

## Stress field in the source area of the 2004 Mid-Niigata Prefecture (Niigata-Chuetsu) earthquake

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We have investigated a stress field in the source region of the 2004 Mid-Niigata Prefecture (Niigata-Chuetsu) earthquake ( $M = 6.8$ ) by using P-wave polarity data obtained by a dense temporal seismic observation. The earthquake took place in central Japan near the eastern border of the Niigata-Kobe Tectonic Zone characterized by E-W contraction. The purpose of this study is to get insight into the stress heterogeneities in the source area including quite complex fault system with two parallel, westerly dipping fault planes and one conjugate plane. About two-thirds of well-constrained 514 focal mechanisms are reverse-fault type with WNW-ESE trending P-axes, which is consistent with the regional stress field in the area. Minor strike-slip events are distributed in the northern and central part of aftershock zone. Ten normal-fault events that are rare in the northeastern Japan are scattered mostly outside the major earthquake faults and occurred in a short period, suggesting that they reflect local stress field. Stress tensors derived from the focal mechanisms exhibit the compressional stress field characterized by nearly horizontal maximum principal stress that is consistent with the average direction of P-axes in the whole aftershock zone. Horizontal rotation of maximum principal stress axis is evident from WNW-ESE in the northeastern part of aftershock zone to E-W in the southwestern part. The direction of intermediate principle stress axis also changes from NE-SW in the northeastern part to NNE-SSW in the southwestern part. The fold axes in the area show similar strike variation. An interesting feature of stress distribution found in this study is the change in dip angle of the maximum principle stress axes. The axes dip gently to WNW throughout the aftershock zone, but for earthquake clusters in the cluster of mainshock fault, the axes dip steeply to the same direction. Judging from the stress ratio, the stress field in the cluster near the mainshock hypocenter is uniaxial while the state in the surrounding areas is relatively close to isotropic stress. Though the difference in dip angle may not significant by considering the estimation error of stress axes, the combined anomalies with the stress ratio suggest that the mainshock occurred in an area of local stress inhomogeneity. We further examined the spatial distribution of earthquakes that have inconsistent focal mechanisms with the estimated stress tensors. Such earthquakes are distributed in the northeastern edge of the aftershock zone, in the southern edge of easterly dipping fault plane, and in a shallow earthquake cluster that is located between the faults of mainshock and the largest aftershock. The location of these events indicates small-scale stress heterogeneities in the source area superposed on the larger-scale stress variation mentioned above.