Tuesday, September 22, 2020 | 8:00 a.m.

Technical Session

Radiometric Sensor Calibration Uncertainty and Error Analysis

Sensor calibration and characterization relies on models, measurements, and analysis to provide the needed data to derive results while estimating errors and uncertainties show how well the results are understood.

- Modeled vs. measured results
- Uncertainty and error assessment techniques
- Measurement equipment characterization methods; both development and operational equipment
- End-to-end system level uncertainty assessment

8:05

Improvements to Stray Light Modeling on the Ozone Mapping and Profiler Suite

Tevis Nichols, Rebecca Schindhelm, Tyler McCracken – Ball Aerospace

ABSTRACT: The Ozone Mapping and Profiling Suite (OMPS) provides a critical capability for the measurement of atmospheric ozone levels. Two OMPS instruments are currently in orbit with a third preparing for launch on JPSS-2 (J2) and a fourth in development. OMPS is a set of three spectrometers each with different wavelength ranges covering 250nm to 1000nm. As part of the calibration and assessment of OMPS sensor, stray light levels in each spectrometer must be accurately modeled and assessed. To do this, a multi-element stray light model has been developed to accurately predict levels of stray light in each spectrometer. This model includes scatter from telescope reflecting surfaces, dispersion, and ghosts from gratings and focal plane array (FPA) windows. For J2 OMPS this model was improved with a new model for reflective surface scatter in the Limb sensor and an automated tuning method for the dispersion model to better match measured data. The model was calibrated and assessed during the ground testing campaign using a variety of light sources with various spectral and spatial characteristics. The new model improves accuracy, is faster to calibrate, is applicable across a wider variety of input scenes, and reduces the alteration of measured PSFs in the dispersion model. This presentation will cover these model improvements and their implementation in the J2 OMPS instrument calibration.

8:25

Microwave Radiometer Instability due to Infrequent Calibration

Kevin Coakley, Jolene Splett, David Walker – National Institute of Standards and Technology (NIST); Mustafa Aksoy University at Albany, State University of New York; Paul Racette – NASA

ABSTRACT: We directly quantify the effect of infrequent calibration on the stability of microwave radiometer temperature measurements (where a power measurement for the unknown source is acquired at a fixed time but calibration data are acquired at variable earlier times) with robust and non-robust implementations of a new metric. Based on our new metric, we also determine a component of uncertainty in a single measurement due to infrequent calibration effects. We apply our metric to experimental ground-based calibration data acquired from a NASA millimeter-wave imaging radiometer (MIR) and a NIST radiometer (NFRad). We demonstrate that the physical interpretation of our new metric is more clear than that of the existing variogram metric. Based on a stochastic model for NFRad, we determine the random uncertainty of our stability metric by a Monte Carlo method.