

Reply to the comments of reviewer #1 on the paper “Version 8 IMK/IAA MIPAS measurements of ClO”, egusphere-2025-3352

Norbert Glatthor et al.

Reviewer comments are in black, while our replies are in blue.

This article presents a new V8 data product for ClO from MIPAS. It looks like a good data product, a significant improvement compared to the previous processing version for the altitude region near
5 40 km, i.e., in the vicinity of the stratospheric peak that is not linked to chlorine processing in the polar vortex.

Overall, I see no major problems with the manuscript.

[We thank Chris Boone for this positive assessment.](#)

- 10 There was just one place where it seemed an explanation may not have been completely explored. There were differences observed between MLS and MIPAS ClO results in July, as shown in Figure 17 (panel c for Figure 17 is reproduced below, with an arrow indicating the largest discrepancies).

Model calculations were employed to show that discrepancy might be attributed to the difference in local time between the two instruments, as shown in Figure 18a, which is reproduced below:

- 15 This argument appears to be well supported, but to make it more complete, a similar calculation should be done for September 1st, where the ClO peaks and the differences between the two instruments (as seen in Figure 17c) are less pronounced. If the model calculations predict a smaller discrepancy for ClO at the two local times in September, that would add more weight to the argument. If the model calculations predict a similar difference at the two local times in September, that
20 would make the argument more tenuous.

- [As suggested, we performed additional EMAC model calculations for 1-2 September 2005. The outcome is that - in contrast to the model results for 1–2 July - the EMAC calculations for 60–90S and 31.62 hPa predict nearly the same ClO amounts for the local times of the MIPAS and the MLS measurements \(see Fig. 1 below\). This is in agreement with the smaller differences between the two
25 instruments in September as compared to July. The average ClO amounts observed by MIPAS and MLS on 1–2 September 2005–2011 are also shown. Due to convolution with a MIPAS averaging kernel, the MLS value in this display is even slightly lower than the MIPAS value. We will add the sentences](#)

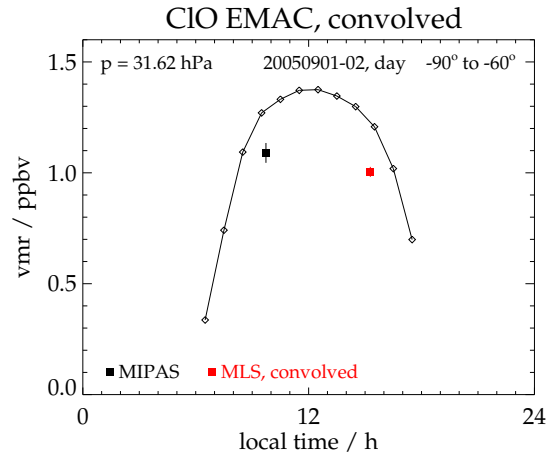


Figure 1. Simulated EMAC daytime ($\text{SZA} < 94^\circ$) ClO volume mixing ratios versus local time for 1–2 September, 2005, at 31.62 hPa in the latitude band 60°S – 90°S . The black and red squares are MIPAS and MLS ClO VMRs averaged over daytime measurements of 1–2 September 2005–2012 in the respective latitude band, plotted against the mean local solar time of the measurements. EMAC and MLS data are convolved with a MIPAS averaging kernel. The vertical lines denote the standard errors of the mean (SEMs) of the measurements.

“As a cross-check, we performed additional model calculations for 1-2 September 2005 (not shown).

30 For the pressure level of 31.62 hPa, these calculations result in nearly the same Antarctic EMAC ClO VMRs for the local solar times of the MIPAS and of the MLS measurements, which corroborates the smaller differences between the two instruments in September as compared to July (see Fig. 17c,d).” at the end of Section 9.4 (P. 33, L. 2). However, because of the large amount of Figures in the current manuscript, we would rather abstain from adding the September results.

35 I will point out a couple of observations of the ClO data that need not be addressed for this manuscript but may serve as food for thought should there be a future processing version. Figure 9 is reproduced below:

In the V8 results, there is a distinct step (increase) in the retrieved background ClO level after the instrument was switched to the reduced resolution mode (i.e., 2005 and later). There also appears
40 to be a persistent slope to the data during background periods between polar winter events for the reduced resolution period, but there is no hint of a slope for the full resolution period. That suggests a possible artifact in the retrieval that is significant only for the reduced resolution period. There is no apparent discrepancy between full resolution and reduced resolution in the V5 results.

At the moment, we do not have an explanation for the step in the background level and for the
45 slope in retrieved V8 ClO of the reduced resolution period. However, both the step as well as the persistent slope are rather small, about 0.05 ppbv only. These issues will be revisited should the

MIPAS data processing algorithms be updated in the future.

A portion of Figure 15 is reproduced above. The arrows indicate the stratospheric ClO peak seen by
50 MLS that MIPAS never seems to fully capture. This is perhaps more evident in the difference plot
between MIPAS and MLS from Figure 14, reproduced below:

MIPAS is persistently lower around 2 to 3 hPa and persistently higher near 1 hPa, which suggests
the ClO retrieval is smearing the peak's contribution in altitude. Since this is presumably associated
with the altitude resolution of your retrieval around 1-3 hPa, I am not sure if there is anything that
55 can be done to improve the situation, but I thought I would mention the issue in case there was.
The systematic blue feature at the bottom of the above plot appears to be associated with enhanced
tropical ClO in the MLS data, which I am not convinced is real, so not a problem in the MIPAS
results.

We also think that, compared to MLS, the MIPAS ClO retrieval is smearing the peak's contribution
60 in altitude. This assumption is confirmed by the good agreement of the MIPAS profiles with the
convolved MLS profiles in Fig. 15b-e. The differences persisting after convolution in Fig. 15a and
15f are caused by the differences in local solar time. We think, we should not try to improve the
situation by weakening the constraint, because the retrieval error at this altitude is already about
100% (see Fig.4 in the manuscript) We will add the sentence

65 "In this display it is also clearly visible that the MIPAS ClO retrieval is smearing the upper strato-
spheric maximum in altitude."

after the sentence "... situated at a 1–2 hPa lower pressure level." on P. 28, L. 16.

Minor comments:

70 > The caption to Figure 1a mentions a green dashed line, but the only panel that features a green
dashed line is Figure 1b.

The reviewer is right. We will shift the sentence "green dashed line: measurement noise in terms of
noise equivalent spectral radiance (NESR)" to point (b) of the caption.

75 > Page 14, line 2: internal line shape (ILS) Do you not mean instrumental line shape," defined as
ILS in the footnotes to Table 5?

The reviewer is right. We will change "internal line shape" into "instrumental line shape."

80 >In the titles for Figures 13a, 13b, 14b, and 14c: CLO Should be ClO, without the capital "L".

The titles will be corrected accordingly.