptional dataset including (i) detailed geological and geomorphological mapping of the area of study, (ii) a collection of historical data and scientific research on the activity of the large rock slope failures in Ticino and Grisons Cantons, (iii) detailed knowledge of the timing of deglaciation for several valleys of the Canton Ticino, (iv) a catalog of instabilities of the Canton of Ticino finalized in 2016, and (v) several results of current surface deformation activity constrained with satellite radar interferometry. Here we present the preliminary results of the activities performed to extend the rockslides catalog in the Calanca and Mesolcina valleys (Canto Grisons) obtained through the evaluation of stereo-photogrammetry datasets and evaluating the state of activity with satellite radar interferometry. Moreover, we will detail the approach used to set upslope stability modeling attempts at selected locations, combining techniques such as slope exposure dating, analysis of morphological parameters from digital elevation models, and analysis of structural data providing the dominant orientations of rock mass discontinuities.