Geophysical Research Abstracts
Vol. 18, EGU2016-7667, 2016
EGU General Assembly 2016

Is the effect of 3-D viscosity distributions on postseismic gravity variations detectable?

Yoshiyuki Tanaka
University of Tokyo, ERI, Japan (y-tanaka@eri.u-tokyo.ac.jp)

Satellite gravity measurements by GRACE and GOCE have successfully revealed postseismic mass transports caused by megathrust earthquakes. So far, several physical models to interpret the variations in the gravity field have been constructed. Some models consider the effects of self-gravitation and compressibility and others heterogeneous viscoelastic structures. Previous studies have already shown that the effects of compressibility are not negligible compared with the observation accuracy of gravity data. In this presentation, we estimate the effect of lateral heterogeneities in viscosity due to the presence of a subducting slab, using a spectral finite-element approach. This time-domain approach allows us to account for 3-D viscosity distributions without the necessity of artificial surface boundary conditions as used in an ordinary finite-element model. It is also possible to consider compressibility without technical difficulties which conventional normal mode methods encounter. As an example, we compare our model with recent gravity solutions in the case of the 2011 M-9 Tohoku earthquake. When the spatial resolution is increased up to d/o 80, the difference caused by considering the slab can reach 10 cm in equivalent water height at the center of the negative coseismic signal after the first 4 years from the main shock. This difference amounts to 20 per cent of the coseismic signal. The result indicates that satellite gravity data are potentially useful for investigating 3-D viscosity distributions in relatively shallow portions in the subduction zones, which will help predict the stress behaviors there in the context of earthquake cycles.