Iceland and the Ontong Java Plateau, a seismic comparison.

Ingi Th. Bjarnason (ingib@hi.is)

Institute of Earth Sciences, University of Iceland, 101 Reykjavik, Iceland

Iceland, a part of the North Atlantic igneous province and the Ontong Java Plateau (OJP), are of the family of large igneous provinces. Iceland and its shelf is a fifth of the area of the OJP. Iceland does not have many analogies in crustal structure with the rest of the world. The average thickness of the upper and middle crust of Iceland is 6-7 km, with a maximum thickness of 8-10 km in central and east Iceland. On land the majority of Iceland's upper and middle crust is basaltic, with an un-quantified fraction of rhyolite, but zero amount of sediments in relative terms. From the surface down to the 6.6 km/s compressional velocity contour, the average compressional velocity of the standard upper and middle crust of Iceland is 5.57 km/s. Stripping the 1.5 km thick sedimentary cover of the OJP upper crust, leaves 8-10 km thick basaltic part with 3.5% lower average velocity than the Iceland's standard model (Miura et al., 2004; Gladezenko et al., 1997). Crustal thickness is still being debated in Iceland, but on average it may be 25-26 km thick, with ±10 km variability. The OJP has on average 33 km thick crust. Both places have seismically fast lower crust, with half or more of the lower crust with compressional velocity in the range $7.0 \leq V_P \leq 7.5$. Neither places have significant under plating velocities $7.5 < V_P < 7.8$ km/s, although in Iceland it is hard to draw a boundary between under plating velocity and mantle velocity. All in all, Iceland and OJP have the closest crustal similarities on earth, OJP being the big sister. A clear difference between Iceland and OJP is in the structure of the mantle lid. The OJP has a 30 km thick lid with high seismic velocity, shear wave velocity V_S=4.5 km/s and V_P=8.2 km/s (Richardson et al., 2000), or even V_P =8.4-8.6 km/s sub Moho velocity. Iceland has in contrast no mantle lid in the central part of the island, i.e. asthenosphere that extends up into the crust, or rather low average mantle lid velocity $V_S \approx 4.25$ km/s. The highest average lid velocity reaches up to 4.4 km/s in the Westfjords of Iceland. The most likely reason for these differences is a hot and shallow melting mantle under Iceland. A similar minimum asthenosphere velocity is though observed at both places at 100-110 km depth, with $V_S \approx 4.1$ km/s. Geodynamical calculations show that under Iceland these low values in the mantle call for solidus temperature and partial melt. The same probably also applies to the OJP, but with much thinner melting zone and less total melt then currently is generated under Iceland.