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Fracture and slope stability monitoring at Puigcercós landslide (Catalonia, Spain)

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The village of Puigcercós (∼50 inhabitants) is located in the region of Pallars Jussà (Lleida) in Catalonia, several km south of the town of Tremp. In 1881 the entire village had to be moved from its historical location on top of the hill to its current location. This was caused by a series of landslides caused by continuing rainfall. The most important landslide occurred on January 13th 1881, which displaced more than 5 million cubic meters of sediments and rocks and created an impressive rock scar of approximately 25 m height and 150 m width. The area where the sediments were accumulated is extensive, reaching 8 hectares.

During the last years, our group has chosen the site of Puigcercós to conduct pilot studies of landslides and rockfalls using multidisciplinary approach, involving Terrestrial Laser Scanner, Total Station, DGPS, seismic monitoring and geophysical techniques. The geophysical surveys of the zone of the sediment accumulation, can help determine the internal structure of the displaced sediments.

The work presented here mainly concerns the deformation monitoring at the site using geodetic techniques. In July 2015, a network of 11 new geodetic points has been established and measured with GPS. The location of these points was chosen with the purpose of answering two important questions in the studies of the stability and geomorphological activity of the Puigcercós landslide: 1) As a result of combined analysis of the tape-meter, total station and GPS measurements, we hope to obtain absolute values of deformation in the upper part of the escarpment, controlling the stability of the escarpment front and the associated fractures near the coronation. For this purpose, two geodetic control points have been established at the hilltop, some 5 meters away from the escarpment itself. 2) Determine the slope stability of the depositional area, where we established nine geodetic points. As of today, these points have been measured twice, in 2015 and 2016, during ∼24 hour long campaigns, overlapping a midnight. Thus, obtained GPS observations cover at least 8 hours for 2 consecutive days, ensuring the millimeter level accuracy after the post-processing using GAMIT/GLOBK software from MIT. After the realization of the third campaign in the spring of 2017, we hope to give more definitive answers to the questions raised above.

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