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Shear-wave velocity of marine sediments offshore Taiwan using ambient seismic noise

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Seismic ambient noise technology has many advantages over the traditional two-station method. The most important one is that noise is happening all the time and it can be widely and evenly distributed. Thus, the Green's Function of any station pair can be obtained through the data cross-correlation process. Many related studies have been performed to estimate the velocity structures based on the inland area. Only a few studies were reported for the marine area due to the relatively shorter recording time of ocean bottom seismometers (OBS) deployment and the high cost of the marine experiment. However, the understanding about the shear-wave velocity (Vs) of the marine sediments is very crucial for the hazard assessment related to submarine landslides, particularly with the growing of submarine resources exploration. In this study, we applied the ambient noise technique to four OBS seismic networks located offshore Taiwan in the aim of getting more information about the noise sources and having the preliminary estimation for the Vs of the marine sediments. Two of the seismic networks were deployed in the NE part of Taiwan, near the Ryukyu subduction system, whereas the others were in the SW area, on the continental margin rich in gas hydrate. Generally, ambient seismic noise could be associated with wind, ocean waves, rock fracturing and anthropogenic activity. In the southwestern Taiwan, the cross-correlation function obtained from two seismic networks indicate similar direction, suggestion that the source from the south part of the network could be the origin of the noise. However, the two networks in the northeastern Taiwan show various source direction, which could be caused by the abrupt change of bathymetry or the volcanic degassing effect frequently observed by the marine geophysical method in the area. The Vs determined from the dispersion curve shows a relatively higher value for the networks in the Okinawa Trough (OT) off NE Taiwan than that in the continental margin offshore SW Taiwan. This observation could be linked to the presence of numerous volcanic outcrops in the shallow marine sediments is the OT area. By comparing the 1-D velocity shear-wave profile with the previous studies, we found that the low Vs area could be associated with a sedimentary layer filled with gas in the OT and the creeping area along the continental margin. The Vs range estimated from our study also shows a good agreement with the velocity profile obtained based on the OBS seismic refraction experiment, suggesting that this method could be a more economical and effective way for the acquisition of the Vs parameters.