S155-004 **Room: IC** **Time: May 17 9:38-9:51**

Modeling fault development in the Mid-Niigata region considering an ancient rift structure

Bunichiro Shibazaki[1]; Aitaro Kato[2]

[1] IISEE, BRI; [2] ERI, Univ. Tokyo

The tectonic loading and generation processes of large inland earthquakes are controlled by heterogeneous rheological structures in the crust and uppermost mantle. The frictional strength of the upper crust is heterogeneous due to the existing faults, basin structure, and heterogeneous pore-fluid pressure distribution. In the lower crust and uppermost mantle, heterogeneous temperature and water distributions cause heterogeneity in the flow properties. In the back-arc region and in the eastern margin of the Japan Sea, NE Japan, during the opening of the Japan Sea, grabens and half-grabens were formed along the listric normal faults. During the shortening that has been occurring since 3.5 Ma, reverse faults and folds have developed. Recently, Kato et al. (2009) obtained the detailed three-dimensional velocity structure for the Mid-Niigata region extending from the source region of the 2004 Chuetsu earthquake to that of the 2007 Chuetsu-oki earthquake. They suggested that generation of these two large earthquakes and their aftershocks are related to the rift structure and the weak zones below the seismogenic zone. In the present study, using a finite element method, we model development of fault zones considering the thick sedimentary basin, rift structure, and weak zone in the basement to reveal the relationship between the complex configuration of fault zones and heterogeneous crustal structure.

Kato et al. (2009) found lateral variations in the thickness of the low-velocity zones corresponding to the folding structure in the Mid-Niigata region. The sedimentary basin is defined as the place where P-wave velocity is less than 5.7km/s, following Kato et al. (2009). We choose values for the elastic constants and frictional coefficients in the basin such that they are smaller than those of the surrounding areas. We also set the frictional coefficient in the basement to be low at locations where P-wave velocity is low. We model the fault development at five cross sections along the direction W35N-E35S which include the source areas of the two large earthquakes. Numerical results show that the plastic strain concentrates and a fault zone is created at the concavity of the boundary of the basin structure and the basement at all the five cross sections. Furthermore, fault zones are well developed at the place where frictional coefficient is low in the basement. We confirm the development of fault zones related to the 2004 Chuetsu earthquake and the 2007 Chuetsu-oki earthquake. In the northeastern cross section, we confirm the development of fault zones which correspond to the Nagaoka-heiya-seien and Yukyuzan fault zones. The basin is also developed between these two fault zones. The development of these fault zones is related with the weak zone in the basement. Our numerical results indicate that rift structures and low-velocity zones revealed by Kato et al. (2009) determine the development of fault zones in the Mid-Niigata region.