

## Fault model of the 17th century great earthquake off Hokkaido estimated from tsunami deposit data

Kei Ioki<sup>1\*</sup>, Yuichiro Tanioka<sup>1</sup>

<sup>1</sup>Institute of Seismology and Volcanology, Hokkaido University

Historically great underthrust earthquakes occurred off east Hokkaido. On the other hand, tsunami deposits by prehistoric tsunami have been found on the coast of east Hokkaido, Japan. These tsunami deposits were found at far inland away from tsunami inundation area by historic great earthquakes. The elevations of the location where tsunami deposits were found are also much higher than estimated heights of historic tsunamis. The recurrence interval of events is about 400 ~ 600 years. The latest event occurred early 17th century because that the latest tsunami deposits can be seen just under the volcanic ash caused by the 1667 Tarumae eruption. Large tsunami of the 17th century was generated by the earthquake that ruptured the area of Tokachi-Oki and Nemuro-Oki regions.

We estimated fault model of the 17th century earthquake by using both lowland tsunami deposit data and elevations of the location where tsunami deposits were found near the coast at highland. A finite-difference scheme was used to solve the non-linear long-wave equations with a moving boundary condition. The computed tsunami inundation and heights were compared to tsunami deposit data at 11 locations on the coast of east Hokkaido. Satake et al. (2008) estimated the fault model of the 17th century earthquake. This fault model was estimated to compare lowland tsunami deposit data and computed tsunami inundation area. This fault model of large rupture area of the plate interface was needed to explain the large tsunami inundation. Additionally, the fault model of very large slip amount at shallow part of the plate interface near the trench is needed to explain the high tsunami height near the coast. Therefore, fault model was added at the plate interface near the trench.

The result shows that lowland tsunami deposit data were explained by a tsunami inundation caused by a large rupture area at deep part of the plate interface. Elevations of the location where tsunami deposits were found 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 earthquake was calculated to be  $1.7 \times 10^{22}$  Nm (Mw 8.8) by assuming that the rigidity is  $4 \times 10^{10}$  N/m<sup>2</sup>. The 2011 Tohoku earthquake also ruptured the large area off Tohoku and very large slip amount was found at shallow part of the plate interface near the trench. It is possible that the 17th century great earthquake was the same type of the 2011 Tohoku earthquake.

Keywords: great earthquake, tsunami, Hokkaido