Geophysical Research Abstracts
Vol. 19, EGU2017-27, 2017
EGU General Assembly 2017

A landslide susceptibility map of Africa

Jente Broeckx (1), Matthias Vanmaercke (1,2,3), Rica Duchateau (1), and Jean Poesen (1)

(1) Department of Earth and Environmental Sciences, KU Leuven, Celestijnenlaan 200E, 3001 Heverlee, Belgium , (2) Research Foundation Flanders (FWO), Egmontstraat 5, 1000 Brussels, Belgium, (3) Université de Liège, Département de Géographie, Allée de La Physique, 4000 Liège, Belgium

Studies on landslide risks and fatalities indicate that landslides are a global threat to humans, infrastructure and the environment, certainly in Africa. Nonetheless our understanding of the spatial patterns of landslides and rockfalls on this continent is very limited. Also in global landslide susceptibility maps, Africa is mostly underrepresented in the inventories used to construct these maps. As a result, predicted landslide susceptibilities remain subject to very large uncertainties. This research aims to produce a first continent-wide landslide susceptibility map for Africa, calibrated with a well-distributed landslide dataset.

As a first step, we compiled all available landslide inventories for Africa. This data was supplemented by additional landslide mapping with Google Earth in underrepresented regions. This way, we compiled 60 landslide inventories from the literature (ca. 11000 landslides) and an additional 6500 landslides through mapping in Google Earth (including 1500 rockfalls). Various environmental variables such as slope, lithology, soil characteristics, land use, precipitation and seismic activity, were investigated for their significance in explaining the observed spatial patterns of landslides. To account for potential mapping biases in our dataset, we used Monte Carlo simulations that selected different subsets of mapped landslides, tested the significance of the considered environmental variables and evaluated the performance of the fitted multiple logistic regression model against another subset of mapped landslides.

Based on these analyses, we constructed two landslide susceptibility maps for Africa: one for all landslide types and one excluding rockfalls. In both maps, topography, lithology and seismic activity were the most significant variables. The latter factor may be surprising, given the overall limited degree of seismicity in Africa. However, its significance indicates that frequent seismic events may serve as in important preparatory factor for landslides. This finding concurs with several other recent studies. Rainfall explains a significant, but limited part of the observed landslide pattern and becomes insignificant when also rockfalls are considered. This may be explained by the fact that a significant fraction of the mapped rockfalls occurred in the Sahara desert. Overall, both maps perform well in predicting intra-continental patterns of mass movements in Africa and explain about 80% of the observed variance in landslide occurrence. As a result, these maps may be a valuable tool for planning and risk reduction strategies.