

## A Viscoelastic Crustal Deformation Model in Tohoku Region.-Laterally heterogeneous viscoelastic structure in the mantle wedge-

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Based on the postseismic deformation data following the 1896 Riku-u earthquake, several researchers have so far estimated viscosity values in the mantle wedge portion in the Tohoku region, northeast Japan (Thatcher et al., 1980, Suito and Hirahara, 1999, Hyodo and Hori, 2005). Though the characteristic time constant of transient deformation following earthquakes has trade-off between the viscosity of asthenosphere and the thickness of overlying elastic lithosphere, the spatial extent of the observed subsidence associated with the Riku-u earthquake can be used to constrain the elastic thickness of lithosphere. As a result, a thin(-30km) elastic crust underlying mantle with the viscosity of  $10^{19}$ [Pa s] well explains the postseismic deformation after the 1896 event. Many tomographic studies show the existence of laterally heterogeneous elastic structure beneath the fore-arc region. Moreover, the lower bound of coseismic rupture zone of M8 class interplate earthquakes extends down to the wedge mantle (corresponds to about 50 km-depth along the plate interface) such as 1968 Tokachi-oki and 1978 Miyagi-oki earthquakes. These imply these earthquakes might occur at the boundary between materials with different rheological properties. Recently, Ito and Hashimoto, (2004) and Fukahata et al. (2004) established the inversion algorithms of the spatio-temporal distribution of slips on the plate interface based on the long-term crustal deformation data, and applied to the recent earthquake cycle at the Nankai subduction zone. However, these studies assume slip response functions evaluated in elastic-viscoelastic stratified half space. In order to apply these procedures to the Tohoku region, it is necessary to adopt a more realistic laterally heterogeneous structure with the subducting plate and wedge mantle configurations as mentioned above.

For this purpose, I construct 3-D laterally heterogeneous visco-elastic finite element model with the subducting Pacific plate and trench-perpendicular heterogeneity near the mantle wedge inferred from the elastic structure of Takahashi et al. (2004). Using this model, I examine the behavior of response to slip on plate interface for different viscoelastic wedge mantle structures.