The 1513 Monte Crenone Rock Avalanche. Numerical model and geomorphological analysis

Alessandro De Pedrini, Christian Ambrosi, and Cristian Scapozza
Istitute of Earth Sciences (IST), University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Canobbio, Switzerland (ist@supsi.ch)

The Monte Crenone rock avalanche of 30 September 1513 is one of the most catastrophic natural events in Switzerland and throughout the Alps. The enormous mass of rock that broke away from the western slope of Pizzo Magr or Monte Crenone, estimated at 50-90 million cubic metres, caused the complete damming of the course of the Brenno river, leading to the formation of a basin that extended from Biasca to the Castello di Serravalle in Semione (De Antoni et al. 2016). On 20 May 1515 the basin formed behind the dam overflowed, giving rise to a wave of more than 10 meters high that led to devastation in the territories downstream to reach Lake Maggiore (Scapozza et al. 2015).

In this project, we analyze the dynamics of the 1513 rock avalanche, trying to reconstruct the event through a numerical model, calculated with the software RAMMS::Debrisflow (RApid Mass Movement Simulation) provided by the Federal Institute for the Study of Snow and Avalanches (SLF/WSL).

The realization of the numerical model was preceded by the reconstruction of the topography before the landslide. This first phase of work, included a geological survey of the landslide body, the analysis of digital data (orthophotos, digital topographic maps, shaded model derived from swissALTI3D) and the collection of previous historical data.

The observation of the stratigraphic data obtained from the 701.27, 701.30 and 701.31 boreholes (part of the geotechnical studies for the Chiasso-San Gottardo highway) of the GESPOS database (GEstione Sondaggi, POzzi e Sorgenti) of the Institute of Earth Sciences SUPSI was essential to understand the landslide body thickness and volume in the deposition zone.

From the first phase of data collection and interpretation, we then moved on to the actual reconstruction of the digital model of the terrain before the landslide. This operation was carried out using ESRI's ArcGIS software, which made it possible recreating multiple models of the pre-event topography and thus finding the most realistic solution applicable to the subsequent RAMMS model.