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From field data collection to a remote sensing based regional assessment of rainfall control on landslides in the western branch of the East African Rift

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The lack of information on landslide hazard in tropical Eastern Central Africa is in sharp contrast with the high landslide susceptibility of the region due to high precipitation and weathering rates. Moreover, the intensity and frequency of landslides in these regions is expected to increase in the future in response to climate change. With rainfall being the primary trigger for landslides, there is a need for an accurate determination of rainfall thresholds for landslide triggering. To achieve this, both regional rainfall information and reliable data on landslide occurrences are needed. The lack of adequate rainfall records from ground monitoring networks in Africa can partly explain the absence of such threshold estimates. With the emergence of satellite rainfall products, the main bottleneck remains the availability of detailed data on landslide occurrences in time and space. In addition, validation of the satellite rainfall estimates is necessary in order to exploit more effectively these data in hazard applications.

Here, we present the first regional landslide inventory for the western branch of the East African Rift, comprising about 200 dated and located landslide events over a span of 49 years from 1968 to 2017. Reported landslides are found to be dominantly related to the annual precipitation patterns and increasing demographic pressure. This inventory is based on extensive archive research and field observations. In parallel, an unprecedented dataset of 47 rain gauges in the study area is used for the validation of the Tropical Rainfall Measuring Mission Multi-satellite Precipitation Analysis (TMPA) from 1998 to 2017, at 0.25° x 0.25° spatial and 24 h temporal resolution. Based on this and COSMO-CLM^2 climate change projections, we present our research approach for regional landslide hazard assessment and trend analyses. This approach is tailored for the context of the study area where satellite rainfall estimates and landslide inventories suffer strong uncertainties.