Geophysical Research Abstracts
Vol. 19, EGU2017-339-2, 2017
EGU General Assembly 2017

Debris flow runout simulation at the basin scale: Zêzere valley (Estrela Mountain, Portugal)

Raquel Melo (1), Theo van Asch (2), and José Luís Zêzere (1)

(1) Centre for Geographical Studies, Institute of Geography and Spatial Planning, Universidade de Lisboa, Lisbon, Portugal (raquel.melo@campus.ul.pt), (2) Utrecht University, Utrecht, The Netherlands

Following the wildfires occurred in 2005 in the upper part of the Zêzere valley (Estrela Mountain, Central Portugal), several debris flows were triggered under intense rainfall. The event caused infrastructural and economical damage, although no life was lost. The present research aims to simulate the runout of two debris flows occurred during the event as well as back-calculate the rheological parameters and the excess rainfall involved. To achieve these purposes a numerical model was used, which integrates surface runoff, concentrated erosion along the channels, propagation and deposition of flow material. Frequently, due the lack of information about the soil thickness in catchment areas, the models assume a homogeneous value for the entire area. In this study, the map of the soil thickness – interpreted as the depth to bedrock – was based on the simplified geomorphologically indexed soil thickness (sGIST) model. The rheological parameters were tested and calibrated using 3 different types of rheology: Bingham, Coulomb-viscous and Voellmy. Moreover, the amount of excess rainfall and the erosion factor were also considered for calibration purposes. Since there is no reliable information about the total volume of material deposited after the event, the validation of the runout models was performed by comparing the results with the spatial pattern of the debris flows occurred in the study area in 2005.
The rheological and entrainment parameters obtained for the most accurate simulation were then used to perform four scenarios of debris flows runout at the basin scale (i.e. the Zêzere valley). For each scenario, the excess rainfall simulated varied. Since there is a lack of quantitative information to validate these models, the results were compared with historical references of events in the study area. Regarding the results obtained in the scenarios, we identified at least 6 gullies where debris flows occurred in the past and caused material damage and loss of life. The buildings at risk in the present day were overlaid with the two worst scenarios where, respectively, 116 and 345 buildings at risk were identified.

Acknowledgments
This work is part of the project FORLAND – Hydrogeomorphologic risk in Portugal: driving forces and application for land use planning [grant number PTDC/ATPGEO/1660/2014] funded by Portuguese Foundation for Science and Technology (FCT).