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Questioning causes and drivers of slope instability in a tropical context – insights from the Ikoma Landslide (DR Congo)

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Understanding the role of landslides in landscape systems and evolution and their associated hazards relies on accurate process characterisation. This ideally requires knowledge on the timing of slope deformation episodes as it allows understanding the link between slope instability and environmental drivers, such as seismicity and climate. However, for many regions, especially in tropical environments where rapid vegetation growth and low-capacity data collection policy is commonplace, such information remains rare. Here we focus on a deep-seated landslide in the landslide-prone and data-scarce Kivu rift, in eastern DR Congo. This landslide, developed in weathered basalt, is comparatively large for the hillslopes of the region. It also shows obvious deformation features at its surface, indicating large deformations during recent years. Taking advantage of their presence, we use high-resolution topography, historical aerial photographs, satellite imagery and careful field investigations to detail the landslide mechanisms and investigate failure development over the last decades. By confronting rainfall time series and major earthquake sequences to the different deformation episodes, we show that the relation between instability triggers and slope failure is not straightforward; e.g., the largest instability occurred at the end of a dry season during a period of relatively low seismicity. Instead of direct influence of external triggers, we suggest that some phases of instability may ultimately be caused by the intrinsic evolution of the hillslope associated with strength degradation of the slope material through time. Our results question the relative weight of the commonly recognized causes and drivers of slope instability in this area. Analysis of landslide processes provided here should help improve the understanding of how surface processes influence pace of landscape evolution, as well as in the accurate evaluation of the landslide susceptibility and hazards in the area and across other regions where similar environmental conditions are met.