Verification for the Deep Sedimentary Velocity Structure in the Kathmandu Valley using Receiver Function Analysis

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The Himalayan continental collision zone of the Indian plate and the Eurasian plate has experienced devastating earthquakes in the past. In addition, the future great earthquakes in Nepal Himalaya have the potential to occur in the Central Seismic Gap of the Main Frontal Thrust. The Kathmandu Valley in Nepal is filled with soft lake sediment of Plio-Pleistocene origin, more than 650 m thick in the central part of the valley. This soft lake sediment might be one of the causes of seismic heavy damage. Therefore, we must examine the amplification characteristics of the valley and grasp the susceptible to the risks of strong ground motion at the next great earthquake.

In order to understand the basement topography of the valley and depth of the sediment, Shigefuji *et al.* (WCEE2020) applied the receiver function analysis to strong-motion waveforms recorded at 17 stations in the Kathmandu Valley (Takai *et al.* EPS2016, Ichiyanagi *et al.* EPS2016; Takai *et al.* JpGU2018). We examined the relationships between the spatial variation of peak phase from the receiver functions and the basement topography of the valley. The peak times of the receiver functions almost correspond with the theoretical time differences between the direct P-wave and Ps-wave converted at the basement-sediment boundary calculated from the 1-D velocity structure (Bijukchhen 2018) under each station. The Ps-P times are large differences in the range of 0.28 to 1.06 second in the sedimentary sites, this feature shows the complex basement topography of the valley.

In this report, we verify the previous deep sedimentary velocity structure model in the Kathmandu Valley (Bijukchhen, 2018) by comparing the observed receiver function with the theoretical one. The theoretical receiver function was calculated in the previous model based on the P-SV propagator matrix method. The P-wave velocity and density were derived from S-wave velocity based on some empirical relationships. The observed receiver functions agreed with the theoretical ones in most stations except stations on the center and marginal part of the valley, which is not used by the construction of this velocity model. Additionary, We will examine the effect of the middle layer of the velocity structure, the direction of the epicenter and the Vp/Vs ratio, to the receiver functions.

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