Assessing urban gully occurrence at the scale of Africa

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The rapid and typically uncontrolled growth of many African cities leads to a plethora of problems and challenges. One of these is the formation and expansion of large urban gullies (UGs) in many (sub)tropical cities. UGs typically lead to the destruction of houses and other infrastructures, displace large numbers of people and often claim casualties. As the formation of such gullies is strongly linked to land use and rainfall intensity, the problems associated with UGs are likely to aggravate in the near future as a result of continued urban expansion and climate change. However, this newly emerging geo-hydrological hazard hitherto received very little research attention. Several studies report on the occurrence and impacts of UGs. Yet, they remain limited to specific local case studies. A clear understanding of the patterns, impacts and driving factors of UGs at larger scales is currently lacking. To address this gap, we aim to better understand the spatial patterns and UG occurrence at the scale of Africa.

In order to achieve this, we are documenting cases of UG occurrence across Africa through the visual analysis of very high spatial resolution satellite imagery. This mapping already allowed us to identify more than 3,500 UGs in 11 countries (mainly across D.R. Congo, Angola, Republic of the Congo, Nigeria and Mozambique). Using on this database, we develop a logistic regression model that accurately simulates the likelihood that UGs occur within (peri-)urban areas across Africa. Our preliminary results show that a combination of rainfall characteristics, topography, soil type and variables describing the land use/urban context can already robustly explain why certain cities are extremely susceptible to the problem and others not. Overall, our dataset and model are first crucial steps to better understand the current and future risks of UGs across Africa.