

## Real-time tsunami inundation forecast system: Application of machine learning for matching algorithm

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Recently NIED developed a new methodology of real-time tsunami inundation forecast system (Aoi et al., 2015, JpGU) using S-net (Seafloor Observation Network for Earthquakes and Tsunamis along the Japan Trench). They constructed the Tsunami Scenario Bank (TSB) that contains offshore tsunami pre-calculated waveforms, coastal tsunami heights, flow depth maps, and others. If a tsunami occurs, the system will search tsunami scenarios from the TSB by matching the observed offshore tsunami waveforms and estimate a tsunami inundation. The matching algorithm using in the system is the multi-index method which was developed by Yamamoto et al. (2016, EPS). In this algorithm, the estimated results have variation because the algorithm picks up more than one tsunami scenario.

In this study, we propose two new predicting methods for tsunami inundation using a machine learning. One is a multiple regression analysis for a maximum inundation at a evaluation point, and the other is a classification analysis of inundated or not inundated at a evaluation point using Support Vector Machine (SVM). The methods learn the relation between the offshore tsunami heights and tsunami inundations from the tsunami scenarios in the TBS.

We tried to combine the multi-index method and the present two method. First, the system picked up several tsunami scenarios using the multi-index method. Next, the tsunami scenarios were screened by comparing the tsunami inundation distribution with the predicted results of a multiple regression analysis and classification analysis. This two-step forecast method provided tsunami scenarios with smaller variance and prediction error than a previous procedure.

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