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Site Amplification Study Using Strong Motion Data Recorded at Various Stations in India from Far-field Earthquakes

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Abstract

Given the importance of site effects, the site response characteristics in the present work are evaluated at different locations of India using recorded data of three earthquakes that occurred in different parts of the country. The used earthquakes include the 2015 Afghanistan earthquake (M_w 7.5); 2016 Hindukush earthquake (M_w 6.7) and 2016 Manipur earthquake of (M_w 6.7). The results are presented in form of peak ground acceleration (PGA), peak ground velocity (PGV), amplification, and predominant frequency. For both Afghanistan and Hindukush earthquakes, the highest and lowest PGA values are observed at SMLA and HYB stations, respectively. For the Manipur earthquake, the highest PGA value of the order of 103 cm/s^2 was observed at the SHL station. In the case of the Afghanistan earthquake, the PGV values did not show much variation, as observed in the Manipur earthquake. The local soil effects at horizontal components of ground motion are strongly amplified compared to the vertical components. It is found that three sites, namely SMLA, SHL, and KOHMA are amplified in the frequency range 8-10 Hz, exhibiting less amplification and may be treated as rock sites, or stiff-soil sites. The other sites, namely, BHPL, HYB, JORHT, and LEKHA show amplification at a lower frequency range of 0.1-2.9 Hz with amplification a little higher than the previous three sites. The shift of peak amplification from higher to lower frequency range indicates that these sites lie in soft soil regions. The estimated predominant frequency and amplification values in the present work may be very important for the valuation of seismic hazard assessment of the region of study. The site amplification characteristics play an important role in altering the ground motions recorded at different locations and because of this, the damage may vary widely.

Keywords: Site amplification, Seismic hazard assessment, H/V Ratio