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Monitoring the morphological evolution of complex glaciers: the Planpincieux case-study (Mont Blanc - Aosta Valley)

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The Planpincieux Glacier (PG) is located on the Italian side of the Grandes Jorasses massif, Mont Blanc, Italy. This area is historically known for the occasional activation of ice falls events from the frontal part of the glacier. The PG is a so-called "polythermal" glacier, meaning that the liquid water present at contact between ice and the bedrock in the lower part of the glacier itself plays an important role in the glacier dynamics, and ice falls might occur in a sudden and unpredictable fashion. In this scenario, the accurate analysis of the glacier morphological evolution assumes a crucial role.
Starting from 2012, within the framework of the regional plan for glaciers risk detection, a research project was set up to study the Planpincieux Glacier and evaluate the potential hazard concerning the possible activation of large ice or ice-snow avalanches triggered by icefall events in that area. Dynamics of such avalanches, as well as potentially endangered areas, have been evaluated in an expertise by the SLF Institute. Therefore, the availability of both qualitative information and quantitative measurements relevant to the glacier movements represented a primary goal. After a careful evaluation of several possible technical solutions to achieve displacement monitoring also based on the results of a preliminary study managed by the ETH Zurich (prof. M. Funk), we installed an experimental monitoring station located on the opposite side of the valley, at the top of the Mt. de la Saxe, ca. 3.5 km away from the main target. The monitoring station is composed of two modules, including: (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 300mm optical zoom, pointed on the Planpincieux glacier front.
At this stage, our analyses focused mainly on the qualitative assessment and recognition of impulsive phenomena affecting the glacier morphology, such as ice falls, changes in water circulation and/or snow precipitation. Moreover, we also considered pixel-offset techniques to measure the surface displacements occurring on the glacier front. Here we present the preliminary results obtained by processing the data acquired from the photogrammetric module starting from September 2013. The obtained results are encouraging.