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An Update on the Integration of Ground Failure Hazard and Loss Estimates with USGS Real-Time Earthquake Products

Kate Allstadt (1), Eric Thompson (1), Michael Hearne (1), Jing Zhu (2), M. Anna Jessee (3), Hakan Tanyas (4), and David Wald (1)

(1) United States Geological Survey, Golden CO, USA, (2) Tufts University, Massachussetts, USA, (3) Indiana University Bloomington, Indiana, USA, (4) University of Twente, The Netherlands

After any significant earthquake worldwide, USGS real-time products rapidly estimate both shaking ("Did You Feel It?"; ShakeMap), and shaking-related losses (PAGER, ShakeCast). Currently missing is the quantitative estimation of hazard and losses from earthquake-triggered landslides and liquefaction, but efforts are underway to develop this capability. We have developed parallel global statistical models for both landslides and liquefaction based 1) on ground failure inventories from past earthquakes, and 2) ground motions estimated using ShakeMap procedures. The candidate models are being tested and refined and will serve as a foundation for hazard estimation. However, much work remains to achieve a robust and defensible suite of openly-available models that will meet the needs of various end users. Necessary efforts include: 1) adapting, developing, and testing higher resolution physically-based models for application when necessary input data exist; 2) developing a methodology for combining models of different types in a unified framework and decision tree logic; 3) making use of higher quality and higher resolution input data (e.g., rock strength, surficial geology, soil moisture) where available, yet exploring and developing proxies where unavailable; 4) expanding the number of ground failure inventories accessible for model development and testing; 5) using old and new inventories to develop models for deep-seated landslides and travel distance; 6) developing statistical techniques for combining inventories of inconsistent quality together in testing and development; 7) improving ShakeMap shaking estimates to account for spatial variability and topographic amplification and 8) compiling loss data to facilitate the development of vulnerability functions. We will describe progress on these fronts and the anticipated products.