Sensitivity analysis with large-scale 3D finite element crust structure model for seafloor geodetic constraints on coseismic slip and interseismic slip-deficit distributions

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Estimating the coseismic slip distribution and interseismic slip-deficit distribution play an important role in understanding the mechanism of massive earthquakes and predicting the resulting damage. It is useful to observe the crustal deformation not only in the land area, but also directly above the seismogenic zone. Therefore, improvements in terms of measurement precision and increase in the number of observation points have been proposed in various forms of seafloor observation. However, there is a room for developing a quantitative evaluation method of the estimation accuracy in cases where new crustal deformation observation points are available or when the precision of the observation methods have been improved. In this study, we proposed a method for quantitatively evaluating the improvement in the estimation accuracy of the coseismic slip distribution and the interseismic slip-deficit distribution in cases where new crustal deformation observation points are available or where the precision of the observation methods have been improved. We will present application examples based on large-scale finite element analysis using high-fidelity 3D crust structure and show the usefulness of the proposed method.

Keywords: seafloor observation, inversion of fault slip, sensitivity analysis, crustal deformation, finite element analysis

