

A fault model of the 1703 Genroku Kanto earthquake inferred from coastal movements, tsunami inundation area and heights

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On December 31, 1703, a large earthquake occurred southern Kanto district, Japan, and was accompanied with coastal movement and tsunami. The earthquake is considered as interplate type along the Sagami trough where the Philippine Sea plate subducts beneath the North American plate.

Previous fault models of the 1703 earthquake are divided into two types. One is the Kasahara's model (Kasahara, 1973, Publications for the 50th anniversary of the great Kanto earthquake, 1923), which represents that the source area extends from Sagami bay to south of Boso peninsula. The other is the Matsuda's model (Matsuda et al., 1978), which represents that the source area extends further off south east of Boso peninsula (fault C). We studied whether fault C is needed for coastal movements, tsunami inundation area, and coastal tsunami heights.

We first combined depths of upper surface of the Philippine Sea plate reported by Sato et al. (2005, Science), Takeda et al. (2007, Chikyū Monthly), and Tsumura et al., (2009, Tectonophysics), and 34 sub faults (15 km long and wide) were set on the combined surface. Slip amounts of the sub faults without fault C were inverted from coastal movements estimated from geological and geomorphological surveys (Shishikura, 2003, BERI). As a result, the slip amount of 10 m was estimated in south of Boso peninsula, and that of 5 m was estimated from Oiso to Miura peninsula.

Tsunami inundation area along Kujukuri beach was calculated from the estimated fault model both with fault C (slip amount of 10 m was given) and without fault C. In the former case, the calculated inundation area is similar to that from historical evidences, while in the latter case, the calculated one is quite narrower (Namegaya et al., 2011, An. Rep. Active Fault and Paleoearthq. Res.).

Coastal tsunami heights from Boso peninsula to Izu peninsula were also calculated from both fault models with and without fault C. In the former case, the calculated tsunami heights in the south east of Boso peninsula are similar to those from historical evidences, while in the latter case, the calculated ones are the half of the former case. These results indicate that fault C is necessary for the fault model of the 1703 earthquake.

Keywords: the 1703 Genroku Kanto earthquake, tsunami, coastal movement, Kujukuri beach, fault model