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Seismological constraints for modeling slab-related mantle flow

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Slab-related flow in the mantle is essentially horizontal at the Earth's surface (as moving plate), directs downward at trench (as subducting slab), stagnates in the mantle transition region (as stagnant slab), penetrates through the lower mantle (as penetrating slab), hits the core-mantle boundary (CMB) to deflect subhorizontally (as graveyard of subducted slab), then meets under the mid-Pacific and Africa to rise (as megaplume). Transitional processes of subducting slab to stagnant slab are sensitive not only to the mechanical properties of the slab and the surrounding mantle but also to the plate tectonic environment controlling trench retreat history. Subhorizontal flow along the CMB is likely to be associated with progressive enrichment of heavier MORB component of the slab in the D" layer so that the megaplume is a chemically distinct entity from the surrounding mantle. I review the recent seismological observations possibly relevant to the above or other scenarios of subducted slab-related flow in the mantle. The emphasis is placed on importance of long-term broadband observations in targeted regions.

Keywords: plate subduction, mantle convection, seismological observation