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# Geodynamic Constraints on the Effective Density and Stability of Large Low Shear Velocity Provinces

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Large Low Shear Velocity Provinces (LLSVPs) are large structures above the core–mantle boundary characterized by slower than expected shear velocities. Seismic observations suggest these regions are both thermally and compositionally distinct, yet conflicting studies infer density variations of approximately ±0.5–0.8% relative to the surrounding mantle. These conflicting observations may arise from how heterogeneous structures are spatially averaged when estimating density, which has influenced our understanding of the effective density of these structures. Effective density variations in LLSVPs are due to variations of intrinsic density anomalies and thermal anomalies, both of which strongly control their average density, morphology, and long-term stability. We have used numerical thermochemical convection experiments to systematically investigate the effects of intrinsic density and thermal variations. Through this investigation we are able to provide geodynamic constraints on the effective density variations of LLSVP-like structures.