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## New reinforcement technique for breakwater foundation to make breakwater resilient against tsunami

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Tsunami waves generated by the 2011 off the Pacific Coast of Tohoku Earthquake struck the Pacific coast of Tohoku region, Japan, which led to catastrophic damage for the population and waterfront structures, such as breakwaters and tide embankments. Reports said that many breakwaters were destroyed because of scouring of foundation and strong horizontal forces on caisson imposed by the 2011 tsunami. Moreover, countermeasures for compound disaster due to predicted Nankai mega-earthquake and subsequent tsunami are issues that should be resolved urgently. Therefore, the authors developed reinforcing technique for breakwater foundation using steel sheet piles and gabions that can minimize damage subjected to the tsunami higher than the design tsunami level. In this research, hydraulic model tests were performed to evaluate tsunami resistant characteristic of proposed reinforcing technique. Comparisons were made between conventional breakwater foundation and proposed reinforced foundation. Results of this research revealed that the settlement and the inclination of the caissons during tsunami could be significantly reduced by the proposed reinforced breakwater foundation. Furthermore, it was found that steel sheet piles could remarkably reduce seepage flow through the rubble mound, and gabions could protect it from scouring.

### Biography

Kengo Nishimura has completed his Bachelor's degree from Kyushu University and matriculated at Department of Civil and Structural Engineering, Graduate School of Engineering, Kyushu University.

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