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Shear wave splitting as a tool to understand the interactions between oceanic plate tectonics and continental dynamics

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Subducting slabs are the major actors of oceanic-plate domain mantle convection, but their temporally variable pull and interaction with continental interiors strongly affect continental tectonics. We discuss how seismic anisotropy can be used jointly with global mantle flow models to constrain some of the governing, yet uncertain, parameters controlling such interactions. These include the relative strength of mantle rocks and the degree to which mantle heterogeneity, e.g. as imaged by tomography, actively drives mantle flow. To link geophysical and geological data, it is useful to consider global models with sufficient numerical resolution to allow for testing of regional geodynamic hypotheses, such as to the strength of plate boundaries and micro plate motions. Recent modeling and imaging results for the southeastern Caribbean, the Alboran/Atlas domain of northwest Africa, and the Middle East Afar/Arabia/Anatolia system show how anisotropy can help track the establishment of whole mantle convection cells, the extent of plume push and spreading, and continental keel-related channeling of asthenospheric currents.