13th International Atmospheric Limb Workshop



Contribution ID: 27

Type: Talk

Accounting for the aerosol particle size distribution in the retrieval of stratospheric aerosol extinction coefficients from OMPS-LP measurements

Stratospheric aerosols play a major role in determining the radiative budget of the Earth's atmosphere. They cool the troposphere by scattering the incident solar radiation back to space and warm the stratosphere by absorbing upwelling thermal radiation. Furthermore, mainly in polar regions, stratospheric aerosol particles serve as condensation nuclei to build PSC particles. Heterogeneous reactions taking place at their surfaces release halogenated compounds and convert nitrogen oxides (NOx) into inactive reservoir species. This process significantly contributes to the catalytic ozone destruction.

Space-borne measurements of the scattered solar light in limb-viewing geometry in the visible and nearinfrared spectral range is one of the major sources of the information on the stratospheric aerosol on the global scale. Data from the limb-scatter instruments currently in operation (OSIRIS and OMPS-LP) are used to retrieve stratospheric aerosol extinction coefficients at one or several wavelengths. The same strategy is foreseen for the upcoming ALTIUS instrument. Measurements of this kind provide a moderately high vertical resolution and dense horizontal sampling and are extremely useful for characterization of the global behavior of the stratospheric aerosols.

A major issue related to the retrieval of the stratospheric aerosol extinction coefficients from limb-scatter measurements is the need to assume the aerosol particle size distribution. So far, all existing retrievals assume an arbitrary aerosol particle size distribution corresponding to background aerosol conditions. As a results, stratospheric aerosol extinction coefficients retrieved from limb-scatter measurements after strong volcanic eruptions (e.g. Hunga Tonga - Hunga Ha'apai in January 2022) show a strong negative bias in comparison to the data from solar occultation measurements.

In this study we investigate methods to account for the aerosol particle size distributions when retrieving the stratospheric aerosol extinction coefficients from OMPS-LP limb-scatter measurements. The measurements after the Hunga Tonga - Hunga Ha'apai eruption in January 2022 are analyzed. Results from different approaches are compared to the data from SAGE III/ISS solar occultation measurements. The latter are considered to be the reference as the corresponding retrievals do not require any information on the aerosol particle size distribution.

Topic

Current and past limb and occultation instruments: algorithms, products, validation

Author: ROZANOV, Alexey (University of Bremen)

Co-authors: Dr POHL, Christine (University of Bremen); Mr WRANA, Felix (University of Greifswald); Prof. VON SAVIGNY, Christian (University of Greifswald); Prof. BURROWS, John (University of Bremen); Prof. BÖSCH, Hartmut (University of Bremen)

Presenter: ROZANOV, Alexey (University of Bremen)