

SAGE version 7.0 algorithm: Application to SAGE II

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Abstract

This paper details the SAGE version 7.0 algorithm and how it is applied to SAGE II. Changes made between the previous (v6.2) and current (v7.0) versions are described and their impacts on the data products explained for both coincident event comparisons and time-series analysis. Users of the data will notice a general improvement in all of the SAGE II data products, which are now in better agreement with more modern data sets (e.g. SAGE III) and more robust for use with trend studies.

1 Introduction

The Stratospheric Aerosol and Gas Experiments (SAGE I, II, III/METEOR-3M, and III/ISS) are an ongoing series of satellite-based solar occultation instruments spanning over 26 years. Measurements from the SAGE series have been a cornerstone in studies of stratospheric change, including having played a key role in numerous international assessments (e.g. WMO, 2011). Given the importance of the data, it is imperative that the data sets, and the processing codes that produce them, be maintained and, when necessary, updated and improved to reflect the evolving “best practices” for processing occultation data to science products. To facilitate using data from multiple instruments to investigate long-term variability in atmospheric components, it is important to maintain consistency in methodology (when applicable) and fundamental assumptions made in processing data from each instrument. This paper describes the first standard algorithm to process SAGE data, SAGE Version 7 (v7.0). The basis of the version 7.0 algorithm derives primarily from the SAGE III/M3M version 4.0 algorithm and is intended to form the basis for the reprocessing of all members of the SAGE series, including the Stratospheric Aerosol Measurement (SAM II) instrument. This paper provides an overview of the instrument operation and algorithm, followed by a detailed description of each step of the processing algorithm and how it is applied to SAGE II, including differences between the previous (v6.2) and current (v7.0) versions.

1.1 Instrument Operation

SAGE II operated on board the Earth Radiation Budget Satellite (ERBS) from its launch in October 1984 until its retirement in August 2005. It employed the solar occultation technique to measure multi-wavelength slant-path atmospheric transmission profiles at seven channels during each sunrise and sunset encountered by the spacecraft. The optical properties of most channels were defined by the position of exit slits along a Rowland spectrometer where photodiodes

