A climate-data record of the "clear-sky" surface temperature of the Greenland Ice Sheet (Invited)

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We are developing a climate-data record (CDR) of daily "clear-sky" ice-surface temperature (IST) of the Greenland Ice Sheet, from 1982 to the present using Advanced Very High Resolution Radiometer (AVHRR) (1982 - present) and Moderate-Resolution Imaging Spectroradiometer (MODIS) data (2000 - present) at a resolution of approximately 5 km. The CDR will be continued in the National Polar-orbiting Operational Environmental Satellite System Visible/Infrared Imager Radiometer Suite era. Two algorithms remain under consideration. One algorithm under consideration is based on the split-window technique used in the Polar Pathfinder dataset (Fowler et al., 2000 & 2007). Another algorithm under consideration, developed by Comiso (2006), uses a single channel of AVHRR data (channel 4) in conjunction with meteorological-station data to account for atmospheric effects and drift between AVHRR instruments. 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 (Stroeve & Steffen, 1998; Wang and Key, 2005; Hall et al., 2008 and Koenig and Hall, submitted), time-series of satellite IST do not necessarily correspond to actual surface temperatures. The CDR will be validated by comparing results with automatic-weather station (AWS) data and with satellite-derived surface-temperature products. Regional "clear-sky" surface temperature increases in the Arctic, measured from AVHRR infrared data, range from 0.57±0.02 deg C (Wang and Key, 2005) to 0.72±0.10 deg C (Comiso, 2006) per decade since the early 1980s. 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. References Comiso, J.C., 2006: Arctic warming signals from satellite observations, Weather, 61(3):70-76. Fowler, Chuck, James Maslanik, Terry Haran, Ted Scambos, Jeffrey Key, and William Emery, 2000, updated 2007: AVHRR Polar Pathfinder Twice-daily 5 km EASE-Grid Composites V003, Boulder, Colorado, USA:

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