

Greenland Ice Sheet

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Cryospheric Data Records

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Abstract:

Regional "clear-sky" surface temperature increases since the early 1980s in the Arctic, measured using Advanced Very High Resolution Radiometer (AVHRR) infrared data, range from 0.57 ± 0.02 deg C to 0.72 ± 0.10 deg C per decade. Arctic warming has important implications for ice-sheet mass balance because much of the periphery of the Greenland Ice Sheet is already near 0 deg C during the melt season, and is thus vulnerable to rapid melting if temperatures continue to increase. An increase in melting of the ice sheet would accelerate sea-level rise, an issue affecting potentially billions of people worldwide.

To quantify the ice-surface temperature (IST) of the Greenland Ice Sheet, and to provide an IST dataset of Greenland for modelers that provides uncertainties, we are developing a climate-data record (CDR) of daily "clear-sky" IST of the Greenland Ice Sheet, from 1982 to the present using AVHRR (1982 - present) and Moderate-Resolution Imaging Spectroradiometer (MODIS) data (2000 - present) at a resolution of approximately 5 km.

Known issues being addressed in the production of the CDR are: time-series bias caused by cloud cover (surface temperatures can be different under clouds vs. clear areas) and cross-calibration in the overlap period between AVHRR instruments, and between AVHRR and MODIS instruments. Because of uncertainties, mainly due to clouds, time-series of satellite IST do not necessarily correspond with actual surface temperatures. The CDR will be validated by comparing results with automatic-weather station data and with satellite-derived surface-temperature products and biases will be calculated.

Keywords:

Greenland AVHRR MODIS ice temperature

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