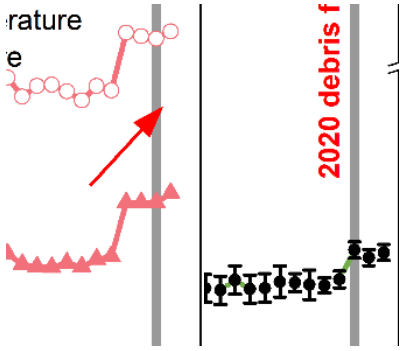
Review of *Variation of sediment supply by periglacial debris flows at Zelunglung in the eastern syntaxis of Himalayas since the 1950 Assam Earthquake* submitted to Earth Surface Dynamics

This is my second review of this paper. I visited the changes to the manuscript found that the authors have addressed most of the comments posed by the reviewers well. However, I am still skeptical of how their data can be interpreted in terms of the effects of earthquakes and climate. The reason is not that I don't believe that climate and earthquakes affect debris flows. Rather, there are three main points, I am not sure I cannot quite get on board with:

(i) The authors suggest (I think) that the 1950 Earthquake led to elevated sediment transport for around 40 years based, I think, on the rate of decline of NVA values between 1950 and 1990. I would need a bit more detail on how the NVA forms to follow the point. Debris flows will directly increase NVA. There are three debris flows in the 40 years after the 1950 event, but their effects on the NVA seem small (or at least they do not show up clearly on Fig 12d). Rather, in the 40 years post 1950, the NVA slowly declines. Isn't the 40 year of declining NVA just representative of the timescale that it takes to re-vegetate the surface? In other words, couldn't it be that the decline of NVA has to do with the timing of vegetation growth rather than the impact of the 1950 earthquake on increased sediment transport? What is happening to the fan surface in-between the major debris flows that you report?

(ii) I am still not sure about the proposed link between the 2020 event and the role of climate. You write that "The correspondence between the recent increases in the local air temperature and the NVA implies that the debris flow occurrences transfer from the tectonic-driven to the climatic-driven", and "based on the fact that the trend of the 1990-2020 NVAs shows a good agreement with that of the air temperature in the same period, it is likely that the 2020 event was driven by the recent local warming rather than by geological events". I have some questions/challenges with that rational

- First, I do not see the correspondence between NVA and temperature. Sure, there is an increase in the unvegetated area after the 2020 debris flow – which is just a product of a debris flow happening. The NVA does not seem to increase just with warming (which starts in 2018).



- Second, given that NVA is driven by debris flows, isn't the argument (a link between climate and NVA changes are indicative of the role of climate on debris flows) a bit circular or redundant? It feels the same as saying: The fact that the 2020 debris flow occurred within a warming trend means that it was triggered by warming. In particular, the occurrence of one debris flow event within a warming period does not seem to me enough evidence to say that warming triggered that debris flow.
- Third, you seem to discount Earthquakes as a trigger for the 2020 event even though you have the highest earthquake frequency on your record right around the 2020 event. As far as I understand, the reason you discount the earthquake trigger is (also?) because the earthquakes do not fall below the Keefer curve (similar to the 1968 and the 1984 events). How robust is this characteristic? What triggered the 1968 and 1984 events then if it wasn't earthquakes or warming? Isn't it possible that the 2020 event is just similar to these two events and was not directly triggered by the warming?

(iii) There are also suggestions in the manuscript in places that the climate change increases the frequency of debris flow events. (e.g. L439: "Undoubtedly, the on-going warming increases the frequency of such glacier-related slope failures".). I am not convinced the data in this work speak to the presence or absence of such a link, and the link between climate change and glacier-related natural hazards can be complex. For example, the frequency of GLOFs does not necessarily just simply increase with climate warming (Veh et al., 2019; Veh et al., 2023).

Line comments

Several of the new sections would benefit from review of the language (e.g.: "Little attentions are paid on" or "imagery for interpretating glacier changes")

L47: Maybe "triggered by" rather than "driven by"?

L71: "It is believed that historical earthquakes and ongoing climate warming drove these events" needs a citation or justification. Who believes that?

L129: As I said before, I do not see an increase in precipitation rates here. The increase is so small it must surely be within the uncertainty of the scatter of the data. If you plotted the confidence bands of the regression or added the standard error of the slope of the line, I would bet it is way within uncertainty of 0 or a decreasing trend. Also, in the discussion, you say there is no significant trend in precipitation.

L414: What do you mean by "the Keefer curve did not detect any of these seismic events"? A curve cannot detect anything.

L440: "show a similar growing trend". Similar to what?

L448: "the trend of the 1990-2020 NVAs shows a good agreement with that of the air temperature in the same period".

L459: Unclear which of the debris flows “the debris flow” corresponds to (presumably the 2020 one, but it’s unclear from this paragraph).

I hope these comments are useful and remain with best wishes

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Veh, G., Korup, O., von Specht, S., Roessner, S., and Walz, A., 2019, Unchanged frequency of moraine-dammed glacial lake outburst floods in the Himalaya: Nature Climate Change, v. 9, no. 5, p. 379-383.

Veh, G., Lützow, N., Tamm, J., Luna, L. V., Hugonnet, R., Vogel, K., Geertsema, M., Clague, J. J., and Korup, O., 2023, Less extreme and earlier outbursts of ice-dammed lakes since 1900: Nature.