Probabilistic Tsunami Risk Assessment based on submarine active faults in the Sea of Japan for a thermal power plant

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Supplementary material

This supplementary material consists of supplementary notes, figures and tables.

Supplementary note:

The fault area was for submarine active faults published by MLIT was obtained from the published fault length and fault width. The magnitude was calculated following the scaling law using the fault area [1].

$$M_o = \left(\frac{S}{4.24} \times 10^5\right)^2 \times 10^{-7} \; (6.5 \leq M_w < 7.7) \quad (1)$$

$$M_o = 1.575 \times S \times 10^{11} \; (7.7 \leq M_w) \quad (2)$$

$$log M_o = 1.5 M_w + 9.1 \quad (3)$$

where, M_o is the seismic moment, S is the fault area, M_w is the moment magnitude. The average slip amount was calculated using the following equation.

$$M_o = \mu D S \quad (4)$$

where, M_o is the seismic moment, μ is the modulus of rigidity, D is the average slip amount, S is the fault area. The modulus of rigidity was set to a uniform value of $3.5 \times 10^{10}\ Nm^{-2}$[2].

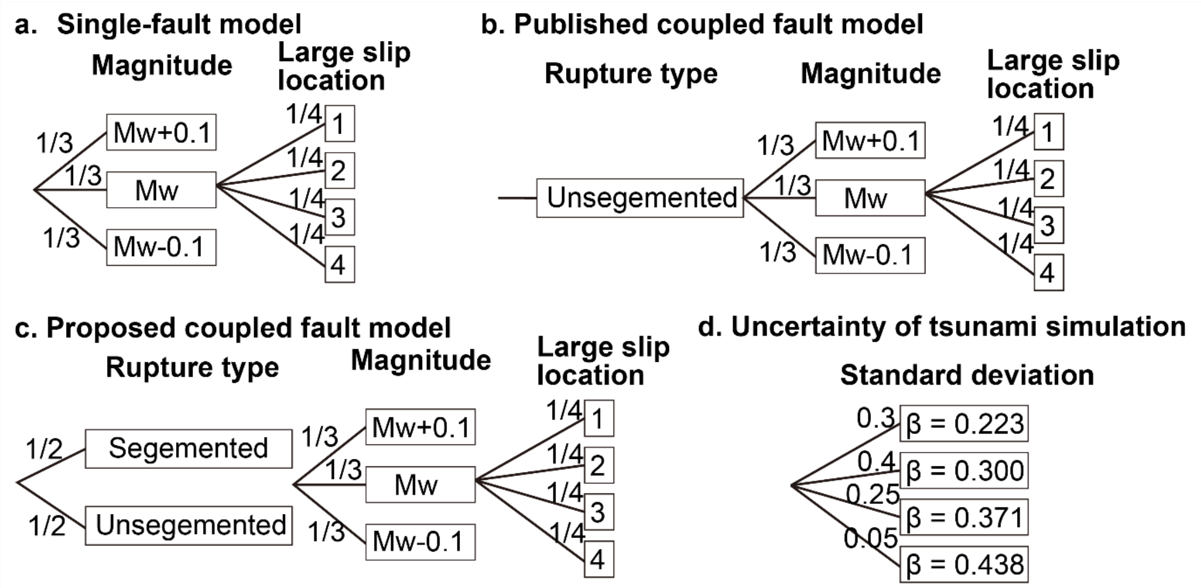
The slip amount of the submarine active fault models published by HERP is expressed as follows [3].

$$D = 10^{-1} L \quad (5)$$

where, D is the average slip amount, and L is the fault length. The magnitude was calculated using Eqs. (3) and (4) using fault slip amount.

It should be noted that the slip amount was limited to 10 m when the length of the fault exceeded 100 km [4].

Supplementary figures



Supplementary Fig. 1 Logic tree considered in the probabilistic tsunami hazard assessment. (a-c) Source model logic tree for (a) single-fault model, (b) published coupled fault model, and (c) proposed coupled fault model. (d) Logic tree for considering the uncertainty of tsunami simulation. The numbers next to the branches indicate their weight.

Supplementary tables

Supplementary Table 1. Earthquake recurrence periods for the Northern Japan Sea [2]

Sea Area	Recurrence Periods (year)
Off the western coast of Aomori	500-1400
Off the coast of Akita	1000-1500
Off the coast of Yamagata	1000-1500
Off the coast of Niigata	1000-1500

References

1. Irikura, K. & Miyake, H. Prediction of Strong Ground Motions Scenario Earthquakes. *Journal of Geography* **110**, (2001).
2. Japan Society of Civil Engineering. *Tsunami Assessment Method for Nuclear Power Plants in Japan 2016*. (2016).
3. Matsuda, T., Yamazaki, H., Nakata, T. & Imaizumi, T. The surface fault associated with the Rikuu Earthquake of 1896. *Bull.Earthq.Res.Inst* **55**, 795–855 (1980).
4. Murotani, S., Matsushima, S., Azuma, T., Irikura, K. & Kitagawa, S. Scaling Relations of Source Parameters of Earthquakes Occurring on Inland Crustal Mega-Fault Systems. *Pure Appl. Geophys.* **172**, 1371–1381 (2015).