A Satellite-Derived Climate-Quality Data Record of the Clear-Sky Surface Temperature of the Greenland Ice Sheet

Dorothy K. Hall[1]
Josefino C. Comiso[1]
Nicolo E. DiGirolamo[2]
Christopher A. Shuman[3]
Jeffrey R. Key[4]
Lora S. Koenig[1]

[1]Cryospheric Sciences Branch
NASA Goddard Space Flight Center
Greenbelt, MD 20771
dorothy.k.hall@nasa.gov

[2]SSAI, Lanham, MD 20706
josefino.c.comiso@nasa.gov

[3]UMBC-JCET, Baltimore, MD 21250
christopher.a.shuman@nasa.gov

[4]Center for Satellite Applications and Research,
NOAA/NESDIS,
Madison, WI 53706 jkey@ssec.wisc.edu

Abstract

We have developed a climate-quality data record of the clear-sky surface temperature of the Greenland Ice Sheet using the Moderate-Resolution Imaging Spectroradiometer (MODIS) Terra ice-surface temperature (IST) algorithm. A climate-data record (CDR) is a time series of measurements of sufficient length, consistency, and continuity to determine climate variability and change. We present daily and monthly Terra MODIS ISTs of the Greenland Ice Sheet beginning on 1 March 2000 and continuing through 31 December 2010 at 6.25-km spatial resolution on a polar stereographic grid within ±3 hours of 17:00Z or 2:00 PM Local Solar Time. Preliminary validation of the ISTs at Summit Camp, Greenland, during the 2008-09 winter, shows that there is a cold bias using the MODIS IST which underestimates the measured surface temperature by ~3°C when temperatures range from ~-50°C to ~-35°C. The ultimate goal is to develop a CDR that starts in 1981 with the Advanced Very High Resolution (AVHRR) Polar Pathfinder (APP) dataset and continues with MODIS data from 2000 to the present. Differences in the APP and MODIS cloud masks have so far precluded the current IST records from spanning both the APP and MODIS IST time series in a seamless manner though this will be revisited when the APP dataset has been reprocessed. The Greenland IST climate-quality data record is suitable for continuation using future Visible Infrared Imager Radiometer Suite (VIIRS) data and will be elevated in status to a CDR when at least 9 more years of climate-quality data become available either from MODIS Terra or Aqua, or from the VIIRS. The complete MODIS IST data record will be available online in the summer of 2011.