**AERGOM**

What is AERGOM?

AERGOM is an improved stratospheric aerosol extinction retrieval algorithm for the GOMOS mission that uses a measurement technique based on stellar occultation.

**INTERCOMPARISONS**

Methodology

In this work, we carried out a systematic comparison of the retrieved stratospheric aerosol extinction coefficients by AERGOM at various wavelengths with occultations observed at (1.12h, 595 km) from multiple satellite instruments: SAGE II, SAGE III, POAM III, AZ2-MASTERO, and OSIRIS. We can use the coverage of these satellite datasets in Fig. 3. We also performed comparisons with the official GOMOS processor (G3OPR) v0.1.

**RESULTS**

The results of the intercomparisons are shown in Fig. 2. From these plots, one can make some general assertions:

- Agreement is typically within ±50% for extinctions in the 400-600 nm spectral range, and between 15 and 30 km tangent altitudes.
- The variability of the AERGOM comparisons with other datasets is usually smaller than those made with G3OPR.
- AERGOM extinction profiles for λ > 700 nm present a strong negative bias below 25-30 km with respect to other instruments, increasing towards higher altitudes.

**IMPROVEMENTS!**

Recent modifications to the retrieval algorithm gas cross-sections, along with a proper convolution with the instrument function, seem to significantly improve the stratospheric aerosol extinction coefficients retrieved at longer wavelengths. Fig. 3 shows the progress made at 750 nm (using OSIRIS as a reference) when using high-resolution cross-sections for O₃, NO₂, and NO₃. Note that these are preliminary results.

**THE CASE OF THE BAD OCCULTATION PROFILES**

AERGOM is an improvement over GOMOS official processor, but it does have issues when performing retrievals with transmission data obtained using ground stars (Fig. 4), which gets the gas and aerosol species completely wrong in some cases (so-called bad profiles). Fig. 5 shows the mean bad profiles compared with ground and occultation optical models. These bad profile cases can be easily flagged, but do limit the coverage of the AERGOM dataset.

Why do this?

Because this finding prompted the consideration that some of the retrievals might be affected by occultation parameters such as star properties (temperature and magnitude), solar zenith angle (SZA) that could lead to a systematic and occultation depth which is an important factor in the imperfect correction of atmospheric zonation. Do these occultation parameters systematically affect the AERGOM retrievals and F, to what extent?

**EFFECT OF OCCULTATION PARAMETERS**

To carry out this study, we used the SAGE II, SAGE III, POAM III, AZ2-MASTERO and OSIRIS datasets as reference (as they should not be influenced by these parameters), and looked for differences in the comparison results due to specific occultation parameters.

For conciseness, we limit ourselves to the examination of two occultation parameters the AERGOM retrievals. Fig. 6 shows the impact of the SZA during the occultation, while Fig. 7 illustrates the effect of the star properties.

**RESULTS SUMMARY**

This work is important to understand the properties of the AERGOM retrieval algorithm and even more crucial for data users, who should be aware of possible biases within the data. This detailed analysis leads to the following conclusions:

- The quality of the retrievals is mainly influenced by the star parameters that directly impact the SZA of the measurement. The dominant parameter is the magnitude quantifying the strength of the star. The comparison shows that a threshold of M ≥ 2.5 is suitable for high-quality retrievals for λ ≥ 700 nm, that stars perform worse than cold stars and the recommended threshold is T > 26 ± 10K.
- The second most important influence is the SZA. Using a threshold of 15° gives good results for extinction at λ < 750 nm, but one should use a threshold value of 180° for extinction at λ > 750 nm.
- The dilution influence also shows the quality of the retrieval to a lesser extent. Overall, a decrease in quality of the retrieval is only expected for a value of the dilution above 60°, especially for λ > 750 nm.

**TABLE 1**: Choices of one property (as defined in the text)