Title: Cape Verde hotspot from the upper crust to the top of the lower mantle

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Abstract: We investigate the crust, upper mantle and mantle transition zone of the Cape Verde hotspot by using seismic P and S receiver functions from several tens of local seismograph stations. We find a strong discontinuity at a depth of similar to 10 km underlain by a similar to 15-km thick layer with a high (similar to 1.9) Vp/Vs velocity ratio. We interpret this discontinuity and the underlying layer as the fossil Moho, inherited from the pre-hotspot era, and the plume-related magmatic underplate. Our uppermost-mantle models are very different from those previously obtained for this region: our S velocity is much lower and there are no indications of low densities. Contrary to previously published arguments for the standard transition zone thickness our data indicate that this thickness under the Cape Verde islands is up to similar to 30 km less than in the ambient mantle. This reduction is a combined effect of a depression of the 410-km discontinuity and an uplift of the 660-km discontinuity. The uplift is in contrast to laboratory data and some seismic data on a negligible dependence of depth of the 660-km discontinuity on temperature in hotspots. A large negative pressure-temperature slope which is suggested by our data implies that the 660-km discontinuity may resist passage of the plume.

Our data reveal beneath the islands a reduction of S velocity of a few percent between 470-km and 510-km depths. The low velocity layer in the upper transition zone under the Cape Verde archipelago is very similar to that previously found under the Azores and a few other hotspots. In the literature there are reports on a regional 520-km discontinuity, the impedance of which is too large to be explained by the known phase transitions. Our observations suggest that the 520-km discontinuity may present the base of the low-velocity layer in the transition zone.

Author Keywords: Hotspot; Plume; Crust; Upper Mantle; Mantle Transition Zone; Receiver Function

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