Supplementary Figures

Figure S1. Histogram of elevation differences between 30 December 2018 and 30 April 2021 in the flat off-glacier terrain for the uncertainty estimation. The relative stable region in the left bank of Sedongpu valley were selected for checking the DEM differencing accuracy
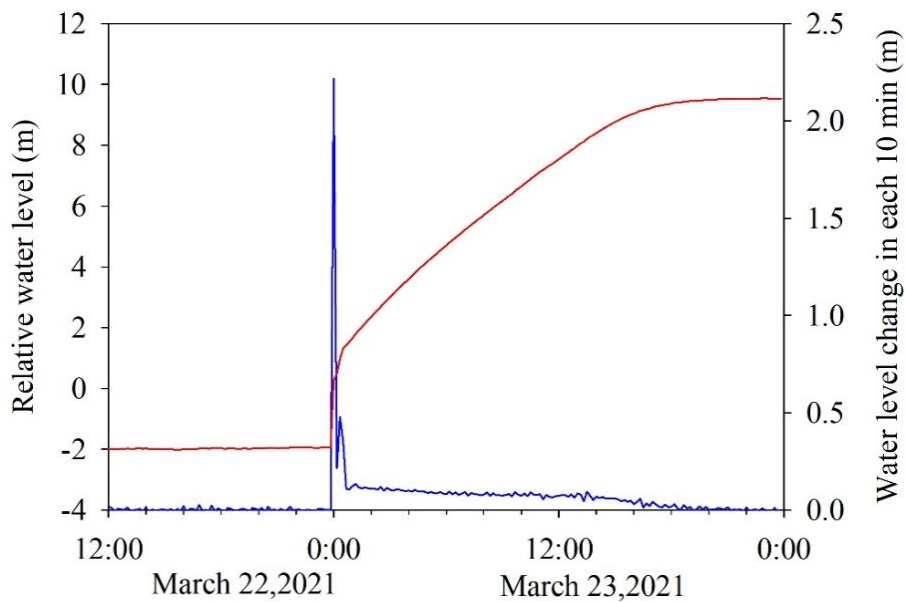
Figure S2. The relative water level (red line) and its changing rate at 10 min interval (blue line) when the Brahmaputra River was blocked by the ice-rock avalanche on 22 March 2021.

Figure S3. Photo taken on October 2019 showing perched ice mass on the mountain ridgeline before the 2021 ice-rock avalanche.
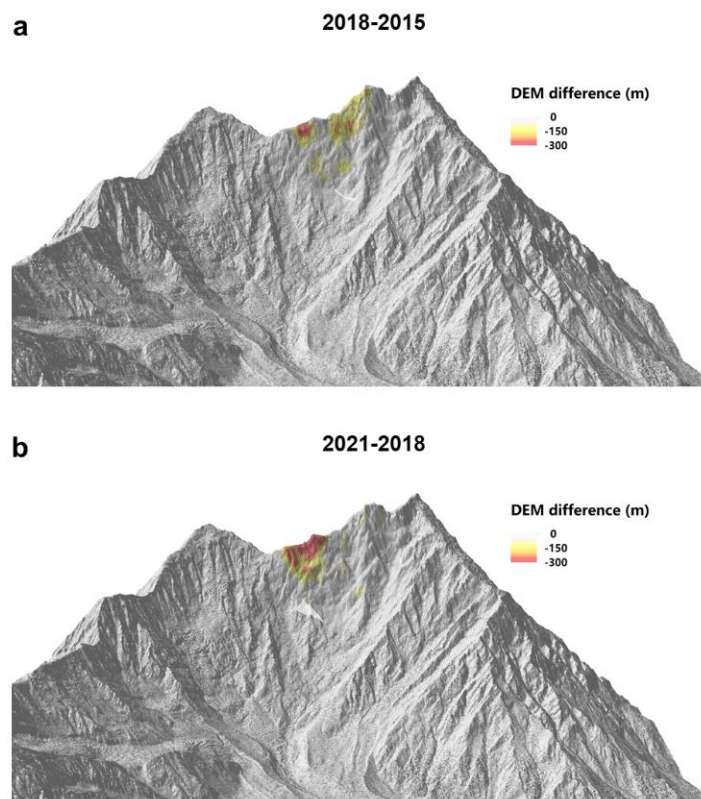
Figure S4. Source regions and magnitudes of ice/rock avalanches during the period from November 2015 to December 2018 **(a),** similar data of Kääb et al., 2021 (SPOT6 on 13 December 2015 and Pléaides image on 30 December 2018) and during the period from 30 December 2018 to 30 April 2021**(b).**
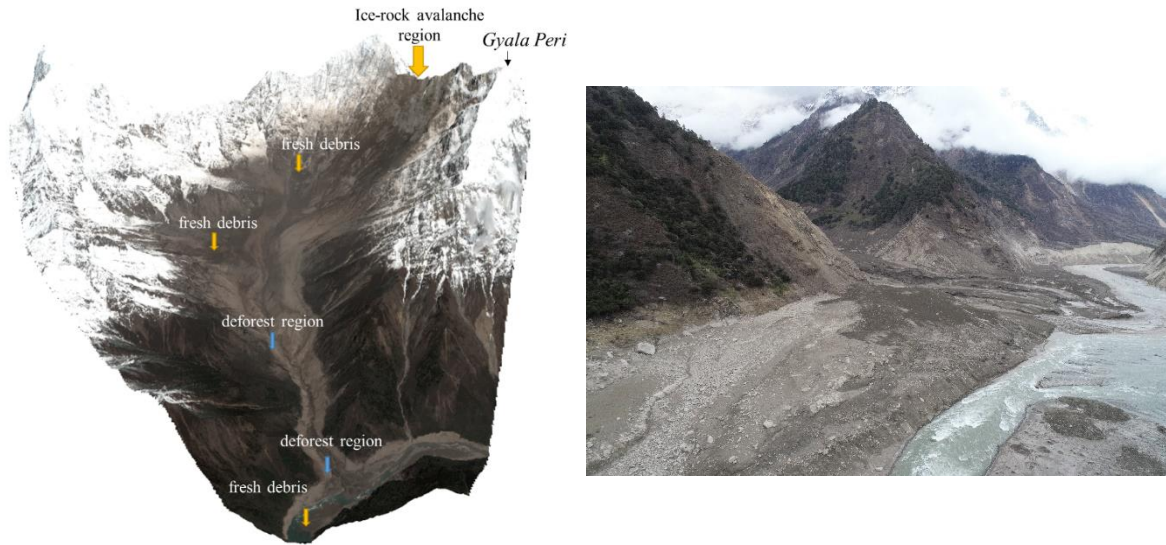
Figure S5. The 0.5m-resolution Pléaides image on 30 April 2021 showing the fresh debris deposition and a large extent of destroyed mature forest in the Sedongpu basin (left) and the photo taken on 25 March 2021 showing the less fresh avalanche debris near the outlet of Sedongpu Basin.
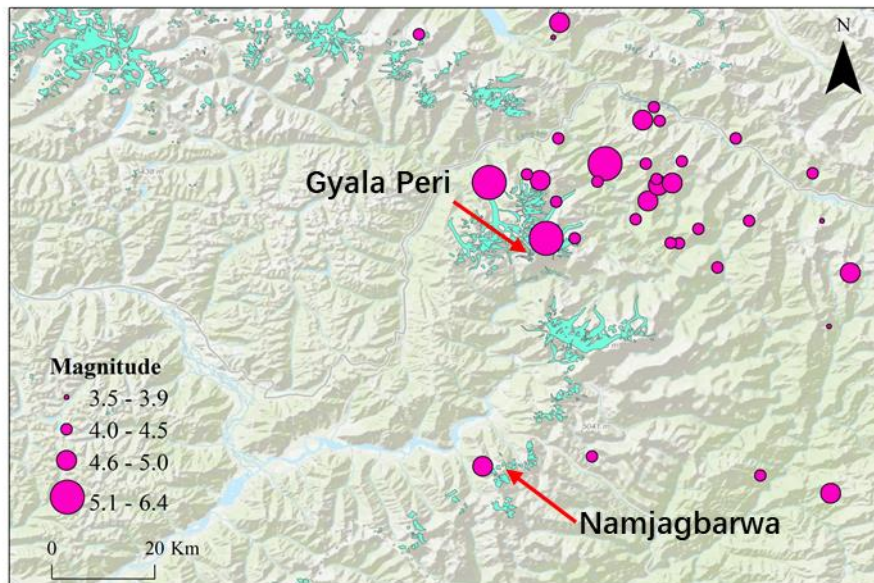
Figure S6. Spatial distribution of earthquakes with magnitude above 3.5 M since 2000 around two glacierized regions of Gyala Peri(7294 m asl) and Namjagbarwa(7782 m asl).
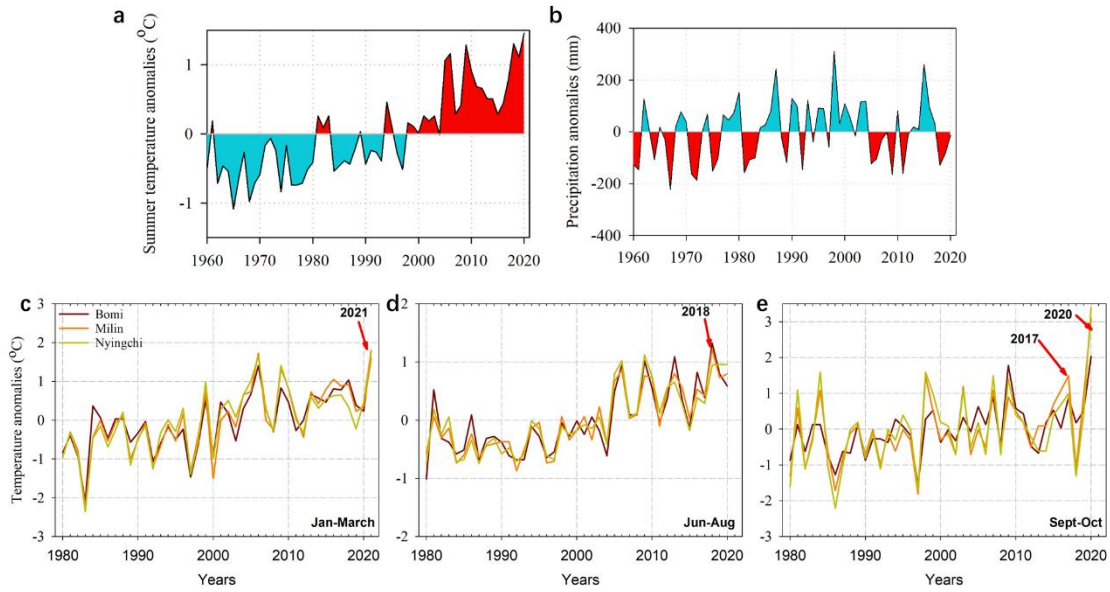
Figure S7. a-b, Anomalies of mean air temperature during the ablation season (June-September) and the total annual precipitation at the Nyingchi station. **c-e,** Similar to Fig.3d-f, but the anomalies of mean air temperature recorded by the three nearest meteorological stations (Bomi, Milin, Nyingchi), corresponding to the massive disasters in October 2017, October 2018 and March 2021.
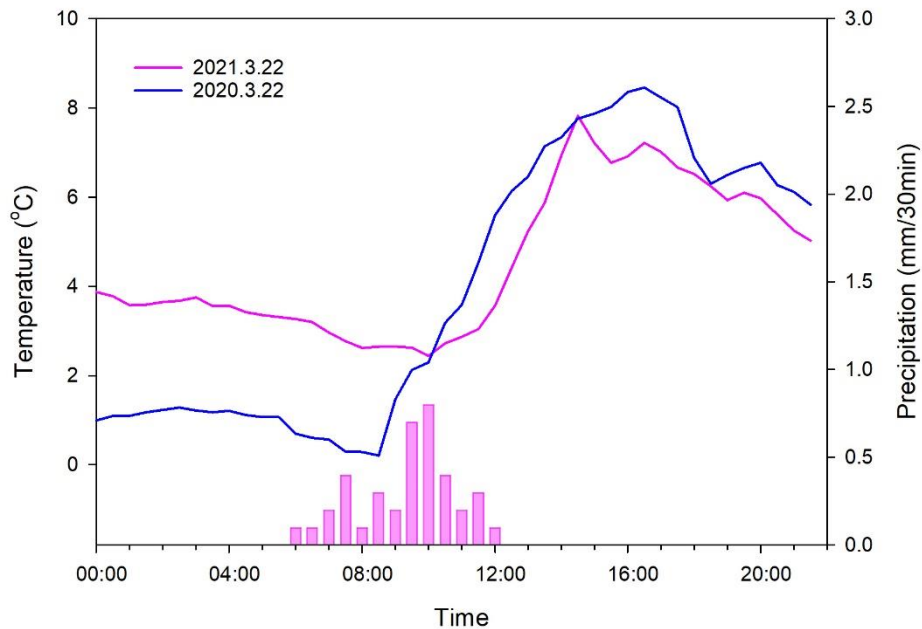
Figure S8. Comparison of air temperature and precipitation on 22 March 2020 and 22 March 2021 recorded at the AWS near the outlet of Sedongpu basin, showing the higher air temperature on night and total daily precipitation of 3.9 mm before ice-rock avalanche on 22 March 2021.