

Reply to Reviewer #1, Francisco Dourado

Below is our reply to the comments from the reviewer #1, Francisco Dourado. We report the comments from the reviewer in black and our replies in red.

We sincerely thank the reviewer for his careful review of our paper and his insightful comments.

RC1: 'Comment on egosphere-2026-621', Francisco Dourado, 23 Feb 2026

The manuscript is an update of the data window (+10 years) of the paper presented by Gariano (2015). Gariano's (2015) work was an important milestone for understanding the spatial distribution of landslides and the relationship between rainfall intensity and landslides. This manuscript is an important update of this relationship between rainfall intensity and landslides.

The author points out his main doubts about the representativeness of the results (regarding the spatial and temporal distribution of the data).

R: We thank the reviewer for his positive comment on our work, and on the previous one too. Indeed, we wanted to clearly highlight the pros and cons of the data used and the results obtained.

In addition to what was indicated by the author, the following doubts remained:

The Calabria region has a very large topographic variation, and I believe that the behavior of the rainfall distribution in the western (coastal) portion of the region is different from the distribution in the eastern (coastal) region. Thus, if there was a distribution of new gauges in a given region, the climatological analysis may present an artificially forced trend. It would be important for the author to present a map showing the distribution of the gauges, highlighting the new equipment added in this study, as well as a map of average annual rainfall recalculated with the new gauges. If possible, a comparative map showing the difference between the current map and the previous map (2015) should also be presented.

R: We thank the reviewer for this comment. Indeed, the rainfall distribution along the two sides of the region is different. Regarding the rain gauge number and distribution in the region, we have checked it and we haven't found any significant increase in the last 10-year period (2011-2020) compared to the preceding ones. Overall, only 13 new stations were installed in the region after 2011, out of a total number of 120 gauges currently operational. Of these, 8 gauges were operational only in 2016, 2017, and 2018. Figure R1 shows the number of operating rain gauges per year in Calabria between 1920 and 2020 (updating Figure 1c from Gariano et al. 2015). It can be seen that overall the number of operating rain gauges in the region has not significantly changed after the year 2000, when the network was transferred from national to regional management and when automatic stations were installed and old stations were dismissed.

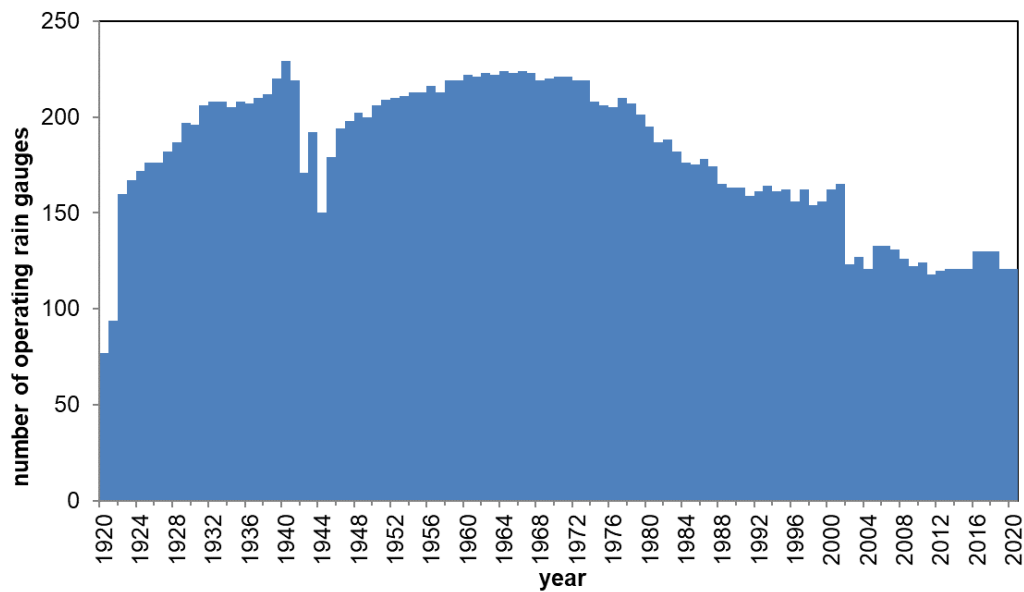


Figure R1. Number of operating rain gauges per year in Calabria region between 1920 and 2020 (modified from Gariano et al. 2015)

Moreover, we have prepared an updated map of average annual rainfall recalculated with the new data and compared it to the previous one. Figure R2 shows the map of mean annual rainfall (MAR) in Calabria, in five classes, as published in Gariano et al. (2015) and updated with the new data. It can be noted that no significant changes can be found.

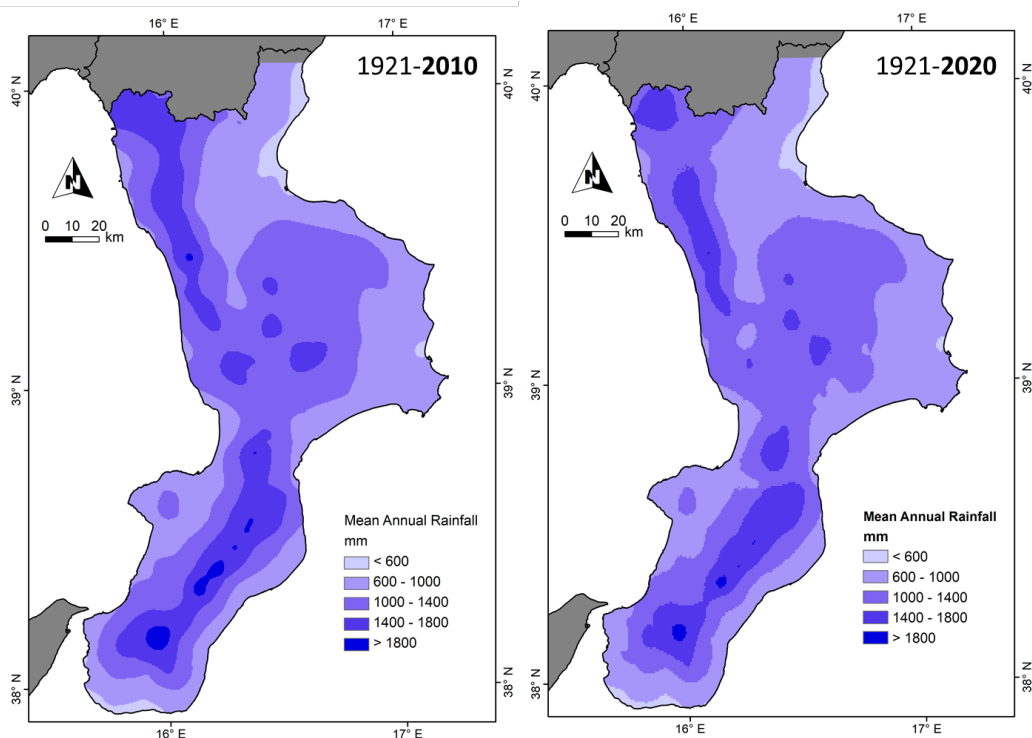


Figure R2. Map of mean annual rainfall (MAR) in Calabria, in five classes, calculated using data in the period 1921-2010 (left) and 1921-2020 (right). Modified from Gariano et al. (2015).

However, we are afraid that we can't add this map into the manuscript due to the limited number of figures/tables allowed for Brief Communications in NHESS journal (https://www.natural-hazards-and-earth-system-sciences.net/about/manuscript_types.html).

The question remains whether the increase in recorded landslide events is actually related to an increase in the frequency of extreme events, or whether this increase in recorded events is related to increased human occupation of the region and, consequently, an increase in the number of observers of these events

R: The reviewer points out a relevant issue in historic data collection from chronicle and technical sources over large areas, such as a whole administrative region as in our case. Indeed, our dataset is composed of landslides that have somehow caused some damage to the population, structures, and infrastructure, as to be reported in a chronicle or mentioned in technical reports. Thus, all landslides in our catalogue had some relations with (increased or decreased) human occupation of the region.

However, this limitation is widely acknowledged in literature and is intrinsic to documentary data sources, which nonetheless remain the only available source of information for reconstructing dated historical landslide events over long periods, in our case. On the other hand, geomorphological landslide inventories derived from aerial photographs or field mapping represent only a static snapshot of slope conditions at the time of the survey or image acquisition and generally do not provide an accurate date (year-month and day) for landslide initiation.

Historical documentary sources, despite their well-known limitations, make it possible to temporally constrain landslide occurrences and therefore to carry on temporal analyses and identify the potentially triggering rainfall events. This represents a key prerequisite for investigations such as the one presented in this paper, which aims to analyze the changes in rainfall conditions associated with landslide triggering. Moreover, please note that the interpretations of changing landslide activity made in the work were mostly focused on the variations in triggering conditions rather than on the total number of landslides.

References:

Gariano, S. L., Petrucci, O., and Guzzetti, F.: Changes in the occurrence of rainfall-induced landslides in Calabria, southern Italy, in the 20th century, *Nat. Hazards Earth Syst. Sci.*, 15, 2313–2330, <https://doi.org/10.5194/nhess-15-2313-2015>, 2015.