Maximum tsunami height prediction by directly using the correlation between ocean-floor pressure gauges and coastal tsunami heights.

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To mitigate tsunami damage, early warning systems are operated around the world using the ocean-floor pressure gauges such as S-Net and DONET. These gauges are connected with the land stations by cables, which enables us to constantly obtain the change of the ocean-bottom pressure due to the tsunami. There are two approaches for predicting the tsunami height from the change of the ocean-bottom pressure. One approach is to estimate an earthquake scenario from observed ocean-bottom pressure values using various earthquake and tsunami database, and then forecast the tsunami height based on the estimated scenario. Thus, this approach consists of two steps, such as Multi-index method [Yamamoto et al., 2016]. On the other hand, in our approach, we studied the relationship between offshore and coastal tsunami heights from tsunami database, and directly predict the tsunami height from observed ocean-bottom pressure values, as recently proposed [Baba et al., 2014; Igarashi et al., 2016; Yoshikawa et al., In preparation]. When constructing the prediction system, it is necessary to select which of these prediction frameworks should be adopted.
In this study, we compared the tsunami prediction accuracy of the two frameworks, using the DONET ocean-bottom pressure values. We found that the prediction error RMSE of the latter approach, using Gaussian process regression [Igarashi et al., 2016], was 28.6% lower than that of the former one. In order to compare the performance of real-time prediction, we then investigated how many minutes each approach needs to predict the tsunami height with high accuracy after the earthquake occurs. We also found that our method only needs half
time with the same precision as the Multi-index method. Thus, our approach, which directly predicts the tsunami height from the ocean-bottom pressure gauges, has lower prediction error and higher immediacy than Multi-index method.

Keywords: Tsunami height prediction, Ocean-floor pressure gauges, Gaussian process regression

