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# Limits on lateral thermal and chemical gradients under the Canadian Shield

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The global seismic discontinuities typically observed at depths 410km, 520km and 660km are commonly ascribed to phase changes in the olivine system. The nature of these discontinuities (visibility and depth) can give insights into the thermal and chemical state of the mantle in this key region of the Earth. For instance, water and temperature have been shown to have a significant influence on the properties of the ‘410. We will present modelling of P-to-S converted energy from the mantle seismic discontinuities using a particularly high quality dataset of teleseismic receiver functions from the Canadian Shield. Conversions from both the ‘410’ (olivine to wadsleyite) and ‘660’ (ringwoodite to perovskite and magnesiowüstite) are clearly observed, and a striking lack of topography on both of the discontinuities suggests little thermal perturbation across the vast extent of the continental root, even at its deepest point. The exceptionally clear data provide an opportunity to accurately constrain the shape and width of these discontinuities through comparison of observed and predicted transmission coefficients with respect to frequency. The fact that the ‘520’ is not conclusively observed using this comparatively high frequency data also places a minimum bound on the thickness of the wadsleyite to ringwoodite transformation.