Abnormal strain distribution in Hokkaido, Japan, inferred from the 2003 Tokachi-oki earthquake (M8.0)

*Kentaro Ishimori[1], Mako Ohzono[2]

1.Department of Earth and Environmental Sciences Graduate School, Yamagata University, 2.Faculty of Science, Yamagata University

From the coseismic strain distribution of the 2003 Tokachi-oki earthquake (M8.0) and 2011 Tohoku-oki earthquake (M9.0), we try to examine how big abnormal coseismic strain can correlate to heterogeneous subsurface structure in Hokkaido, Japan. For the 2003 Tokachi-oki earthquake, Ishimori and Ohzono (2015, JpGU) compared coseismic crustal deformation observed from GEONET F3 solutions with theoretical crustal deformation which calculated from dislocation model (Okada, 1992) with a rectangular fault. The result shows 10^{-7} of strain anomaly (difference between observations and calculations), and good agreement of spatial distribution of the strain anomaly region and characteristic subsurface structure, such as thick sedimentary area. This feature is supported by a simulation that suggests the relatively small elastic moduli of the thick sedimentary layer in the upper crust (Yabe et al., 2015). We also estimate the coseismic strain anomaly in Hokkaido at the 2011 Tohoku-oki earthquake. As a result, we found 10^{-8} of coseismic strain anomaly. However, the relationship between the strain anomaly distribution and subsurface structure was not clear. We conclude that that the tiny strain anomaly ($<\sim10^{-7}$) cannot detect characteristic subsurface structure.
For the coseismic strain anomaly of the 2003 Tokachi-oki earthquake, the vectors of principal maximum strain calculated from residual displacements (observations - calculations) indicates relatively large NW-SE convergence axes in eastern part of Hokkaido (Kushiro-Nemuro region). On the other hand, middle size of interplate earthquake, such as 2004 Kushiro-oki earthquake (M7.1) is occurred after the Tokachi-oki earthquake (2003, 1952). Because residual convergence direction agrees with the plate convergence direction, there is a possibility that those earthquakes might be triggered by the large coseismic strain anomaly.

Keywords: 2003 Tokachi-oki earthquake, subsurface structure, abnormal strain