Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG57-29 会場:国際会議室 時間:5 月 28 日 15:30-15:45

2011 年東北沖地震後の奥羽脊梁山脈周辺における粘弾性緩和過程と歪異常のモデル化
Modeling viscoelastic deformation and strain anomaly around the Ou Backbone Range after the 2011 Tohoku-oki earthquake

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This study investigates the viscoelastic deformation processes of the northeastern Japan island arc after the Tohoku-oki earthquake by considering the heterogeneous rheological structure. Recently, Shibazaki et al. (2014) calculated the effective viscosity of the Japanese island arc crust and upper mantle, considering the thermal structure obtained by dense geothermal observations using Hi-net boreholes (Matsumoto, 2007) and by Tanaka et al. (2004). They reproduced several elongated low-viscosity regions in the crust and upper mantle of the northeastern Japan arc, striking transverse to the arc, which correspond to hot fingers. Recently, Miura et al. (2014) found a postseismic strain anomaly along the Ou Backbone Range after the 2011 Tohoku-oki earthquake. This postseismic anomaly could have been affected by the existence of low-viscosity anomalies caused by the hot fingers.

We develop a finite element model of the viscoelastic deformation processes after the Tohoku-oki earthquake, considering the realistic crustal and mantle structures, and coseismic fault slip distribution (Iinuma et al., 2012). Our numerical results show that significant extensional viscous deformation occurs in the low-viscosity regions in the crust and upper mantle. This deformation causes significant subsidence in the back-arc region and Ou Backbone Range, but uplift near the Pacific coast. We also try to reproduce the decreases in areal strain along the Ou Backbone Range observed by Miura et al. (2014). In the case where low viscosity zones are extended to the shallower part of the crust, we can reproduce the areal strain decrease which is caused by contraction along the N-S direction. In our model, we cannot reproduce the expansion of areal strain decrease over time along the arc observed by Miura et al. (2014). To model this phenomenon, we would probably need to consider afterslip after the Tohoku-oki earthquake.

キーワード: 東北沖地震, 東北日本弧, 粘弾性緩和過程, 奥羽脊梁山脈, 歪異常
Keywords: the Tohoku-oki earthquake, the northeastern Japan arc, viscoelastic deformation, the Ou Backbone Range, strain anomaly