



MONT BLANC – COULOIR DU GOÛTER

STATISTIC STUDY: STONE FALL & NUMBER OF CROSSINGS - SUMMER 2011

CONCLUSIONS

In the summer of 2011, the geotechnical engineering company Alpes Ingé realised a statistic study concerning stone fall and the frequentation of the Goûter couloir, which is the main access to Mont Blanc. Observations indicate that around a thousand mountaineers were faced with falling stones, on an estimated 17,000 crossings. Factors which aggravate or reduce risk have also been identified. Better informed mountaineers can manage risks better.

This statistical study followed on from the safety study conducted by the MEIGE engineering team in February 2011 which investigated the stone fall hazards in the couloir and also examined the objective dangers of the site. The Alpes Ingé team observation took place from Monday June 20th to Sunday September 18th 2011.

STONE FALL

During this period, the engineers spent 42 days in the field, however, during this whole study 754 "stone fall" events were recorded of which 251 consisted of a single rock during the event (33%), 140 with 4 rocks at a time (19%) and 363 events with more than 5 rocks (48%). 75% of stone falls arrived between 10am and 4.30pm. Hours which are the most critical are between 11am and 1.30 pm, equating to 34% of the events observed. But stone fall remains an important hazard all day.

**During the most critical hours, between 11am and 11.30am,
we can observe that a stone fall occurs on average every 17 minutes.**

The snow cover within the couloir didn't have any noticeable effect concerning stone fall but there is a direct influence on the number of rocks which fell in the same event and on the height of the stones' rebound. We notice a huge reduction of stone falls when the temperature is negative. The correlation is not so clear when the temperature is positive, as a high positive temperature isn't synonymous with stone falls.

We notice also that stone falls are more regular when the humidity is less than 50%. Low humidity is synonymous with clear weather and with thaws linked to solar radiation, meaning that stone falls are more likely when the weather is good. On the contrary, stone falls reduce when the weather is more humid.

NUMBER OF CROSSINGS

During the observation period, the Alpes Ingé team recorded 5928 mountaineers crossing the couloir, of which 2,537 were ascending (43%) and 3,391 descending (57%). **The team estimated the total number of crossings to be between 17,000 to 17,500 throughout the summer period – 7,300 to 7,500 ascending and between 9,700 and 10,000 descending.** The number of visitors to the site is lowest before 8.30am. 76% of the crossings are between 9am and 3pm and 40% between 11.30am and 2pm.

**During peak crossing hours, between 12.30am and 1pm,
one person crosses the couloir every 105 seconds.**

The Alpes Ingé team observed mountaineers in perilous situations, in the couloir whilst stone falls were occurring. They recorded 363 mountaineers in difficulty due to rock fall. This represented 6% of the total number of crossings with 15% to 40% occurring on the 5 most dangerous days.

During the observation period in the 2011 season, one thousand mountaineers were confronted by stone fall while they were crossing the couloir.

**During peak crossing hours, between 12.30am and 1pm,
one mountaineer every 21 minutes could find themselves in a perilous situation.**

Our study is based on a partial observation of a statistical analysis conducted over 42 days in the field. Any published results must be considered cautiously. The study does, however, give an unquestionable level of seriousness to both stone fall and also to the number of mountaineers exposed whilst crossing the Goûter couloir.

CONCLUSION

The regularity and size of the stone falls observed confirm the existence of an objective danger when crossing the couloir. Stones fall may occur any time during the season, but we can observe strong variations linked directly with the climatic condition.

Periods less exposed to stone fall are the coldest during the season, with negative temperatures and overcast skies.

The periods which are most exposed to stone fall are the sunniest when temperatures are high and humidity is low. Generally, these periods attract the highest number of mountaineers crossing the Goûter couloir, ascending or descending from the summit of Mont Blanc.