Analysis of the November 2016 Fukushima tsunami using the slip distribution of the seismic source process analysis

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An earthquake of Mw 6.9 occurred off Fukushima Prefecture on November 22, 2016. Tsunami was observed in a wide area from Hokkaido to Wakayama, especially tsunami amplitude of 1.4m was measured at Sendai port tide gage station (JMA, 2016).
In this study, the results of the seismic source process analysis are used for the evaluation of the tsunami. First, the slip distribution on the small fault is obtained by the source process analysis. After that, the crustal deformation of the seabed surface due to each fault is calculated. The crustal deformation is given as sea level, and the tsunami is calculated. Here, it is assumed that the sea level is instantaneously given at the occurrence time of the earthquake. The mesh size of the ocean bottom topography data is set to 50 m at the minimum. The seismic moments due to the small faults are added together, and Mw is 7.2 (when the rigidity μ= 30GPa) and Mw 7.0 (μ = 15 GPa).
The coastal tsunami waveform obtained by calculation well demonstrated the shape and amplitude of the short period waves of the observed tsunami. To adjust the phases of the first wave and the reflected wave obtained by the calculation to that of the observation, the initial water level was translated in the southwest direction. As a result, the wave source of the tsunami became closer to the aftershock distribution, and it gave a result that very well matches the coastal tsunami observation record.
Furthermore, we investigated what would happen if a fault that fits the optimum initial water level is given by a single uniform fault. As a result of preliminary, it was found that it was necessary to set a fault which was considerably out of the scaling law of Mw 6.9, the fault length was 20 km, the width was 15 km, and the slip amount was 6.3 m. Here, the rigidity ratio was assumed to be 15 GPa. Such a large amount of slip appears locally in the slip distribution of the seismic source process analysis and it is considered to be within a reasonable range.
In case of an earthquake deviating from the scaling law of the fault size and slip amount due to magnitude like this time, the information of the wave source of the tsunami by the source process analysis is effective. In addition, when analyzing immediately, in order to deal with the uncertainty of the horizontal position, it is conceivable that a plurality of calculations allowing some error in the grid search are performed and the result is taken out.
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