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A REVIEW ON PERFORMANCE OF MODIFIED EQUIVALENT LINEAR VERSUS NONLINEAR SITE RESPONSE ANALYSIS MODELS

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There are two main groups of soil models to account for the soil nonlinearity: equivalent linear models, and nonlinear models. This study proposes a modification to account for confining stress and frequency dependence of modulus reduction and damping in equivalent linear site response analysis program Shake91 (Idriss and Sun, 1992) and yields a comparison of results with modified Shake91 and two nonlinear site response analysis models DeepSoil (Hashash et al., 2009) and Dyneq (Yoshida and Suetomi, 1996) based on selected borings.

The performance of modified equivalent linear versus nonlinear site response analysis models were reviewed based on vertical array soil profiles that have recorded ground motion under a range of moderate to intense shaking levels. Site response analysis carried out to evaluate the effect of confining pressure dependency on predicted ground motions show that using confining pressure dependent curves results in higher amplitude ground motions than those predicted with average generic curves because of the fact that modulus degradation and material damping curves become increasingly linear as confining pressure increases. Analyses based on stress dependent dynamic properties were rerun adopting frequency dependent characteristics into Shake91. This modification by taking frequency dependent behaviour into account improved lower amplification in high frequency range disadvantage of the equivalent linear analysis. The improvement was more pronounced as the soil profile gets deeper. The common observation is that while both methods give similar response spectra, the equivalent linear method underestimates displacements and overestimates accelerations.

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