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Rock instability hazard in high mountain area: the example of the Brenva spur (Mont Blanc massif)

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Large rock-ice avalanches have been observed in the past in the Mont Blanc Massif area, notably from the Grand Pilier d'Angle in 1920 and from the Brenva spur in 1997, which involved millions of cubic meters of material. More recently, a rockslide detached from the Brenva spur in 2016, involving 35000 m^3 of material. In the context of monitoring, in the fall of 2020 and 2021, two Lidar campaigns were performed to obtain 3D models of the rock face and monitor future rockfall activity. Moreover, point clouds were obtained from the Structure from Motion technique, using aerial photos from helicopter. Comparing the point clouds of 2020 and 2021 in CloudCompare software, only a few small rockfalls of 10-30 m^3 were observed. The three-dimensional model of the rock wall was used as an input for the structural analysis of the Brenva Spur and Grand Pilier d'Angle, using Coltop3D software. The analysis showed that the same families of discontinuities characterizing the Brenva Spur are also found in the Grand Pilier d'Angle and other granitic crops at lower altitudes, indicating that they all belong to the same regional set of discontinuities. To monitor the collapses of the Brenva spur, an accelerometer was installed in 2017 on the wall and a high-resolution camera was placed at a distance of about 6 km. In June and July 2018, two rockfalls and one rockslide were detected, by both the accelerometric signal and the visual inspection of the photos. A spectrogram was therefore created, which showed that both high and low-frequency contents are present. Low frequencies may correspond to the sliding and high frequencies may correspond to rock bounces.