Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08469, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08469
EGU General Assembly 2008

Normal fault control on alpine landscapes in Norway

Osmundsen, P.T. (1), Redfield, T.F.(1), Hendriks, B.(1), Henderson, I.(1), Dehls, J.(1), Lauknes, T.R.(2), Fredin, O.(1) Larsen, Y.(2), Davidsen, B. & Anda, E.(1)

(1) Geological Survey of Norway, N-7491 Trondheim, Norway, (2) Norut a/s, Pb 6434 Forskningsparken, 9294 Tromsø, Norway

Along the Norwegian segment of the NE Atlantic passive margin, alpine landscapes bounded by well-defined tectonic lineaments rise from sea level to heights of 1000-2500 metres. Alpine landscapes are commonly formed by glacial erosion at high altitudes in young orogens. However, the reason why elevated alpine landscapes should form on a mature passive margin 54 Ma after the cessation of rifting is not well understood. Based on new structural, thermochronological, geomorphic and satellite radar data we argue that in Scandinavia, alpine landscapes formed in the upthrown footwalls of normal faults.

At the scale of Scandinavia, the relationship between apatite fission-track (AFT) age-patterns and asymmetric topography require differential denudation and uplift to post-date the Late Jurassic. At more local scales, fault offset is recorded by 2σgtatistically significant jumps in apparent AFT age data across lineaments. Synthetic aperture satellite radar (InSAR) data indicate that normal-sense displacement have continued along some of the faults to present day. Structural and geomorphologic evidence include several generations of fault-rocks and kinematic indicators, topographic steps, and pronounced landscape contrasts between alpine footwalls and much less incised hanging walls. Impressive range-front scarps are variably modulated by fluvial and glacial erosion, and locally associated with steeply dipping triangular facets.

The formation of alpine footwall ranges can be explained by the contrasts in drainage density produced by pre-glacial normal faulting. Drainage density will normally be higher on the steep, upthrown footwall slope than on the more gently dipping, back-

rotated hanging wall slope. We argue that in Scandinavia, subsequent exploitation of such a pre-glacial drainage pattern by Quaternary ice remodelled the footwalls into alpine ranges that are parallel to, and bounded by, post-rift and active normal faults. On the back-tilted hanging walls, gentler landscapes prevail that are characterised by the preservation of widely distributed palaeosurfaces that are incised by valleys and fjords. Thus, abrupt landscape contrasts were developed across the faults. In areas undergoing active faulting, high densities of post-glacial landslides cluster along steep-sided glacial valleys, consistent with present-day adjustment of the landscape to the combination of tectonics and glacial erosion.