



Monitoring surface displacements of glaciers with ground based photogrammetry: insights from Planpincieux Glacier, Grandes Jorasses massif, Mont Blanc

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Monitoring the spatial and temporal evolution of glaciers modifications in a climate change scenario is a major scientific problem. The Italian side of the Grandes Jorasses massif, Mont Blanc, is historically known for the occasional activation of icefalls events from the frontal part of the glaciers located on that area. The Planpincieux Glacier (PG) is a "polythermal" glacier, meaning that the liquid water present at the contact between ice and the bedrock in the lower part of the glacier itself plays an important role in its dynamics. Under these conditions icefalls might occur in a sudden and barely predictable manner. In this scenario, an accurate analysis of its morphological evolution is crucial; however, one of the major problems on PG is the limited access to perform direct measurements. For this reason, remote sensing has been identified as the more convenient approach to achieve quantitative measurements of surficial modifications.

An experimental monitoring station was installed on August 2013 in order to monitor the surface displacements at PG. The monitoring station is located on the opposite side of the valley, at the top of the Mt. de la Saxe, ca. 3.5 km away from the target under investigation. Monitoring includes: (i) a surveillance module, based on a medium resolution digital camera, observing large part of the slope; (ii) a photogrammetric module, based on a high resolution digital camera equipped with a 300 mm optical zoom, pointed to the PG front. Digital images acquired by the monitoring station are acquired with a revisit time of 1-hour, and analyzed by considering change-detection and pixel-offset techniques. This approach allows to evaluate surface changes over time, as well as to retrieve quantitative measurements of the glacier displacements. Here we present the results after one year of monitoring, and we discuss how the combination of different remote sensing techniques can be exploited for a better understanding of the glacier dynamics.