Data User Guide

AMSU/MSU Day/Month Temp Anomalies and Annual Cycle V5

Introduction

The AMSU/MSU Day/Month Temp Anomalies and Annual Cycle V5 datasets were derived from a series of microwave sounding instruments flown on a series of satellites. Daily Zonal and Monthly Temperature Anomalies for the middle troposphere on a global 2.5 degree grid are derived from both the Advanced Microwave Sounding Unit (AMSU) channel 5, and from the Microwave Sounding Unit (MSU) channel 2 using the Limb 90 correction. The dataset is available from January 1978 through October 2018.

Notice:
These version 5 datasets was active from 5 October 1999 to 25 October 2018, and has now been retired. The new version is now available:

- AMSU/MSU Midtroposphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA403)
- AMSU/MSU Lowtroposphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA402)
- AMSU/MSU Lowstratosphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA401)
- AMSU/MSU Tropopause Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA404)*
  *New dataset

AMSU/MSU Midtropo Day/Month Temp Anomalies and Annual Cycle Citation

Christy, John R and Roy W Spencer. 1999. AMSU/MSU Midtropo Day/Month Temp Anomalies and Annual Cycle[indicate subset used]. Dataset available online from the NASA Global Hydrology Center DAAC, Huntsville, Alabama, U.S.A.
DOI: http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA303

AMSU/MSU Lowstrat Day/Month Temp Anomalies and Annual Cycle Citation

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Keywords:

NASA, GHRC, AMSU, MSU, Lower stratosphere, lower troposphere, mid-troposphere, AMSU-A, infrared wavelengths, microwave, atmospheric temperature

Project/Instrument Description

Global temperatures have been monitored by satellites since 1978 with the Microwave Sounding Units (MSU) flying onboard the National Oceanic and Atmospheric Administration's (NOAA) Television InfraRed Operational Satellite-Next-generation (TIROS-N) series of polar-orbiting weather satellites. As the predecessor to the Advanced Microwave Sounding Unit (AMSU), the MSU was first launched onboard the TIROS-N satellite in October 1978 and provided global coverage (from Pole to Pole). The MSU carries a 4-channel microwave radiometer, operating between 50 to 60 GHz. The spatial resolution on the ground is about 2.5 degrees in longitude and latitude (about 250 km circle). There were 9 different MSUs launched onboard TIROS-N and NOAA-6 through NOAA-14 (excluding NOAA-13), respectively. These MSUs provided temperature measurements of the troposphere and lower stratosphere until 1998, when the first AMSU was deployed.

The first AMSU was launched in May 1998 on board the NOAA-15 satellite. So far, there are 8 AMSU instruments, 5 on NOAA platforms (NOAA-15 through NOAA-19), 2 on the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) platforms (Metop-A and Metop-B), and one on NASA AQUA satellite. The AMSU is a multichannel microwave radiometer installed on meteorological satellites. The instrument examines several bands of microwave radiation from the atmosphere to perform atmospheric sounding of temperature and moisture levels. The AMSU has two subinstruments, AMSU-A and AMSU-B. AMSU-A is a cross-track, line-scanning instrument

designed to measure scene radiances in 15 discrete frequency channels which permit the calculation of the vertical temperature and moisture profile from about 3 millibars (~45 km) to the Earth's surface. Each scan has 30 cells, with a resolution of 3.3 degrees (50 km at nadir). The swath width is about 2,343 km (96.66 degrees). The AMSU-A instrument is made up of two separate modules, A1 and A2. AMSU-A1 contains the 13 highest frequencies (50.3 - 89 GHz) of various polarizations. AMSU-A2 contains the two lowest frequency channels (23.8 and 31.4 GHz), both vertically polarized.

The AMSU/MSU Day/Month Temperature Anomalies and Annual Cycle V5 datasets are derived by combining MSU data on board TIROS-N, NOAA-6 through NOAA-14 (excluding NOAA-13) and AMSU data from NOAA-15, NOAA-18, NOAA-19, and AQUA.

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Data Characteristics

The AMSU/MSU Day/Month Temperature Anomalies and Annual Cycle V5 datasets consist of global temperatures for the lower stratosphere, mid-troposphere, and lower troposphere derived from MSU and AMSU radiance data. The datasets began on January 1, 1978 and retired on October 25, 2018. The data were available in netCDF-4 and ASCII formats at a Level 3 processing level. More information about the NASA data processing levels are available on the [EOSDIS Data Processing Levels website](#). These data are now retired and have a new version available; however, these version 5 data are available upon request. Table 1 provides the characteristics of the AMSU/MSU datasets.

Table 1: Data Characteristics

Characteristic	Description
Platform	Platforms for MSU: TIROS-N, NOAA-6, NOAA-7, NOAA-8, NOAA-9, NOAA-10, NOAA-11, NOAA-12, NOAA-14 Platforms for AMSU-A: NOAA-15, NOAA-18, NOAA-19, AQUA
Instrument	Microwave Sounding Unit (MSU), Advanced Microwave Sounding Unit-A (AMSU-A)

Projection	n/a
Spatial Coverage	N: 89.0, S: -89.0, E: 180.0, W: -180.0 (Global)
Spatial Resolution	2.5 degrees
Temporal Coverage	January 1, 1978 - October 25, 2018
Temporal Resolution	Annual
Sampling Frequency	Daily
Parameter	Atmospheric temperature
Version	5
Processing Level	3

File Naming Convention

The AMSU/MSU Day/Month Temperature Anomalies and Annual Cycle V5 datasets have the following file naming convention:

Data files:
t[lt|mt|s]monacg_5.0[.txt|.nc]
t[lt|mt|ls]glhmam_5.0[.txt|.nc]
t[lt|mt|ls]monamg.YYYY_5.0[.txt|.nc]
uahncdc_[lt|mt|ls]_5.0[.txt|.nc]
uahncdc_pen_[mt|ls]_5.0[.txt|.nc]

Table 2: File naming convention variables

Variable	Description
lt|mt|ls	Vertical ranges: lt: lower troposphere mt: mid-troposphere ls: lower stratosphere
monacg	gridded climatological monthly global temperature (30-year climatology from 1980 to 2010) *mon=monthly, ac=annual cycle, g=gridded
glhmam	regional monthly mean anomaly temperature since Dec. 1978 (global, southern hemisphere, northern hemisphere, tropics) *gl=global, hm=hemisphere, am=anomaly
monamg	gridded monthly anomaly temperature since Dec. 1978 *mon=monthly, am=anomaly, g=gridded
uahncdc	regional monthly mean anomaly temperature since Dec. 1978 (global, southern hemisphere, northern hemisphere, tropical, north pole, south pole, conterminous USA, conterminous USA and Alaska, Australian)

uahncdc_pen	regional 5-day mean anomaly temperature since Dec. 1978 (global, southern hemisphere, northern hemisphere, tropical, north pole, south pole, conterminous USA, conterminous USA and Alaska, Australian) *pen=pentad (a group or set of five)
YYYY	Four-digit year
.nc	netCDF-4 format
.txt	ASCII format

Data Format and Parameters

The AMSU/MSU Day/Month Temperature Anomalies and Annual Cycle V5 datasets consist of atmospheric temperature data files in netCDF-4 and ASCII formats. Main parameters include monthly anomaly temperature, climatological monthly mean temperature, and daily mean anomaly temperature. These data are now retired and have a new version available; however, these version 5 data are available upon request. More information about these version 5 datasets are available at https://www.nsstc.uah.edu/data/msu/docs/readme.msu.

Software

The data files in netCDF-4 format may be read using Python, IDL, or other common netCDF4 reader. Panoply can be used to easily view these data. No software is required to view the ASCII data files.

References

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Related Data

Other dataset containing parameters derived from AMSU measurements can be considered related to this dataset. These dataset can be located using the GHRC HyDRO 2.0 search tool, by entering the term 'AMSU'. These data are retired, therefore the new version 6 datasets should be used:

AMSU/MSU Lowstratosphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA401)

AMSU/MSU Midtroposphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA403)

AMSU/MSU Lowtroposphere Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA402)

AMSU/MSU Tropopause Day/Month Temperature Anomalies and Annual Cycle V6 (http://dx.doi.org/10.5067/GHRC/AMSU-A/DATA404)

Contact Information

To order these data or for further information, please contact:
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> 320 Sparkman Drive
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> Web: https://ghrc.nsstc.nasa.gov/

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