

General comments:

The manuscript presents an interesting and valuable presentation of synthetically produced meteorological data used as input for a hydro-mechanical stability model. The results demonstrate the feasibility of such model approach for landslide early warning purposes.

As the discussion is combined with the results section, a self-critical reflection of the methodology is missing. In most parts you are using an FS-model to validate the performance of the model framework, instead of relying on real landslide occurrences. When applied to real landslide data, the performance drastically decreases. A more critical discussion of the chosen approach as well as a more critical conclusion would be very necessary. Maybe, also compare the results and the model framework to other studies using synthetic datasets in landslide studies.

In my opinion, the last section (3.3) is very valuable as it applies the model for real case landslides. Here it would be interesting to present more information of the 9 landslides assessed. What are the triggering conditions (Rainfall intensity, duration etc.), what are the disposing conditions (slope angle, geotechnical parameters if available etc.). Proof/compare the parameters of large-scale application you are using (table 4) to the real case landslides. Do landslides really only occur on slopes of $40^\circ \pm 2^\circ$ SD?

While the results are well presented and understandable, the manuscript lacks in quality of precise and clear English writing (misspelling, comma setting etc.). Many sentences should be rewritten making the paper more readable and easier to understand. Note, only some errors are listed below. In particular the writing of the introduction is often rocky. The instruction sometimes lacks a red thread were sentences follow one another in meaning. In my opinion, some lines should be spent on introducing the mechanical stability (FS model) and hydrological (Richard-Equation) models. Further note, that results and conclusions of your study (as in last paragraph) do not belong in introduction.

Specific comments on lines:

Paragraph 1&2: You are repeating "rainfall induced landslides" 3 times. Maybe state that by "landslides" you refer to "rainfall induced landslides"

Line 29: misspelling: "...it lacks a physical basis..."

Line 37: "components"

Line 43: "...increase of water stored..."

Line 42: triggering can also be related to a decrease in suction (you are also stating that in the methodology part).

Line 43: Achievement is weird here... Rewrite sentence.

Line 46: Instead of stating "much of the..." use "not sufficient..."

Line 61-63: Sentences not really clear.

Line 62: Weird beginning of sentence

Line 69: "per definition" makes no sense.

Line 75: Start sentence e.g. with "In this study..."

Line 86: "commonly followed" seems like an over exaggeration.

Line 87 – 92: Too long and complicated sentence, rewrite...

Line 99 – 101: Too complicated sentence, make two sentences.

Line 103 – 104: Too complicated sentence, make two sentences.

Line 105: What do you mean by “singularities”?

Line 110: “to this aim” sounds rocky...

Line 127: “Study refers to” sounds weird.

Fig 1: Insert map of Italy is distorted. Red on green colors do not work for color blind people. Also Fig. 8 – 10 and 12.

Line 136: “travelled” is weird.

Line 137: “causing casualties” instead of “leaving human casualties”.

Line 146: “was” instead of “is”

Section 2.2: Maybe rewrite title... You mostly talk about your model framework and not specifically of the synthetic dataset. Clearly state why you are using a hydrological model: to produce the 500-year synthetic dataset. Then start examining the model framework. Also note, no repetition of introduction should be made (lines e.g. 151-153).

Line 161: Fig. 2 does not show that the assumption is feasible. Maybe rewrite...

Fig 2: at the soil-bedrock interface: is this only a sink term as the direction of the arrow indicates?

Line 184: “all model parameters” instead of “all the model parameters”

Line 191: Maybe use “location” instead of “origin”.

Fig. 3: Why is there such a large delay until the FS drops after H2?

Line 225: You mean Figs 3a and 3b...

Paragraph 235: Clearly state that H is the rainfall amount. Can be a bit confusing with Fig 3 as you use H1 and H2 as duration.

Line 254: “served” is weird.

Line 257-258: Is this first sentence relevant here?

Line 261: “affect” not “affects”

277: It would be nice to state at the beginning of this paragraph, why you do extensive comparison of stations: to get meteo uncertainty.

277: “rainfall amount” or something similar not “rain depth”. Maybe also two sentences here, a bit rocky...

284: what is meant by “at another”?

Fig 4. Explain in caption the blue distribution line.

Lines 299 – 302: Do not repeat the same text in text and figure captions.

Lines 326: Are there seasonal differences, related to thunderstorms or similar? Did you check?

Paragraph from 327 on: State that you are considering the water content as areal means derived through ERA-5 products... Water content itself is highly variable even at small scales, surely much more than 0.02 SD (see publication on in-situ measurement). And are there even in situ water content measurements available which could be used for comparison?

Line 353: Maybe start with: "In the FS equation (5)"

Table 4: Where do you have the mean and SD values from, from the study of Roman Quitero et al. 2024? Or did you assess these values using DEM-maps and geotechnical laboratory testing? And did you test your model with other parameters? Would you get similar performances?

Line 376: I don't understand... 20 landslides in 500 years of which 10 occurred since 1999? The 10 landslides occurred in the entire region not on the reference slope. What do you mean exactly?

Line 400: "shown" not "seen"

Paragraph 424 onwards: Does that not belong to the introduction?

429: Maybe reformulate to not repeat methodology section, e.g.: "As described in section 2.4.2, Normal distributed fluctuations with standard deviation of 0.10 was introduced to account for large scale..."

Line 451: Fig. 9b does not look linear to me... What do you mean by linear equation?

Fig 9b: Why is there a drop of probability with increasing water content (at the top of the plot)?

Chapter 3.3: Did you try to run the real case landslides through the hydrological (to get the water content) and mechanical model (to get the FS)? Would be interesting to see how it performs.

Line 522: "well" not "perfectly"

Line 542: Is it really "real data" when you are not directly modelling the slopes, but just a mean and some SD?