Rapid Hazard Assessment Report

Location: Kondus, Karmanding, Ghanche, Baltistan

Country: Pakistan

Lat: 35.267650°N - Lon: 76.686532°E - Elevation: 3022 m a.s.l.

Date: 24th July 2025

Local time: Unknown

Hazard type: Debris flow

Imagery: (Source: Planet SuperDove, 21st July of June, 27th of July)

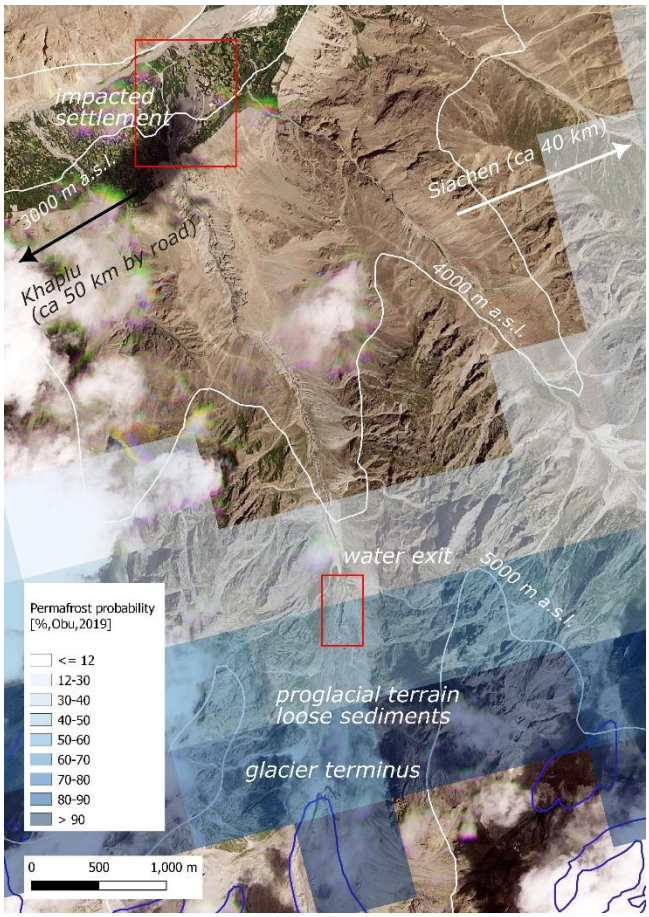

Figure 1: Overview over the debris flow event, with exit of the main water source (possibly collecting under the rock coverered proglacial permafrost) and impacted settlement ca 5km downstream.

Preliminary process understanding:

On the 24th of July, as multiple high intensity precipitation events hit Gilgit Baltistan, a debris flow originated ca 1km below the terminus of a glacier in the Karmanding area in Ghanche, Baltistan (Figure 1) at an elevation of 4300 m. The flow visibly started below permafrost features and possibly contained melt water from the glacier as potentially previously accumulated water in the permafrost area. Permafrost maps indicate the source area to be exactly at the transation of possible permafrost to definite permafrost (Figure 1), where recent changes have likely occurred in terms of permafrost thaw. Large amounts of unconsolidated sediments in the source and path

area increased the impact. The flood reached part of the Kondus settlement at 3000 m and destroyed 50 houses completely, displacing large parts of the population[1].

While precipitation was not extreme at the time of the event, temperatures in Khaplu were between 5 and 10°C above the average for the season, suggesting strong forcing potential for extreme melt and thaw. The region features hardly any lakes and no lake drained in this event, contrary to other reports and previous records of GLOFs in the area.

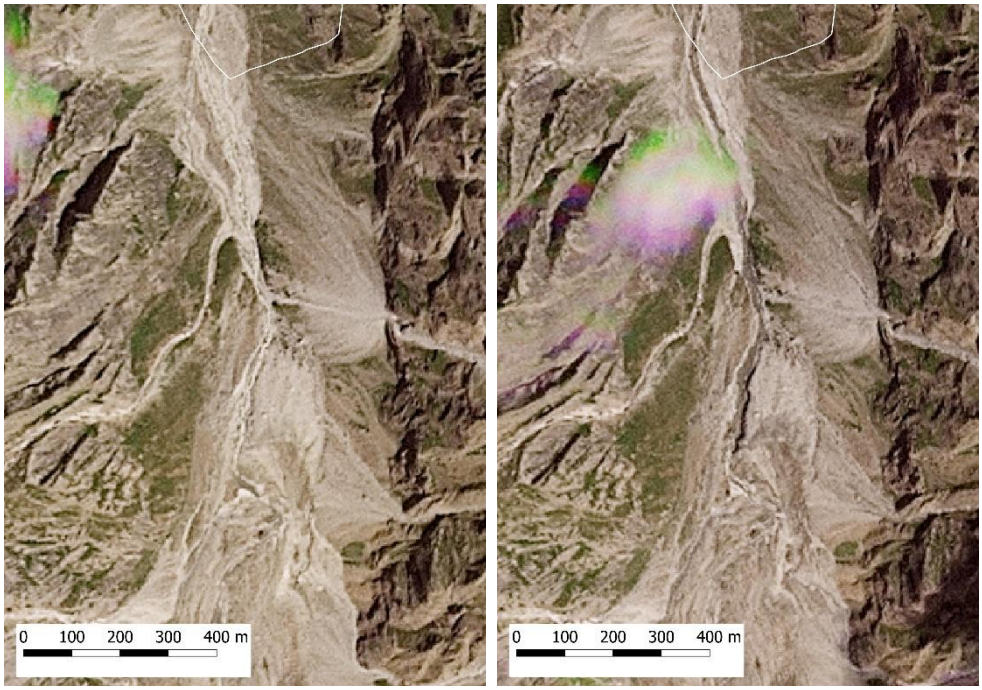

Figure 2: Source area before (21st of July) and after (27th of July). Note that no lake is visible and this is therefore not a GLOF. In general hardly any lakes are present in this region.

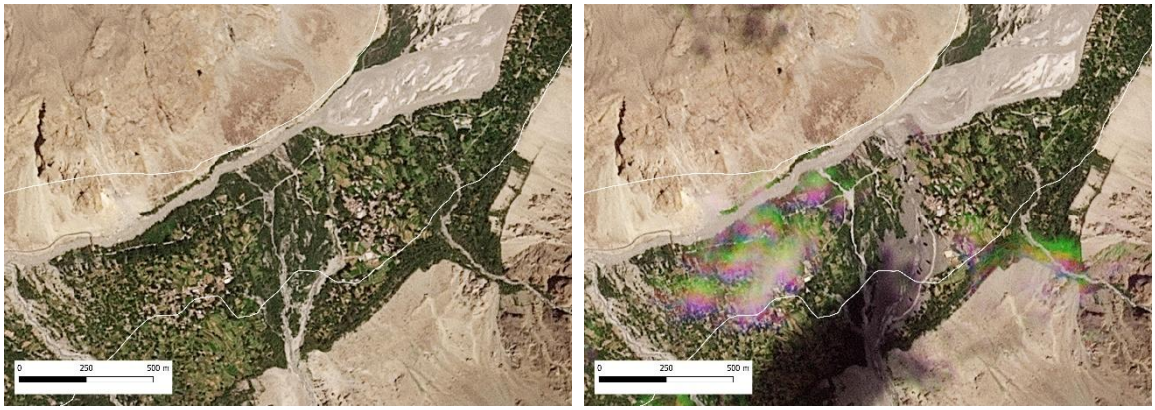

Figure 3: Part of the Kondus settlement destroyed by the flood (0.2 km²).

Climate change context: No research exists on the cryosphere in the area, apart from recent regional studies of rock glaciers (Hassan et al., 2024), not present though in this catchment. The area has however likely seen permafrost change and glacier ice retreat that could have led to larger amounts of sediments available for such events.

[1] https://www.facebook.com/reel/1081251343556771, https://www.dawn.com/news/1927003

Socioeconomic risk context: The debris flow caused widespread likely irreversible damage to infrastructure and agricultural land, across an area of 0.2 km^2.

Early warning: Not in place.

Potential for recurring events: Due to the large amount of unconsolidated sediments at the terminus of the glacier, future likely smaller flood events during the same year are likely.

Similar events/frequency: Previously, debris flow events (largely misclassified as GLOFs) were reported but not properly documented in the valley.

Literature:

Hassan, J., Berg, D. L., Lippert, E. Y. H., Chen, X., Hassan, W., Hassan, M., Hussain, I., Bazai, N. A., & Khan, S. A. (2024). Rock glacier distribution and kinematics in Shigar and Shayok basins based on radar and optical remote sensing. *Earth Surface Processes and Landforms*, *49*(7), 2278–2290. https://doi.org/10.1002/esp.5820