Inventory and characteristics of known saprolite locations in Norway

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Recent hydrocarbon discoveries in crystalline basement (mainly Haugaland high) offshore Norway have sparked renewed interest in understanding the genesis, age and landscape evolution of fractured and weathered bedrock. The BASE-project, launched at NGU by integrating different research groups, addresses this problem by investigating the nature and timing of fracturing in relation to the timing and environmental conditions of saprolite formation.

The new project builds upon a previously established database of known saprolite localities extracted from a comprehensive literature review. The database gathers over 250 sites of weathering phenomena that include saprolites, tors, weathering pits, and other weathering related features. Generally two types of saprolites are identified, clayey and grussy, which commonly have been related to different weathering processes and formation times. Most saprolites are located close to the coast, with few observations in inland areas. The saprolites have mainly developed in coarse- to medium-grained, intermediate to felsic magmatic rocks and occur in regions with generally limited glacial erosion or deposits. The saprolite locations can be geographically grouped into seven distinct regions occuring mostly at elevations below 400 m asl.

Geochemical and mineralogical analyses completed on saprolites of both types from different regions reveal extensive depletion of leachable elements in the saprolites compared to fresh bedrock. Decreasing grain sizes with progressing weathering is related to the formation of secondary clay minerals that include smectite, vermiculite, montmorillonite, illite, kaolinite and, at few locations, gibbsite. The database provides a useful tool to invesitgate the long-term landscape evolution in Norway.