Recent slope instabilities in steep alpine rockwalls affected by permafrost: a case study in the Mont Blanc massif (the Drus)

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Unlike rockfalls (< 100 m^3) that are essentially seasonal phenomena, rock avalanches (> 100 m^3) are exceptional processes because of the control (beyond structural conditions) of three main factors with very variable rates : post-glacial slope decompression ; seismicity ; and permafrost deterioration, as a consequence of the climatic change associated to the global warming observed those last decades. Over 1.25°C in the Alps during the 20th Century, the warming trend has accelerated since 1990.
In the Mont Blanc massif, the Petit Dru west face (3733 m) combines the three factors but the permafrost evolution seems dominating for the time being. By the way, the face was affected by a series of increasingly important events until 2005, when the largest rock avalanches (> 250,000 m^3) occurred.
We present here the first results and methodologies used to (i) reconstruct the face gravitary activity since the Little Ice Age by using historical documents; (ii) quantify the volume of rock avalanches identified, with long-range ground-based LIDAR measurements; (iii) monitoring of the present morphological activity by diachronic comparison of hight resolution DEM obtained in 2005 and 2006 thanks to the LIDAR.