再決定震源と強震記録による 2004 年中越地震の断層モデル

A Fault Model of the 2004 Mid-Niigata (Chuetsu) Earthquake Deduced from Strong Motion Records and a Relocated Hypocenter

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本研究で再決定された震源を使い、強震記録から 2004 年中越地震の断層モデル（すべり量と破壊開始時刻の分布）を推定した。また、破壊開始時刻の分布から破壊伝播 slowness を計算した。その結果、すべり量の大きい領域（アスペリティ）は震源（破壊

開始点）の updip 側と南西側の 2 箇所で見いだされた。これらのアスペリティの間では、破壊伝播が遅くなっており、また、これ以外にも破壊伝播速度に変化が見られるところがいくつか見いだされた。破壊伝播のゆらぎが高周波地震動の主要な源であることを考えると、これら破壊伝播の揺らぎが見いだされたところが、高周波源と重なるかどうかを検討することが次の課題である。

Variable rupture propagation is a source of high-frequency radiation, and modeling of high-frequency radiation is important for earthquake engineering. However, the variation tend to be ignored in the conventional characterization of fault rupture. The 2004 Mid-Niigata (Chuetsu) earthquake that occurred in the middle part of Honshu, Japan was characterized with the domination of high frequency radiation. Moreover, strong motions were recorded at several stations close to or above the causative fault, and these records may contribute to the construction of a reliable fault model.　In this sense, the Chuetsu earthquake provides a valuable opportunity to consider the character of high frequency radiation. I performed inversion of the strong ground motion records to construct a fault model of the Chuetsu earthquake with emphasis on rupture variation over the fault.

The hypocenter was relocated before the construction of a fault model because preliminary inversion analysis suggests that the hypocenter determined by the Japan Meteorological Agency (JMA) is biased. Different velocity structure models were assumed in the relocation to suppress the bias of lateral variation of velocity structure that comes from geological structure of the source region. The resultant hypocenter was located about 4 km northwest of the JMA hypocenter.

Analysis of strong motion records revealed two asperities (patches of large slip) on the fault. One is to the updip direction of the hypocenter, and the other is located to the southwest of the hypocenter. The latter asperity explains the abrupt rise of S-wave observed at the station located in the same direction. Different combination of stations used in inversion showed that stations above the fault strongly constrained the rupture variation; without the stations, the derived rupture tended to propagate smoothly. In other words, observation close to the fault is vital to obtain a well-constrained image of rupture propagation. I calculated local rupture slowness, taking spatial differences of rupture time. This quantity enables us quantitative discussion on the rupture propagation. It wad found that rupture slowed down between the two asperities, and other variations of rupture propagation were clarified with the distribution of rupture slowness. These changes may be significant sources of high frequency radiations. It is necessary to infer the distribution of high-frequency radiation over the fault in order to check the possibility. I also analyzed the correlation between the slip and rupture slowness, and found weak correlation (correlation coefficient of 0.44). Statistical testing showed that the correlation is meaningful. Accumulation of the correlation may be helpful for characterizing the variability of rupture propagation.

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