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On-Orbit Extensibility of the Stratospheric Aerosol and Gas Experiment III (SAGE III) Data Product

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The Stratospheric Aerosol and Gas Experiment III (SAGE III) is slated for delivery to the International Space Station in 2016. SAGE III utilizes a charge-coupled device (CCD) of 857 pixels in the spectral dimension of which 809 pixels correspond to approximately 1 nm wide wavelength bands ranging from 282 nm to 1038 nm. The remaining 48 pixels characterize readout noise on a per-measurement basis. An additional silicon photodiode channel collects a wider passband centered at 1543 nm. The CCD readout is table-configured to provide 86 channels for solar occultations and 340 channels for lunar occultations and limb scatter measurements. Limb scatter measurements are further configurable with two on-board tables, which can be switched at-will. Finally, a spectral survey mode is capable of producing the full CCD data capture. The on-orbit configurability of the CCD readout process enables a test bed for transmission measurements tailored to experimental retrievals of specific species of interest beyond the nominal data product. For example, the strong vibronic structure of the Bromine Monoxide (BrO) extinction cross section in the ultraviolet makes this species a prime candidate for study. Previous research using the spectral survey occultation data from the earlier SAGE III Meteor–3M mission suggests BrO retrieval is possible. In addition, new nighttime species can be targeted during lunar occultations. The combination of careful spectral calibrations during ground testing, a system solar attenuator that has been upgraded from the Meteor–3M mission, and on-orbit CCD readout configurability is expected to improve retrievals of SAGE III mesospheric ozone, temperature, and pressure.