This statement applies to SAGE III/ISS Version 5.1 (Solar Level 1B, Solar Level 2, and Lunar Level 2) data products.

Software Comments:

Both IDL and Python reader software are available to access the products. New readers are required for this release. The product formats have changed significantly, so new readers are being provided. Readers for previous versions of SAGE III data are not compatible with this version. However, the new version of the IDL and Python data readers are backwards compatible with the previous version of the data product.

General Comments:

This release contains the first official release of SAGE III/ISS that are suitable for use in both validation and research studies for some data products (see Product Notes below for details). Version 5.1 replaces Version 5.0, which will be withdrawn from public availability. The public is invited to continue to make comments on the new release.

Vertical profiles of ozone, nitrogen dioxide (NO_2), and water vapor (H_2O) concentrations as well as multi-wavelength aerosol extinction coefficient are included in the solar Level 2 data product files. Three ozone profiles are available in this release of the solar products: a UV-based mesospheric product (i.e., "Ozone_Mes" in the product files) and two Chappuis-based products. One Chappuis-based product uses a spectrally-focused spectral fitting retrieval (i.e., "Ozone_MLR") while the other uses a broad-spectrum retrieval scheme that is similar to that of SAGE II (i.e., "Ozone_AO3"). Composite ozone and retrieved temperature/pressure products are not included in the V5.1 data set. Slant path (line of sight) quantities have permanently been removed from the product files. Vertical profiles of ozone and nitrogen trioxide (NO_3) concentrations are included in the lunar Level 2 product files. Chlorine Dioxide (OClO) and nitrogen dioxide (NO_2) from lunar occultation are not included in this release. The channel wavelengths used in solar and lunar retrievals are available in the Data Product User's Guide (DPUG).

Loss of Events

The mid-inclination orbit of the ISS periodically results in high solar beta angles that make solar occultation measurements impossible. Additionally, events are occasionally not acquired due to obstructions of the Sun by the ISS or its components. There are brief periods during
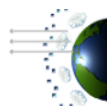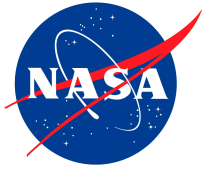
which SAGE III measurements are not taken due to unfavorable ISS configuration or activities (e.g., abnormal orientation, Extravehicular Activity (EVA) or 'new' space vehicle arrival). A space vehicle of one kind or another is always docked at the ISS and generally presents no harm to SAGE III.

On rare occasions, a necessary time correction parameter from ISS is invalid and cannot be corrected resulting in a lost event. In addition, ISS supplied ephemeris data is also occasionally unavailable for an event which cannot then be processed. Overall, these two cases account for about 0.5% of all solar and lunar events acquired. These events have been withheld from this release but may be available in the future.

A number of other special cases occur with varying frequency and may affect data quality. These include situations where 1) the pointing system (hexapod) was unable to move the instrument into the requested position for the event, 2) the contamination window was closed for the event, 3) the ISS time correction parameter was invalid, but could be corrected by interpolation, 4) large mechanical vibrations occurred, 5) a line-of-sight, structural blockage was detected and mitigated during the exoatmospheric portion of the event, 6) spectral calibration could not be performed (likely due to a blockage), and/or 7) a solar eclipse occurred during a portion of the event. Such cases are indicated in the product files by the issuance of a bit flag.

Product Classifications

In the following sections we classify each product to fall in one of three categories: beta, provisional, and research. Beta products are intended to enable users to gain familiarity with the parameters and the data and comments to the SAGE III team are appreciated. Provisional products are partially validated and improvements are continuing; quality may not be optimal since validation and quality assurance are ongoing. Research products are suitable for validation and potentially usable for science and publication though users should be cautious.

<u>**Solar Product Notes**</u>

The V5.1 data products have been screened by the SAGE III/ISS team in order to remove failed events and/or specific product profiles. Most of these are due to platform-related issues such as blockages and severe platform disturbances but a few fail due to unknown instrument and/or retrieval algorithm anomalies. As a matter of practice only the most severe failed events are
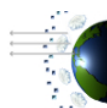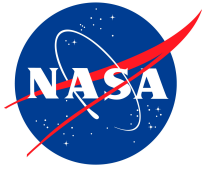
removed and some thought into filtering data for less egregious data anomalies may be necessary for the user. For specific products, some empirical usage recommendations and ways to identify outliers are discussed below. It is important to note that these rules are likely to need evaluation and refinement by the users.

Ozone: The "MLR" and "AO3" ozone products are both considered provisional products (i.e., of sufficient quality to be considered for validation studies). The MLR and AO3 products are generally in good agreement (<5%) with a mean difference of <1% throughout the middle stratosphere. The AO3 product has less noise in the upper stratosphere (above 40 km) and is thus the recommended ozone product. That being said, the MLR product is more robust in the presence of occasional instrument and/or retrieval anomalies (>1% of events) and is useful for identifying outliers in the AO3 product.

The mesospheric (i.e., "Ozone_Mes") product in this release is still considered a beta release. As a result, these data are not suitable for validation or science applications, though comments to the SAGE team are appreciated for product improvement. Mesospheric ozone channels are affected by out-of-band stray light and a thorough analysis of its impact and a potential correction have not yet been completed.

In the past, SAGE III has provided a composite ozone product. In Version 5.1, this product is left blank as the SAGE Team feels that more thought into the construction of this product is required.

Aerosol Extinction Coefficient: The aerosol extinction coefficient profiles are considered provisional products for this release.

Nitrogen Dioxide: The vertical profiles of NO_2 concentration are considered provisional products (i.e., of sufficient quality to be considered for validation studies). Since NO_2 is a by-product of the MLR ozone retrieval, it appears to be unaffected by the MLR-AO3 ozone anomalies though caution with the use of such events is recommended.

Water Vapor: The vertical profiles of H_2O concentration are a beta product for this release. As a result, these data are not suitable for validation or science applications, though comments to the SAGE team are appreciated. The water vapor product is episodically quite noisy, possibly due to platform-related noise. In addition, this product also exhibits substantial non-physical behavior in the upper stratosphere in a few percent of events. These are easily recognized in
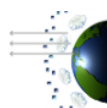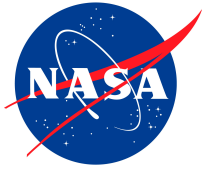
mixing ratio space where the water vapor mixing ratio may systematically exceed 10-12 ppmv over several kilometers. This occurs most often between 35 and 60 km. While we believe these to be due to noise in the measured atmospheric transmission associated with the platform stability, a thorough analysis of the data quality below these systematic biases has not yet been completed.

Lunar Product Notes

Ozone: The vertical profiles of ozone concentration are considered provisional products (i.e., of sufficient quality to be considered for validation studies).

Nitrogen Trioxide: The vertical profiles of NO_3 concentration are a research product with the user cautioned on the use of this data. This product tends to be rather noisy and, under most conditions, requires substantial averaging to produce a meaningful profile.