Submitted Abstract

ID IMC22-FSAbstr- 661

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Organisations	Chair of Climatology, Technische Universität Berlin, Germany
Country	Germany
Region	Western Europe
Title	Climate Trends And Patterns Over High Mountain Asia As Resolved By The High Asia Refined Analysis Version 2.
Keywords	Climate Change, High Mountain Asia, Dynamical Downscaling
Type	List Of Focus Session
Focus Session ID	09

Abstract

High Mountain Asia (HMA), also known as the “Third Pole”, is the largest reservoir of glaciers outside the polar regions. On average, glaciers have retreated over HMA, except for the Pamir-Karakorum-western-Himalaya region. Under the background of global warming, glacier retreats and consequential expansion of glacier lakes will increase the risk of glacier-related natural hazards, such as landslides and glacial lake outburst floods.

To understand the physical linkage between local-scale glacier changes and large-scale climate, it is essential to investigate climate change over the past decades in HMA. Although this topic has already been extensively studied, some inconsistencies and open questions still remain. For example, climate change over high-elevated areas (> 5000 m a.s.l.), where most glaciers are located, is still not fully understood mainly due to the lack of meteorological stations at high elevations.

Using the high-resolution, long-term High Asia Refined analysis version 2 (HAR v2), we are able to analyze trends and spatio-temporal patterns of essential climate variables, such as precipitation and air temperature, for the HMA region from 1981 to 2020. The HAR v2 was generated by dynamical downscaling of ERA5 using the Weather Research and Forecasting model. With a high spatial resolution of 10 km, the HAR v2 has a more realistic representation of complex terrains over HMA. Thus, the HAR v2 would exhibit more detailed regional-scale patterns than its forcing data ERA5. In addition, the linkage between the detected large-scale climate change and local changes of glaciers is discussed, with a focus on the Halji glacier (~5300 m a.s.l.) located in northwestern Nepal.