

Local contrasting weather dynamics as a potential control of the Karakoram anomaly

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Consistent with the global trend, glaciers in the central Himalayas are retreating due to rising temperatures. However, glaciers in the Karakoram region appear stable or even gaining ice mass. This phenomenon is commonly called the Karakoram anomaly and is not fully understood yet. The two regions have contrasting climates, since Westerly winds dominate the climate in the Karakoram, while the climate in the Central Himalayas is monsoon dominated. In this study, the WRF (Weather Research and Forecasting) model is used at 500 meter grid spacing to simulate two representative catchments for the two contrasting regions. To gain more insight into possible controls of the Karakoram anomaly, the differences in (local) climate are studied. The months July 2010 and February 2011 are simulated to represent a summer and winter month respectively. A systematic assessment is made of the two catchments regarding key drivers of the glacier mass balance, e.g. precipitation, temperature, wind speed and the surface energy balance. Results show large differences between the timing, magnitude and elevation dependence of key meteorological variables that directly influence the glacier mass balances and the associated hydrological regime. Our results indicate that it is essential, both for understanding glacier behaviour and the hydrological response, to quantify spatio-temporal variation in local circulation using high-resolution weather models. In subsequent research we will link our model results to a high-resolution glacier model for a longer period to test whether the Karakoram anomaly can be explicitly explained by the local differences.