

Tomographic velocity model for the aftershock region of the 2001 Gujarat, India Earthquake

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We conducted field seismological observations in the damaged area of the 2001 Gujarat, India Earthquake during the period from February 28 to March 6. 8 temporary stations were operated and totally 1434 hypocenters were determined. Aftershocks were distributed as a plane dipping to south, and the depth range is 10 km to 35 km. It indicates that the fault plane does not reach to surface.

A tomographic investigation has been applied to the aftershock data, both P and S arrivals, to clear the fine velocity structure of this region. We used the resultant hypocenters obtained by the Joint Hypocenter Determination Method as initial hypocenters. The velocity model that used in National Geophysical Research Institute of India was modified and used as an initial model. The analysis technique is based on a grid-modeling tomography method by Zhao et al. (1992). V_p , V_s and hypocenters are determined simultaneously.

It is very important to investigate structure and rheology of seismogenic zone in this area, because this earthquake occurred at very deep, as lower crust. Therefore we tried to use the Extended Information Criterion (EIC) incorporation the bootstrap statistics for determining an optimum model in the seismic tomography. This approach has been applied to some tomographic study (e.g., Nishizawa and Kei, 1995; Aoike et al., 1998).

The resultant V_p and V_s structure show similar pattern at the all depths. It seems that the aftershock distribution is corresponds to the boundary between high- and low-velocity heterogeneities. Relatively small V_p/V_s is found generally at the depth of 10 to 40 km. In Japan, V_p/V_s is relatively larger at middle to lower crust, and it is considering that earthquake can occur hardly at the depth range. The fault plane of this earthquake is, however, at the middle to lower crust. Our tomographic investigation becomes on of the information which makes why this event occurred at such deeper crust.