Regional shear waves from an unusually deep earthquake beneath Ogasawara Islands: 660 km discontinuity and anisotropy

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Following a large deep earthquake beneath Ogasawara Islands on 30 May, 2015, an aftershock (mb 4.9) took place at a depth of 678 km (USGS). P and S waves from the aftershock were recorded by F-net broadband stations in Japan at distances of 1 to 18 degrees. The aftershock is small enough to neglect source effect. Here I explore structure effect on the shear wave propagation. SH waves recorded by the transverse directions in western Japan were generally characterized by a single pulse. The peaks of the SH waves tend to arrive earlier than those of the SV waves in the radial directions. The dominance of a single pulse in the SH waves can be explained by the iasp91 model with the 660 km discontinuity shallower than the aftershock. When the 660 km discontinuity is assumed to be deeper than the aftershock, additional signals predicted in radial components can apparently cause different peak time arrivals between SH and SV waves. However, in these cases, the SV peaks arrive earlier than the SH peaks, which cannot fit the observations. It is thus more likely that the observed peak time difference is attributed to anisotropy. Because signals due to crustal reflection are predicted in the radial components ~6 sec after the direct S waves, shear wave splitting parameters were carefully estimated by using initial portions of S waves. The fast directions obtained in western Japan are nearly in the east-west, which looks different from the fast direction observed for a nearby deep earthquake in the Wadati-Benioff zone. We cannot see systematically early arrivals of SH peaks from Fiji earthquakes in a similar back azimuth. The anisotropic regions may be located deep.

