Numerical Modeling of the Kanto Earthquake and the Boso Slow Slip Events, Central Japan

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Beneath the southern Kanto region, central Japan, the Philippine Sea (PHS) plate is descending from the Sagami trough at the rate of 2-3 cm/year. Several large thrust earthquakes of M~8 have occurred with recurrence intervals of 200-500 years in the Kanto region, along the Sagami Trough. Many studies reported the slip distribution of the 1923 Taisho Kanto earthquake (M7.9) and the 1703 Genroku Kanto earthquake (M8.2) [e.g., Nyst et al., 2006; Matsu'ura et al., 2007; Shishikura, 2012; Sato et al., 2016]. Based on these studies, we can divide the source areas into four segments (Figure 1). The 1923 Taisho earthquake was ruptured at the western two segments (A+B). The 1703 Genroku earthquake was ruptured at the central two segments (B+C) (in addition, the eastern segment D based on Tsunami analysis). The eastern two segments (C+D) may not been ruptured since 1703.

Since there are no historically known earthquakes that occurred only on the eastern two segments (C+D), long-term evaluation of large earthquakes beneath the eastern two segments (C+D) has not been conducted [Headquarters for Earthquake Research Promotion, 2014]. However, the accumulation of slip deficit is reported on these segments [Sato et al., 2016], and slow slip events (SSEs) were recently observed with the recurrence intervals of 0.6~7 years [e.g., Ozawa et al., 2014; Kato et al., 2014] on segment D. Such modulation of the recurrence intervals of SSEs indicates the stress level nearby the SSE area may be approaching to cause large interplate earthquake there [Matsuzawa et al., 2010].

Hence, we conducted numerical simulation of earthquake cycles of the Kanto earthquakes and the Boso SSEs to prepare for revision of long-term evaluation targeting this area. We will also investigate relationship between recurrence intervals of the SSEs and the large earthquake. In this workshop, we introduce the result of modelling on the three-dimensional (3-D) plate interface with reference to our previous studies [Nakata et al., 2014; 2017]. In the future, we will proceed to the earthquake cycle simulation by the finite element method using a 3-D heterogeneous medium model. We will investigate the next possible scenario such as spatial distribution of source area, crustal deformation and tsunami caused by the earthquake.

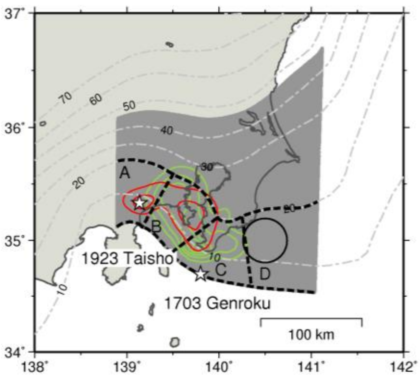

Figure 1. Image of seismic segments (A-D) along the Sagami Trough. The dark gray area indicates the area to be modelled in this study. Stars indicate the epicenters of the 1923 and 1703 earthquakes. The red and green contours at the interval of 4 m represent the coseismic slip distribution of the 1923 and 1703 earthquakes [Matsu'ura et al., 2007; Sato et al., 2016]. Open circle approximates the slip distribution of the slow slip events. Contours indicate depth (km) to the upper surface of the descending PHS plate [Headquarters for Earthquake Research Promotion, 2012].