Estimation of Vp/Vs in the source region for 2004 Niigata Chuetsu earthquake

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The features of 2004 Niigata Chuetsu earthquake are 1) Several large earthquakes (M6 class) , 2) Reversed faulting higher dip angle related to tectonic inversion 3) large number of aftershocks. Sibson (2007) argued that these characteristics could be explained by effect of fluid. To reveal fluid distribution in deep crust, seismic tomography has played an important role. But it is insufficient to examine fluid migration just around the fault during large earthquake sequence. We investigate in this study Vp/Vs ratio analysis in source region of 2004 Niigata Chuetsu earthquake proposed by Lin and Shearer (2007), to obtain high resolution Vp/Vs images. P and S waves picked times from 27Oct to 23 Nov, 2004 for 664 events are used. Hypocenter data for these events are obtained from Shibutani et al. (2005). We conducted Vp/Vs analyses for 3D grid points with 1km space. In each analysis, we used events within 2km from grid point. Average of entire analysis shows 1.74. This value is larger than that obtained by Wadati diagram technique (1.67: path averaged Vp/Vs including aseismic region). Earthquake source region show higher Vp/Vs value. Higher standard deviation shows strong heterogeneity of Vp/Vs in source region. Vp/Vs values around mainshock are very higher value than 2.0. These values became smaller with time based on temporary subdivided analysis. For M6 class events with higher dip angle show high to moderate Vp/Vs ratio, while for low dip angle fault, low to moderate Vp.Vs ratio are obtained. Higher dip angle fault which are unfavourably oriented fault for reactivation, require fluid contribution to satisfy slip condition. In contrast, low dip angle fault reverse fault is favourably oriented. In such case fluid contribution is not necessarily required.

We confirmed this technique provide some new aspects to image fluid migration during earthquake sequence.

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