CMT solutions of the 2016 central Oita earthquakes using near-field strong motion records

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On 16 April 2016 at 1:25 (JST), the 2016 Kumamoto Earthquake (M_{JMA}7.3) occurred in Kumamoto Prefecture. 32 seconds later from the origin time, an event (M_{JMA}5.7) was triggered in central part of Oita Prefecture, and the seismic activity increased in the area from Yufu to Beppu Bay. In our previous study (Kowari *et al.*, 2019, SSJ), we found that four events which occurred on 16 April at 7:11 (M_{JMA}5.4), 8:27 (M_{JMA}3.7), 23:26 (M_{JMA}3.6) and 29 April at 8:27 (M_{JMA}4.5) may be caused to the Yufuin fault reactivation since these events have nodal planes almost parallel to it. In this study, we apply a CMT inversion to near-field strong motion records of 14 events greater than M_{JMA}3.0 that occurred in this area within one month after the Kumamoto earthquake. We employ the CMT inversion technique developed by Okamoto *et al.* (2017, EPS) with 3D-FDM Green functions calculated by HOT-FDM (Nakamura *et al.*, 2012, BSSA) including topography effect as well as 3D subsurface structure. For the inversion, we use velocity waveform data which are obtained by integrating and band-pass filtering the original strong-motion records observed at K-NET and KiK-net stations of NIED and seismic intensity stations of JMA, and by band-pass filtering the original velocity records at temporal stations installed in the Comprehensive Research on the Beppu-Haneyama Fault Zone. We select the records at 2 to 6 stations for inversion of each event based on the record quality and azimuth coverage of the stations. The number of stations and the frequency bands are chosen along to the magnitude of the event. The CMT results in Figure 1 show that the depths of centroid hypocenters were very shallow (minimum depth is 1 km below sea level), especially for event around the epicenter of the triggered earthquake and around Mt. Tsurumidake (active volcano). This is consistent with the fact that the lower limit of the seismogenic layer in this region is much shallower than the outer region. The tension axes are almost north-south for all events. The fault parameters for the two events which occurred on 16 April at 6:51:29 (M_{JMA}3.2) and at 6:51:52 (M_{JMA}3.0) near the epicenter of the triggered earthquake, were similar to those of the triggered earthquake estimated by Nakamura and Aoi (2017).

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Keywords: CMT inversion, Moment tensor, Oita prefecture, near-field strong motion record, 3D subsurface structure model

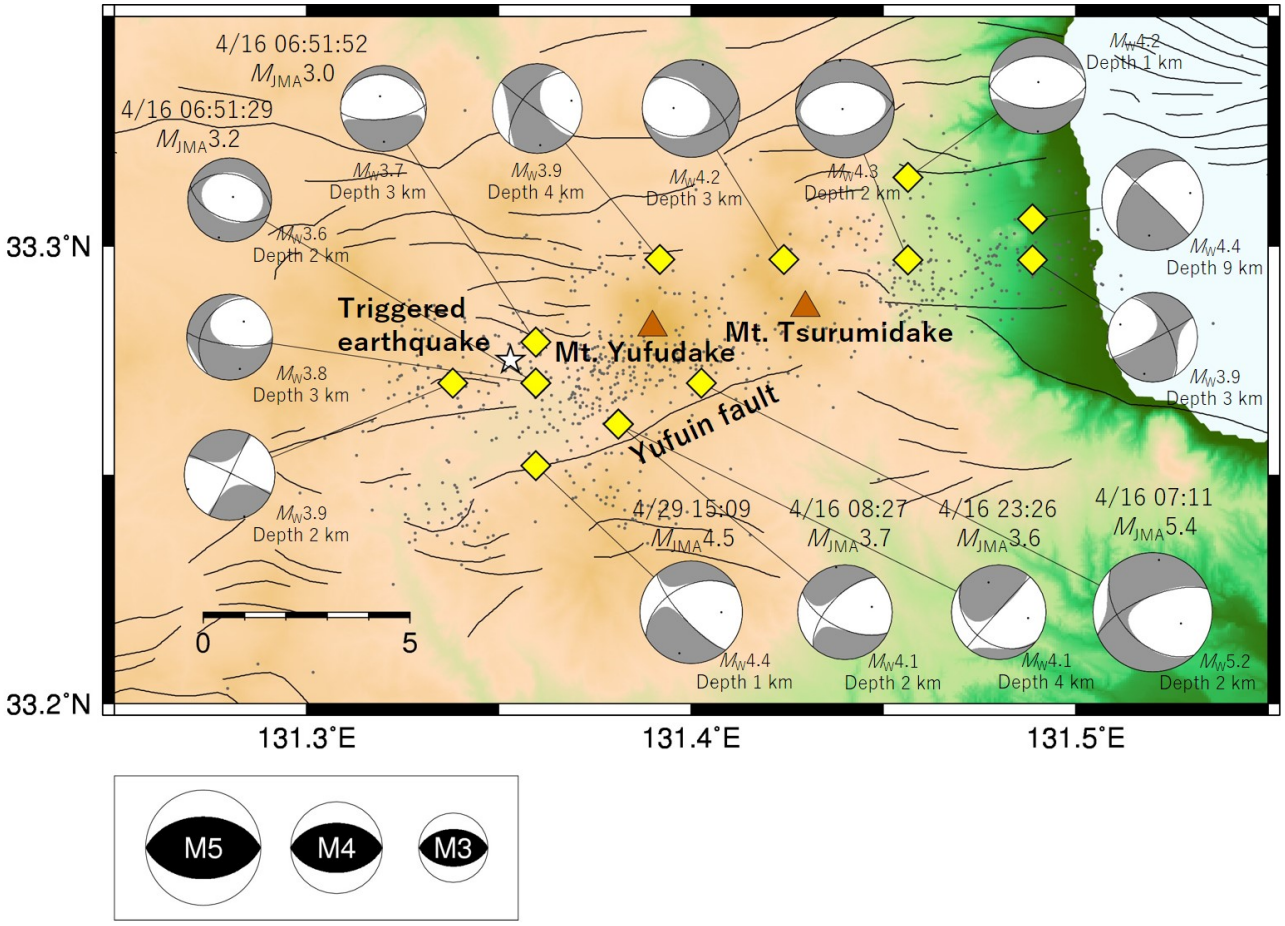

Figure 1. Optimum focal mechanism and location of centroid epicenter (rhombus). The size of each mechanism indicate the magnitude of the event. Note that the centroid depth is given in kilometers below sea level. White star denote the epicenter of triggered earthquake reported by JMA unified catalogue. Gray points indicate the aftershocks that occured within one month after the 2016 Kumamoto Earthquake. Triangles denote the active volcanoes. The active faults in this region are shown as black lines.