Contribution ID: **45** Type: **Talk**

The impact of particle size on OSIRIS aerosol retrievals after the Hunga eruption

Stratospheric aerosols play an important role in atmospheric processes through their cooling effect on the surface and their role in cloud formation. Though aerosols have been widely studied for decades, there still exists a large gap between measurements and models. More refined measurements of aerosol size, shape, concentration and composition are required to close this gap to improve climate modelling. Many instruments provide measurements of aerosol, such as the Optical Spectrograph and InfraRed Imaging System (OSIRIS), a Canadian instrument currently flying aboard the Swedish Odin satellite. Launched in 2001, OSIRIS measures vertical profiles of limb scattered sunlight. With its lifetime far exceeding its initial mission length of 2 years, OSIRIS has provided measurements over last 24 years. The Hunga Tonga eruption in 2022, one of the largest volcanic eruptions in recent history, injected large amounts of water and sulfur into the stratosphere. When compared to aerosol retrievals from other instruments such as SAGE III/ISS and OMPS-LP, there appears to be a strong low bias in the OSIRIS aerosol during and after the Hunga Tonga eruption. It is plausible that this low bias is due to the assumed particle size distribution used in the retrieval process- the v7 retrievals use the same particle size distribution across all years of data, but this is not representative of the distribution after the Hunga Tonga eruption. A new retrieval approach will be presented, using the OSIRIS measurements in conjunction with the SAGE particle size distributions, which are used to constrain the particle size in the retrieval forward model. This approach shows promising results, with OSIRIS retrievals performed post-Hunga Tonga showing notable improvement in their agreement with the SAGE retrieved aerosol extinction.

Topic

Aerosols and clouds

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