

Heterogeneous crustal structure in and around the source region of the 2004 mid-Niigata Prefecture earthquake

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Data recorded by a seismic network deployed the day after the 2004 Mid Niigata Prefecture Earthquake (M6.8) in central Japan are used to determine the major source faults responsible for the mainshock and major aftershocks. Using this high-resolution seismic data, three major source faults are identified: two parallel faults dipping steeply to the west located 5 km apart, and the other dipping eastward and oriented perpendicular to the west-dipping faults. Tomographic analysis revealed that the lateral variation of seismic velocity observed at surface extends to a depth of 15 km, encompassing the source area of the mainshock. A magneto-telluric survey was conducted in the source area, showing a conductive zone that corresponds to a low seismic velocity. The strong heterogeneity of the crust is considered to be related to the geological and tectonic evolution of the area, and to provide a setting with numerous potential sites for moderate to large earthquakes. The prominent aftershock activity following the 2004 Mid-Niigata Prefecture Earthquake can therefore be attributed to the highly heterogeneous crustal structure of this area, coupled with E-W compression along the Niigata-Kobe tectonic line.