# Puigcercós: a natural laboratory to study landslides and rockfalls in the Catalan Pyrenees

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## ABSTRACT

The village of Puigcercós is located in the region of Pallars Jussà (Lleida) in Catalonia, Spain, 4.5 km south of the town of Tremp. A large-scale landslide occurred there on January 13th, 1881, moving more than 5 million m$^3$ of sediments and rocks and creating a 200 m long and 25 m high rock scarp. Luckily, a series of small landslides preceding this main event prompted the evacuation and re-location of the entire village, saving lives of its inhabitants.

During the last decade, the members of the RISKNAT group from the UB have chosen the site of Puigcercós to conduct pilot studies of landslides and rockfalls using a multidisciplinary approach. The utilized observational techniques include Terrestrial Laser Scanner, photogrammetry, GPS, seismic monitoring and geophysical prospecting techniques. The work presented here is an overview of these activities and presenting main milestones of the ongoing research. Special emphasis will be given to the deformation monitoring of the landslide using geodetic techniques in the depositional area and around the crown cracks at the upper level. As a result of the GPS observations, for the first time, it was possible to observe a continuing geomorphological activity of the depositional zone of the historical landslide, 130 years after its occurrence [1]. Currently, the RISKNAT-UB group operates cost-effective and HR photogrammetric instruments and seismic continuous records at the site, in order to monitor the evolution of the Puigcercós landslide and the rock scarp [2]. The correlation of the seismic data and the photogrammetric data and intermittently obtained LiDAR images enables us to monitor and characterize frequent rockfalls occurring at the site [3]. These observations have allowed quantifying the rate of retreat of the rock scarp at a rate of 10 to 11 cm/yr. [2] and a slow motion of the depositional zone at a rate of 6 mm/yr. [1]. Since the geologic risk at the study area is not significant, due to the absence of population and/or infrastructures, the given site is an ideal natural laboratory for developing new observational techniques, which can be used to develop early warning systems for rockfalls and landslides [4].

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