Postseismic Crustal Deformation Following the 1995 Hyogo-ken Nanbu Earthquake,Central Japan

Yuka Asahi[1]; Takeshi Sagiya[2]

[1] Earthsciences,Nagoya Univ.; [2] Environmental Studies, Nagoya Univ.

We have been studying rheological structure of the Japanese inland from postseismic deformation of large earthquakes for the purpose of understanding inland deformation and tectonic loading of inland earthquakes. Based on an analysis of postseismic deformation of the 1891 Nobi earthquake, we have obtained a rheological model with the lithospheric thickness of 37km and the asthenospheric viscosity of 1 x 10^{19} Pa s (Asahi and Sagiya, JPGU, 2008). Since the relaxation time of the asthenosphere is expected to be 5-10 years, it is highly probable that we can detect postseismic signal due to viscoelastic relaxation for the 1995 Hyogo-ken Nanbu earthquake from accumulated observation data. We take a look at daily coordinate data of GEONET by subtracting steady deformation effects, which are estimated from coordinate changes from 2006 to 2008, if the residual time series contain postseismic signals. We detect exponential decay with a tgs near the source region of the main shock. This is the first observational evidence of postseismic deformation of the 1995 Hyogo-ken Nanbu earthquake in the time scale of several years. We calculate viscoelastic response to the earthquake with the VISCO1D software (Pollitz, 1997) with a fault model by Hashimoto et al. (1996), and find that the asthenospheric viscosity of 1 x 10^{18} Pa-s is appropriate. Thus the estimated asthenospheric viscosity is smaller than that of the Nobi area by an order of magnitude. We also find that observed postseismic displacements are in opposite sense to the calculated one to the northwest of the source region. Based on these observations, it is considered that the postseismic deformation of the Hyogo-ken Nanbu earthquake is affected by multiple causes such as afterslip, poroelastic rebound, in addition to viscoelastic rebound. It will be worthwhile to consider power law creep in the asthenosphere since we observe the time dependence of the viscosity. Another important factor in this region is the effect of structural heterogeneity, which was inferred from seismic tomography (Nakajima and Hasegawa, 2007). We will discuss the relationship between the observed postseismic deformation and these candidate mechanisms.