**Title: Validation and Calibration of MSU/AMSU Measurements and Radiosonde Observations using GPS RO Data for Improving Stratospheric and Tropospheric Temperature Trend Analysis**

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The monitoring and detecting of the vertical structure of atmospheric temperature trends are a key element in the climate change problem. The Microwave Sounding Unit (MSU), on board the National Oceanic and Atmospheric Administration (NOAA) polar orbiting satellites, has provided data for climate studies since its first launch in 1979. Because MSU measurements, which are in the 50 to 60 GHz oxygen band, are not affected by clouds and are directly proportional to the specific atmospheric layers corresponding to the weighting functions, their data are unique for long-term temperature trend analysis.

Nonetheless, due to different adjustment and analysis procedures used to calibrate the shift of sensor temperatures caused by on-orbit heating/cooling of satellite components and inter-satellite offsets, large trend differences were found between different groups. These temperature trend differences have resulted in a global warming controversy over the surface versus the free troposphere temperatures, and have plagued efforts to quantify tropospheric and stratospheric temperature changes. Radiosonde observations have been used as benchmarks to calibrate satellite-derived soundings. However, because of changing instruments and measurement practices and limited spatial coverage, especially over the oceans, the use of radiosonde observations as a reference to construct a long-term climate quality data set has also presented many difficulties.

Recently, the Global Positioning System (GPS) radio occultation (RO) limb sounding technique, which provides all-weather high vertical resolution refractivity profiles, has emerged as a robust global observing system. Because the basis of the GPS RO measurement is a time measurement against absolute timed and calibrated atomic clocks on the ground, this data type is ideal for use as a climate benchmark. Recently, the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) mission was successfully launched in April 2006. With about an order of magnitude more data (around 2500 profiles per day) than that available from previous missions, COSMIC presents a unique opportunity for validating the vertical structure of atmospheric temperatures (because of its short data records, detecting trends is not realistic at this stage). In this study, we propose to carry out three tasks: (i) To use GPS RO data to identify radiosondes of climate quality for further climate studies; (ii) To use GPS RO data in the stratosphere and use the identified radiosondes in the troposphere as climate benchmark datasets to validate the precision and accuracy of pixel level MSU and Advanced Microwave Sounding Unit (AMSU) brightness temperatures generated from different analysis teams, depending on their data availability; (iii) To generate long term stratospheric and tropospheric climate quality temperature datasets by reprocessing multiple years of MSU/AMSU data. Although only CHAMP data since June 2001 and upcoming COSMIC data are available, the ‘adjusted’ MSU/AMSU data can serve as reference data to other overlapped AMSU/MSU data. We will reprocess AMSU/MSU data from 2001 to 2009.