

Possible non-double-couple aftershocks of the 2004 Mid Niigata Prefecture Earthquake

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Kosuga et al. (2007) have determined focal mechanisms of aftershocks of the 2004 Mid Niigata Prefecture (Niigata Chuetsu) Earthquake using the combined data set of temporary and permanent observation. The data was provided by the research team of aftershock observations for the Chuetsu Earthquake. They found that some aftershocks show non-double-couple (NDC) polarity distribution on focal sphere. In this study we have reread P-wave polarities from the waveform data of temporary observation and investigated the possibility of NDC earthquake.

Among 673 newly determined focal mechanisms with sufficient quality, 24 events show NDC polarity distribution. Most (23) earthquakes have significantly wider area of negative polarity on the focal sphere than the area of positive polarity. Minor positive polarities are distributed on narrow band trending mainly N-S, or small area of NE and SW corners on focal sphere. We rechecked the waveform data and confirmed that the NDC events are caused neither by misread of polarities nor polarity reversal of specific stations.

A marked feature of possible NDC earthquake is that they formed a cluster both in space and in time. They are distributed in the southwestern part of aftershock zone near the mainshock hypocenter. Kosuga et al. (2007) have pointed out that the stress state near the mainshock hypocenter deviates from the state in the surrounding region. The location of possible NDC events are included in a boundary zone of significant velocity change imaged by tomographic studies. However, because many ordinary double-couple events occurred in the same area as well, the velocity boundary cannot account for the occurrence of NDC events.

In addition, possible NDC earthquake occurred in a short period from 1 November to 3 November 2004. These facts suggest that the occurrence of possible NDC events is a transient phenomenon. The origin of these events needs further investigation using waveform data.