Dear Sunwi Maskey,

We sincerely thank you for your thoughtful and constructive suggestions on our manuscript "*Brief communication: A landslide-induced winter outburst from a frozen glacial lake in the Central Himalaya.*" We greatly appreciate your recognition of the scientific value of this case study and your encouraging assessment that it is "perfectly suited as 'brief communication' in The Cryosphere." Your comments have been invaluable in improving the clarity and impact of our work.

Below, we provide our point-by-point responses to your comments. All revisions have been made in the revised manuscript with changes highlighted.

Reply

General:

This manuscript presents a case study of a winter outburst flood from a glacial lake, triggered by a rock avalanche. Two rock avalanches originating from a permafrost rock slope at the uppermost section of Pida Lake collapsed, with fragmented rock mass falling partly onto the frozen glacial lake surface and partly onto the glacier terminus. This generated a sub-ice impulse wave that triggered a flash flood. The documented event demonstrates that winter hazards in frozen lakes are likely to become more frequent as paraglacial slope failures increase, and that the occurrence window for GLOFs in high-mountain regions will widen as lake ice cover diminishes in winter. The manuscript emphasizes the importance of monitoring winter conditions and incorporating glacial lake ice phenology into GLOF hazard assessments.

We thank the reviewer for this accurate and comprehensive summary of our work. We are pleased that the key messages and scientific contributions of our study are clearly understood.

The author should further describe the geological/geomorphological setting of the surrounding slopes and moraine to verify the presence of permafrost in the area and should include relevant climatic conditions of the region.

We agree entirely with this important suggestion. A thorough description of the geological/geomorphological setting and climatic conditions is essential to verify the presence of permafrost and to contextualize the slope failure mechanisms. We have added explicit emphasis on the cold-dry climatic conditions of the study region and the permafrost characteristics. Specifically:

In Section 2 (lines 83-85 in revising version), we have expanded the description of climate in this region:

" It is a highly permafrost-affected catchment, with mean annual air temperatures below -3.6°C and average relative humidity of about 40%, characterized by the cold-dry climate zone in the Central Himalaya (Banerjee and Sati, 2026)."

In Section 4 (lines 160-162 in revising version), we have strengthened the connection between glacier retreat, permafrost degradation and rock failure:

"The rock slope failure occurred in a permafrost-affected bedrock wall that has been progressively de-buttressed by glacier retreat. The cold-dry permafrost conditions in this region make rock slopes particularly susceptible to thermal-mechanical stress changes during rapid temperature fluctuations."

The case study offers an interesting account of the sub-ice impulse wave, which lifted the marginal lake ice near the end moraine, creating an "ice tsunami." The observed removal of river ice in the downstream valley further supports understanding of the flow mechanism. The combination of ground observations and remote sensing evidence used to reconstruct the event is well presented. Given these strengths, submitting this work to “The Cryosphere” as a Brief Communication is well suited to the journal's scope.

We sincerely thank you for your positive and encouraging assessment of our manuscript. Your recognition of the scientific value of this case study—particularly the sub-ice impulse wave dynamics, the "ice tsunami" phenomenon, and the integration of ground observations with remote sensing evidence—is greatly appreciated. We are also delighted that you concur with our assessment that this work is well-suited for publication as a “Brief Communication” in The Cryosphere.

A few minor comments and recommendations are provided below:

Minor remarks:

Line 18: broke (not broken)

Revised.

Line 24: Better to rephrase as: “…. danger and to incorporate lake-ice condition into future GLOF risk-assessments/ early warning systems as one of the monitoring parameters under relevant safety protocols.”

Thanks, we have modified the text as your suggestion.

Line 52: Better as: “…out of all 687 total GLOF events, less than five were from November to March”

Revised as your suggestion.

Line 52/53: Slightly unclear as to the number of events from November to March. First, it is mentioned, that only 5 out of 687 were from November to March but then it is mentioned 325 date confirmed failures took place within the same month. Is the figure 5 in percentage?

Sorry for the confusion. The 687 were total numbers of all type GLOFs, and the 325 were for the type of moraine-dammed lake type. We revised the text as:

In High Mountain Asia (Shrestha et al., 2023), out of all 687 GLOFs events (all types), less than five were from November to March, and all 325 date-confirmed moraine-dammed GLOFs took place between March and November (further 74% of cases occurred between June and August).

Line 59: Better as: "overlaps with"

Revised.

Line 70: Better write as: "It is a permafrost dominated catchment…."

We prefer to use "highly permafrost-affected catchment" because

Line 97: Check Figure label, must be "Fig 1 e-g"

Yes, you are right. Revised.

Line 123-126: Maybe rephrase it as such: "The second rock avalanche with a volume of ~4.29Mm3 occurred from the same slope in the late afternoon of 16 December, leaving a distinct scraped edge line on the cliff wall. An estimated volume of ~2.86 Mm3 from this avalanche struck the frozen lake impacting the lake ice."

Thanks for your suggestions. Also following Wilfried's suggestion, we have modified the text as:

The second landslide occurred in the late afternoon of 16 December. A volume of 4.29 Mm^3 collapsed from the upper part of the same glacially de-buttressed permafrost slope, leaving a distinct scarped edge line on the cliff wall. An estimated part of ~2.86 Mm^3 of this rock-ice avalanche directly struck the frozen lake. This impact generated a sub-ice impulse wave that fractured the ~35 cm thick lake ice, producing an "ice tsunami" with ~10 m run-up, and triggered a down valley flash flood.

Line 129-130: Maybe better as: "Following this collapse, another section of glacier ice (~250m×27m) across the entire glacier tongue calved away."

Revised as your suggestion.

Line 135: Sufficiently (not insufficiently)

No, here we would like to say that the lake ice was not sufficiently thick, then the landslide broke the lake ice and mass was not seen on the near-terminus lake ice surface.

Line 152/153: Better as: "…during which a noticeable drop in the air and lake water temperature were observed."

Revised as your suggestion.

The numbers and labels in Figure 1 are difficult to read, specially in 1 (a), a rearrangement or a separation of the graphs is recommended.

We have improved Figure 1 to enhance the text presentation. Due to the limitation of figure numbers of the Brief communication paper, we kept it in one figure and did not separate it. See above the modified Fig 1.

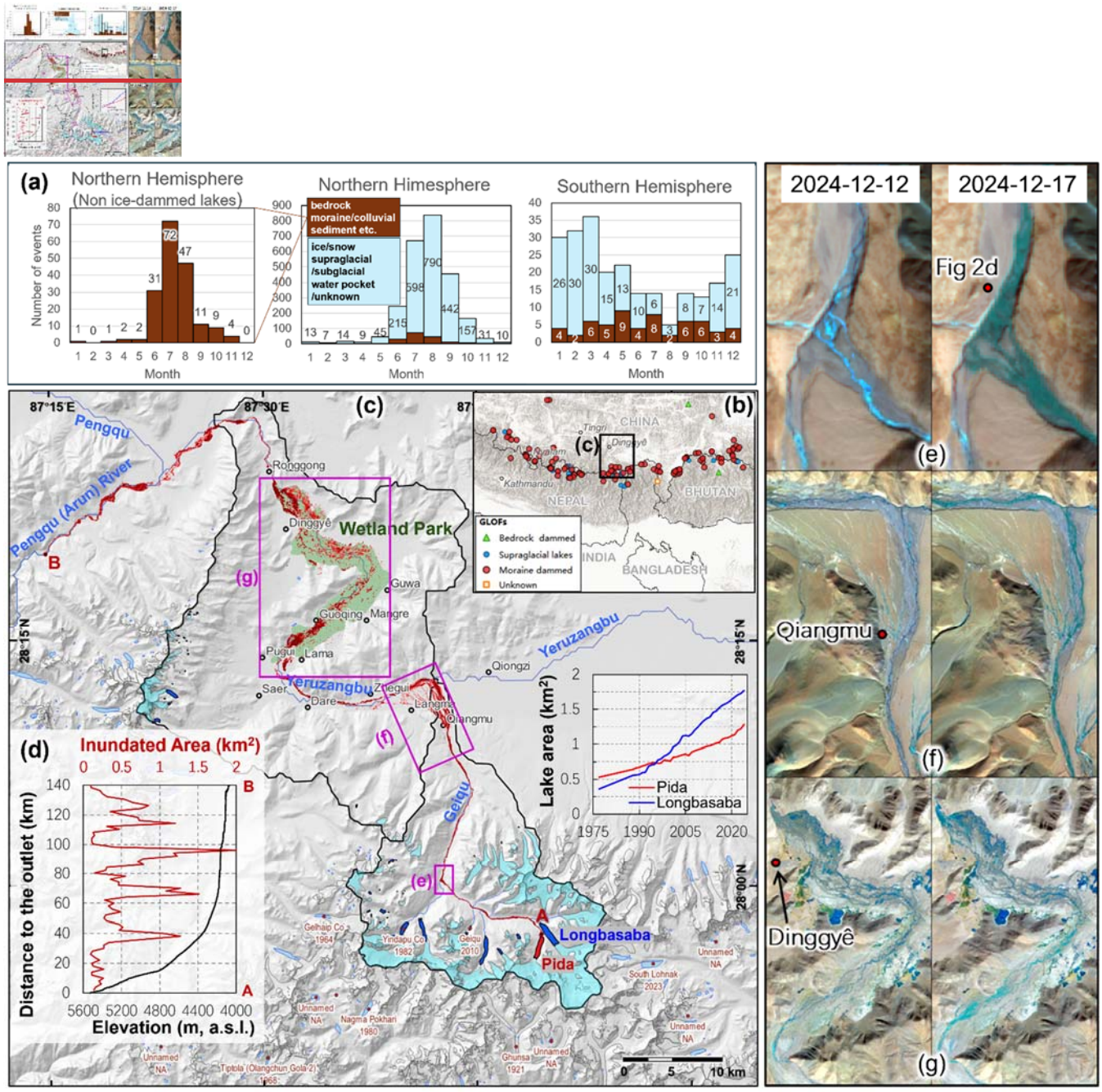

Fig 1. (a) Seasonal distribution of globally reported GLOF events in the Northern and Southern Hemispheres. The plot incorporates 2,753 month-confirmed events out of 3,151 reported worldwide GLOFs (Lützow et al., 2023), grouped into (1) non-ice dams (bedrock, moraine, colluvial, etc.) and (2) ice-dammed sources (ice, snow, subglacial, supraglacial, water pocket, etc.); totals are given on each bar. Icelandic cases (590) are excluded because >95% were by geothermal/volcanic activity or ice-dammed lakes. (b) GLOFs in the Central Himalaya coloured by different dam types. (c) Location and distribution of glaciers and glacial lakes in the Geiqu River basin and surroundings,