EGU21-14149
https://doi.org/10.5194/egusphere-egu21-14149
EGU General Assembly 2021

Freshwater input into a low-Arctic Fjord in West Greenland: Timing, drivers and model evaluation

Jakob Abermann[1,2], Kirsty Langley[2], Sille Myreng[2], Dorthe Petersen[2], Kerstin Rasmussen[2], and Stefanie Peßenteiner[1]

[1]Department of Geography and Regional Science, University of Graz, Austria
[2]Asiaq, Greenland Survey, Nuuk, Greenland

The majority of the freshwater input from Greenland stems from the Greenland Ice Sheet. Despite its importance in terms of freshwater totals, there is a much higher number of individual catchments disconnected from the ice sheet contributing on average about 26% of the total Greenland freshwater flux. Most of those catchments have local glacier cover, only very few of them are instrumented and little scientific literature exists. We present a dataset of 12 years of discharge of four catchments less than 15 km apart, that are different in size (between 7 and 32 km²), local glacier coverage (4-11%) and lake cover (0-5%). They all drain into Kobbefjord, a well-studied fjord in West Greenland, near Greenland's capital Nuuk. We find that annual specific discharge totals vary greatly (between 1.2 and 1.9 m/yr on a 12-year average within 15 km) due to a general climatic gradient and different strengths of orographic shading. The seasonal cycle differs among the sites mainly due to different exposure to solar radiation as a driver for major snowmelt; small ice coverage in the catchments plays only a minor role in discharge variability. Dry years generally increase the magnitude of spatial gradients in specific discharge and no significant temporal trends have been found in the studied catchments. On the sub-daily scale, the presence and elevation of lakes determines the catchment's response during sunny days, leading to a difference in the timing of maximum discharge of between 7 and 12 hours depending on the site and the time of the year. The response of discharge to major precipitation events is discussed, where uniform reaction is found for the catchments with no lakes near the gauge and a delay of between 5 and 7 hours in the catchment with low-lying lakes. A comparison with a recently published modelled discharge time series on individual catchment scale shows the model's capability of reproducing both snowmelt and large-scale storm events; however, the strong spatial heterogeneity of discharge magnitude and timing as well as the presence and variability of base-flow is not captured. We discuss methods to combine observational data with existing model output in order to improve the potential of their combined usage on the Greenland-scale.