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Analysis of the stress field using the multiple inverse method and K-means clustering in the Western Nagano Prefecture

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Stress inversion using earthquake focal mechanisms data is important in understanding the stress field in the seismogenic region. In this study, we performed stress inversion with the dense seismometer network in the Western Nagano Prefecture region .
It is assumed that stress field is homogeneous in the investigation area. However, it is difficult to analyze the stress field in an area where plural stress fields exist. So, in this study, we performed the stress inversion using multiple inverse method (Otsubo et al,2008) that stress field is assumed to be heterogeneous in an objective area .The stresses obtained by multiple inverse method are determined for some clusters recognized by K-means clustering(Otsubo,et al 2006). Furthermore, because there is arbitrariness about determination of cluster`s number in performing the clustering, we quantitatively tried to determine the cluster`s number referring to the algorithm of cluster separation (Hiratsuka and Sato,2008).
In this study, we determined 2365 focal mechanism using the data from dense seismogram network in the Western Nagano Prefecture between January 1, 1998 and December 31, 2003 and then divided them horizontally by every about 1.3km interval and vertically at depths of 2, 3 and 4 km, and performed stress inversion using multiple inverse method and K-means clustering in the above region. We obtained that a stress ratio ($=(s_1-s_3)/(s_2-s_3)$) is about 0.3 and strike slip stress field is dominant in the surface parts at the upper margin of the 1984 Western Nagano main shock fault.