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H/V spectral ratios of the continental margin sediments offshore southwestern Taiwan

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For decades, it has been mentioned that submarine slope failures are spatially linked to the presence of gas hydrates/gas-charged sediments. When triggered by earthquakes, over steepen and instable sediments may prompt breakouts of the slopes containing gas hydrates and cause submarine landslides and tsunamis. Widely distributed BSRs have been observed in the area offshore of southwestern Taiwan where the active accretionary complex meets with the passive China continental margin. In the region, large or small scale landslides were also reported based on seismic interpretations. In order to clarify the link between earthquake, landslide and the presence of gas hydrate, we evaluate the response of seafloor sediments in regard to passive dynamic loads. Horizontal-to-vertical (H/V) spectral ratios are used to characterize the local sediment response. Ambient noise as well as distant earthquake is used as generators of the passive dynamic loads. Based on this study, we aim to characterize the site in terms of its physical properties and the local site effect produced by shallow marine sediments. Estimating H/V spectral ratios of data recorded by the short period OBSs (Ocean Bottom Seismometer) deployed in the active and paqssive margin offshore southwestern Taiwan show similar spectral characteristics and provide a general understanding of the preferential vibration modes of sediment systems. The results show that the maximal H/V ratios appeared in the range of 5-10 Hz, where the horizontal amplitudes increased by an order of magnitude relative to the vertical amplitude. The stations located in the northwestern part of study area were characterized by another relatively small peak at proximately 2 Hz, which may indicates the presence of a discontinuity of sediments. For most stations, the H/V ratios estimated based on the earthquakes (i.e. strong input signal) and noise (background, micro-seismic noise) records were characterized by different pattern. No distinct peak is observed for the H/V pattern calculated during earthquakes. This phenomenon may suggest that no clear sedimentary boundary exist when a stronger motion applies. We found that the resonance frequency for the relative rigid material, such as mud diapir, is relatively higher, about 9 Hz. Moreover, their main resonance frequency is not affected by occurrence of earthquakes. On the general sedimentary layer and marine landslide, the resonance frequency shows relatively low value, about 7$\sim$8 Hz. When the site is affected by earthquakes, the main frequency becomes unclear. Finally, when a site is characterized by very thick sedimentary layer, the frequency of about 5 Hz is the lowest observed in the experiment.