



Spatio-temporal variability of snow accumulation on the Biafo and Hispar glaciers in the central Karakoram

Alexander Raphael Groos¹, Christoph Mayer², Astrid Lambrecht², Sabrina Erlwein³, and Margit Schwikowski⁴

¹Institute of Geography, University of Bern, Bern, Switzerland (alexander.groos@giub.unibe.ch)

²Bavarian Academy of Sciences and Humanities, Munich, Germany

³Chair for Strategic Landscape Planning and Management, Technical University of Munich, Freising, Germany

⁴Laboratory of Environmental Chemistry, Paul Scherrer Institute, Villigen, Switzerland

The Karakoram is an extensively glacierised mountain range in the western part of High Mountain Asia and constitutes an important source of fresh water for millions of people in the Indus Basin. Over the last years, the Karakoram has attracted increasing attention due to an anomalous glacier stability, which contrasts the progressing ice mass loss across the Himalaya. Decreasing summer temperatures and increasing winter precipitation have been proposed as potential causes for the anomaly. However, the lack of snow accumulation studies and long-term meteorological measurements above 3,000 m a.s.l. hampers the corroboration of this hypothesis. To quantify the spatial and temporal variability of snow accumulation in the central Karakoram, we followed the track of a Canadian research expedition from 1986. We reinvestigated eight sites between ca. 4,400 and 5,200 m a.s.l. in the connected accumulation zone of the Biafo and Hispar glaciers in 2019. Density measurements were performed in each snow pit down to the summer horizon of the previous year to quantify the elevation-dependent amount of annually accumulated snow. In addition, snow samples were collected from three selected pits for the analysis of rare earth elements and stable water isotopes to constrain the origin and seasonality of the deposited snow. Finally, we compared our recent measurements with the 30-year-old results from the Canadian research expedition as well as independent meteorological data. In doing so we aim to evaluate the hypothesised increase in winter precipitation in this region.