Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02993, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02993
EGU General Assembly 2008

Integrated numerical modeling of a landslide early warning system

C. Huggel (1), N. Khabarov (2), M. Obersteiner (2), J.M. Ramirez (3), M. Künzler (1)

(1) Department of Geography, University of Zurich, Switzerland, (2) International Institute for Applied System Analysis, Laxenburg, Austria, (3) Swiss Agency for Development and Cooperation, Bogota, Colombia

Early warning systems (EWS) for natural disasters such as landslides consist of different components, including environmental monitoring instruments (e.g. rainfall or flow sensors), physical or empirical process models to support decision-making (warnings, evacuation), data and voice communication, organization and logistics-related procedures, and population response. Considering this broad range, EWS are highly complex systems, and it is therefore difficult to understand the effect of the different components on the overall performance, ultimately being expressed as human lives saved or structural damage reduced. In this contribution we present a novel approach to assess a landslide EWS in an integral way, both at the system and component level. We developed a numerical model using 6 hour rainfall data as basic input. A threshold function based on a rainfall-intensity/duration relation was applied as a decision criterion for evacuation. Damage to infrastructure and human lives was defined as a linear function of landslide magnitude, with the magnitude modelled using a power function of landslide frequency. Correct evacuation was assessed with a 'true' reference rainfall dataset versus a dataset of artificially reduced quality. Performance of the EWS using these rainfall datasets was expressed in monetary terms (i.e. damage related to false and correct evacuation). We applied this model to a landslide EWS in Colombia that is currently being implemented within a disaster prevention project. We evaluated the EWS against rainfall data with up to 200% of artificially introduced error and computed with multiple model runs the probabilistic damage functions depending on

rainfall error. Results showed that small errors in measuring rainfall do not significantly affect the overall damage, but errors about $>$50% have serious consequences. The model is designed such that changes of EWS components, including the physical and socio-economic systems, can be systematically evaluated. For instance, the effect of a climatic change (e.g. higher rainfall intensity) on the overall damage can relatively easy be assessed using this model structure. The model represents a first attempt to integrally simulate and evaluate EWS. Future work will concentrate on refining model components and a spatially explicit representation.