Title: Climate Data Records of Sea-Surface Temperature

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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.