Please find enclosed our answers to your comments on our paper entitled:

Manuscript: MIPAS database: new HNO3 line parameters at 7.6 ìm validated with MIPAS satellite measurements" by A. Perrin, J.-M. Flaud, M. Ridolfi, J. Vander Auwera, and M. Carlotti.

Dear Reviewer (2)

We would like to thank you for your useful comments.
Please find hereafter our answers.

Reviewer (2)

==> Q: P11648L7: 'Line shape parameters (air- and self-broadening coefficients, temperature dependence of the air-broadening coeffient, and air-shift coefficients) were added using the corresponding information available in MIPAS-OLD for the 11 m spectral range of HNO3 (Rothman et al., 20012).'
How have these parameters been determined for the lines which are not present in MIPAS-OLD but in MIPAS_2015 and could you explain how this transfer from the 11 m to the 7.6 m range has been performed?

A: The available experimental data for air- or self- broadening of HNO3 lines are really sparse, and all the "really reliable" measurements were performed in the microwave region. Indeed, in the infrared, the HNO3 spectrum is much too dense for correct individual line width measurements.
This is explained in details in the papers performed by Gomez et al (2009) and Laraia et al. (2009).
 Therefore all the line shape parameters (air- broadening, self- broadening) are based on computations or extrapolations which were "validated" using only the microwave measurements.
As a consequence,   pressure halfwidths in the 7.6 microns region are based on analogous calculations as at 11 microns.

==> Q: P11648L16: 'A multiplicative factor was applied to all the line intensities at 7.6 m so that the HNO3 VMR retrieved using the 7.6 m region matches that retrieved using the 11 m range.' (and P11650L1: 'In troposphere or lower stratosphere the presence of H2O emission lines in the 7.6 m region masks the signal from HNO3.')

We determined the scaling factor by requiring that the HNO3 VMR differences should be zero, on average, in the peak region (21 and 24 km). More sophisticated approaches are not worth here as the obtained differences in scaling factors are much smaller than the residual error of 1.5% that is due to the the instrument calibration. In the revised paper we now mention this approach. Please note also that for the HNO3 retrieval we do not use optimal estimation and related a-priori information (see Raspollini et al. 2013).

We agree, as mentioned above Sect.3 of the revised paper contains much more details regarding the used retrieval approach.

Actually, the additional figure(s) would be quite similar to Fig.1, therefore we would prefer to keep showing only Fig.1 and to mention the results of the additional tests only in the text of the paper. If necessary we could supply additional figures as``AMT supplemental material''.

This is the relative accuracy between 11 and 7.6 m. Could you also state which absolute accuracy is attributed to the line intensities of the new line-list?

A: It is difficult to answer this question since this depends on how well the experimental conditions during laboratory spectroscopic measurements are known. HNO3 is not a stable molecule indeed , and decomposes during the recording of the laboratory spectra.

According to Table 5, the "absolute uncertainties" associated to the S(11 microns) 11 μm and (S(7.6 microns)) 7.6 μm bands intensities are of the order of ~3.3% for the most recent measurements (Sharpe et al. 2004).

This may be too optimistic, but it is difficult to go further on this point. On the other hand, we are really confident on the uncertainty associated to the intensity ratio (S(7.6 microns)/S(11 microns)) because this ratio is not sentitive to experimental conditions.

==> Q: P11653L20: 'is in reasonable agreement with the measurements' Such qualitative statements should be avoided since they do not provide any information.

A: We change the sentence which is now: "Considering their associated uncertainties, one can say that MIPAS-2015 is in agreement with the most recent measurements."

==> Q: P11654L6: 'In particular, the improvement is really significant at 1331.1, 1341.1 and 1343.8 cm-1' Why is the region between 1310 and 1330 cm-1 not mentioned?

A: We just wanted to pint out the spectral domains for which the improvement is the most striking. In the 1310 - 1330 cm-1 spectral region there is also an improvement but not so strong since this spectral region corresponds to HNO3 transitions not too badly modelled in the old linelist since they involve rather low rotational quantum

==> Q: P11666, Figure2: The vmr-data point slightly above 20 km of the red curve in the left panel of the figure is not equal to the vmr-value of this data-point in Figure 1. However, they should be identical.

A: Thank-you for highlighting this inconsistency, we apologize for the inconvenience. The profiles and their differences reported in Fig.1 of the AMTD paper refer (by mistake) to a test comparing two retrievals performed, alternatively, with the new line database (MIPAS-2015) and an old version of the

MIPAS database (version pf3.2). The two databases differ in the line parameters of several molecules (among which also H2O) beyond HNO3. The intent of the figure is to show only the effect of the change in HNO3 line parameters, therefore in the revised paper we updated the figure. The reference test retrieval uses now the MIPAS-OLD database described in the text of the paper.

Technical:

==> Q: P11647L13+21+22: 'V' should be replaced by 'nue'

A: We don't think so since "V3" (for example) is associated with the V3=1 vibrational state, while "nu3" is the nu3 band.

==> Q: P11649L2: which MIPAS level-1 data version has been used?

For the final tests presented in the paper we used Level-1b data version 7.11 (the most recent version available to date). During the study, however, we also verified that the results do not change significantly when using the earlier Level 1b version 5 (note that version 6 of MIPAS Level 1b data does not exist). In the revised paper we now specify also this detail.
==> Q: P11652L5: '37% weaker' -> should this not read '27% weaker' ?

A/ Yes. This is right. This is corrected.

==> Q: P11654L14: ': : : showed that MIPAS-2015 proves clearly the improvement brought by the new database.'
This part of the sentence sounds not really logical.

A/ Yes, This is right. We changed the sentence:
Comparisons with available laboratory information (individual line intensities, integrated absorption cross sections, and absorption cross sections) show clearly the improvement brought by the new database MIPAS-2015 as compared to the old one.