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The seismic low velocity of Iceland's mantle. The shape of a thermal and melt anomaly

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The most dramatic landscape in the seismic velocity structure is in the top 200 km under Iceland. Analysis of near distance and regional surface waves (Love and Rayleigh in the ICEMELT dataset) in the period range 5-100 s, makes it possible to define variation in absolute velocity and anisotropy with fine vertical details in 6 different 1-D models distributed laterally over 500 km distance. There is a large asymmetry in the thickness of the lithosphere across the ridge system. Under similar aged surface geology (10-15 Ma) a 60 km thick lithosphere is under northwest Iceland and at least 100 km thick under east Iceland. Hypothesis of a buried continental fragment under east Iceland have been proposed. More likely explanation is an un-conformal upbuild of thick crust (30-35 km) on top of $\sim$ 30-40 Ma old oceanic lithosphere, due to repeated rift jumps to the east. Another factor in the east-west lithosphere asymmetry, though not quantified, is the predominant west and northwest mantle flow in the asthenosphere inferred from anisotropy, thus supplying greater transport of heat under the American plate. However, not all aspect of the anisotropy structure fits a preconceived plume model: So far there is no convincing evidence of a large scale vertical mantle flow in the top 200 km. A major characteristic is a low shear velocity in the shallow asthenosphere under central Iceland and the rift zones. The absolute SV velocity in the depth range 30-120 km is 8.2% lower on average than the PREM model, with $\sim$200 km diameter. Kreutzmann et al. (2004) have with geodynamical methods modeled the Iceland seismic plume signature (LVZ) as a combination of thermal and melt anomaly. Bjarnason and Schmeling (2007) continue to model Iceland's LVZ as a combination of thermal and melt anomaly, although with higher partial melt 3% in the shallowest asthenosphere at $\sim$ 30 km depth, while Kreutzmann et al. (2004) modeled 1% overall partial melt in the depth range 30-120 km. Whether this means that the plume exists is a matter for a lively debate with red wine in hand or from the podium.