

Slip deficit distribution using earthquake catalogs

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We tried to make a spatial distribution of the slip deficit beneath subduction trench. Slip deficit is defined by ratio of deficit of seismic or aseismic slip to cumulative plate convergence. Yamanaka & Kikuchi, 2003 showed a spatio-temporal distribution map of seismic slip (nominally asperity map) in the Tohoku district using historical strong motion records. If we assume that asperities slip only by seismic slip, shortness of seismic slip on an asperity relative to plate convergence is defined as slip deficit. To make slip deficit map using their method, we need to define spatial distribution of asperities and amount of seismic slip for all historical earthquakes in addition to subduction velocity. However, strong motion seismogram is not always available for historical earthquakes in the world. Therefore, we tried to make the space-time slip distribution map using Earthquake Catalogs which only equips the hypocenter and magnitude informations instead of record of strong-motion seismogram. Before making the space-time distribution map beneath global subduction trenches, we made the space-time slip distribution map in the Tohoku district and assessed whether this method would be appropriate replacement of strict asperity map. In order to assess the validity of this method, we compared the spatio-temporal distribution map of co-seismic slip beneath the Tohoku district made in the previous studies with that made by our easy method. As a result, although there are some differences in the results between the previous study and our method, they are generally similar. Although there is a room for improving in our method, it can be applied to other subduction zones in the world.

Keywords: asperity, subduction, the 2011 Tohoku-Oki earthquake, earthquake catalog, slip history