



Deeply weathered basement rocks in Norway

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Recent studies show that, in addition to tectonic processes, surface processes have also had a profound impact on the topography of Norway. This is especially obvious for the northernmost part of the Nordland county and for western Norway, where the current immature Alpine-type topography cannot be easily explained by tectonic processes only. Erosion of the sedimentary succession also does not seem sufficient to explain the observed relief. Common remnants of deeply weathered basement rocks, however, indicate a history of deep alteration and later erosion of the bedrock, which needs to be considered as another important factor in the development of the topographic relief.

Most of the sites with deeply weathered basement exhibit a clay-poor grussy type of weathering, which is generally considered to be of relatively young age (Plio-/Pleistocene) and thought to represent an intermediate stage of weathering. Unfortunately, small amounts or complete absence of clay minerals in these weathering products precluded the accurate dating of this weathered material. Scandinavia was exposed to a large range of glaciations and the once extensive sedimentary successions have been almost entirely eroded, which impedes a minimum age estimate of the weathering profile. Although several sites preserving remnants of deep weathering can still be observed onshore Norway, they are all covered by Quaternary overburden and the age of the regolith remains thus unconstrained and a matter of debate. The only exception is a small Mesozoic basin on Andøya, northern Norway, where weathered and clay-poor saprolite was found underlying Jurassic and Cretaceous sedimentary rocks.

Over the last few years the Geological Survey of Norway (NGU) has mapped and investigated deep weathering onshore Norway to better understand weathering processes and to constrain the age of the weathering remnants. The combined interpretation of geophysical, mineralogical and geochemical data, together with recent observations from the Norwegian shelf, where grussy type of weathered bedrock was found buried under Mesozoic sediments, leads to the conclusion that coarse-grained, clay-poor saprolite does not necessarily indicate a young age of weathering but could in fact be of Early Mesozoic age or even older. The Late Jurassic to Early Cretaceous faults in the Lofoten-Vesterålen area are for instance little affected by weathering processes. With the goal to refine our understanding of the complex weathering processes and to constrain them in time, the NGU is establishing a new K-Ar laboratory for the dating and characterization of illite grown authigenically in the saprolites. It is expected that the data generated therein will contribute new quantitative constraints to the long-lasting debate as to the age of weathering processes in Scandinavia.