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Greenland ice sheet surface water vapour fluxes from automatic weather station records

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The mass balance of the Greenland ice sheet is influenced by surface water vapour fluxes. Sublimation and evaporation remove mass from the surface, while condensation and frost deposition adds mass. The energy spent on sublimation and evaporation cools the surface and thus reduces melting, whereas frost deposition and condensation will have the opposite effect. Box and Steffen (2001) estimated the net surface water vapour flux of the ice sheet using data from the Greenland Climate Network (GC-Net) automatic weather station (AWS) from 1995 to 2000. In the last 22 years, the Arctic has been warming at an increasing rate. This project aims to extend the work of Box and Steffen (2001) to the GC-Net AWS data up to 2022 and to investigate how the water vapour fluxes are influenced by arctic warming. The determination of instrument height is crucial for estimating water vapour fluxes but is complicated by the accumulation of new snow at the surface and by the AWS mast being raised periodically to keep the sensors from being buried. Here, we use field notes, photogrammetry and surface height change measured by acoustic sounders to reconstruct the instrument heights. For the time periods with two working levels of temperature, humidity, and wind speed data, we will estimate the net water vapour fluxes and compare with regional climate models.

Work Cited
- Box, J. E. and Steffen, K.: Sublimation on the Greenland Ice Sheet from automated weather station observations, J. Geophys. Res., 106, 33965–33981, https://doi.org/10.1029/2001jd900219, 2001.

Field of study

Earth & Climate Physics

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