

## **Thermal conditions of rock slopes below unstable infrastructure in Alpine permafrost area: the cases of the Cosmiques hut and the Grands Montets cable-car station (Mont Blanc massif)**

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Thermal state of steep permafrost-affected rock faces is crucial to assess the safety and reliability of mountain infrastructure as current permafrost degradation affects the rock slope stability. In the Mont-Blanc massif, 23 infrastructures are built on such a rock face with 13 of them that are characterized by a high risk of destabilization (Duvillard et al., 2015), including the upper station of the Grands Montets cable car (3325 m a.s.l.) as well as the Cosmiques hut (3613 m a.s.l.) on which we will focus. These two buildings have already been affected by different geomorphological processes. A rockfall event (600 m<sup>3</sup>) occurred for example on the SE face on the Arête inférieure des Cosmiques on the 21st of August 1998 (Ravel et al., 2013) and the Grands Montets case shows a slow subsidence of the stairway over the last decade.

In order to better assess the role of the permafrost in these processes and to gain insight on possible future geomorphic activity, we characterized the current permafrost conditions and simulated its changes up to the end of the 21st century using two complementary approaches: (i) the result of ERT (Electrical Resistivity Tomography) surveys carried out in October 2016 on the northern and southern faces right below the Cosmiques hut (at the level of the foundations) and at the Aiguilles des Grands Montets; (ii) the modeling of mean annual rock surface temperature for 2016 and at the end of the 21st century (Magnin et al., in rev.).

Duvillard P.-A., Ravel L., Deline P. (2015). Risk assessment of infrastructure destabilisation due to global warming in the high French Alps. *Journal of Alpine Research*, 103 (2).

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Ravel L., Deline P., Lambiel C. and Vincent C. (2013). Instability of a high alpine rock ridge: the lower arête des Cosmiques, Mont-Blanc massif, France. *Geografiska Annaler A*, 95 : 51-66.