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Erosion of mountain plateaus along Sognefjord, Norway, constrained by cosmogenic nuclides

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Norway is famous for its deeply incised, steep-sided fjords, carved out by glacial erosion. The high relief of the fjords stands in contrast to the extensive areas of relatively low relief found between the fjords. The origin and development of these low-relief areas remain debated. The classical interpretation relates them to a Mesozoic peneplanation surface, uplifted to the current high elevation in the early Cenozoic (e.g. Nesje, 1994). The validity of this interpretation has, however, been repeatedly questioned in recent times (e.g. Nielsen et al. 2009, Steer et al. 2012). Recent studies point instead to a significant impact of glacial and periglacial erosion processes on the long-term development of the low-relief surfaces (Egholm et al. 2015).
Here, we present a large new dataset of in-situ produced cosmogenic 10Be and 26Al in bedrock and boulders from the high, flat summit surfaces along a transect from the coast to the inner parts of Sognefjorden in Norway.
Our results indicate substantial glacial modification of the sampled low-relief surfaces within the last 50 ka. Close to the coast, at an elevation of around 700 meters, the cosmogenic nuclide signal was reset around the Younger Dryas due to extensive glacial erosion. Regarding the higher surfaces further inland, our results indicate a maximum cosmogenic nuclide inheritance of 20-30 ka prior to the last deglaciation. We do not find any signs of exceptional longevity of the low-relief landscape. In contrast, our results indicate that the low-relief areas were continuously eroded by glacial and periglacial processes in the Quaternary.

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