

Pre-Jurassic weathering and erosion studied on Andøya, northern Norway

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Introduction

Remains of old regoliths onshore Norway are sparse due to several glaciations during the Quaternary. Remnants of the Mesozoic cover and potential thick packages of altered basement rocks were eroded and today's landscape with steep deep valleys and fjords was formed.

A small Mesozoic basin has been preserved onshore on the island Andøya, Northern Norway, and earlier studies suggest that Mesozoic sedimentary rocks are resting on deeply weathered bedrock. At the southern boundary of the basin a kaolinite-rich horizon is outcropping, sandwiched between the basement and the overlying Early Jurassic siliciclastic rocks.

The present study aims an improved understanding of i) old weathering processes in Norway; and ii) assess whether weathered basement is preserved underneath Mesozoic sedimentary rocks on a regional scale. We investigated the mineralogy and geochemistry of the outcropping weathering profiles, focusing on the transition zone between mildly weathered basement and overlying sedimentary rocks from three well cores in the basin.

Results

Our results show a 18-m-thick transition zone consisting mostly of kaolinite and quartz. Quartz grains are angular indicating short transport. An abundance of clay minerals in the transition zone (65-92 wt%) in comparison to underlying mildly weathered basement rocks (11-36 wt%) and overlying sedimentary rocks (8-13 wt%) suggests that a zone of deeply altered basement rocks existed prior to the deposition of the sedimentary rocks. A kaolinite-rich horizon of comparable thickness to the one observed at the surface is absent in all drill holes onshore Andøya. Deeply weathered basement rocks may therefore have developed only locally, or it may have been a regional development, that was only locally preserved. The latter can be explained by local erosion during development of the basin, when parts of the regolith were close to sea level and exposed to waves and tidal changes.