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# Modeling regional initiation of rainfall-induced shallow landslides in the eastern Umbria region of central Italy

D. Salciarini (1), W. Z. Savage (2), J. W. Godt (2), P. Conversini (1), R. Baum (2) and J. A. Michael (2)

(1) Department of Civil and Environmental Engineering, University of Perugia, Italy, (2) United States Geological Survey, Denver Federal Center, Colorado, USA.

We model rainfall-induced initiation of shallow landslides over a broad region using a deterministic approach. This approach, the Transient Rainfall Infiltration and Grid-based Slope-stability model (TRIGRS), couples an infinite-slope stability analysis with a one-dimensional analytic solution for transient pore-pressure response to rainfall infiltration. This model permits the evaluation of regional shallow landslide susceptibility in a Geographic Information System (GIS) framework and we use it to analyze the development of shallow landslides in the eastern Umbria Region of central Italy. Input data for the model include time-varying rainfall, topographic slope, colluvial thickness, initial water-table depth, and material strength and hydraulic properties. Because much of the necessary input data is missing for our study, we focus on parametric analyses to calibrate and validate the model and show the effect of variation in material properties and initial water-table conditions on the distribution of simulated instability in the study area in response to realistic rainfall. Comparing the results with a published shallow landslide inventory map we find up to 80% agreement between predicted shallow landslide susceptibility and the inventory, despite the paucity of input data.