Seismic response from microtremor of Chogye basin, Korea

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When seismic waves corresponding to the resonance frequencies reach a certain area, the ground motion can be rapidly amplified. This is especially true if the nature of the soil is composed of sedimentary layers, not the bedrock in the area, as in the Chogye basin. Ground motion amplification can be observed more easily when seismic waves propagate through a basin with slow velocity. Chogye basin, which is surrounded by country rock, has a closed-basin form (Choi et al., 2001). In such a basin, incident seismic energy can form multiply reflected waves, thus causing energy concentration to occur at this closed-basin area. Therefore, measuring resonance frequencies of closed-basins is very important to estimate the earthquake response for seismic hazard evaluation. Two field investigations were conducted for this research at the Chogye basin, which is located in Chogye-myeon and Jeokjung-myeon, Hapcheon-gun, Gyeongsangnam-do, Republic of Korea. For the first on-site inspection, we set 23 observation points, which were divided into 8 transfer routes, and recorded background noise by moving two to three times. The 2nd on-site inspection was also done in the same way as before; however, this time, we included the measurement of microtremors from the basin area to the surrounding mountains. Based on the observations of microtremors acquired from two field inspections, we calculated the Horizontal to Vertical Spectral Ratio (HVSR) using on the 3 component microtremor data. Using the HVSR ratio, we were able to derive the resonance frequencies for every observation point. Through this process, we derived the link between an observed elevation and resonance frequencies. We were able to identify the thickness of the sediments is inversely proportional to the resonance frequencies. We noticed that the thicker sedimentary layers are more likely to be very sensitive to long period waves. In contrast, shallow sedimentary layers respond well to short period waves. This implies that sediment thickness is an important parameter that can be used to predict the ground response when seismic waves arrive.

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References

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