

## Fault model of the 1611 Keicho Tsunami earthquake (Mw9.0) estimated from historical documents using tsunami inundation simulation

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The 1611 Keicho Tsunami earthquake generated huge tsunamis and caused a disaster along the Pacific coast of Tohoku area from Fukushima to Miyako. There are several historical documents, but some of them were controversial. Recently, Ebina and Imai (2014) checked historical documents in detail and made the most reliable data set of the tsunami inundation of the 1611 Keicho Tsunami. We compared the data set with the tsunami inundation of the 2011 Tohoku tsunami and found that the tsunami from the 1611 tsunami earthquake inundated larger distance than the 2011 Tohoku tsunami at many places. The numerical tsunami inundation computations with various fault models were carried out along the Pacific coast of Tohoku. The computed inundation were compared with reliable tsunami evidences of historical documents in Ebina and Imai (2014 in Japanese), such as tsunami evidence about 30 m height at Koyadori in Iwate or tsunami evidence at Suwa in the Sendai plain about 7 km away from the coast. Results indicate that the tsunami generated from the combination of two rectangular fault models, north fault with the length of 100 km, the width of 100 km, and the slip amount of 80 m and south fault with the length of 150km, the width of 100 km, and the slip amount of 40 m, explains all reliable evidences very well. The moment magnitude of the 1611 tsunami earthquake is calculated to be 9.0 by assuming that the rigidity is  $3 \times 10^{11}$  N/m<sup>2</sup>. The moment magnitude of the 1611 Keicho tsunami earthquake is the same as that of the 2011 Tohoku-oki earthquake.

The northern part of the fault with a slip amount of 80 m was not ruptured by the 2011 Tohoku-oki earthquake but located at north of the rupture area. The southern part of the fault, where 40 m slip was estimated, is located at the almost same area of the large slip area of the 2011 Tohoku-oki earthquake. This suggested that the 2011 Tohoku-oki earthquake re-ruptured the southern part of fault area ruptured by the 1611 Keicho tsunami earthquake. This southern part was also ruptured by the 869 Jogan earthquake previously. Because the plate convergence rate of Pacific plate along the Japan Trench is about 9 cm/year, a large slip of 40 m by the 1611 Keicho tsunami earthquake is slightly smaller than 65 m accumulated after 869 Jogan earthquake. But a large slip of about 45 m estimated for the 2011 Tohoku-oki earthquake is slightly larger than 36 m accumulated after the 1611 Keicho tsunami earthquake. Because the above differences are not so large, it can be caused by the different slip distributions of three earthquakes.

Keywords: 1611 Keicho Tsunami Earthquake, Tsunami inundation simulation, 2011 Tohoku-oki Earthquake