ABSTRACT: This talk focuses on how the variability in driving and resisting force parameters together translate into uncertainty in seismic slope deformation predictions. Predictive uncertainty of the Newmark rigid-block and Makdisi-Seed decoupled deformation-based methods was evaluated by performing a series of probabilistic Monte Carlo simulations for two idealized slope models. Results from these analyses demonstrate that the highly non-linear relationship between acceleration ratio and displacement associated with the deformation models dictates the way in which parametric variability is propagated through the analysis and can lead to varying degrees of uncertainty in the deformation predictions. Based on this observation, three zones along the displacement-acceleration ratio relationship will be identified according to their relative degree of nonlinearity and correlated with their relative influence on predictive uncertainty; these are: (i) highly uncertain, (ii) moderately uncertain and (iii) low uncertainty. Using this framework, the widely held notion of generic “order-of-magnitude” estimate for deformation predictions is a misnomer. Based on this, it is recommended that realistic levels of parametric variability be incorporated in the seismic slope deformation analysis to establish the operating conditions of the slope system. Systems identified as highly uncertain or moderately uncertain require a more robust probabilistic analyses to meaningfully interpret poorly constrained deformation predictions.

BIOGRAPHY: Joseph Wartman is the H. R. Berg Associate Professor of Civil and Environmental Engineering at the University of Washington. The author of over 60 professional articles, Wartman is an editor of the ASCE Journal of Geotechnical and Geoenvironmental Engineering and chair of the Geo-Institute (GI) Committee on Embankments, Dams, and Slopes. He is the recipient of several awards and honors including, most recently, the 2011 Prakash Research Award and selection for the National Academy of Engineers' 2011 Frontiers of Engineering program. Prior to his arrival at the University of Washington in 2010, Dr. Wartman spent nearly 10 years at Drexel University, where he was a founding Co-Director of the Drexel Engineering Cities Initiative. From 2007 to 2008, he was a Visiting Scholar at the Universitat Politècnica de Catalunya (UPC) in Barcelona, Spain. Before his career in academia, Wartman was a professional practitioner in California and Pennsylvania for 5 years. He received his B.C.E. from Villanova University, and his MS, MEng, and PhD degrees from the UC Berkeley. Wartman is a Registered Professional Engineer in Pennsylvania and California.