Maintenance and Production of CDR’s for Microwave Sounding Unit (MSU) and AMSU Atmospheric Temperatures and NCDC Special Sensor Microwave Imager (SSM/I) Brightness Temperatures

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NOAA Sponsor: NOAA

NOAA Office: NOAA’s National Climatic Data Center (NCDC)

Contribution to CICS Themes (%): Theme 1: %, Theme 2: 100%, Theme 3: %

Main CICS Research Topic: Climate Data and Information Records and Scientific Data Stewardship

Contribution to NOAA Goals (%): Goal 1: 100%, Goal 2: 0%, Goal 3: 0%, Goal 4: 0%, Goal 5: 0%

Highlight: MSU/AMSU brightness temperatures updated and transferred to CDR Archive at NCDC. SSM/I Version 7 brightness temperatures updated and transferred to CDR Archive at NCDC.

BACKGROUND

NOAA’s National Climatic Data Center (NCDC) Climate Data Record Program (CDRP) leads NOAA’s development and provision of authoritative satellite climate data records (CDRs) for the atmospheres, oceans, and land. This project addresses CDRP’s current need to sustain and maintain two specific CDRs derived from satellite microwave radiometers:

1. Atmospheric temperatures at multiple layers derived from the Microwave Sounding Units (MSUs) and Advanced Microwave Sounding Units (AMSUs)
2. Top of the atmospheric (TOA) brightness temperature ($T_b$) derived from the SSM/I on the F15 spacecraft and from the SSM/IS on the F17 spacecraft

The air temperature measurements began in late 1978 with the launch of the first Microwave Sounding Unit (MSU), and the SSM/I brightness temperature measurements began in 1987 with the launch of the first SSM/I on the DMSP F08 spacecraft. Both types of measurements will continue to be recorded with the ongoing operation of various Advanced Microwave Sounding Units (AMSUs) on NOAA, NASA, and EUMETSAT platforms and with the four SSM/IS on F16, F17, F18, and F19.

These measurements have been an important part of national (Climate Change Science Program (CCSP)) and international (Institute of Geophysics, Planetary Physics, and Signatures (IGPP)) assessments of climate change, as well as providing a basis for a number of independent studies of climate change. The continuation, validation, and improvement of these datasets are of fundamental importance to our ability to continue to monitor long-term changes in atmospheric temperature. The goal of this proposal is to ensure the continued production of high quality CDRs from both MSU/AMSU and SSMI/SSMIS.
ACCOMPLISHMENTS
The main focus of this project to date has been to transition the MSU/AMSU and SSM/I brightness temperature products from research to operations. The transition is complete and the focus of the project is now routine updates and transfers of data to NCDC as well as ongoing monitoring of the data stream. The two sections below summarize progress for each of the data products.

**MSU/AMSU**
The group has completed the following tasks for MSU/AMSU.

- Completion and approval of Quality Control and Quality Assurance Description Document.
- On-going routine transfers of the MSU/AMSU data in CF 1.6 compliant netcdf to NCDC on a monthly basis.

An example of the monthly atmospheric temperature anomalies from this dataset is shown below.

![Example of MSU/AMSU temperature anomaly](image)

*Figure 1: Temperature Anomaly in the lower troposphere for February 2014. The large positive anomaly over Eastern Europe contributed to poor snow conditions at the 2014 Olympics in Sochi, Russia.*

**SSM/I – SSMIS**
We have completed the following tasks for SSM/I – SSMIS.
• Completion and approval of Quality Control and Quality Assurance Description Document.
• Completion of code to write F17 data in netcdf4 format with approved CF-1.6 metadata.
• Conversion of the dataset to netcdf4.
• Transfer of all previous F17 data to NCDC.
• Ongoing production of data from F17
• Routine transfer of SSMIS F17 data to NCDC in netcdf4 format.

A daily map of the 37 GHz H-Pol brightness temperatures is shown below.

Figure 2: SSM/I 37 GHz H-Pol brightness temperatures for January 19, 2001. These data were obtained from the DSMP F13 satellite. Variations in the brightness temperatures are due to a combination of surface (temperature, emissivity) and atmospheric (water vapor, clouds, and rain) effects.

PLANNED WORK
• Develop simple automated validations tools for both MSU/AMSU and SSM/I brightness temperatures
• Continued production, reformatting and transfer of MSU/AMSU and SSM/I data to NCDC
• Ongoing monitoring and quality assurance of these data streams

DELIVERABLES
• Monthly Updates to the MSU/AMSU datasets, completed by the 10th of the following month
• Monthly Updates to the SSMIS F17 dataset, completed by the 10th of the following month
- Yearly Update to the SSM/I F15 dataset, completed after RSS extends the calibration for this instrument.

### PERFORMANCE METRICS

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