Climate Data Records from Microwave Satellite Data: A New High Quality Data Source for Reanalyses

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Current passive microwave sounder data, used in reanalyses and hydrological applications, are derived from POES satellites for which the primary mission is operational weather prediction. These data are not calibrated with sufficient stability for climate applications. A properly calibrated fundamental climate data record (FCDR) needs to be developed to enable the utilization of these data for Thematic CDR (TCDR) and Climate Information Records and to extend their application into the JPSS era (e.g., POES/AMSU to NPP/ATMS to JPSS/ATMS). Once the FCDR's are developed, they will be use to create TCDR's for water cycle applications (precipitation, water vapor, clouds, etc.) which will become key components in international programs such as GEWEX, CEOS and GPM; collaborators on this project hold key roles in many of these programs.

Passive microwave sounder data have proven their worth in more than just tropospheric temperature and moisture monitoring. NOAA/NESDIS generates operational products from the Advanced Microwave Sounding Unit (AMSU) focused on the hydrological cycle (e.g., rainfall, precipitable water, cloud water, ice water, etc.) through two product systems known as the Microwave Surface and Precipitation Products Systems (MSPPS) and the Microwave Integrated Retrieval System (MIRS). MSPPS has the longest legacy dating back to NOAA-15 (July 1998) while MIRS is an advanced, 1DVar retrieval system that is portable to different passive MW sensors thus making it attractive for multi-sensor TCDR generation. MSPPS and MIRS products are archived at NCDC and are being widely used in the scientific community. As we enter the JPSS era, AMSU-A and AMSU-B (and its successor, MHS) will be replaced with the ATMS sensor, first to be flown on NPP, then on all of the JPSS spacecraft. These data offer the unique opportunity to develop CDR's that can contribute to other satellite time series with similar capabilities such as the DMSP SSM/I and SSMIS, the TRMM TMI, and Aqua AMSR-E. This project will focus on the development of AMSU FCDR's for the AMSU-A window channels and the AMSU-B/MHS sensor. The AMSU/MHS project utilizes established methods or develops new approaches to generate FCDR's and take "multiple paths" to determine which methodology is the most applicable to AMSU. The generation of TCDR's is a necessary step to assess the accuracy of the FCDR's; similar results by multiple methods yield confidence and uncertainty estimates in the CDR's.

The main tasks to be included in this project are as follows:

1. Investigating and correcting geolocation errors including satellite attitude, sensor mounting, and clock offset errors

2. Scan asymmetry and scan bias correction: multiple datasets will be used to evaluate different biases related to the scan asymmetry and scan bias

3. Intercalibrating AMSU/MHS data from all NOAA POES (NOAA15-19) and MetOp-A satellites: data from different satellites will be compared and intercalibrated to a stable reference

The output of this project is a 10-year consistent climate data record that can be used for product

retrieval, climate and hydrological assessments, and reanalyses. It is worth to mention that this CDR project is for AMSU-A window channels (Channels 1, 2, 3, and 15) and all AMSU-B and MHS channels, The geolocation errors that are discussed in this project are also relevant for all other AMSU-A channels.

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