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Chronological constraints on the Holocene glacier dynamics of the Argentière Glacier (Mont Blanc massif, France) based on cosmogenic nuclide dating

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While reconstruction of glacier fluctuations during the Holocene provides important information about the glacier response to natural climate change, it is still a challenge to accurately constrain chronologies of past glacier advances and retreats. Moraine deposits and roches moutonnées represent valuable geomorphic markers of advanced glacier extensions, while the currently ongoing glacier melt uncovers proglacial bedrock that can be used as a new archive to investigate the durations when a glacier was in retreated position during the Holocene.
Our study focuses on the Mont-Blanc massif (MBM), located in the Western Alps and hosting some of the largest glaciers of Europe. Chronologies of Holocene glacier fluctuations in this area are still sparse, even if recent studies considerably improved the temporal reconstruction of Holocene advances of some glaciers in the MBM and locations near-by (e.g. Le Roy et al., 2015). Here we present preliminary 10Be exposure ages obtained from moraine boulders, roches moutonnées and pro- and subglacial bedrock in the area of the Argentière Glacier, located on the north-western flank of the MBM. The ages of moraine boulders and roche moutonnée surfaces outboard of the investigated moraines suggest that the Early Holocene deglaciation of this area started around 11 ka ago. Also, 10Be measurements of recently deglaciated bedrock surfaces indicate that the glacier was at a position at least as retracted as today for a minimum duration of 7 ka throughout the Holocene. The 10Be measurement of one sample from a surface that is currently still covered by 60 m of ice suggests that the glacier was shorter than today for at least a duration of 3 ka.
These first results will soon be completed with in situ 14C measurements, which will allow us to quantify and take into account subglacial erosion rates and thus to more accurately determine the cumulative duration of pro- and subglacial bedrock exposure during the Holocene.