

Mantle discontinuities oceanward of the Krile - Honshu slab

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Triplication waveforms of the 410-km discontinuity (the 410) and 660-km discontinuity (the 660) recorded on Hi-net (High Sensitivity Seismograph Network in Japan) from Kuril earthquakes are analyzed to investigate seismic structures of the discontinuities. The first P-waves of which ray paths bottom depths well above the 410 arrive much earlier than expected by any standard spherical velocity model because they propagate through the dipping Pacific fast slab. However, such fast arrivals are well predicted by our tomography model GAP_P4 (Obayashi et al., 2013) (Figure 1). On the other hand, the later phases of the mantle discontinuity triplication are less affected by the dipping slab. Figure 2 shows the region of interest indicated by the ray paths grazing the discontinuities located oceanward the Kurile-Honshu slab. Figure 3 shows the square of envelope waveforms stacked for 11 earthquakes after equalizing the focal depths to a common depth of 120 km. This equalization was made using a representative slowness value of 11.5 or 9.7 (sec/deg) to emphasize the retrograde branch of the 410 or 660 triplication. The retrograde branches of the 410 and the 660 are clearly observed as shown by yellow thick lines in Figure 3. The retrograde branch for the 660 is consistent with the theoretical travel time predicted by IASP91 model. However, the retrograde branch for the 410 arrives later by 2 or 3 seconds and its slowness is larger than the prediction, suggesting slow anomalies atop of the 410. We will show a spherical model that explains the characteristics described above.

Keywords: mantle discontinuity, slab, triplication

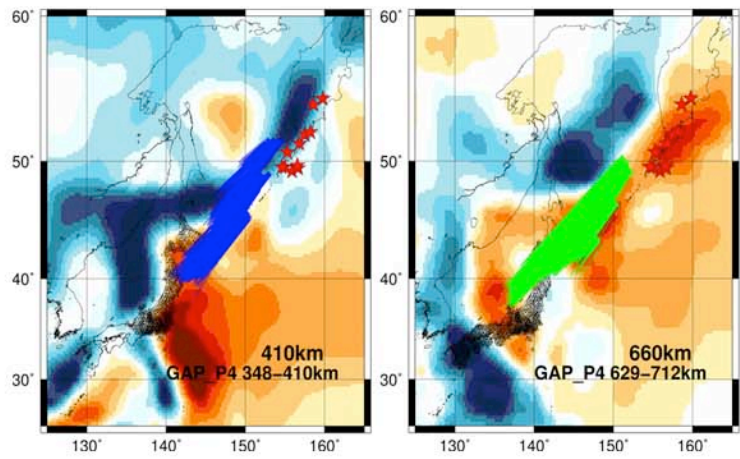
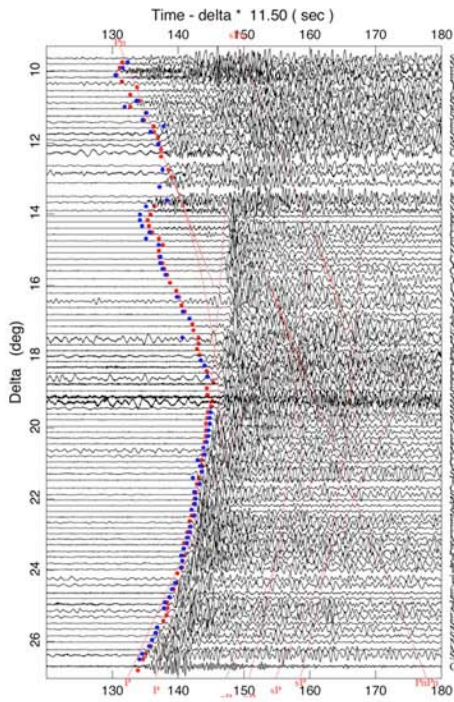


Figure 2. ray paths grazing the 410 (left) and the 660 (right) superimposed on GAP_P4 3D velocity model.

Figure 1. Vertical component Hinet seismograms for the Kuril earthquake on Oct. 16, 2012 aligned with increasing epicentral distance. Onset times manually picked (blue) and predicted by GAP_P4 (red) are shown by dots.

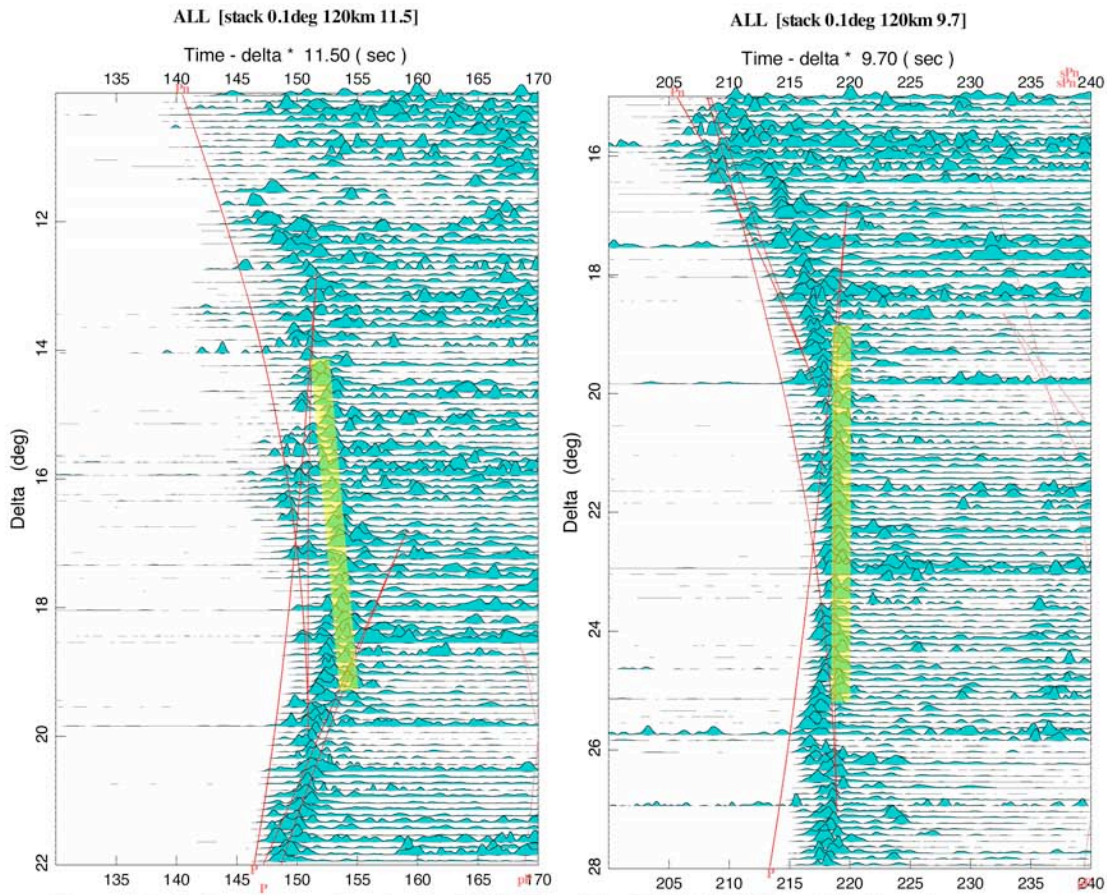


Figure 3 Stacked square envelope for the 410 (left) and the 660 (right) Yellow thick lines show the retrograde branches of the triplication that we focus on in this study.