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Discussions and Replies — Session VIII

Multiple Authors

DISCUSSIONS AND REPLIES
SESSION VIII

Discussion on paper titled: "Scaling Strong Earthquake Ground Motion in Geotechnical Design", by M. D. Trifunac (Paper No. 8.05)

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The author pointed out that the strong earthquake motions for geotechnical design should consider more than just one single parameter, such as peak ground acceleration. Other ground motion variables including duration, ground velocity, frequency content, energy, incoherence, etc., should also be considered. He also demonstrated a very good approach to include these ground motion variables.

In the current practices of most geotechnical designs, the primary ground motion parameters are the peak ground acceleration and, in some cases, the earthquake magnitude to include the effect of earthquake duration (or number of loading cycles). The reasons of lacking consideration of other ground motion variables are:

1. The present available ground motion records and measurements for a site with geotechnical problems during past earthquakes, such as liquefaction, are very limited in both quantity and quality. Mostly, only the magnitude (or intensity) and peak acceleration at the ground surface could be estimated from the record. With the advances in seismic instrumentation and wide-spread installation of seismic recording devices, sufficient data base can be collected in the future to provide the basis for better design methods to include the effect of the aforementioned ground motion parameters.

2. Geotechnical problems are very site-specific and strongly affected by the soil and geological conditions, such as soil types and their distributions, ground water, etc. The current understanding of soil behaviors under earthquake loading is not adequate to fully consider various aspects of the ground motions in design for different site conditions. Laboratory and field experiments, and analysis method need to be developed specifically for evaluating the soil responses under earthquake loading of different parameter values. The results can then be incorporated in the design method with the field performance data as discussed in 1.