Shallow and Deep Shear Wave Velocity Structures and Site Responses of the Bangkok Basin for Seismic Hazard Assessment

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ABSTRACT

The Bangkok basin in the lower Central Plain of Thailand, is susceptible to ground shaking from large distant earthquakes due to its thick sediments. This study investigates shallow and deep shear wave velocity structure and the associated ground response of the Bangkok basin using active and passive MASW and microtremor array measurement to characterize site effects in the basin. Most of the Vs30 at 200 sites in Bangkok basin are less than 180m/s (Soil Class E). The deep shear wave velocities at 6 sites in Bangkok and vicinity are calculated by a two-station spatial autocorrelation method using long-period accelerometers. We found that at some locations, the bedrock with Vs higher than 2,000 m/s exists at depths greater than 1,000 m. 3C microtremor observations in the study area suggest that the ground response in most areas has 2 predominant periods, 0.8-1.2 s and 2-5 s. The short period ground response ranges between 0.3 – 1.2 s which increases toward the south to the Gulf of Thailand and decreases towards the north and northwest. The long predominant periods of the study area range between 1.2 – 5.9 s and higher (6-8 sec) at some area. We also observe that the dominant ground response period of 0.8-2.5 s in central Bangkok corresponds to the damage reports of high rises and strong motion data from the 2025 Mw 7.7 Myanmar earthquake.

Keywords: seismic microzonation, shallow and deep shear wave structure, horizontal to vertical spectral ratio, microtremor array measurement, Bangkok, Thailand