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First analysis of landslides triggered by the August 14, 2021, Nippes (Haiti) earthquake, compared with the 2010 event

Hans-Balder Havenith¹, Kelly Guerrier², **Romy Schlögel**¹, Anne-Sophie Mreyen¹, Sophia Ulysse², Anika Braun³, Karl-Henry Victor², Newdeskarl Saint-Fleur², Lena Cauchie¹, Dominique Boisson², and Claude Prépetit⁴

¹University of Liege, Geology, Liege, Belgium (hb.havenith@uliege.be)

²Université d'Etat d'Haïti, Port-au-Prince, Haiti

³TU Berlin, Berlin, Germany

⁴Bureau des Mines et de l'Energie, Port-au-Prince, Haiti

First analyses of landslide distribution and triggering factors are presented for the region affected by the August, 14, Nippes, earthquake (Mw=7.2) in Haiti. Landslide mapping was mainly carried out by comparing pre- and post-event remote imagery (~0.5-1 m resolution) available on Google Earth® and with Sentinel 2 (10 m) satellite images. The first cover about 50% of the affected region (for post-event imagery), the latter were selected to cover the entire potentially affected zone. On the basis of the completed landslide inventory, comparisons are made with a catalogue compiled by the USGS for the January, 12, 2010 seismic event (Mw=7.0); additionally, we also analyzed the pre-2021 earthquake slope stability conditions. These comparisons show that the total number of landslides mapped for the 2021 earthquake (=7091) is smaller than the one observed for the 2010 (=23567). However, these fewer landslides triggered in 2021 cover a much wider area of slopes (>80 km²) than those induced by the 2010 event (~25 km²). A simple statistical analysis indicates that the lower number of 2021-landslides can be explained by the 'under-mapping' of smallest landslides triggered in 2021, partly due to the lower resolution imagery available for most of the areas affected by the recent earthquake; this is also confirmed by an inventory completeness analysis based on size-frequency statistics. The much larger total area of landslides triggered in 2021, compared to the 2010 earthquake, can be related to different physical reasons: a) the larger earthquake magnitude in 2021; b) the more central location of the fault segment that ruptured in 2021 with respect to coastal zones; c) and possible climatic pre-conditioning of slope stability in the 2021-affected area. These observations are supported by (1) a new pre-2021 earthquake landslide map, (2) rainfall distribution maps presented for different periods (including October 2016 - when Hurricane Matthew had crossed the western part of Haiti), covering a region including both 2010- and 2021 affected zones, as well as (3) the shaking intensity prediction and related simplified Newmark Displacement maps.