Reviewed research article

Tertiary volcanism in Iceland

Björn S. Harðarson[1], J. Godfrey Fitton[2] and Árni Hjartarson[1]
[1]*Iceland GeoSurvey (ISOR), Grensásvegur 9, 108 Reykjavík, Iceland* bsh@isor.is
[2]*School of GeoSciences, University of Edinburgh, West Mains Road, EH9 3JW, UK*

Abstract — *The Tertiary igneous rocks of Greenland, Iceland, the Faeroes and Britain have been the subject of study and debate for more than a hundred years. Iceland is of particular significance because the coincidence of a mantle plume with the Mid-Atlantic Ridge combines the two fundamental forces that promote magmatism, namely the elevated mantle potential temperature induced by the Iceland plume and adiabatic decompression in response to spreading at the ridge. Furthermore, the exposed Iceland crust contains evidence of major ridge-jumps over the last 16 million years and this relocation of the magmatic focus has been a prominent process in the evolution of the island. The control on ridge-jumping is clearly related to the interaction of the mantle plume with the overlying lithospheric plate. This process has had a significant impact on the investigation of magmatic, tectonic and sedimentary processes. The bulk of the Tertiary region is made of subaerial tholeiitic flood basalts separated by minor clastic interbeds, usually of volcanic origin. The relatively monotonous Tertiary lithology is interrupted where central volcanoes occur with their buried palaeotopography, evolved rocks, hydrothermal alteration and stratigraphic complexities. It has become clear that the range of chemical composition of Tertiary basalt is much more limited than that seen among Pleistocene and Holocene basalt, and depleted basalt appears, surprisingly, to be absent from the Tertiary succession. These observations can be explained by processes of crustal accretion operating today in the active rift zones of Iceland. It is a widely held assumption that V-shaped ridges observed in the gravity field around the Reykjanes Ridge imply variation in plume temperature and plume activity. Temporal variations in some isotope ratios in the Tertiary lava flows seem to coincide with the formation of the V-shaped features, and this could be consistent with a pulsating plume model.*