

An introduction to the FY 2010 Fundamental Climate Data Records at National Climatic Data Center

Kenneth Knapp[†]; Lei Shi; Xuepeng Zhao; John J. Bates

[†] NOAA NCDC, USA

Leading author: Ken.Knapp@noaa.gov

NOAA's National Climatic Data Center (NCDC) initiated a satellite Climate Data Records (CDR) program to continuously provide objective climate information derived from weather satellite data that NOAA has collected for more than 30 years. As defined by National Research Council, a CDR is a time series of measurements of sufficient length, consistency, and continuity to determine climate variability and change. Projects have been carried out by principal investigators from US government agencies and universities. This abstract focuses on three satellite CDRs delivered to the NCDC CDR program in 2010, which include AVHRR Pathfinder atmospheres extended (PATMOS-X) reflectance, gridded satellite Data from International Satellite Cloud Climatology Project (ISCCP) B1 (GridSat-B1) IR window channel, and inter-satellite calibrated clear-sky HIRS channel 12 brightness temperatures. Data are stored in the netCDF format using standards that permit a wide variety of tools and libraries to quickly and easily process the data. Documentations such as algorithm descriptions and source codes are available for public access. The PATMOS-X CDR project produces and delivers level-2 all-sky reflectance for AVHRR channels 1, 2, 3a, and 3b and brightness temperature for the channels 4 and 5. The data are in 0.1 x 0.1 degree equal angle grid and cover a time period from 1978 to 2009 obtained from TIROS-N, NOAA-7, -9, -11, -12, -14, -15, -16, -17, -18, -19, and MeteoSat-2 satellites. The AVHRR observations have been inter-calibrated with the advanced MODIS observations retrospectively and formed a consistent and long-term fundamental climate data record (FCDR), which has been used to derive other important thematic climate data records (TCDR), such as cloud, aerosol, sea surface temperature, land surface temperature, etc. The ISCCP GridSat-B1 project archives a subset of the full resolution geostationary earth orbit (GEO) data at ~10 km resolution at 3 hourly intervals since 1983. Efforts at NCDC to make the data available include remapping the data to standard map projection, recalibrating the data to ensure temporal homogeneity, extending the record of observations back to 1978 and reformatting the data for distribution. The gridded dataset includes observations from the visible, infrared window and infrared water vapor channels. A novel data layering approach, together with sufficient satellite and file metadata allows users to access the data at varying levels of complexity based on their needs. The result is a fundamental climate data record already in use by the meteorological community. The inter-satellite calibrated clear-sky HIRS channel 12 brightness temperature CDR project archives daily data at swath resolution from 1978 to 2009. To minimize intersatellite biases, measurement adjustments are derived from overlapping HIRS data from the equator to the poles to account for the large global temperature observation range. Examination of the inter-satellite biases shows that the biases are scene temperature-dependent. Many overlapping satellites have bias variations of more than 0.5 K across the scene temperature ranges. An algorithm is developed to account for the varying biases with respect to brightness temperature. The work produces a climatologically homogenized time series used by global climate modelers and tropical convection researchers.