Sensitivity analysis based on numerical results of various logic tree Fault parameters in the East-Sea tsunami simulation

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1. Introduction

If nuclear power plants are damaged, it will cause huge amounts of damage to local country, as well as neighboring countries such as Fukushima case in 2011. Therefore nuclear power plants must prepare to extream limit tsunami damage. Research to analyze, 1993 Okusiri Tsunami 1983 Akita Tsunami made in the existing national was done[1,2,3,4]. The research area of this study is around Uljin nuclear power plant. 80 cases of tsunami near East sea of Korea was simulated and value each cases for estimating sensitivity of the fault parameter

2. Methods and Results

2.1 model(COMCOT)

COMCOT can be applied the spherical coordinate system and the Cartesian coordinate system. Also it can be selected linear and non-linear by the governing equation. Lattice be used nesting grid using the square lattice system and derive the more accurate results in the coast.

We have developed a program that uses the Nesting grid system, was performed domain total of five, and has been simulated, information each of which are shown in table 1..

Table I: domain information

Domain	Grid	Shallow water eq.	Grid size
Mother	484*381	linear	3000m
nest1	321*333	linear	1110m
nest2	414*387	linear	370m
nest3	363*387	linear	123.333m
nest4	303*288	non-linear	41.111m

It has been simulated by setting the grid size of 40m the Uljin nuclear power plant to be studied. Also, in order to calculate maximum height, we analyze mean value of three points that near of breakwater.(fig.1)

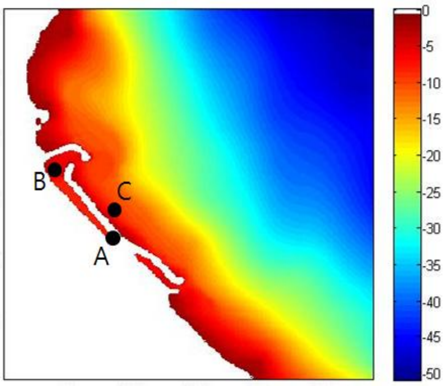

Fig. 1. Analyze mean maximum height of point .

2.2 Initial condition

It will be different, depending on the ability to accurately reproduce how much the initial condition in Tsunami model, research results to be different. Typically, Initial condition is to use an expression Okada's rule, Manshina Smyile rule for the calculation with the fault parameter.

The COMCOT, module that making initial condition is existed. But, in order to obtain more accurate results, FFI which is using Okada's rule program for making initial condition was developed.

2.3 logic tree

Seismic source of fault that was used for the Tsunami simulated, using the information provided by the Atomic Energy Society of Japan, but the present moment one of the largest that can be generated based on the magnitude of the fault that caused the existing (MW) have. Scale of the moment, which is presented to each earthquake members E0 (M 7.8), E1-1 (M 7.5), E1-2 (M 7.8), E1-3 (M 7.7), E2-1 (M 7.5), E2-2 (M 7.7), E2-3 (M7.5), at E3 (M 7.8), 7.5 scale – is in the range of 7.8, in this study, in the range of ±0.2, the total of 80 for the scale has been presented I chose the case of type.

Direction fault width direction toward If the location Tsunami occurs may change (strike), thereby changing, in the case of fault zones such, the position of the strike are the same. For example, the value of the strike of E2-

1, E2-2, E2-3, E3 is the same as the same value of the strike of the E1-1, E1-2, E1-3.

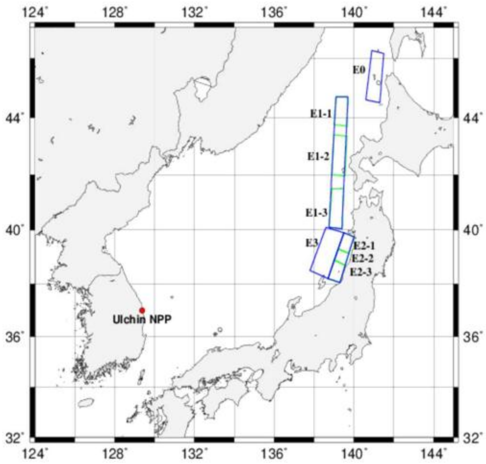

Fig. 2. Generation area of tsunami.

2.4 sensitivity

Figure3, something that drew divided into 1 ~ 5, 6~10case, depending on the size of the Tsunami that occur at each time point, because regardless of the place of occurrence of Tsunami, scale becomes larger, that the maximum wave height is increased It can be confirmed. Scale in the same case as the big generation position, maximum digging that occurs in primary peripheral is also increased.

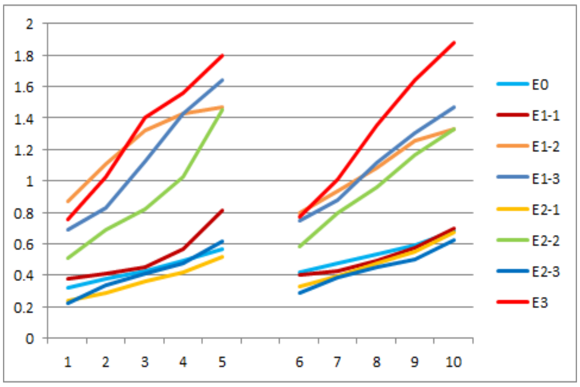

Fig. 3. Maximum height of occurrence point. (Unit: m)

Figure4 is a graph comparing the maximum digging Tsunami at the E0, E3 associated with the case. Despite using the same parameters, scale small compared to the maximum digging of the Tsunami that occurred at the time of E0 the maximum wave height of the Tsunami that occurred at the time of E3 is (7.6), from 0.4m large-scale (8.0) is, is larger 1m. It is expected that the probability of being displayed larger maximum wave height in primary around the earthquakes in the region of E3 is the highest.

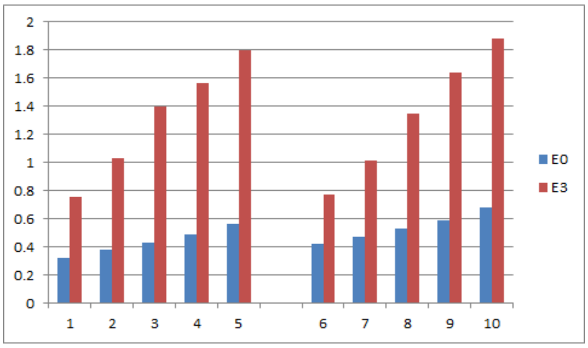

Fig. 4. Compare Point E0 and E3 maximum height . (Unit:m)

It is not the same location, but if you want to use the same parameters as the magnitude of (7.6, 7.7), the probability that the maximum wave height of the Tsunami generated by the E1-2, E1-3, E3 occurs very compared to other regions with high. Fiure5 and 6 is what uses the 7.6, 7.7 the scale of the logical tree, which is simulated in all points, and analyzed the maximum value, but when analyzed using this, E1-1, E1-2, when the Tsunami occurred at the time of E3, around the nuclear power plant it is analyzed the probability of maximum wave height is largely generated is high.

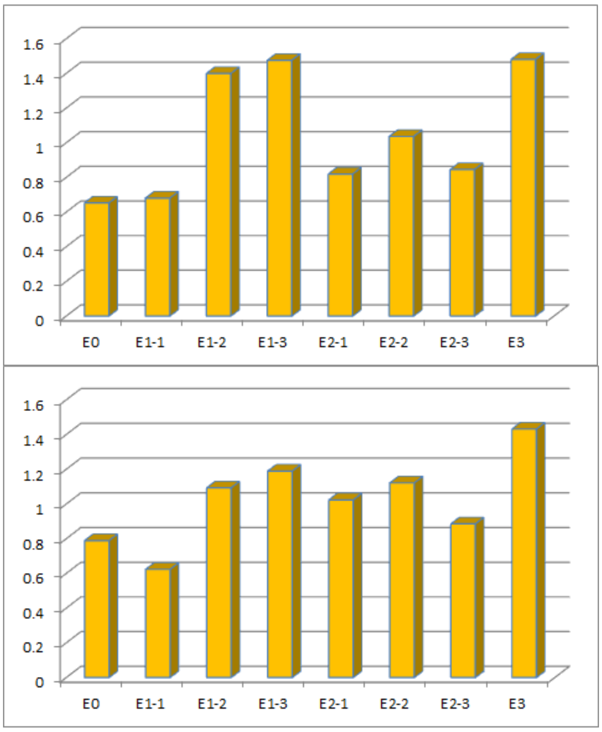

Fig. 5. Magnitude 7.6, according to point maximum height. Upside at dip30, downside at dip 60. (Unit: m)

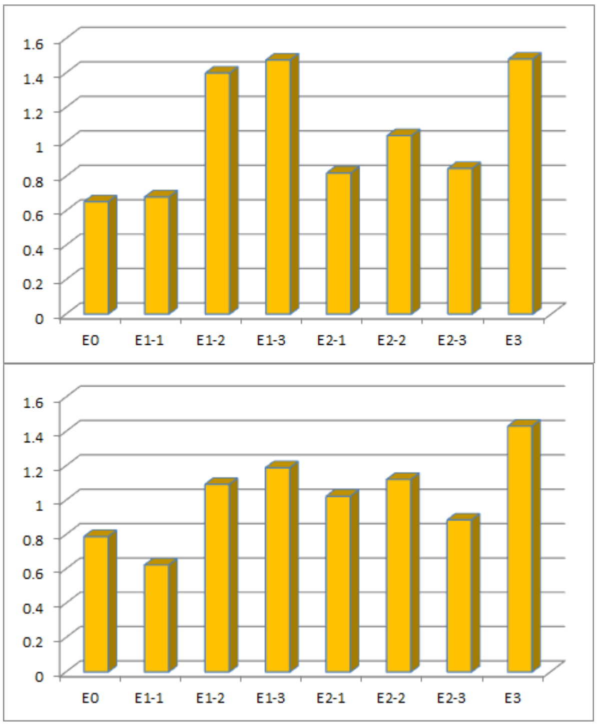

Fig. 6. Magnitude 7.7, according to point maximum height. Upside at dip30, downside at dip 60. (Unit: m)

3. Conclusions

Simulated based on the logic tree the Tsunami that might be using the COMCOT(Cornell Multigrid Coupled Tsunami Model), occurring in the fault zone west of Japan. By simulating the total 80case, to analyze the sensitivity depending on the fault parameter in the breakwater near the front of the Uljin nuclear power plant.

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