A trial to simulate deep low-frequency earthquakes occurring on the subducting plate boundary

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1. Introduction

Recently, occurrences of deep low-frequency tremors/earthquakes have been recognized at depths of about 30 km in southwest Japan [Obara et al., 2002]. Similar deep low-frequency tremors have been detected also in Cascadia [Dragert et al., 2001] and southern Mexico [Kostoglodov et al., 2003]. The tremors occur sometimes independently and sometimes go into chain-reaction propagating at a speed of about 10 km/day, which may result from interaction among nearby small asperities. In this study, we formulate a 3-D subduction plate boundary model to simulate such a complex activity of the tremors.

2. Model

We assume that there are a large asperity which generates great earthquakes and some groups of small asperities. These asperities with diameters of 5-10 km are arranged parallel to the trench at a depth of 30 km on a plate boundary dipping at 15 degrees.

3. Preliminary results

Our simulations have successfully represented both independent occurrence and the chain-reaction type rupture propagation with various propagation directions (from eastward to westward, for example) along the trench. However, propagation speed of the chain reaction is about 1˜3 km/day, which is smaller than observations and may be derived from strong barrier effect because the present asperity size (˜10km) is larger than actual tremors.