

# Overview of the Mid Niigata prefecture Earthquake in 2004

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The M6.8 inland earthquake occurred in the mid Niigata prefecture (depth of 13km) at 17:56 October 23, 2004. The Japan Meteorological Agency called it the Mid Niigata prefecture earthquake in 2004. This earthquake showed the thrust fault type with the pressure axis in the WNW-ESE direction. Seismic intensity 7 in JMA seismic intensity scale was observed in Kawaguchi-town during the M6.8 earthquake. Seismic intensity 6 upper or 6 lower were observed in Ojiya-city, Yamakoshi-village, Oguni-town and Nagaoka-city. Seismic intensities 1 to 5 upper were observed from the Tohoku to Kinki districts. After the JMA added the scale of intensity 7 in the JMA seismic intensity scale, it was secondarily observed in this time. The first seismic intensity 7 was observed during the 1995 Hyogo-ken Nanbu earthquake. Measurable seismic intensity of 6.5 and maximum acceleration of NS:1141.9, EW:1675.8, UD:869.6 (cm/s<sup>2</sup>) were observed with the seismic intensity meter in Kawaguchi-town of the seismic intensity 7. Strong motion continued from about 10 to 15 seconds in sites near the source region. The damage such as 39 dead, 2623 injured persons, 415 complete destruction of houses, 874 partial destruction of houses, 9409 partial damage houses, and 9 building fire houses occurred because of this seismic activity, a natural dam was formed in the Imogawa river by a slope collapse. Moreover, the horizontal acceleration that exceeded 2G were observed as NS:1639.9, EW:2035.6, UD:548.5 (cm/s<sup>2</sup>) in the Kawaguchi-town during the maximum aftershock of M6.5.

Aftershock activity was active as M6.3 earthquake at 18:03 Oct. 23 (maximum seismic intensity 5 upper), M6.0 at 18:11 Oct. 23 (6 upper), M6.5 at 18:34 Oct. 23 (6 upper), and M6.1 at 10:40 Oct. 27 (6 lower). These large aftershocks showed thrust fault type same as the main shock. The earthquakes of M6 or larger were observed six times, and the earthquakes with 5 lower in maximum seismic intensity were observed 19 times.

The aftershock distribution was extent the range of about 30km in NNE-SSW direction. Precise hypocenters were determinate with the hypocenter determination method by Waldhauser and Ellsworth (2000) by using the data of the routine observation network. The aftershock distribution indicated multi-planer fault system of double fault planes dipping to WNW direction and a single fault plane dipping to ESE direction (Aoki et al., 2005). The upper plane of the double fault planes was formed at the main shock. The lower plane was formed during the M6.5 aftershock at 18:34 Oct.23. The single fault plane of the conjugate type was formed during the M6.1 aftershock at 10:40 Oct. 27.

Active level of the aftershocks was the class of the most active aftershock activity in the inland earthquake among earthquakes since 1923. The Mikawa earthquake (M6.8) of the thrust fault type of the inland earthquake on January 13, 1945 showed active level of the aftershocks as well as this earthquake. The high level of the aftershock activity seems to be caused by the multi-planer faults system.