ガウス過程回帰による海底水圧データからの最大津波高予測
Maximum tsunami height prediction using Ocean-Bottom Pressure Values based on Gaussian Process Regression

*高橋 光太郎[1]、柏原 健之朗[1]、五十嵐 康彦[1,2]、馬場 俊孝[3]、堀 高峰[4]、岡田 真人[1]

*Kotaro Takahashi[1], Kenjiro Kashiwabara[1], Yasuhiko Igarashi[1,2], Toshitaka Baba[3], Takane Hori[4], Masato Okada[1]

1. 東京大学大学院新領域創成科学研究科、2. 科学技術振興機構 さきがけ、3. 徳島大学大学院社会産業理工学研究部、4. 海洋研究開発機構地震津波海域観測研究開発センター
1. Graduate School of Frontier Sciences, The University of Tokyo, 2. Japan Science and Technology Agency PRESTO, 3. Institute of Technology and Science, The University of Tokushima, 4. Research and Development Center for Earthquake and Tsunami, Japan Agency for Marine-Earth Science and Technology

Tsunami early warning systems using water pressure gauges operate around the world to cope with human damage caused by tsunami waves. The systems use a correlation between observed pressure gauges value around coast and tsunami height at prediction points near shore, based on prior insights such that tsunami height highly depends on the topography (bathymetry) during its propagation.

In predicting the tsunami height, it is important both to avoid underestimation for minimizing the damage and to increase accuracy for minimizing the evacuation cost. Takahashi et al. [2018] proposed a method making use of a database of the tsunami height and the observed pressure-gauge-values. While it is good at avoiding underestimation, it puts the prediction accuracy second; its prediction is likely to be highly overestimated. To improve the accuracy, Igarashi et al. [2016] proposed a method based on Gaussian Process regression, but it does not avoid underestimation. In this work, we extend the method by Igarashi et al. [2016], and proposed a prediction method with less underestimation and higher accuracy. We used pressure gauges data from the Dense Ocean-floor Network System for Earthquakes and Tsunamis (DONET) in the Nankai trough to investigate the prediction accuracy and the possibility of underestimation by our proposed method. Compared to the method by Takahashi et al. [2018], our method dropped the average prediction error from 4.44m to 1.61m, at the cost of an increase in the average underestimation rate of only 3.5%. Likewise, compared to the method by Igarashi et al. [2016],

our method dropped the average underestimation rate from 43.2% to 4.38%, at the cost of an increase in the average prediction error of only 0.84m. These facts prove the effectiveness of our method, which is good at making predictions with both little underestimation and high accuracy.

キーワード：ガウス過程回帰、機械学習、防災、津波予測
Keywords: Gaussian Process, Machine Learning, Disaster prevention, tsunami height prediction

　　　- HDS13-09 -