



Is the Neogene uplift of the circum-Atlantic margin caused by serpentinisation of the lithospheric mantle?

O. Olesen (1), A., Skelton (2), J. Ebbing (1) and L. Gernigon (1)

(1) Geological Survey of Norway, Trondheim, Norway (2) Department of Geology and Geochemistry, Stockholm University, Stockholm, Sweden (odleiv.olesen@ngu.no / Fax: +47 73904494 / Phone: +47 73904456)

There is no general consensus about the mechanisms that explains the Neogene uplift phase of the circum-Atlantic margin. Gravity data provide means to study the mechanism of exhumation of these mountainous areas. Assuming that the region is close to isostatic equilibrium, these uplifted mountainous areas must be supported at depth by substantial volumes of low-density material within the upper mantle. Several competing mechanisms can be proposed to explain these low-density features. One of the most effective processes to reduce the density of the mantle peridotite could have been the influx of considerable quantities of water inducing the serpentinisation of the upper mantle. The oceanic fracture zones, linked with old inherited Caledonian fault zones and Moho interface could represent weakness zones or channels for transport of sea-water to the continental mantle. This hypothesis is supported by (1) serpentinisation of the uppermost 2 km of tectonically exhumed mantle on the Iberian margin at an estimated rate of 0.1 - 10 cm/year, interpreted based on chromatographic modelling of seismic velocity data and (2) an apparent spatial relationship between the locations of oceanic fracture zones, their continental expression, and localized areas of Neogene uplift in the NE Atlantic, (e.g. the Denmark Strait, Jan Mayen, Senja and Greenland FZs). A recent aeromagnetic survey along the Jan Mayen FZ reveals wide zones with low magnetic signature on either side of these "tectonic corridors". They are explained by fluid alteration of the basaltic crust, after substantial fluid transportation along the main border faults.