



Episodes of Phanerozoic uplift in Greenland and Scandinavia: Correlation and lack of correlation across the North-East Atlantic

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We have used apatite fission-track analysis data and results from stratigraphic landscape analysis in key areas of West and East Greenland and southern Scandinavia to define the burial and exhumation history of these areas.

For the period prior to the break-up of the North-East Atlantic, our results from North-East Greenland and southern Scandinavia reveal a pattern of synchronous episodes of uplift and erosion; notably during the three main phases of break-up of Pangaea (late Carboniferous, Middle Triassic and on the Early–Middle Jurassic transition; ~310, 245 and 175 Ma, respectively).

This is in contrast to the dominant phases of uplift and erosion that affected the divergent margins after the opening of the North-East Atlantic at the Paleocene–Eocene transition.

The mountains of southernmost Norway formed during two main steps after post-breakup subsidence and burial. First, early Miocene (~23 Ma) uplift and erosion to the base level of the adjacent ocean led to formation of a peneplain that included the present-day Hardangervidda plateau (and the South Småland Peneplain in Sweden). Second, uplift that began in the early Pliocene (~5 Ma) raised the plateau to its present elevation of ~1200 m a.s.l. (and ~150 m a.s.l. for the South Småland Peneplain) and led to re-exposure of tilted, Mesozoic surfaces at lower elevations.

The mountains of West and East Greenland formed in three steps after a phase of post-breakup subsidence and burial. First, late Eocene (~35 Ma) uplift and erosion to the base level of the adjacent ocean led to formation of a peneplain, the Upper Planation Surface (UPS). Second, late Miocene (~10 Ma) uplift and erosion led to formation of the Lower Planation Surface (LPS) by incision below the uplifted UPS. Early Pliocene uplift raised the UPS and the LPS to their present elevations of about 2–3 and 1–2 km a.s.l. and initiated the formation of the present-day landscape through fluvial and glacial erosion.

The formation of the dominant peneplains thus began earlier in Greenland than in southern Norway (late Eocene and early Miocene, respectively). The uplift of these plains leading to the incision of the present-day relief also began earlier in Greenland than in Norway (late Miocene and early Pliocene, respectively). The final phase of uplift that began in the early Pliocene, affected both Greenland and Scandinavia at about the same time.

We present some speculations about the nature of the underlying processes based on this correlation – and lack of correlation – of uplift events across the North-East Atlantic.