# Seismicity and fault structures in the southern end of the source region of the 2004 Mid Niigata prefecture earthquake

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We investigated seismicity and fault structures in the southern end of the source region of the 2004 Mid Niigata prefecture earthquake. We started temporary observations with 12 stations since November 25, 2004. The mean spacing of the stations is about 5 to 10 km. Seismometers employed in the observations are three-component velocity transducers having a natural frequency of 2 Hz (L22-E, Mark Product Inc.). The events were recorded on LS7000 data loggers (HAKUSAN Inc.) at sample rates of 100 Hz in continuous mode and by off-line recording with GPS clock. We collected data once on December 23-24, 2004, and confirmed that data quality is relatively high. Based on unified JMA hypocenter catalogue, we selected 111 earthquakes that occurred in the southern end of the source region and the period from June 2002 to December 2004. We also included another 13 events that were newly detected by setting up the temporary stations into our data set.

In hypocenter determinations, we assumed two different 1D crustal velocity structures of the northwestern and southeastern sides. The boundary between these structures is nearly coincides with the Shibata-Koide tectonic line. Focal mechanisms were inferred from absolute P and SH amplitudes as well as P-wave polarity data. Comparing with the unified JMA hypocenter catalogue, our locations cluster more tightly and moved to northwest about 2-5 km. The depth range did not change significantly. In order to obtain fine fault structures, we applied the double-difference earthquake location algorithm of Waldhauser and Ellsworth (2000) to P- and S-phase arrival time readings. The relocated hypocenters present a sharp view of the seismicity and reveal a number of discrete clusters including western dipping planes as well as eastern dipping planes, suggesting complex fault structures. The strikes and dip angles of these clusters are consistent with those of the focal mechanisms of small earthquakes occurring in each cluster. It should be noted that only eastern dipping clusters became active after the occurrence of the 2004 event. Progress in understanding of the interaction among these clusters should improve our ability to forecast earthquake hazards.

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