

4 TECTONICS

The plate-tectonic interpretation of Japan and its close vicinity is illustrated in Figure 4.1. The earthquake seems to take place along a collision boundary between Euro-Asian Plate and North American Plate (?). The earthquake area is on the eastern part of Fossa-Magna and underwent extensive folding, which has been still proceeding. The folding axes are ruptured by seemingly sinistral lateral strike-slip faults along the valleys of Nagano-Joetsu, Yuzawa-Kashiwazaki, Yunozawa-Ojiya and Nagaoka-Teradomari. These valleys may be interpreted as kink bands.

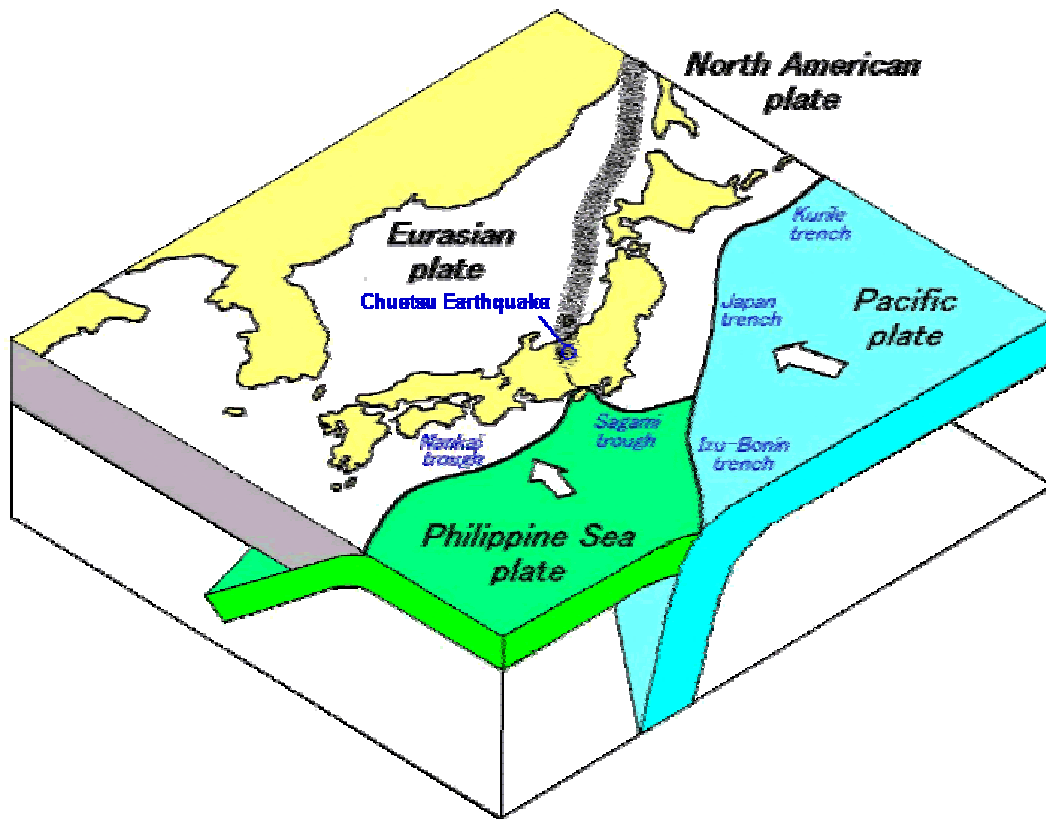


Figure 4.1: Plate tectonics interpretation of Japan and its close vicinity (modified from NIED)

The topography of Sadogashima Island to the north of earthquake area implies the existence of a dextral-type fault with an offset of 18-20km. There is no recognized active fault in the earthquake-inflicted area on the active fault map of Japan. However, folds in this area are regarded as "active folds" (Figure 4.2). Most of faults are in the vicinity of the Uonuma Hills, e.g. the Yukyuzan, Katagai, Yamamotoyama, Tokamachi and Muikamachi Faults and they are reverse faults dipping to NW.

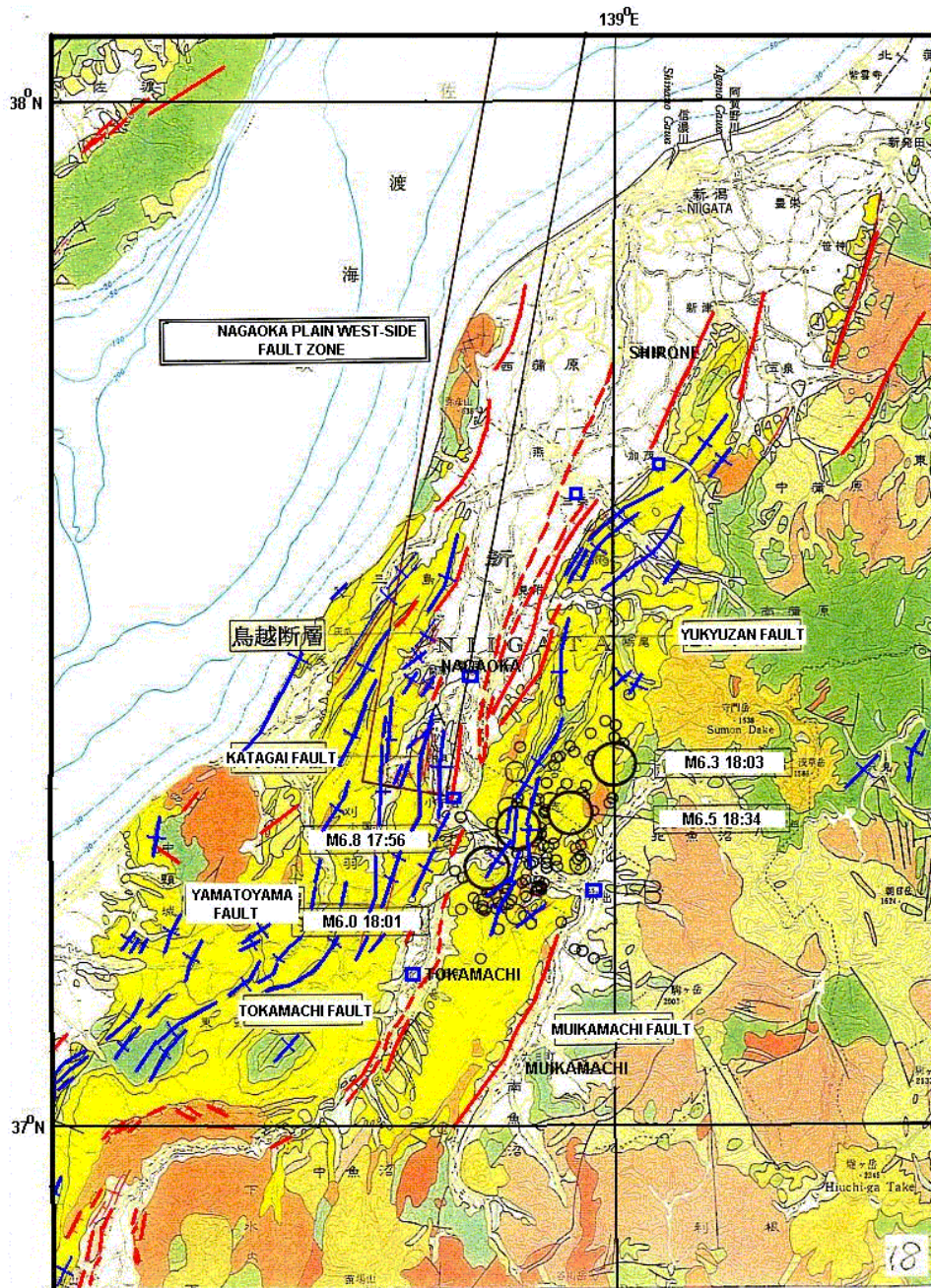


Figure 4.2: Folding and faults in the epicentral area (modified from JGS & NIED)

The author noticed some faults during the investigation (Figure 4.3). One of these faults was observed on the eastern side of Shinano-river nearby the landslide area and the second one nearby Horinouchi town along the Kanetsu expressway. One of the surfaces is associated with a thrust fault and the other surface is a sinistral lateral strike-slip fault. Faulting mechanisms inferred from the faults in Horinouchi are shown in Figure 4.4.



(a) Thrust fault nearby the landslide area in Ojiya



(b) Thrust and sinistral faults nearby Horinouchi along Kanetsu expressway

Figure 4.3: Faults observed during site investigations

Faulting mechanism of earthquakes between 1997 and Oct 23, 2004 obtained by F-Net of NIED are shown in Figure 4.5. A close-up view of the faulting mechanisms of the region inset in Figure 4.5 is shown in Figure 4.6. As noted from the figure earthquakes are dominated with thrust faulting. Nevertheless, some small earthquakes having sinistral lateral strike slip-faulting mechanism for NW-SE striking faults are also observed in the close vicinity of the epicentral area. It is also of great interest that

earthquakes occurred before October 23, 2004 has similar faulting mechanism to the main event. Furthermore, faulting mechanisms shown in Figure 4.4 are quite similar to those shown in Figure 4.6.

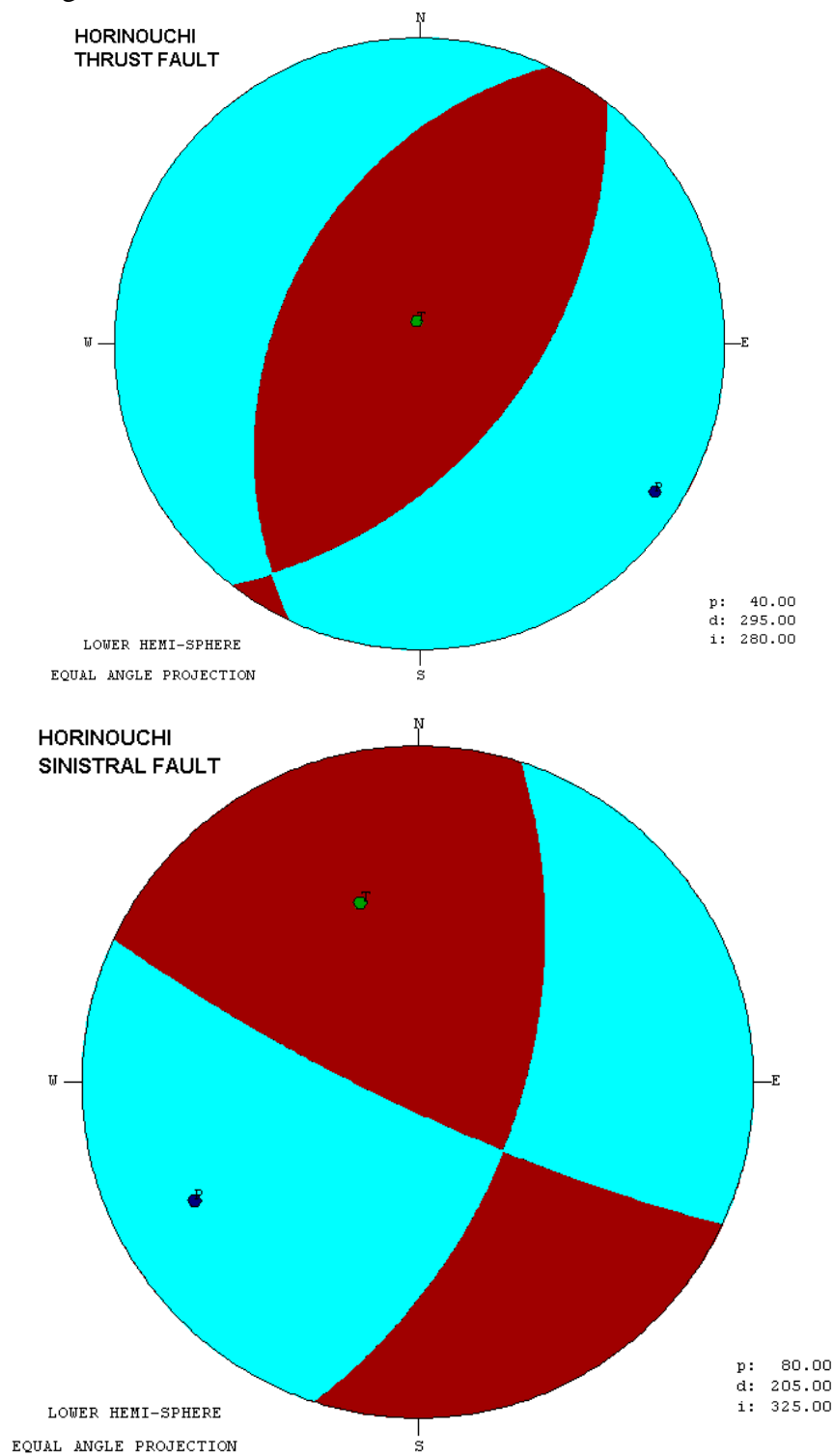


Figure 4.4: Inferred faulting mechanisms for faults nearby Horinouchi

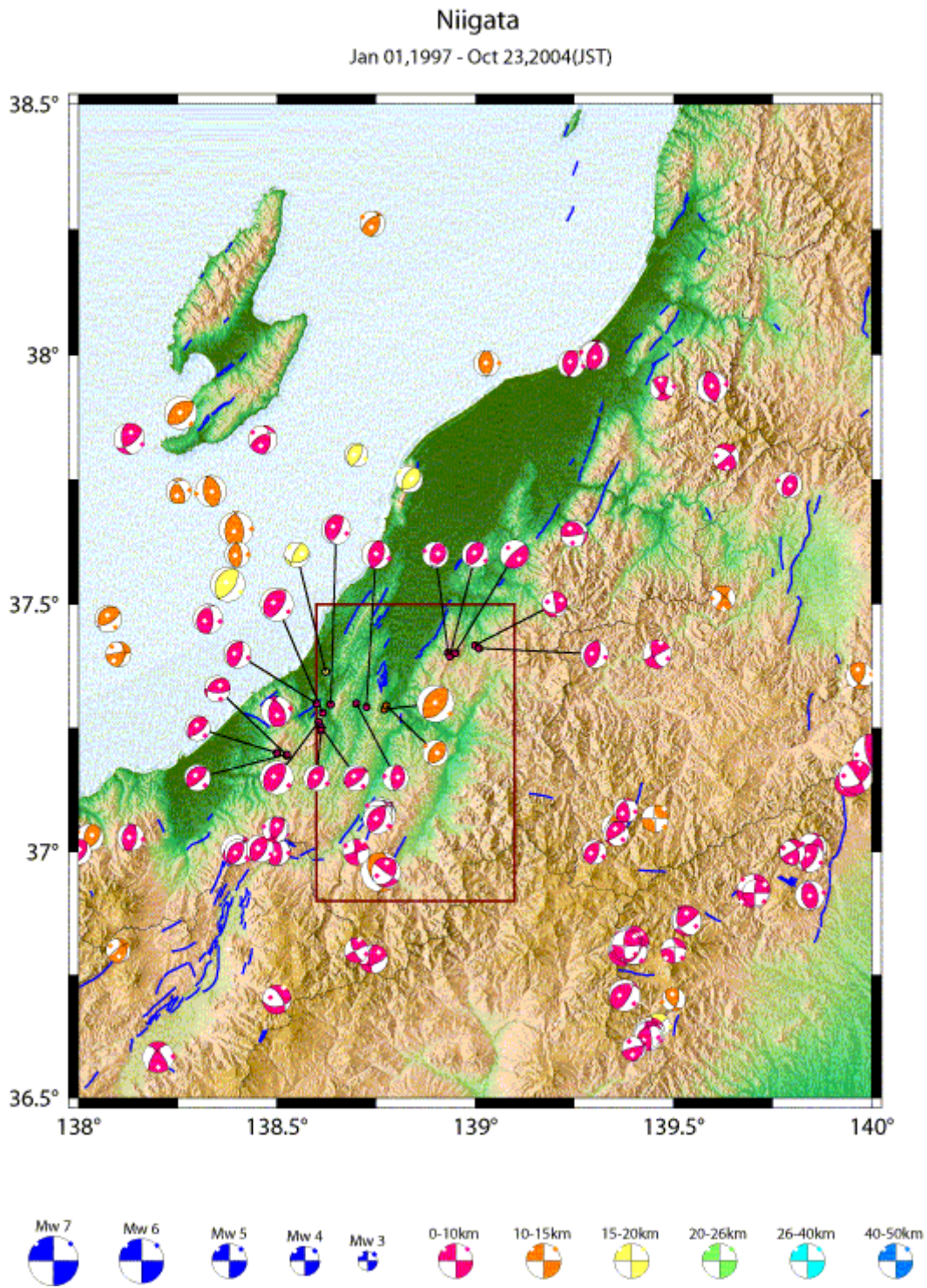


Figure 4.5: Faulting mechanism of earthquakes obtained by F-Net of NIED around the epicentral area

Mid_Niigata

Jan 01,1997 - Oct 23,2004(JST)

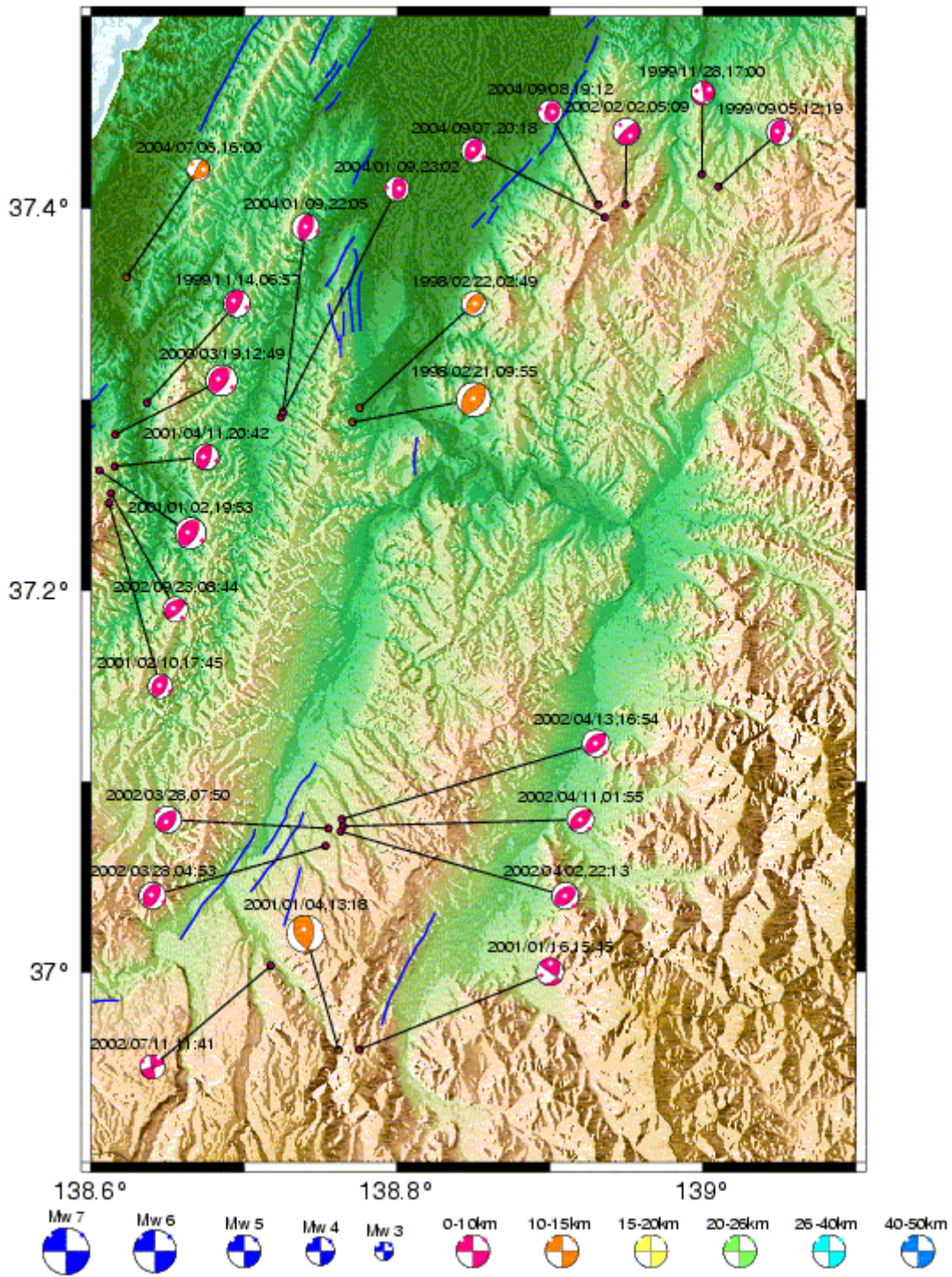


Figure 4.6: Faulting mechanism of earthquakes obtained by F-Net of NIED in the epicentral area