Supplementing Vs30 and Z1.0 with H/V Fourier Spectral Ratios and Spatial Correlation for Predicting Site Effect

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In this study, we propose a methodology to involve H/V Fourier spectral ratios from strong motion data and ambient motion data individually as well as spatial correlation in GMPE directly to improve the prediction of the site effect. We illustrate it by developing a Vs30&Z1.0 based GMPE supplemented with spatial correlation and H/V Fourier spectral ratios of strong motion data collected from 628 strong motion stations. Then we develop an another Vs30&Z1.0 based GMPE supplemented with spatial correlation and H/V Fourier spectral ratios of ambient motion data collected from 112 stations collocated with 112 strong motion stations. The standard deviation of site-to-site variability can be reduced up to 90% while considering spatial correlation and H/V Fourier spectral ratios for both cases. The spatial distribution of the station terms predicted from 3699 stations with H/V Fourier spectral ratios of ambient motion data shows consistent spatial distribution of the station terms predicted from 721 strong motion stations by using the proposed models. The site-to-site variability of the stations with inferred Vs30 is similar with the site-to-site variability of the stations with measured Vs30 while considering spatial correlation and H/V Fourier spectral ratios. This study provides a good basis to improve the prediction of the site effect for a target site without available strong motion data by measuring H/V Fourier spectral ratios of ambient ground motion from micro-tremor.

Keywords: H/V Fourier Spectral Ratios, Spatial Correlation, Ground Motion Prediction Equation, Site Effect