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10Be surface exposure dating of rock glaciers in Larstigtal, Tyrol, Austria

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In the context of Lateglacial and Holocene climate change research, rock glaciers (creeping mountain permafrost) also play an important role. They are phenomena of discontinuous alpine permafrost and as such good indicators for the mean annual air temperature for the period they are active. We have 10Be surface exposure dated boulders from two relict rock glaciers in Larstigtal, Austria. This is the type area for a postulated mid-Holocene cold period called the Larstig oscillation. The period of activity was suggested to be of similar age as the mid-Holocene Frosnitz advance of glaciers in the Venediger Mountains farther to the east (Patzelt and Bortenschlager, 1973). For rock glaciers of this size to be active at 2200 m a.s.l. in Larstig valley would have required a significant drop in temperatures, thus a marked mid-Holocene cold pulse, for at least several centuries at around 7.0 ka. In contrast, our exposure dates show that the rock glaciers stabilized during the early Preboreal (Ivy-Ochs et al., submitted). We see no distinct pattern with respect to exposure age and boulder location on the rock glaciers. This implies that for our site the blocks did not acquire inherited 10Be during exposure in the free rock face, in the talus at the base of the slope, or during transport on the rock glaciers. Our data point to final stabilization of the Larstigtal rock glaciers in the earliest Holocene and not in the middle Holocene. Combined with data from other archives (Nicolussi et al., 2005), there appears to have been no time window in the middle Holocene long enough for rock glaciers of the size and at the elevation of the Larstig site to have formed.

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