Imaging depth variations of interplate coupling

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Recent geodetic measurements have revealed that brittle-plastic transition zones (BPTZs) are loci of slow slip episodes. Furthermore, recent seismic observations detected non-volcanic harmonic tremors at the BPTZ. It is important to estimate the depth range of BPTZs and how interplate coupling changes within the BPTZ, not only for understanding the interseismic stress accumulation process in subduction zones but also exploring the causes of slow slip and harmonic tremors. Here we imaged depth variations of interplate coupling in the Nankai trough, southwest Japan, by inverting Global Positioning System (GPS) velocities to gain more insight into the rheology of the BPTZ in subduction zones. Interplate coupling was estimated for three profiles: the source region of the 1946 Nankaido earthquake, that of the 1944 Tonankai earthquake, and the Tokai seismic gap. The results show a gradual decrease of interplate coupling between about 20-25 and 35-45 km depth with a plateau region between 25-35 km for all three profiles. Because there are GPS sites near the trench, the Tokai profile was capable of resolving interplate coupling at shallower depths than the other two profiles. The result from the Tokai profile shows that interplate coupling decreases from full to zero above 6 km depth. The updip limit of the seismogenic zone for the Tokai profile is significantly shallower than expected for the Nankaido profile, consistent with seamount subduction under the accretionary prism.