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Exploration of deep sedimentary layers in Tacna city, southern Peru, using microtremors and earthquake data for estimation of local amplification

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Abstract

S-wave velocity profiles of sedimentary layers in Tacna, southern Peru, based on analysis of microtremor array data and earthquake records, have been determined for estimation of site amplification. We investigated vertical component of microtremors in temporary arrays at two sites in the city for Rayleigh wave phase velocity. A receiver function was also estimated from existing earthquake data at a strong motion station near one of the microtremor exploration sites. The phase velocity and the receiver function were jointly inverted to S-wave velocity profiles. The depths to the basement with an S-wave velocity of 2.8 km/s at the two sites are similar as about 1 km. The top soil at the site in a severely damaged area in the city had a lower S-wave velocity than that in a slightly damaged area during the 2001 southern Peru earthquake. We subsequently estimate site amplifications from the velocity profiles and find that amplification is large at periods from 0.2 to 0.8 s at the damaged area indicating possible reasons for the differences in the damage observed during the 2001 southern Peru earthquake.

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