# Numerical models for multi-segment great earthquakes in subduction zones: A review and a problem for giant earthquakes

# Takane Hori[1]

[1] IFREE, JAMSTEC

Muli-segment great earthquakes has been studies using spring-slider models for many years. In such models, one segment is usually modeled as a block. The interaction of two or more sliders are investigated with different kinds of frictional properties. Chaotic behavior appears when healing time is relatively short. On the other hand, nearly periodic behavior can be found if healing time is long enough. One severe problem in the spring-slider model is that spring constant can be arbitrarily chosen. Recently, multi-segment or asperity interaction has been investigated using continuum models on 2D fault plane in 3D medium. In such models, one segment or asperity is composed of many small sub faults. The segment boundary or non-asperity area is also explicitly modeled. Thus the interaction not only between segments but also surrounding area can be considered. In these models, interaction between sub faults can be determined using slip response functions in elastic or elastic-viscoelastic medium. Even two asperity models, earthquake size, recurrence time, and aseismic slip pattern can change significantly depending on distribution of frictional properties. Using this model, complicated behavior in natural great earthquakes can be reproduced to some extent. For example, recurrence pattern of the 1968 Tokachi-oki and 1994 Sanriku-oki earthquakes is roughly reproduced with two large and some smaller asperities (Kato, 2005). The afterslip distribution of the 1994 earthquake can be explained by that model. Rupture and recurrence patterns of great earthquakes along the Nankai trough are also reproduced with depth dependent frictional property and heterogeneities in segmentation boundary (Hori, 2006; Kodaira et al., 2006). Although the recurrence patterns are successfully reproduced in some earthquakes, occurrence of giant earthquakes such as the 2004 Sumatra-Andaman earthquake. One important character found in such giant earthquakes is that smaller magnitude earthquakes occur within the rupture area. Earthquake occurrence of significantly different size in the same area is not a simple problem can be modeled by multi-segment or asperity model as described above.