Seismic-wave contributions to bottom pressure fluctuations in the Taiwan offshore area – implications for the CWB DART stations

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Two sets of the tsunami alarm system, deployed in 2018 in east and southwest offshore Taiwan by the Central Weather Bureau (CWB) for the regional tsunami hazard monitoring, have worked with the PMEL systems for Deep-Ocean Assessment and Reporting of Tsunami (DART). Up to date, there was one occasion in which the real-time reporting system was set into tsunami event mode by regional earthquakes. In this study, we examine the time series acquired from two CWB DART stations from 2018 to 2021 to investigate the relationship between variations of the ocean bottom pressure with seismic waves. Because the compressibility of the water layer does not play an essential role in low-frequency seafloor oscillations, the changes in the seafloor pressure excited by low-frequency seismic waves are proportional to the seafloor acceleration. The PSD analysis showed the proportionality coefficient equal to the mass of the water column at the installation of the observatory. As the most less response of the BPR recording is at a frequency of about 60 mHz (17s period), higher than the tsunami frequency band, we considered the transition of the water fluctuation in the full-response for the seismic Rayleigh waves. However, the effect of sediment layer resonances may provide uncertainty in pressure /acceleration transition in seafloor water pressures. This study can address the practical issue of whether the threshold value in the DART systems is appropriate for region earthquakes that are capable of generating dangerous trans-Pacific tsunamis.

Keywords:CWB DART system, seismic Rayleigh wave, tsunami