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Paraglacial control on rock avalanches occurred during the recent Holocene in the Mont Blanc massif

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Although rock avalanche is a very high-magnitude process in mountain environment, many of past rock avalanches are still ignored because of a frequent mix-up with others deposits (e.g. glacial) and a low frequency. In the recent period, more attention was paid in the study of many worldwide events, some very destructive. Most of these rock avalanches occurred in high mountain areas and interact with the glacial environment. These interactions deal with the triggering of the rock avalanche, its displacement and its deposition, and the effect of a debris cover on the glacier dynamic. Due to the high elevation of the Mont Blanc massif and to its steep rock slopes, rock avalanches are not rare in this glacierised mountain area. Because a dense urbanisation in several parts of its valleys, a major european transport axis and a strong tourism activity, this area is one of the most vulnerable in the Alps. Visited and studied since longer, it is also one of the best-documented alpine regions since the 18th Century. The study of these historical data was combined with detailed geomorphological mapping, stratigraphic observations and absolute and relative dating methods, in order to interpret several deposits which result from rock avalanches on glacier. Six case studies are here presented: three sites (Miage and Drus Glaciers, and Tour des Grandes Jorasses) which are characterised by a short or negative excessive travel distance (i.e. the horizontal distance beyond the distance one expects from a slide with a friction coefficient of 0.62), and three sites (Brenva, Triolet and Frébouge Glaciers) where this distance is long (800 to 4000 m); about 15 events were studied at these sites, which occurred between 2500 BP and AD 2007. Relations between these rock avalanches and the paraglacial period (i.e. the time which is need for the adjustment of the mountain dy-

namics to the main climate changes) are investigated. Renewed paraglacial response, triggered by secondary climate changes like the termination of the Little Ice Age characterised by a strong retreat of Alpine glaciers is studied. Researches and datation about the long-term stability of high altitude steep rockwalls in the Mont Blanc massif question the paraglacial control on rock avalanches.