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A comprehensive technical and management procedure for flash-flood and debris-flow nowcasting and for loss and damage reduction in Southern Switzerland

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The now-casting of flash flood in very small basins still belongs to the most challenging topics in hydrometeorology. This paper presents the framework developed by the cantonal authorities of Canton Ticino, Southern Switzerland for the reduction of the vulnerability and the damages induced on a industrial areas by frequent and destructive debris flows, triggered by intensive rainfall events.
On 15th Mai a rockfall of about 200'000 m3 happened in the Municipality of Preonzo and rock debris lies on slopes above the industrial area of the small village. This material becomes saturated with water during rainfall events and easily develop into large debris flows reaching the productive area. Due to the rockfall the old drainage network of the small basin (around 2 km2) was completed canceled and water and debris flows are actually developing a new drainage network, threatening several industrial buildings and important road infrastructures.
The implemented now-casting and alarm system was developed in collaboration with MeteoSwiss, the Swiss Federal Office of Meteorology, who supported the cantonal alert group with the internal nowcasting platform, where radar rainfall estimation, storm tracking monitoring, rainfall forecast and other useful tools are made available for the cantonal technical staff.
This real-time information is used, according to a detailed procedure, to prealert and alert local authorities and responsible of private factories threatened by debris flow.
In addition, an analysis of rainfall data recorded during debris-flows which occurred before and after the rockfall, were carried out, in order to define suitable triggering thresholds for different rainfall duration in the study area. A comparison of the relations before and after the rockfall shows that the last one is a lower triggering threshold, due to the geomorphological conditions on the slopes after the rockfalls and the availability of a large amount of fine and middle-size material.
In parallel, a detailed hazard and vulnerability analysis was carried aiming at determining updated hazard and risk maps after the mentioned rockfall.
The combination of technical, planning and emergency tools significantly increased the effectiveness of the whole alert procedure, with an important reduction of damages and other related losses during the summer season 2012.
The project also showed the importance of the definition of governance activities. This ensure that critical information reaching the involved persons is sufficiently complete, accurate and timely to enable appropriate management decision making, and provide the control mechanisms to ensure that instructions are carried out systematically and effectively.