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# Geometry of relict surfaces in Northern Norway: Implications for the extensional evolution of the NE Atlantic margin

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The distribution and geometry of relict surfaces adjacent to the northern Norwegian passive margin can help constrain the post-rift evolution of the onshore region. A swath map of relict surfaces, covering the coast of Senja Island and extending SE to the drainage divide, was constructed from DEMs, aerial photos and an NGU digital map database of Quaternary features. The map and histograms of elevation distribution depict three distinctly stepped, coast-parallel belts of preserved relict surfaces. The belts increase in mean elevation from coast to the southeast and, to a certain degree, correlate with the bedrock geology. Overall, the relict surfaces dip to the NW. Locally SE dipping surfaces in the coastal and central belts may be controlled by post-surface reactivation of normal faults.

The coastal belt coincides with a fault-bounded horst of Precambrian rock. Although deeply incised by Alpine glaciers and fjords, relict surfaces are preserved on ridge tops and local broad peaks at 700-800 m. A central belt of much lower relief and with surfaces averaging 900-1100 m high coincides with Caledonian nappe rocks and exhibits few preserved surfaces. An inner belt of extensive and well preserved surfaces averaging 1300-1400m high coincides with peaks and the gently rolling upland of the Scandinavian mountain crest. Here, NW-trending paleoridges and paleovalleys are evident in contours of the highest surfaces.

NW-SE topographic profiles (perpendicular to the COB) show distinct steps in the maximum height of the relict surfaces, interpreted to coincide with mapped normal faults whose vertical offsets (throw) may be up to 600-700 m. The geometry of relict surfaces is consistent with multiple rock column uplift events. Published apatite fission track (AFT) apparent ages are $\sim$200 Ma (range $\sim$170-220 Ma), indicating the onshore bedrock was within $\sim$2-3 km of the surface since Early Jurassic time. No distinct AFT age offsets can be resolved within the data, limiting net throw to less than ca. 1 km. The AFT data are thus consistent with the landscape elements resolved in this study.

Between Lofoten and the Senja Fracture Zone (SFZ) the proximal margin is extremely narrow; to the north of SFZ the crustal thinning gradient becomes much less extreme. Distinctly younger apatite fission track ages along the Lofoten margin point towards considerably more throw. NE-SW (COB-parallel) profiles show a gradual decrease in elevation occurs across the projection of the Senja Fracture Zone. The effect of sharp taper on the Lofoten/Senja margin may be reflected in topography >100 km to the NE of the tip zone of the main normal faults. Further landscape analysis will be used to assess the pattern of margin uplift and faulting through space and time in this region.