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Basaltic mantle reservoirs from seismic inversion of reflection data

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Convective stirring of chemical heterogeneities introduced through oceanic plate subduction results in the marble cake model of mantle composition. A convenient description invokes a chemically unequilibrated mixture of oceanic basaltic crust and harzburgitic lithosphere. Such a composition is required to explain joint observations of shear and compressional waves reflected underneath transition zone (TZ) discontinuities[1]. The formation of basaltic reservoirs at TZ depth results from complex interaction between phase-change induced chemical segregation, subducted slab downward entrainment, and plume upward advection. However, the dominant mechanism to create and maintain the reservoirs is debated, because both present-day reservoir location and the amount of basalt in these reservoirs are unconstrained. Here, Bayesian inversion of SS- and PP-precursors reflection data indicates that the TZ comprises a global average basalt fraction f = 0.32 ± 0.11. We find the most enriched basaltic reservoirs (f = 0.5-0.6) are associated with recent subduction in the circum-Pacific region. We investigate the efficiency of plate subduction to maintain such reservoirs using global-scale thermochemical convection models[2].

[1] Waszek, L., Tauzin, B., Schmerr, N.C., Ballmer, M., & Afonso, J.C. (in review). A poorly mixed mantle and its thermal state inferred from seismic waves.

[2] Yan, J., Ballmer, M. D., & Tackley, P. J. (2020). The evolution and distribution of recycled oceanic crust in the Earth's mantle: Insight from geodynamic models. *Earth and Planetary Science Letters*, *537*, 116171.