The inheritance of a Mesozoic landscape in western Scandinavia

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The occurrence of in-situ weathered bedrock, saprolite, is widespread in formerly glaciated Scandinavia. Understanding the genesis of these weathering products and placing them into an adequate tectonic and climatic framework is currently of great interest for two reasons. First, the origin of the landscape in Scandinavia is currently the subject of a lively debate hinged around the number and age of episodes of regional uplift and denudation. Second, there have been recent discoveries of major hydrocarbon reserves within weathered basement highs in the North Sea immediately offshore Norway. The age of weathering, however, remains loosely constrained, which in turn impacts on the credibility of existing landscape evolution models and on large-scale morpho-tectonic correlations. Here we provide new geochronological evidence that the first-order geomorphology of western Scandinavia is a relict from Mesozoic times. K-Ar dating of authigenic, syn-weathering illite clay separated from on- and offshore saprolitic remnants reveals basement exposure and weathering in the late Triassic. This age is independently confirmed by stratigraphic constraints. We conclude that the iconic "strandflat" landscape of western Scandinavia initially originated during the late Triassic through deep weathering in a warm climate, and that it was only rejuvenated through stripping as late as the Pleistocene, thus challenging the hypothesis of predominantly Pleistocene sculpturing of the landscape.