NPOESS PREPARATORY PROJECT OZONE MAPPER AND PROFILER SUITE SENSOR SUCCESSFUL COMPLETION AND DELIVERY – PERFORMANCE DESCRIPTION

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The Ozone Mapping and Profiler Suite (OMPS) is a new generation system designed to monitor global changes in stratospheric ozone from space. OMPS was designed and built for the National Polar-orbiting Operational Environmental Satellite System (NPOESS), which is managed by the IPO (Integrated Program Office) as a joint project of the Department of Commerce, the Department of Defense, and NASA. OMPS will be included on the NPOESS Preparatory Project (NPP) spacecraft, scheduled to launch in 2010.

OMPS was designed and built by Ball Aerospace & Technologies Corp (BATC), to specifications generated by the ozone science community and then validated by the NPOESS Integrated Operational Requirements Document (IORD). The OMPS suite has recently been completed and delivered to the NPOESS prime contractor (Northrop Grumman Aerospace Systems (NGAS) after a successful interagency review process, and has been integrated onto the NPP spacecraft.

This poster summarizes the delivered sensor performance, and the process carried out to ensure that the sensor characterization and associated analysis were sufficient to satisfy not only the contractual system requirements but also the calibration and validation needs to generate appropriate Sensor Data Records (SDR) and Environmental Data Records (EDR) products. The process to coordinate the review and approval of the sensor tests and analysis for acceptance of the sensor will also be described.

The suite consists of three sensors that operate synergistically: a nadir-viewing sensor of the ozone total column (TC), a nadir-viewing sensor of the ozone vertical profile (NP), and a limb viewing sensor that measures the ozone vertical profile with finer vertical resolution (LP). OMPS data will be used to generate operational raw, calibrated, and environmental data products. The nadir viewing measurements will continue the daily global TC data produced by the Total Ozone Mapping Spectrometer (TOMS) and the Ozone Monitoring Instrument (OMI), and the nadir profiles produced by the Solar Backscatter Ultraviolet radiometer (SBUV/2). The limb viewing measurements will continue the limb scatter profile data produced by OSIRIS and SCIAMACHY.

The test program included not only characterization and calibration tests at the sensor level, but also environmental and functional tests for the MEB (main electrical box) and environmental, functional and limited performance tests (irradiance and trending) for the ISS (Integrated Sensor Suite). At the sensor level, tests were carried out and analyzed to characterize the radiometric and spectral accuracy, precision, and stability, as well as the spatial and geolocation parameters and the long and short term repeatability. Several calibration parameters can be identified as having the most significant impact on the quality of the OMPS environmental products. These include: the albedo calibration uncertainty, the spectral calibration accuracy and on-orbit stability, the stray light response, diffuser spatial and spectral structure, Signal-to-Noise Ratio (SNR), and band pass shape and knowledge.

The Nadir sensors were delivered with all performance requirements expected to be within specifications. Although most of the parameters have a large margin to satisfy the specifications, those with little or no margin have been identified as critical parameters for post launch calibration, validation, and monitoring. For example the TC total stray light requirement of 2% is predicted, through measurements, detailed modeling and analysis to be satisfied with margin for most wavelengths and global average conditions. However, it may fall short for specific condition and shorter wavelengths. Another important parameter for ozone retrieval quality, the TC wavelength dependent albedo calibration uncertainty, is currently predicted to have less than 1% positive margin. The Limb Profiler sensor was also completed with expected performance within goal requirements with the exception of the stray light performance for portions of the profile. Stray light correction algorithms are being developed by the limb science community to address those cases.

For this poster, we will summarize the ground calibration tests and analysis performed to characterize the various sensor parameters necessary to process successful SDRs and their relationship to the on orbit calibration and validation. Matrices describing the relationships between the sensor characterization tests, the calibration parameters, the SDR inputs and additional requirements will be presented. The poster will also describe areas where potential deficiencies may be corrected with algorithm modifications as well as potential improvement for the next flight model.

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