

Static Stress Changes and Aftershock Occurrence Accompanying the 2004 Mid-Niigata Prefecture Earthquake

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The 2004 Mid-Niigata prefecture earthquake (Mw6.6) occurred at 17:47(JST), on October 23, 2004. Numerous aftershocks, including 4 large aftershocks with magnitude of 6 or greater, followed this earthquake. Aftershock distribution determined by a temporary aftershock observation [Sakai et al., 2005; Kato et al., 2005] have revealed two westward dipping fault planes, which were associated with the mainshock and the 18:34(JST) largest aftershock, and one eastward dipping fault plane, which was associated with a large aftershock occurred on October 27. We have considered that the stress changes induced by these earthquake sequences associated with each fault plane triggered complex aftershock occurrence.

We investigated the relationship between 5 large aftershocks and static stress changes in shear and normal directions. We calculated static stress changes by the mainshock, the largest aftershock, and the 10/27 large aftershock. The results showed positive correlations between 5 aftershock hypocenters and their rupture area and either shear stress change or normal stress change. The deeper part of the rupture plane of the largest aftershock, including its hypocenter, is located in the area of positive shear stress change and negative normal stress change. In opposite, the shallower part is located in the area of negative shear stress change and positive normal stress change. These differences in the relationship between aftershocks and stress changes may be interpreted by differences in the coefficient of friction and the effects of crustal heterogeneity.