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Effects of the 17th century great Hokkaido tsunami on Tohoku regions

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Historically, great underthrust earthquakes occurred off east Hokkaido, Japan because the Pacific plate subducts beneath the Okhotsk plate. Also, tsunami deposits by prehistoric tsunami have been found off east Hokkaido on the coast of Pacific Ocean.

Previous study suggest that the 1611 Keicho tsunami earthquake is the 17th century great earthquake (Okamura and Namegaya, 2011). In this study, we examined effects of the 17th century great tsunami generated off east Hokkaido on the coast of Pacific Ocean in Tohoku region.

We estimated fault model of the 17th century great earthquake by using locations and elevations where tsunami deposits were found (Ioki and Tanioka, 2013). The result shows that tsunami inundation spread far inland were explained by a large rupture area at deep part of the plate interface. Surveyed tsunami heights near the coast were explained by very large slip amount at shallow part of the plate interface near the trench. The total seismic moment of the 17th century great earthquake was calculated to be 1.7×10^{22}Nm (M_w 8.8).

Tsunami heights and inundation were also calculated along the coast of Pacific Ocean in Tohoku region. Computed tsunami heights along the coast were almost less than 4 m and computed tsunami inundation area is very small at Yamada bay. Even if slip amount of estimated fault model is two or three times larger, computed tsunami inundation area in Tohoku region is small. Tsunami inundation area by the 1611 Keicho tsunami were not explained by our estimated fault model. By an effect of directivity, high tsunami was propagated toward east Hokkaido and low tsunami was propagated toward Tohoku.

Keywords: tsunami, great earthquake, Hokkaido, Kurile trench