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Vertical Motions at the Edges of the Icelandic Plume

Charlotte Schoonman (1), Nicky White (1), and Richard Luckett (2)
(1) Bullard Laboratories, University of Cambridge, UK, (2) British Geological Survey, Edinburgh, UK

The Icelandic mantle plume, a major convective upwelling, has had a profound effect on the evolution of the North Atlantic region over the last 62 Myrs. Recent body and surface wave tomographic studies show that the planform of the Icelandic Plume is not circular but highly irregular, with fingers of anomalously slow mantle extending beneath the lithosphere of the British Isles and Norway. In these regions, analysis of receiver functions indicates that crustal isostasy does not completely account for present-day topographic elevation, which suggests the presence of a significant component of dynamic support. This study investigates the crustal and mantle structure above these asthenospheric fingers in order to develop an understanding of the interaction between convective processes and their topographic expression at the surface. Large teleseismic earthquakes recorded on a network of broadband, three component seismometers deployed throughout the British Isles are being used to construct receiver functions. Through forward and inverse modelling of these receiver functions, as well as joint inversion of the receiver functions and Rayleigh wave group dispersion data, the velocity structure of the crust and mantle underneath each station is determined. Preliminary results show that anomalously thin crust occurs beneath Northwest Scotland, directly above an asthenospheric finger. Further work will attempt to image the top of the anomalously hot asthenospheric finger and to extend the project into other parts of the North Atlantic Ocean, constraining the spatial distribution of any dynamic topography.