

Estimation of seismic fault slip distribution from marine terrace data using an earthquake cycle model

Toshinori Sato[1]; Harutaka Higuchi[2]; Mitsuhiro Matsu'ura[3]; Chihiro Hashimoto[4]

[1] Chiba Univ.; [2] Earth Sci., Chiba Univ; [3] Dept. of Earth & Planetary Science, Univ. of Tokyo; [4] Univ. of Tokyo

1. Introduction

It is important to estimate seismic slip distribution of large earthquakes in order to understand seismic source processes and reduce earthquake disaster. The earthquakes whose seismic and geodetic data exist are well investigated. The earthquakes without seismic and geodetic data are investigated using active faults, old literatures, and marine terraces. The data from marine terraces seem to be useful for estimation of slip distribution of plate boundary events at subduction zones. But, slip distribution could not have been estimated by marine terrace data because the data include coseismic, interseismic and permanent displacements, and these displacements could not be divided. This presentation shows how to divide the coseismic, interseismic and permanent displacements using the earthquake cycle model which we proposed (Matsu'ura and Sato, 1989; Sato and Matsu'ura 1992), and describe the method to estimate slip distribution from marine terrace data.

2. Method

Our earthquake cycle model represents the interaction between plates as the increase of tangential displacement discontinuity across the interface. This model can estimate the permanent displacements by the steady state subduction, which were ignored in the previous studies. The model also reveals that the difference between the data whose phases in the earthquake cycle are the same (for example, data of all marine terraces are in the phase of just before event), but whose ages are different depends only on the permanent displacements. This means that we can estimate the permanent displacements if we have two or more marine terrace data whose ages are different. Since our cycle model can estimate stress relaxation in the asthenosphere, we can divide the coseismic, interseismic and permanent displacements into one another. From the coseismic and interseismic displacements, we can estimate slip distribution of the event.

This presentation shows the above method. The application of this method to real data is presented by Higuchi et al. 'Seismic fault slip distribution of the 1703 Genroku Earthquake from marine terrace data using an earthquake cycle model' (in poster presentation of this session in this meeting).