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Monitoring the surface deformation of Hurd rockglacier using D-GPS measurements and D-INSAR: first results (Livingston Island, Antarctica)

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Rockglaciers have been described by various authors in the South Shetlands archipelago (Antarctic Peninsula region), with the main contribution being that of Serrano and Lopez-Martínez (2000), who have described 9 rockglaciers and 11 protalus lobes. However, little is known about the deformation rates of rockglaciers in the region nor about possible changes associated with climate warming. Since the Western Antarctic Peninsula region is one of the areas on Earth which has been warming at a faster rate, monitoring rockglacier deformation should provide insight into the influence of climate change on geomorphodynamics. Hurd rockglacier is located in the south part of Hurd Peninsula, in a glacial cirque with a ridge varying from 227 to 301 m asl that connects directly to False Bay through a series of raised-beach terraces. The bedrock is composed of sandstones, shales and greywackes with a flysch facies, of the Myers Bluff formation. The valley shows steep rockwalls with extensive scree slopes and a small retreating valley glacier with a prominent frontal moraine, from where the rockglacier develops. The rockglacier body is ci 630 m long and 290 m wide and the surface shows frequent pressure ridges and furrows, especially in the lower sector. The rockglacier front is 15-20 m high and shows a slope of 45º (Serrano and López-Martínez 2000). In this poster we present the first data from surface deformation monitoring using stakes and D-GPS measurements conducted annually since 2011. Preliminary results show deformation values of 8 to 15 cm/year. Since 2011 we are also conducting DInSAR analysis using TerraSAR-X imagery and despite problems related mostly to snow cover, we have obtained image pairs allowing to identify deformation in the same order of magnitude of field observations. We expect to be able to present new results from the summer of 2013-14 campaign, which include a more intensive image acquisition plan. Results from a Vertical Electrical Sounding fro 2013 confirming the presence of permafrost, as indicated by Serrano et al (2004) are presented. The preliminary results from the monitoring of Hurd rockglacier and especially the application of DInSAR monitoring techinques indicate that such an approach is valid for monitoring surface deformation in the Maritime Antarctic and that it can be used to identify areas of high deformation rates, without a priori field knowledge. The main limitation is the short snow free period and the irregularity of snow fall events that occur also during the summer.

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