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Closure to âShear-Wave VelocityâBased Probabilistic and Deterministic Assessment of Seismic Soil Liquefaction Potentialâ by R. Kayen, R. E. S. Moss, E. M. Thompson, R. B. Seed, K. O. Cetin, A. Der Kiureghian, Y. Tanaka, and K. Tokimatsu

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The writers appreciate the kind comments and observations of the discussers. This paper focuses on the shear-wave velocity V_{s1} assessment of the triggering of seismic soil liquefaction. In this paper, the conventional cyclic-stress approach is used to evaluate a large new global data set of 422 case histories. The discussers have found that the writers' V_{s1} data set also successfully segregates liquefaction and nonliquefaction points using their unconventional approach to the characterization of seismic load. Here, the discussers use a term composed of peak ground velocity, small-strain shear modulus, a strong-motion duration term, and effective stress. Parameterization of seismic load in the discussers' LP-term model serves as a proxy for the elements of the conventional cyclic stress approach [$0.65 \times a_{max}$; $\sigma' v$, duration weighting factor (DWF); and depth-reduction factor r_d]. Likewise, the discussers use a proxy for shear-wave velocity when they characterize soil capacity by converting V_{s1} into equivalent $(N_1)_{60}$ values (Pathak and Dalvi 2012). The exception to the similarity is that the discussers use the term G_{max} that scales with the soil-capacity terms V_{s1} and $(N_1)_{60}$. It is curious that the discussers have included G_{max}, a measure of soil stiffness, in the seismic-load term and a proxy for G_{max} in the soil-capacity term. Also, when converting between the two different measurements, it should be pointed out that both the uncertainty in the first measurement (V_{s1}) and the uncertainty in the statistical correlation between V_{s1} and $(N_1)_{60}$ should be properly accounted for to arrive at an accurate estimate of the second measurement (Moss and Hollenback 2009).

Nevertheless, it is beneficial for the engineering community to use alternate parallel procedures to the simplified cyclic-stress ratio (CSR) approach that can better characterize certain aspects of the seismic load. For example, the use of integrated intensity measures in liquefaction assessment directly incorporates strong-motion duration into the seismic-load term and certainly represents an improvement over DWF·a_{max}. Two examples of integrated intensity measures in liquefaction assessment are the cumulative absolute velocity (CAV) approach of Kramer and Mitchell (2006) and the Arias intensity (I_{hb}) approach of Kayen and Mitchell (1997).

Regarding the generalized form of the DWFs for scaling of cyclic-stress ratio, it is encouraging, indeed remarkable, that the V_{s1} catalog independently leads to a result so similar to those of Seed and Idriss (1982), Cetin et al. (2004), Idriss and Boulanger (2008), and Zhou and Chen (2007). These approaches depend on either standard-penetration-test field data or laboratory-derived relationships, whereas the writers developed the DWF relationship purely through a V_s catalog largely captured via the spectral analysis of surface waves technique.

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