

## Fault model of the 12th century Hokkaido Nansei-oki earthquake estimated from tsunami deposits distribution

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Tsunami deposits were surveyed along the coast of southwestern Hokkaido and Okushiri Island. The distribution of those deposits suggested that large earthquakes and tsunamis repeatedly occurred off southwestern Hokkaido, Japan. Those deposits were distributed farther inland and higher elevations than the tsunami inundation area of the 1993 Hokkaido Nansei-oki earthquake. At the southern coast of Okushiri Island, 5 tsunami sand layers were remained during last 3000 years. The latest one was deposited by the 1741 Oshima-Oshima tsunami. The second one was deposited by the 12th century tsunami. The ages of tsunami deposits were estimated using tephra chronology and accelerator mass spectrometry <sup>14</sup>C age. Although the 1741 tsunami was generated by sector collapse of Oshima-Oshima, the 12th century tsunami was generated by a large earthquake. The reason is that tsunamis were generated repeatedly from tsunami deposits survey, that submarine active faults exist in the Japan Sea, and that landslide was occurred inland of the Okushiri Island around the same term. In this study, a fault model of the 12th century earthquake was estimated by comparing distribution of tsunami deposits and calculated tsunami inundation at 5 areas. Fault model (F17), a submarine active fault in the Japan Sea close to Oshima-Oshima (Hokkaido Disaster Management Council, 2017), was a probable source for the 12th century tsunami. However, we modified fault parameters from the F17 fault model to explain the distribution of tsunami deposits. To tsunami inundation calculation, non-linear long wave equations were solved using a finite difference scheme. We determined the length of 104 km and slip amount of 18 m for the fault model to explain the distribution of the tsunami deposits at 5 areas. The seismic moment of this earthquake was calculated to be  $9.95 \times 10^{20}$  Nm ( $M_w$  7.9) assuming the rigidity of  $3.43 \times 10^{20}$  N/m<sup>2</sup>. This modified fault model is located between the focal regions of the 1993 Hokkaido-Nansei-oki earthquake and the 1983 Japan Sea earthquake.

Keywords: tsunami, earthquake, tsunami deposit