

Dynamics and controls of a tropical slow moving landslide measured by remote sensing: the study case of Grand Éboulis, Réunion Island.

Coline Hopquin¹, Éric Gayer¹, Laurent Michon^{1,2,3}, Delphine Smittarello^{4*}, and Antoine Lucas¹

¹Université Paris Cité, Institut de Physique du Globe de Paris, CNRS, France

²Laboratoire GéoSciences Réunion, Université de La Réunion, France

³Université Clermont Auvergne/CNRS/IRD/OPGC, Laboratoire Magmas et Volcans, Clermont-Ferrand, France

⁴European Center for Geodynamics and Seismology, L-7256, Walferdange, Luxembourg

Corresponding author: coline.hopquin@gmail.com

Abstract:

Slow-moving landslides can cause significant infrastructure damage and casualties, making their monitoring a critical societal challenge. In the context of climate change and the projected intensification of rainfall extremes, understanding the response of slow-moving landslides to extreme meteorological conditions is essential. However, ground-based surveys are often difficult. In this study, we associate radar interferometry and optical imagery to investigate the dynamics of a remote tropical slow-moving landslide on Réunion Island, Grand Eboulis, and its relationship with precipitation regimes. Our approach enables us to retrieve (1) the bi-monthly dynamics of the Grand Eboulis landslide from cumulative displacement maps and ground deformation time series derived from Sentinel-1B images and (2) its multi-annual dynamics from optical aerial images. Between 2016 and 2021, the landslide moved eastward and downward at rates of up to 14 cm/yr and 9 cm/yr, respectively. Displacement was punctuated by periods of accelerated motion following an exceptionally wet season in mid-2018. In contrast, two slower periods coincided with the 2018 dry season combined with an exceptionally arid 2019, and with a prolonged drought in 2020. Additionally, between 2017 and 2019, shallow failures were mapped only in 2018 at the landslide front and were attributed to Cyclone Dumazile. This study suggests that slow-moving landslides may respond to seasonal contrasts by modulating their continuous displacement and to extreme events through shallow failures. The combined use of InSAR and remote sensed optical imagery proved to be efficient for studying such a type of events and can easily be widely applicable.