山陰歪集中帯における変形場及び応力場のモデル化
Modeling deformation and stress state in the San-in strain concentration zone

*芝崎 文一郎[1]、西村 卓也[2]、飯尾 能久[2]、松本 拓己[3]
*Bunichiro Shibazaki[1], Takuya Nishimura[2], Yoshihisa Iio[2], Takumi Matsumoto[3]

1. 建築研究所国際地震工学センター、2. 京都大学防災研究所、3. 防災科学技術研究所
1. International Institute of Seismology and Earthquake Engineering, Building Research Institute, 2. Disaster Prevention Research Institute, Kyoto University, 3. National Research Institute for Earth Science and Disaster Resilience

Recent GNSS observations have revealed various strain concentration zones: Niigata-Kobe, Tohoku Sekiryo, San-in, and Kyushu. The many recent large earthquakes occurred in the strain concentration zones; therefore, it is important to understand the mechanisms of these zones to understand the generation processes of large earthquakes. It is thought that strain concentration zones are developed by weak rheological structure due to the existence of water, high temperatures, and the preexistence of weak structures, such as ancient rifts. Recently, Nishimura and Takada (2017) found a right-lateral San-in strain concentration zone, in which the 2016 central Tottori earthquake occurred. This study models the San-in strain concentration zone by considering the heterogeneous rheological structure using a finite element method with nonlinear viscoelasticity and Mohr-coulomb plasticity.

First, we generate a lithostatic stress state. We then set the boundary conditions, which cause the strike-slip stress regime. We assume the temperature increases with depth using the observed geothermal gradient distribution. Geothermal gradients are high along the volcanic region. Our model generates a strain concentration zone along the high geothermal gradient zone. Furthermore, small faults are generated in a direction almost perpendicular to the strike of the strain concentration zone when the accumulated shear stain is small. This model explains the faulting process of the 2016 central Tottori earthquake, the strike of which was almost perpendicular to the strike of the San-in strain concentration zone. The model also explains the fault development of the 1943 Tottori earthquake. This model set the azimuth of the maximum horizontal stress axis at N110°E. Due to the development of the strain concentration zone, the azimuth of the maximum horizontal stress axis rotated from N110°E to N130°E in the strain concentration zone. The results are consistent with the observed stress state obtained by Kawanishi et al. (2009).

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