The 2018 Osaka Earthquake with non-double-couple components

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On 18 June 2018, the earthquake with M_{JMA}6.1 hit the northern Osaka, metropolitan city in western Japan, involving 5 causalities and 435 wounded. The P-wave first motion focal mechanism shows a west-east trending pressure axis and a reverse fault type, while the moment tensor (MT) solution shows the same trending pressure axis but complicated focal mechanism with quite non-double-couple components. The surrounding active faults, each of which is not only reverse fault type or strike-slip type, seem to be not corresponding to the earthquake because they are a little apart from the epicenter or different from the already evaluated dip angle and strike. The aftershock distributions are roughly classified into two clusters, northern and southern parts. Here we show the aftershock distributions that are precisely relocated, and clarify the earthquake source mechanism including rich non-double-couple components.

We apply the hypocenter relocation method, Double-Difference method (Waldhauser and Ellsworth, 2000), to the Hi-net routine pick data and waveform cross-correlation data from June 18 to June 30, 2018. The used velocity structure is 1-D model for the Hi-net routine modified from Ukawa et al. (1984).

The Aftershocks are mainly distributed along the plane dipping to the east. The detailed aftershock pattern clearly distinguishes into two different systems in northern and southern regions from the mainshock. The reverse fault type is significant in northern region, while strike-slip fault type is dominated in the southern region. We choose two representative focal mechanisms from each northern and southern region, one is the reverse fault type taken from the mainshock and the other is the strike slip type. Their strike and dip agree with the fault geometry found by seismicity. We found that the combination of the two focal mechanisms can explain the MT solution of the mainshock. Therefore, we conclude that the mainshock involves in two different mechanisms and the two vicinity faults in each northern and southern region may rupture at almost the same time.