Geophysical Research Abstracts
Vol. 21, EGU2019-18367, 2019
EGU General Assembly 2019

Added value of regional landslide susceptibility analysis: the western branch of the East African Rift

Arthur Depicker (1), Liesbet Jacobs (1), Damien Delvaux (2), Hans-Balder Havenith (3), Jean-Claude Maki Mateso (4,5), Gerard Govers (1), and Olivier Dewitte (2)

(1) Katholieke Universiteit Leuven, Department of Earth and Environmental Sciences, Heverlee, Belgium (arthur.depicker@kuleuven.be), (2) Royal Museum for Central Africa, Department of Earth Sciences, Tervuren, Belgium, (3) Université de Liège, Department of Geology, Liège, Belgium, (4) Centre de Recherche en Sciences Naturelles, Department of Geophysics, Lwiro, DRC, (5) Université catholique de Louvain, Earth and Life Institute – Environmental Sciences, Louvain-La-Neuve, Belgium

Landslides have a strong impact on environments and societies in many regions worldwide. Nonetheless, for most of these regions, landslide susceptibility has not been assessed in detail, so that susceptibility assessments necessarily rely on relatively coarse global/continental models. The regional accuracy and/or geomorphological plausibility of these global/continental models can be questioned due to several reasons: (1) they have not been calibrated and validated for the region under consideration (2) they rely on few and simple covariates, and (3) when they are data-driven, they are calibrated using a global rather than a local dataset. Therefore, we investigated whether there is an added value of regional models that justifies the construction efforts and costs and whether these efforts should be focused on compiling the regional landslide inventory or on the quality of spatial covariates such as slope steepness and lithology. More specifically, we performed a regional susceptibility assessment in a tropical data-scarce environment (the western branch of the East African Rift, with an approximate extent of 100,000 km2) and assessed its added value compared to recent continental and global assessments in terms of model performance. First, we constructed three data-driven regional models using a historical inventory (> 6000 occurrences) compiled in Google Earth. Second, we quantified the cost of making such an inventory, by looking at how the model quality was impacted by (1) the inventory size, and (2) the use of more accurate regional peak ground acceleration and geo-lithology covariates. Third, we compared the predictive power and geomorphological plausibility of the regional and global/continental models. Despite the fact that global/continental models are useful in terms of identifying landslide-prone areas, we observed that they were considerably outperformed by the regional models in terms of predictive power (ΔAUC > 15%) and plausibility. We also showed that the differences in model performance are linked to differences in the size and quality of the landslide inventory, rather than the use of more accurate, regional covariates. Within our study area, high-quality models can be obtained with inventories of $\pm$500 landslides, i.e. 15% of the total inventory: a further increase in inventory size did not lead to better predictions. In conclusion, we demonstrated that regional susceptibility assessments do lead to a better understanding of spatial patterns in landslide susceptibility and are characterized by significant improvements in performance, compared to global and continental products. For our study area, we showed that the construction of representative local inventories plays a determinative role in these improvements.