

Seismic imaging of the 2016 Kumamoto earthquake area using P and PmP data

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We determined a high-resolution model of 3-D P-wave velocity (V_p) tomography of the crust in the source zone of the 2016 Kumamoto earthquake (M 7.3) in Kyushu, SW Japan using a large number of arrival times of first P-waves and reflected P-waves from the Moho discontinuity (PmP). The PmP data are collected from original seismograms of the Kumamoto aftershocks and other local crustal events in Kyushu. Detailed resolution tests show that the addition of the PmP data can significantly improve the resolution of the crustal tomography, especially that of the lower crust. Our results show that significant low-velocity (low- V_p) anomalies exist in the entire crust beneath the active volcanoes, which may reflect the pathway of arc magma. The 2016 Kumamoto earthquake occurred at the edge of a small low- V_p zone in the upper crust. A significant low- V_p anomaly is revealed in the lower crust beneath the source zone, which may reflect the arc magma and fluids ascending from the mantle wedge. These results suggest that the rupture nucleation of the 2016 Kumamoto earthquake was affected by fluids and arc magma.

Keywords: Kumamoto earthquake, crustal reflected wave, seismic tomography