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北海道で発生する千島前弧スリバーの運動に伴う小地震の断層面解の分布
Distribution of fault plane solutions of smaller events associated with transcurrent movement of Kuril fore-arc sliver

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Using the method developed by Imanishi et al. (2006), Sugawara et al. (2010, 2011) determined fault plane solutions of smaller events to find the evidence of transcurrent movement of fore-arc sliver along the southern Kuril trench. They used P- and SH-waves amplitudes as well as P-wave polarity data and determined fault plane solutions of smaller events with magnitude range from 2.0 to 3.5 and the numbers of P-wave polarity data are 10 or greater. Especially, they focused on the fault plane solutions of events along the estimated boundary of the fore-arc sliver in Hokkaido. Hiratsuka et al. (2012) investigated the spatial distribution of P-axes and T-axes of those fault plane solutions determined by Sugawara et al. (2010, 2011) in more detail. As results, WNW-ESE trending P-axes are distributed along the volcanic front, which is consistent with transcurrent movement of Kuril fore-arc sliver. Under the Hidaka Mountains, ESE-WNW trending P-axes are distributed along the upper interface of subducted Pacific plate. P-axes sub-parallel to the Kuril trench is distributed in the western side of Hidaka Mountains, which is consistent with ongoing process of collision between Kuril fore-arc sliver and Northeastern Japan arc. Strictly speaking, azimuth of P-axes near the hypocenters of 1970 Hidaka earthquake (M6.3) and 1982 Urakawa-oki earthquake (M7.1) are oriented SW-NE direction, while in the surrounding region they are oriented WSW-ENE direction. These results may imply that at least three different stresses act on the vicinity of the Hidaka Mountains.

In order to estimate stress field in the vicinity of Hidaka Mountains, we applied the multiple inverse method (Yamaji, 2000; Otsubo et al., 2008) to the fault plane solutions of smaller events determined by Sugawara et al. (2010, 2011). On the basis of azimuthal distribution of P-axes, we assumed the existence of three different stresses and estimate the direction of their principle stress axes and stress ratio ((sigma2-sigma3)/ (sigma1-sigma3)). We discussed the origin of those stresses based on the calculation of stress field for a homogeneous half-space using the formulae developed by Okada (1992) and comparison with 3D seismic velocity structure inferred by Nakamura et al. (2008).

References

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