

Recent North Greenland temperature warming and accumulation changes

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Abstract. In a warming climate concise knowledge of the mass balance of the Greenland ice sheet is of uttermost importance. Speculations that current warming will also increase the snow accumulation and mitigate mass balance losses are unconstrained as accumulation data in large regions of the northern Greenland ice sheet are scarce. We have reconstructed the accumulation from six North Greenland shallow firn cores and eight snow cores to constrain recent accumulation patterns in Northern Greenland, and we calculate recent warming in the same area using borehole temperature measurements.

We find an increase in temperatures in the north Greenland interior of 0.9 to 2.5 °C per decade over the past two decades in line with an arctic amplified anthropogenic warming. We compare annual reconstructed accumulation from the firn cores (1980-2015) to radar estimates and to annual re-analysis data of precipitation-evaporation from the Danish Meteorological Institute model (HIRHAM5). The spatial variability resembles that observed by other means with a clear increase west of the divide and a low accumulation area in North-East Greenland. Compared with earlier firn core estimates, our new accumulation estimates are generally larger. However, we do not find a general increasing trend in the time reconstructions possibly due to a high noise level in the records.

In the vicinity of the EGRIP deep ice core drilling site, we find variable accumulation patterns likely owing to local topographic effects as a result of the North East Greenland Ice Stream.