

Complementary relationship between co-seismic slip and aseismic slip in Hyuga-nada and Sanriku-oki, Japan, region

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1. Introduction

Using high-density continuous GPS data provided by GSI, we investigate unusual aseismic slip often called 'episodic slip'. Such an episodic slip must readjust the stress distribution in the seismogenic zone to control the occurrence of a future large earthquake. In this study, we develop a numerical method to derive spatio-temporal variation of fault slip from the continuous GPS data, and apply it to the observed data in Hyuga-nada and Sanriku-oki region.

2. Data

The time interval analyzed is from 1996 June to 1998 December for Hyuga-nada region, and from 1994 December to 1995 March for Sanriku-oki region. The GPS data of Hirosaki University is also used for Sanriku-oki region.

3. Method

We take a fault model region on the plate boundary considering the fault plane of previous earthquakes and seismicity, and divide it into many sub-faults. The slip-rate function at each sub-fault is modeled by a series of isosceles. Neglecting the source duration of ordinary earthquakes, the coseismic fault slip is described by Heaviside step function. To divide slip distribution into co-seismic and aseismic slip, we applied the prior constraints of co-seismic slip determined by seismic wave analysis to our method.

4. Results

In Hyuga-nada, the plate interface is completely coupled at the site of the asperity of 1968 Hyuga-nada earthquake that is the largest earthquake ever occurred in this region. The sites for co-seismic slip, episodic slip, and continuous slip in Hyuga-nada region do not overlap but share a plate boundary.

In Sanriku-oki, the large co-seismic slip and after-slip of 1994 Sanriku-haruka-oki earthquake do not overlap, but share a plate boundary region. These sites may have their own slip character, which may control individual modes of moment release as well as the entire event sequence.