Discordance between P- and S-wave tomography models using ISC travel time data

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We determined P- and S-wave 3D velocity models and compared them. We used travel time data from January 1964 to December 2012, which obtained from arrival-time data reported by International Seismological Centre. For organizing a set of earthquakes, events were selected to distribute globally as evenly as possible. Thus our dataset contains ~14,000,000 paths from ~90,000 events for P and ~1,100,000 paths from ~20,000 events for S. These data were inverted based on the travel time tomography method (Inoue *et al.*, 1990; Fukao *et al.*, 1992; Obayashi *et al.*, 2013) until convergences were archived. Comparing the resultant P- and S-wave tomography models, remarkable high-velocity zones below South America, eastern Australia and the Japan-Izu-Bonin-Mariana region are shown in both models, whereas detailed features are different from each other. Especially in the Izu-Bonin region, high-velocity zones laterally extend significantly near the 660-km discontinuity in the P-wave model (Figure b) whereas S-wave model (Figure c) does not show such significant high-velocity zone. On the other hand, in the depth range from 700 to 1000 km below the south end of the Izu-Bonin trench, high-velocity anomalies exist in the S-wave model, but not so notable in the P-wave model. Previous studies using travel time tomography show similar discordance between P- and S-wave models in the Izu-Bonin region (e.g. Wei *et al.*, 2015). Such difference could be caused by different amounts of datasets that P- and S-wave have. Thus we conducted P-wave tomography applying only a set of earthquakes and stations which was used in S-wave tomography (Figure d), and discuss the effect that this factor affects the tomography models.

Figure:P- and S-wave models using all datasets (b, c) and a P-wave model using a set of earthquakes and stations of S-wave (d).

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