Flat slabs revealed by *SS* precursors

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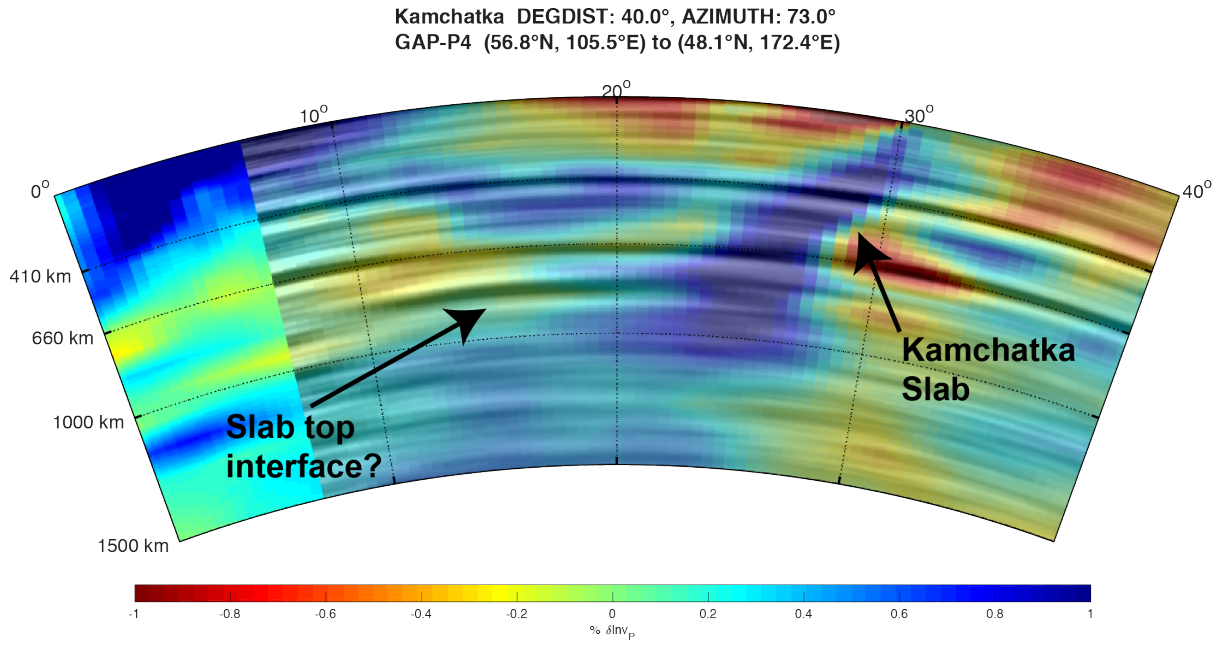
Abstract:

We stack long-period, transverse-component seismograms recorded by FDSN stations (1976-2010) and USArray-TA stations (2004-2014) to systematically search for mantle discontinuities and horizontal reflectors. *SS* precursor waveforms are converted to the depth domain based on the IASP91 model [*Kennett & Engdahl*, 1991], and then stacked in 10,312 overlapping bouncepoint caps at 2˚ spacing. Several megameter-scale reflectors are detected in the lower mantle, some of which coincide with fast anomalies in tomography models. For example, a reflector as strong as the 660-km discontinuity is seen at ~830 km depth near the subducted Kamchatka slab imaged by global *P*-wave tomography (e.g., the GAP_P4 model by *Obayashi et al.*, 2013). This reflector is too strong to be explained by phase changes in mantle minerals, but possibly indicates the top surface of the Kamchatka slab or a fragment of subducted oceanic crust. Further comparisons between global tomography and reflectors detected by *SS* precursors provide an effective tool to locate lower-mantle slab remnants, which are crucial for plate reconstructions.



Apparent reflectors/discontinuities from stacked *SS* precursors superimposed on the GAP_P4 *P*-wave tomography model [*Obayashi et al.*, 2013] along a cross section of the Kamchatka slab. Dark stripes represent strong reflectors and discontinuities across which *S*-wave impedance increases dramatically.