



Weathering characteristics of arctic islands in northern Norway

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The arctic islands of the Lofoten-Vesterålen archipelago in northern Norway have a wide distribution of weathered land surfaces commonly located above 250 m with several apparent similarities. In order to investigate the characteristics of (deep) weathering in this region, northern Langøya and Hadseløya were chosen for in-depth analyses. Eight weathering profiles were excavated from various surfaces, and the stratigraphies were logged in detail. Material was collected throughout the weathering horizons, and all samples were subsequently analysed for clay mineralogy (<63 μ m fraction) and grain size distribution. The sampling strategy was complemented by samples from additional saprolites and other landforms such as moraines and rock glaciers. The XRD results indicate that the presence of secondary minerals, such as gibbsite ($\text{Al}(\text{OH})_3$) and kaolinite ($\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$), are very common throughout the profiles. Gibbsite is an extreme end product of silicate weathering and usually associated with a warmer and more humid climate, as found in Scandinavia during the Tertiary. The grain size analyses (<63 μ m) show that the finer silt fractions (<8 μ m) tend to be high in the profiles (20-40%), with significant amounts of clay (5-15%) demonstrating that the regolith itself is susceptible to frost sorting mechanisms. ^{10}Be exposure dates from in situ quartz knobs on tors and boulders of local origin suggest >40,000 years of sub-aerial conditions. Considering the steady surface erosion, this figure should be viewed as an absolute minimum age estimate. Mapping of the superficial sediments and geomorphological features of the study areas has revealed several common morphological features, which indicate dominance of glacial and periglacial processes in the areas lying below the lower boundary of blockfields (c. 250 m). The weathering mantles are not a periglacial end product, but rather a relict tertiary landform that were modulated

by permafrost processes as well as biological processes at later stages. The regolith cover constrain the vertical extension of warmbased Quaternary ice sheets challenging the notion of a parabolic ice mass consuming every mountain top of Lofoten and Vesterålen.