Numerical modelling of the crustal deformation due to postglacial rebound and postseismic deformation in southern Alaska

Jun'ichi Okuno[1]

[1] ERI, Univ. Tokyo

Postglacial rebound is the response of the Earth to the decay of ice sheets. The recent studies have measured the rapid present-day glacio-isostatic uplift derived from GPS geodetic observations combined with studies of raised shorelines (e.g. Larsen et al., 2005). In these studies, a postglacial rebound model explains the rapid crustal deformation in southern Alaska that occurred during retreat of the Cordilleran ice sheet, and GPS studies of glacial rebound have importance for infering crustal and mantle properties. Furthermore, because glacial rebound affects sea-level measurements, the observation and modelling of glacial rebound can lead to the evaluation of global sea-level change associated with the global warming and the related phenomena.

On the other hand, during the AD 1964 Mw=9.2 earthquake, coastal sediments around upper Cook Inlet in south-central Alaska experienced up to 2 m of subsidence suggested by Shennan and Hamilton (2006) using the analysis of the sediment cores and micro fossils. The crustal deformations revealed by these data in this region include the two components of postglacial rebound and co-, post-seismic deformation. These deformations are interpreted as the viscoelastic Earth deformation. In this study, we use the numerical modelling of the viscoelastic Earth deformation, and reconstruct land uplift and subsidence by the postglacial rebound due to the deglaciation from the Last Glacial Maximum and Little Ice Age (about 200 ˜100 yrBP) and the 1964 and five earlier great earthquakes during the past 3300 years. And we estimate the contributions of isostatic and tectonic components to Holocene and recent crustal deformations and infer the appropriate viscosity structure of the crust and mantle in this region.