The multi-decadal hazard cascade of a tropical mountain wildfire

Response to reviewer comments

RC1:
https://doi.org/10.5194/egusphere-2025-5106-RC1

Thank you for your detailed comments which will certainly improve the communication of our work and the overall quality of the manuscript. We reply to each comment in turn:

General comments:

- We agree the sentence structure was fragmented, particularly in the highlighted sections and have reviewed these to improve the flow of the article.
- We have included more references in the Results section where hydrological theory is raised without reference.

Line comments:

- Line 34-35: we have updated this
- Line 39: we have removed 'they are tectonically active'
- Figure 2: Thanks for raising this, based on your comments and those of our other reviewers we have revised this figure.
    - We agree that Fluvial Floods (and other flood types) will interact with Runoff Pollution and have updated the figure to suit
    - Here, we haven't included a connection between Landslides and Runoff pollution as landslides are defined as those connected to the river system (i.e. this wouldn't be a non-point source of pollution). We have included #24 Landslides > Heavy Metal Pollution where the landslides act as a point-source, contributing heavy metals to the river system.
    - Here, we also agree Avulsion Floods (and Debris Floods) should also connect with Runoff Pollution and have included this as number 6* in the diagram and Table 1 – it's included as an asterix to avoid obfuscating the diagram with long arrows
    - In this scenario there is no evidence for connections between Avulsion Floods (occurring in the lower catchment) and Landslides or Debris Floods (upper and mid-catchment) so we have not included this.
    - There is no evidence of additional Wildfires with any relation to other hazards within the cascade, so the single wildfire event in the far upper catchment remains uni-directionally connected as the hazard initiator. We have clarified this in Lines 220 – 228.
- Line 314: Noted and thanks for the clarity here – we have updated line 314.
- Line 335: We are pleased that you raised this comment as it is something we discussed in the delivery of the work but which didn't make it into the first submission. We have included your suggested reference to the specific example in Arizona, and included some other relevant examples in the paragraph too.

Your contribution here has been very valuable in improving the quality of this paper. Thanks again for your time and for considering this work in detail, it is much appreciated. Best wishes from the Authors.

RC2:
https://doi.org/10.5194/egusphere-2025-5106-RC2

Thank you for providing thoughtful and detailed comments on our manuscript, and for addressing its importance as a topic. Your comments, particularly surrounding terminology, have improved the clarity and overall quality of communication of this work, which we really do value. We reply to each comment in turn:

General comments:

- We have included a Table of Terminology (Table D1, Appendix D) in which we will define our use of all terms used in this paper, which specifically have been based off the 2025 Hazard Information Profiles (UNDRR, 2025).
    - Landslides are defined only as those triggered by toe erosion and connected to the river
    - Riverbank erosion has been be clarified as lateral riverbank erosion with the removal of 'river cliff' terminology throughout the paper
- Thanks for your suggestion, we have included a section which details the study region [Lines 99-112]
- Figure 2:
    - Your suggestion regarding mine waste storage as a primary hazard was considered by the research team during the analysis, however our conclusion based on Appendix K Figure K1 was that this was not originally a hazardous activity as the mine waste was a reasonable distance from a well-contained river at the time of its construction. It was the generally unexpected and rapid change in the river's dynamics which led to this becoming a hazard, hence its position as a tertiary hazard.
    - We noted your comment on the caption terminology and have updated this.
- We agree that it is important to include channel bed sediment deposition (accretion) here. In the Hazard Information Profiles (HIPs) this is defined together with river channel erosion and therefore we have included 'river channel erosion and accretion' as a combined hazard. Whilst the separation of these hazards is also valid, for visual clarity in the diagram we have retained the UNDRR (2025) combined definition. We have updated the process-oriented discussion describing the erosion and accretion processes within this cascade [Line 336 – 356].
- We agree that increased channel bed elevation due to deposition may also be responsible for the erosion and widening, so we have reframed the hazard as river erosion and accretion to address this point and align with the HIPs.

Specific suggestions

Abstract line 25: updated

Introduction

- Line 36: Again, noted and agreed
- We have included bank erosion and channel sediment deposition in the introduction
- We have reviewed all units and are not clear where Imperial units have been used instead of metric. Please could you specify the line, so we are able to update as requested.
- We have clarified that this is the topic of the research rather than a known fact [Line 89]
- We have included details of the scope of the study [Line 114, Section 1.4 Study Scope]

Methods

- We have updated the terminology throughout the paper to clarify that throughout we are referencing riverbank erosion.

Results and Figure 2:

- By defining the Table of Terminology we have provided clarity on the positionality of landslides within Figure 2 (i.e. connected to the river system only)
- Figure 2:
    - Based on your comments and those of our other reviewers have revised Figure 2 to include channel bed sediment deposition (accretion), in line with UNDRR's Hazard Information Profiles (HIPs; UNDRR, 2025).
    - In this instance, no, River Channel Erosion and Runoff Pollution are secondary hazards due to elevated discharge from the wildfire area (not necessarily from flooding). However, we have added interactions between Fluvial, Avulsion and Debris Flooding and Runoff Pollution
- Figures 3c, d, and appendix F
    - We have included this as an interaction chain between Wildfire #1> Runoff Pollution #5> Erosion & Accretion
- Section 3.4: We have clarified discussion on erosion and accretion driven hazards.

Thanks again for your time and for considering this work in detail. Best wishes from the Authors.

RC3:
https://doi.org/10.5194/egusphere-2025-5106-RC3

Thank you for providing comments on our manuscript, and for addressing its importance as a topic. Your comments, particularly surrounding debris flood/flow terminology, have improved the clarity and overall quality of communication of this work. We reply to each comment in turn:

Your major comment here is regarding the difference between debris flood and debris flows and the accuracy of our use of these throughout the manuscript. To help clarify our use of these terms we will include a Table of Terminology (Table D1, Appendix D) in which we have defined our use of all terms used in this paper. This includes references to hydrological and geomorphological theory.

We have reviewed each use of debris flood or flow in the paper and ensure we have evidence for the correct use of these terms.

We note that 'mudslides' remain in Table 2 with reference to the May 2024 event as this is what was described in the grey literature. We also note that (mud)slides have been included in the HIP (2025) terminology [GH0304].

Line-by-line comments:

L47: Agreed, thanks for sharing this paper, it's been included as a citation.

L56: We have removed reference to the thin atmosphere as the literature on lower CO2 levels at higher elevations being a limiting factor of plant growth was non-specific for the region.

Fig 1: Yes, we agree that BARC is a more commonly used method of post-fire severity classification however it requires ground validation. Here we have used dNBR as we were not able to do ground validation considering this is a retrospective study. We are confident this is a suitable form of burn severity classification in this scenario.

Fig 2:

- Thanks for noting this error, these have been mis-numbered in the figure and 14 should be the positive feedback loop.
- Fluvial Floods > Runoff Pollution has been added (#6*)
- Thanks for this suggestion - here we are defining landslides in relation to the river channel only which has now been clarified in the Table of Terminology

L159: Agreed and updated

L163: Here we use the term 'burn severity' because we are using the spectral response from Landsat data in a dNBR analysis. When using dNBR only 'burn severity' is considered the degree to which the ecosystem has been altered by fire. We cannot separate out into 'soil burn severity' or 'vegetation burn severity' as we have not done ground validations of vegetation or soil conditions. We have clarified this in the Methods section [Line 138]

Table 2: Thanks for highlighting this. Yes, the impacts listed are linked to the change in catchment hydrology driven by the post-fire conditions, however this comment highlighted the need for clarification of terminology.

L222: This return period is for 6hr duration event (Jacobs et al., 2016). The 2013 event was a debris flood which we have updated reference to throughout the manuscript.

Section 3.5: Yes, the pollution aspect is terrible. We are pleased that you have picked this up as we also hope that this helps bring more awareness of the problem.

L362: Thanks for this recommendation. We have included reference to risk assessment methods used in more developed regions (USA and Canada), and comment on how these methods might be less standardized in developing regions where high-mountain wildfires are an emerging risk.

Thanks again for your time and for considering this work in detail. Best wishes from the Authors.