Tomography and anisotropy in the 2018 East Iburi earthquake area

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We used a seismic tomography method (*Zhao et al*., 1992, 2015) to investigate 3-D P and S wave velocity (Vp, Vs) structures and Poisson's ratio images in the source area of the 2018 East Iburi earthquake (M 6.7) in Hokkaido, Japan. We collected a large number of P and S wave arrival-time data from two groups of earthquakes released by the Japan Meteorological Agency (JMA) Unified Earthquake Catalog, which were recorded at 74 seismic stations belonging to the Kiban seismic network installed in southern Hokkaido. One group contains 53,784 P-wave arrivals and 38,840 S-wave arrivals from 3073 local shallow and intermediate-depth earthquakes during June 2002 to August 2018 before the East Iburi earthquake. The intermediate-depth earthquakes mostly occurred in the subducting Pacific plate, providing very good ray coverage in the mantle wedge beneath the source zone. The other group contains 8540 P-wave arrivals and 6528 S-wave arrivals from 460 earthquakes that occurred in the crust and uppermost mantle (mostly < 40 km depth) during 6–14 September 2018, including the mainshock and aftershocks of the East Iburi earthquake. The picking accuracy of the arrival times is estimated to be ~0.05–0.15 s for P-wave data and ~0.1–0.2 s for S-wave data. The 2018 Iburi mainshock occurred at the edge of a high-Vp (2–4%) seismogenic zone. Significant low-Vs (-1 to -3%) and high Poisson's ratio (2–7%) anomalies are imaged in and below the source zone and extend to the upper surface of the subducting Pacific slab, most likely reflecting ascending fluids released by the slab dehydration. A high consistency between the fault plane and the low-Vs and high Poisson's ratio anomalies indicates that the fluids may have entered the fault and affected the rupture nucleation. A high-V (1–3%) anomaly is revealed in the fore-arc mantle wedge and connects with the high-V seismogenic zone, probably reflecting a lithospheric fragment and contributing to cool down the mantle wedge. We also apply the method of *Wang and Zhao* (2013) to investigate the 3-D Vp azimuthal anisotropy structure in the 2018 Iburi earthquake area. The results reveal complex seismic anisotropy in the crust in and around the source zone, which may reflect complicated stress regime and strong structural heterogeneities there.

References

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