Three-dimensional simulation for earthquake cycle at a subduction zone: Effect of seismogenic zone width

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At several subduction zones, large earthquakes repeatedly occur with its interval of about several 10-100 years. We conduct a numerical simulation to reproduce such seismic cycles at subduction zones, which include not only great or large earthquakes but also slow slips, and to understand what physical processes control these behaviors.

In the previous meeting (Hirose and Hirahara, 2001, Seismological Society of Japan Fall Meeting), following results were reported: (1) sliding behavior varies with the model dimension in strike direction; (2) in case with longer model length in strike direction, fast slip events occur not only near the center but also near the edge of the model region; (3) slip velocity and duration are different between the events occurred near the center and near the edge. In the present study, the effect of seismogenic width on the slip behavior is explored.

Our three-dimension numerical simulation method is an extension of Kato and Hirasawa's (1997) method. The following results are obtained. First, a generic behavior is that there are some foci more than one focus in the models with larger dimension in strike direction, as reported before. In other words, multi slipped regions, or, segments appear spontaneously. Second, comparing the results for the models which have different seismogenic zone widths, the number of segments (or foci) is larger in case with narrower width than in case with wider width. From another point of view, it suggests that the aspect ratio of the slipped region is tend to be about 2, which is independent of the event size. Nevertheless, it is expected that these results depend on friction parameters. Therefore we must examine the dependence of the friction parameters on the slip behavior.