EGUsphere, author comment AC1
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Reply on RC1

Judith Uwihirwe et al.

Author comment on "Potential of satellite-derived hydro-meteorological information for landslide initiation thresholds in Rwanda" by Judith Uwihirwe et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-596-AC1, 2022

Dear Referee,

We are so thankful for your overall positive feedback on the manuscript and for the important comments and suggestions. We have therefore addressed them as follow:

Specific comments

Comment1: Section 3.3.3 This section describes the hydrological model-derived soil moisture. I feel that maybe the manuscript can benefit from a few more words about the model and its calibration. Perhaps just 5-10 lines may be sufficient, as I understand that you do not want to break too much the flow of the manuscript. Otherwise go for an appendix/supplementary material.

Response: An appendix about the Wflow model and its calibration will be added to the final version of the manuscript

Comment 2: Equation 7. I really appreciate the approach of normalizing the soil water content to make comparisons between models and observations. However more details should be given on this: which values of theta_max and theta_min have been found for the various soil moisture products?

Response: We agree that the normalization of soil water content (theta) was made for easy comparison of the observed, model-derived and satellite-based soil moisture products. However, for all compared soil moisture products, the and were 1 and 0 respectively which led to almost similar values of Se (effective soil moisture) and (actual soil water content). We will add such information in Section 3.4.1 of the manuscript for clarification.

Comment 3: Section 3.1 The landslide inventory is made of 32 useful landslides. These are a bit few (see analyses in https://link.springer.com/article/10.1007/s10346-021-01704-7). A comment on this may be added. However, for the manuscript this is not a big issue as it focuses on Rwanda which is an area for which only a few studies exist.

Response: This short paragraph on the constraints related to the used small sized sample (32 hazardous landslides events) will be added to Section 4.2.4. ”Ideally one would have a

landslide inventory of about 200 landslides events in order to have a precise estimation of threshold parameters (Peres and Cancelliere, 2021). However, the landslide inventory used for this study counts for only 32 hazardous landslides. Although, the reliance on this limited sample size is likely to lead to a bias towards the larger landslide events and those with impact to society, this landslide inventory is the most comprehensive currently available in the study area".

Comment 4: Section 4.2.3 : A comment on the limitations of the analysis related to the constraint of using a bilinear threshold form may be added (see e.g., https://www.mdpi.com/2073-4441/13/13/1752/htm, where other forms are suggested).

Response: The limitations and constraints of using the bilinear format have been shortly presented in Section 4.2.4. However, additional comment on the constraint of using a bilinear threshold will be added in Section 4.2.4 referring to Conrad et al., (2021).

Minor comments/technical corrections

Comment 1: LL 364-365 This is unclear: I imagine that the critical level for landslide occurrence is sort of fixed and then it is reached more or less easily based on the prior rainfall and the time lag.

Response: It is true that the critical level for landslide occurrence is more or less fixed when other geological and geomorphological condition are kept constant and it is reached more or less easily depending on the prior rainfall expressed in terms of antecedent soil moisture and the time lag between the landslide triggering rainfall and the soil hydrological response. LL 364-365 will be paraphrased accordingly.

Comment 2: LL 500 The authors apply a threshold of 10 mm on satellite products to make them better agree with observations. This is a sort of a "bias correction", about which a lot of literature exist. Perhaps make a fast literature review and add some references. (This could be useful also for future work)

Response: The threshold definition of a rainy day (10 mm) improved the similarities between the satellite-based and gauge-based landslide thresholds and thus considered as a bias correction between the two sources of rainfall data. Similarly, bias correction methods were adopted by other researchers to ensure for the high accuracy between ground- and satellite-based rainfall data (Bhatti et al., 2016; Vernimmen et al., 2012). This paragraph and references will be added to LL 500

Comment 3: Fig. 1 is perhaps a little bit messy (especially in B/W).

Response: Fig 1 will be improved to ensure for a better visibility and readability.

Comment 4: LL 512 the authors write "inter-event time" as the minimum dry interval between rainfall events. Perhaps add "minimum", even if I understand that IET is aligned with previous literature in the field of landslides.

Response: The word "minimum" will be added and thus "minimum inter-event time"

Comment: L120 a ")" is missing after Mukungwa.

Response: a ")" will be added after Mukungwa

Comment: L586 thus "can be" (?) very useful (something is missing in the sentence).

Response: The word “can be “ will be added “thus can be very useful for landslide hazard….”