



27 October, 2023

Dear Editor and Reviewers,

Thank you for your recent communications and comments regarding our paper, *Brief Communication: An Ice-Debris Avalanche in the Nupchu Valley, Kanchenjunga Conservation Area, Eastern Nepal*.

Your concerns and our responses are shown below:

**While Reviewer #1 is now satisfied with the revised manuscript, I share the concerns of Reviewer #2 that:**

**1. The paper still lacks consideration of how typical such events could be in this region.**

To address Reviewer #2's request to include information regarding the (a) frequency/magnitude of events such as the Nupchu ice/debris flow, and (b) their relation to climate change, we have revised the following paragraph under the Discussion section, starting at line 144, as follows:

*Still, the acceleration of torrent-like pulses of debris upon the historic debris cone since 2020 suggests that these events may be linked to contemporary warming trends, similar to those that may have triggered larger-scale mass wasting events elsewhere in the Himalaya (e.g., Shugar et al. 2021; Kääh et al. 2021; Taylor et al. 2023). The frequency of such ice-debris flow events within the KCA region, and more broadly across the Himalaya, is unknown. However, with projections of continued warming in these regions (e.g., Lalande et al. 2021), a more systematic approach to determining their historic frequency, as well as a better understanding of their triggers, is warranted. After further evaluation, vulnerable villages, such as Kampuchen, may wish to consider the installation of preventative floodwater diversion mechanisms, such as the rock-filled gabion walls currently protecting tourist lodges in the Mt. Everest region (e.g., Rounce et al. 2017; Byers et al. 2022) using participatory processes as outlined in Watanabe et al. (2016).*

Note that the paragraph above also includes a new reference (i.e., Lalande et al. 2021) to climate change trends in the High Mountain Asia region as well.

**2. The tracked changes and lack of clarity in some aspects of the response letter (for example, Figure xxxx) give the impression that careful review of the materials was not completed before submission.**

We apologize if the response to and figure for the paper's selection of DEM model was not entirely clear. We have revised the response to now read as follows:

90: Why specifically this DEM, not e.g. the HMA DEM?

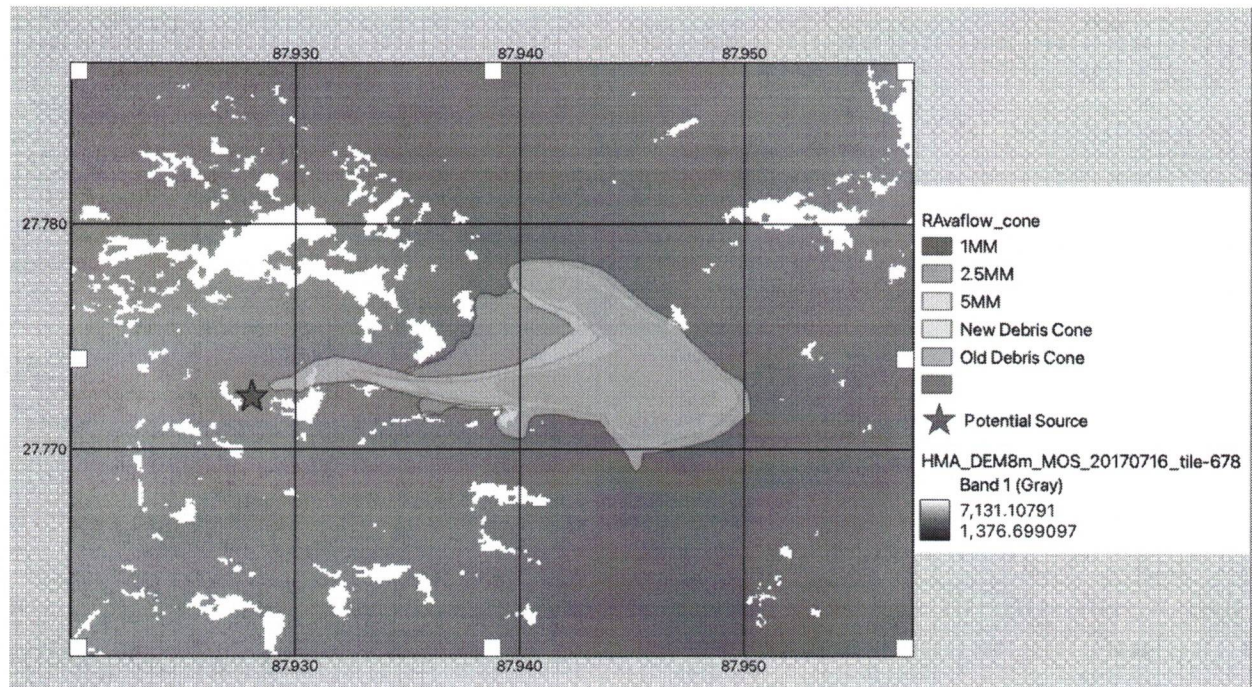
***Thank you for this suggestion. Our initial simulation was conducted on the ALOS-PALSAR DEM since prior research (e.g., Bhardwaj, 2019; Shawky et al. 2019) suggested it had the best resolution and elevation accuracy in mountainous and rugged terrain. Given this suggestion, we investigated the use of the HMA DEM (Shean 2017) but found that there are several data gaps (Figure 1) within our simulation area that would require data interpolation to make it suitable for study. As we do not expect significant sensitivity in the model results to modest changes in the input DEM, we feel that the use of the original DEM is sufficient.***



Bhardwaj, A. (2019). Assessment of Vertical Accuracy for TanDEM-X 90 m DEMs in Plain, Moderate, and Rugged Terrain. The 2nd International Electronic Conference on Geosciences, 8. <https://doi.org/10.3390/IECG2019-06208>

Shean, D. (2017). High Mountain Asia 8-meter DEM Mosaics Derived from Optical Imagery, Version 1 [Data Set]. Boulder,

Shawky, M., Moussa, A., Hassan, Q. K., & El-Sheimy, N. (2019). Pixel-based geometric assessment of channel networks/orders derived from global spaceborne digital elevation models. Remote Sensing, 11(3). <https://doi.org/10.3390/rs11030235>



**Figure 1: HMA DEM elevations [m] in the vicinity of the debris flow. Data gaps in the model domain would require interpolation in order to be suitable for simulations.**

Thank you again for kind attention to and interest in our Brief Communications submission. Please feel free to contact me at any time if there are any remaining concerns or questions.

Sincerely,

Alton

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