NOAA/NESDIS/NCDC Scientific Data Stewardship (SDS) Project
Announcement of Opportunity
FY08+ Funds

Selections (3)

Title: Continued Monitoring of Atmospheric Temperature Using Data from Microwave Sounding Instruments

Investigator(s): **Carl A. Mears (PI)**
Frank J. Wentz

Institution: **Remote Sensing Systems**

Remote Sensing Systems has been producing Climate Data Records derived from the Microwave Sounding Units (MSUs) and Advanced Microwave Sounding Units (AMSUs) for the past several years. These measurements have been an important part of national (CCSP) and international (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 this dataset is of fundamental importance to our ability to continue to monitor long-term changes in atmospheric temperature.

We propose to continue to produce, diagnose, and maintain the accuracy of atmospheric temperature measurements from microwave sounding instruments. Such measurements began in late 1978 with the launch of the first Microwave Sounding Unit (MSU). With the continued operation of various Advanced Microwave Sounding Units (AMSUs), the advent of the Advanced Technology Microwave Sounder on the NPP and NPOESS platforms such measurements will continue for at least 20 additional years.

Our proposed work includes:

1. Continued production of Climate Data Records (CDRs) from available microwave sounders.
2. Investigation and removal of any calibration problems that develop in the dataset.
3. Development of a CDRs from new instruments that are suitable for merging with the earlier data.
4. Validation of CDRs using adjusted radiosonde and radio occultation measurements.
5. Software engineering to improve the reliability, transparency, and efficiency of our data processing system. The end result would be a processing system suitable for converting to operational status.

Title: Climate Data Records of Sea-Surface Temperature

Investigator(s): **Peter Minnett (PI)**

Institution: **University of Miami**

Statement of the Problem: Sea-surface temperature (SST) is recognized as being a critical variable in the climate system, and one that is particularly accessible to satellite remote sensing. To achieve the status of a Climate Data Record the error characteristics of the satellite-derived SSTs must be well established and the absolute values independent of the instrument (satellite radiometer) used to make the measurement. In the case of temperatures, the satellite retrieval should have a calibration and validation traceable to a National Standard.

Summary of Work: It will be proposed to make use of existing measurements taken at sea over the last decade using the three Marine – Atmospheric Emitted Radiance Interferometers (MAERIs) to characterize the uncertainties in the SST retrievals from NOAA (AVHRR, GOES Imager) and other satellite sensors (EUMETSAT SEVIRI & AVHRR; EOS AMSR-E). The MAERI has been deployed for over 3,400 ship-days, on 43 different cruises spanning a wide range of oceanographic and atmospheric conditions. It measures skin-SST with an absolute accuracy of better than 0.1K. The at-sea alibration of the M-AERI is accomplished using two internal blackbody cavities, and the accuracy of these are checked using facilities in the PI's laboratory, including a NIST-traceable and characterized laboratory infrared calibration target, and NISTtraceable reference thermometers. The M-AERI data have been used to characterize the SST error characteristics of the MODIS's on Terra and Aqua, and, in a preliminary fashion, the AVHRR Pathfinder SSTs using five M-AERI cruises from 1996 and 1998. The M-AERI data have also been used by the A-ATSR Team to validate their SSTs and to provide NIST traceability to their products.

This proposed activity will result in NIST-traceable error characteristics of SSTs derived from a wide range of satellite sensors. It takes advantage of work already done through the NASA-funded MODIS Science Team (proposal to continue this activity is pending), and the NOPP-funded GHRSTT Science Team to provide refined error estimated for the MODIS retrievals. The current AVHRR Pathfinder SSTs are derived and their uncertainties determined using the in situ measurements from buoys, mainly drifters. Yet these are decoupled from the surface by diurnal heating and the skin effect. The consequences of diurnal heating have recently been addressed in the PhD research of Chelle Gentemann, under the supervision of the PI, and the skin layer effects will be a focus of research in the proposed work, an outcome of which will be an improved skin-layer model for use with the AVHRR Pathfinder SSTs. This work therefore dovetails with the SST Data Stewardship and the GHRSST Reanalysis activities of K. Casey, NOAA.

Title: Development of an Integrated Northern Hemisphere Snow and Ice Operational Climate Data Record

Investigator(s): **David A. Robinson (PI)**

Sheldon Drobot
Mark R. Anderson

Institution: **Rutgers University**

The generation of operational climate data records (CDRs) is a critical step in providing the necessary information for scientists, decision-makers, and stakeholders to make adaptive choices that could improve the nation's resiliency to environmental change and variability, maintain our economic vitality, and improve the safety and comfort of U.S. citizens. Operational CDRs for northern hemisphere snow and ice characteristics are particularly important because interannual variations in snow and ice conditions influence ecosystems, climate, weather and water, and commerce and transportation, NOAA's four central goals.

Although several research data sets on snow and ice conditions have nearly reached a critical level of maturity in science and data preservation, they do not satisfy all of the CDR requirements listed in the NRC (2004a) report on creating climate data records, and there has not yet been an effort to create an integrated snow and ice CDR over the northern hemisphere. Accordingly, our goals in this project are to develop an integrated snow and ice CDR and design a framework for incorporating other complimentary CDRs into the integrated snow and ice CDR.

To accomplish these goals, our project has three main objectives, namely (1) Develop mature Northern Hemisphere terrestrial snow and sea ice CDRs with known levels of uncertainty and with community-standard metadata; (2) Assemble mature Northern Hemisphere terrestrial snow and sea ice data products into an integrated snow and ice CDR; and (3) Provide the snow and ice CDR in multiple grids, on multiple time steps, and in multiple formats for the research community, decision-makers, and stakeholders. Throughout the project, we will seek community feedback via an Advisory Council and through town hall meetings at the AGU conference in years 1 and 3 to ensure that our CDR will meet community needs.

The integrated CDR will be provided via an existing Web site (http://climate.rutgers.edu/snowcover/) on several time steps (daily through annual), in various grids (e.g., Equal-Area Scalable Earth, 1° x 1°), and in various formats (e.g., text, netCDF, flat binary) for access by the community. The integrated CDR will also be distributed to relevant national data centers. Upon completion of this project, the CDR will begin the transition to operational production at a NOAA center by introducing production into the ongoing operations at the Rutgers' National Climatic Data Center's Applied Research Center satellite facility. Once production confidence is fully attained and all requisite data archives and metadata are completed, the final transfer of processing to a NOAA operational center will take place. At that point, our study team will be performing scientific data stewardship activities only.