Global Spaced-based Stratospheric Aerosol Climatology (GloSSAC) Project Guide Document

1. Project Overview

Name of Project:
Global Spaced-based Stratospheric Aerosol Climatology (GloSSAC) Project Guide Document

Project Introduction:

GloSSAC is a 42-year record of stratospheric aerosol optical properties measured primarily by space-based instruments. It was developed as a part of the stratospheric aerosol forcing for the Climate Model Intercomparison Project (CMIP6) set (1979 to 2014) and subsequently extended through 2020. GloSSAC focuses on the Stratospheric Aerosol and Gas Experiment (SAGE) series of instruments through mid-2005 and on the Optical Spectrograph and InfraRed Imager System (OSIRIS) and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) data thereafter. SAGEIII/ISS data is also incorporated in GloSSAC to extend the climatology to the present and to test the approach used to correct OSIRIS/CALIPSO data particularly during the time when overlap measurements are available. We also utilize data from other space instruments and from ground-based, air and balloon borne instruments to fill in key gaps in the data set. The end result is a global and gap-free data set focused on aerosol extinction coefficient at 525 and 1020 nm and other parameters on an 'as available' basis. We developed a new method for filling the post-Pinatubo eruption data gap for 1991 to 1993 based on data from the Cryogenic Limb Array Etalon Spectrometer (CLAES). In addition, we developed a new method for populating high wintertime latitudes during the SAGE period employing a latitude-equivalent latitude conversion process that greatly improves the depiction of aerosol at high latitudes compared to earlier similar efforts. We report data in the troposphere only when and where it is available. This is primarily during the SAGE II period except during the most enhanced part of the Pinatubo period. It is likely that the upper troposphere during Pinatubo was greatly enhanced over non-volcanic periods and that domain remains substantially under characterized. We note that aerosol levels during the OSIRIS/CALIPSO period in the lower stratosphere at mid and high latitudes is routinely higher than what we observed during the SAGE II period. While this period had nearly continuous low-level volcanic activity, it is possible that the enhancement in part reflects deficiencies in the data set. We also expended substantial effort to quality assess the data set and the product is by far the best we have produced.

An interim version (version 1.1) was released in September 2018 that corrected an error in the way the CLAES data is incorporated into the long-term data record that caused some large errors in the lower stratosphere between July 1991 and April 1993. We recommend that all GloSSAC users update to version 1.1.

Another version change reported in 2020 with a new version (Version 2.0), which was focused on improving the post-SAGE II era (after 2005) with the goal to mitigate elevated aerosol extinction in the lower stratosphere at mid and high latitudes noted in v1.0 as noted in Thomason et al. (2018). Changes include the use of version 7.0 OSIRIS and the recently released CALIPSO Lidar Level 3 Stratospheric Aerosol profile monthly product. Major changes that occurred to version 2.0 is for the post-SAGEII era

data set where we implement a conformance process to OSIRIS and CALIPSO data that is based on SAGEII/SAGEIII-ISS overlap measurements. We recommend that all GloSSAC users update to version 2.0.

Important changes to the current version (version 2.1) includes a revised cloud screen method for SAGE III/ISS and version changes to individual data sets used in the post-SAGE II era (2005-2017) and SAGE III/ISS era (June 2017-present). All individual data sets used from 2005 have undergone version changes and we use OSIRIS version 7.1, CALIPSO Level 3 stratospheric aerosol profile monthly product that now includes a minor version change from version 1.0 to 1.01 from July 2020. Additionally, a revised cloud-screen method is implemented for SAGE III/ISS, which improves the representation of aerosols in the lower stratosphere in particular, following volcanic/PyroCb events. The revised cloud-free data for SAGE III/ISS now shows enhancement of extinction coefficient in the lower stratosphere following these events.

Thomason, L. W., N. Ernest, L. Millán, L. Rieger, A. Bourassa, J.-P. Vernier, G. Manney, T. Peter, B. Luo, and F. Arfeuille (2018), A global, space-based stratospheric aerosol climatology: 1979 to 2016, submitted to Earth System Science Data, 10, 469–492, https://doi.org/10.5194/essd-10-469-2018.

Kovilakam, M., Thomason, L. W., Ernest, N., Rieger, L., Bourassa, A., and Millán, L. (2020), The Global Space-based Stratospheric Aerosol Climatology (version 2.0): 1979–2018, Earth Syst. Sci. Data, 12, 2607–2634, https://doi.org/10.5194/essd-12-2607-2020.

Discipline(s):

Earth Sciences
Atmospheric Sciences

Geographic Region(s):
Global meridionally averaged data

2. Data Availability:

Data Type(s):

This data is in netCDF (Network Common Data Form).

Input/Output Media:

Data is available to the user via FTP (see Data Access section below).

Proprietary Status:

There is no proprietary status for the data sets currently on-line at ASDC.

3. Data Access

Data Center Location:

ASDC User and Data Services Office
NASA Langley Research Center

Contact Information:

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Associated Costs:

Currently, there is no cost associated with this data.

4. Principal Investigator Information:

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6. Acknowledgements:

The requested form of acknowledgment for any publication in which this data are used is:
"These data were obtained from the NASA Langley Research Center Atmospheric Sciences Data Center."

7. Document Information:

Document Creation Date: December 2021
Document Review Date: December 2021
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