

## ***Interactive comment on “MIPAS database: new HNO<sub>3</sub> line parameters at 7.6 μm validated with MIPAS satellite measurements” by A. Perrin et al.***

**Anonymous Referee #2**

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The present paper concerns a new database of HNO<sub>3</sub> line parameters for MIPAS. On basis of a new theoretical analysis of the HNO<sub>3</sub> bands at 7.6 μm it describes (a) the intensity calibration of this band system relative to the HNO<sub>3</sub>-bands at 11 μm on basis of MIPAS retrievals and (b) the comparison of this new database with independent laboratory investigations. This is an important new work since it not only concerns the retrieval of HNO<sub>3</sub> from MIPAS observations, but is applicable to future measurements in this spectral range. Further, it will advance the retrieval of other trace gases with spectral signatures within this wavelength range by improving the overall spectral fit quality, a relevant point which is perhaps worthwhile to be mentioned in the conclusions of the manuscript. Thus, the manuscript is well suited for publication in AMT. Below some issues which should be tackled before publication:

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P11648L7: ‘Line shape parameters (air- and self-broadening coefficients, temperature dependence of the air-broadening coefficient, and air-shift coefficients) were added using the corresponding information available in MIPAS-OLD for the 11 μm spectral range of HNO<sub>3</sub> (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 μm to the 7.6 μm range has been performed?

P11648L16: ‘A multiplicative factor was applied to all the line intensities at 7.6 μm so that the HNO<sub>3</sub> VMR retrieved using the 7.6 μm region matches that retrieved using the 11 μm range.’ (and P11650L1: ‘In troposphere or lower stratosphere the presence of H<sub>2</sub>O emission lines in the 7.6 μm region masks the signal from HNO<sub>3</sub>.’)

Could you describe the determination of this factor a bit more in detail? Have all altitudes been used or only a subset or has a weighting been applied (e.g. HNO<sub>3</sub> at the lowest altitudes derived from the 7.6 μm band might be influenced more strongly by the a-priori than at 11 μm)? Has the minimisation been calculated with respect to absolute (vmr) differences or relative differences or absolute concentrations? Why has the choice been made and how would the derived factor change by using one of the other parameters for optimization?

P11649L2:

Could you describe the retrieval approach in the 7.6 μm band more in detail? How have the spectral windows been determined? How have the interfering gases been handled?

P11649L20: ‘The results of these additional tests show that, actually, the observed differences between the average HNO<sub>3</sub> VMR retrieved from the 11 and the 7.6 μm regions amount to a maximum of 1.5% in the height range from 15 to 30 km.’

It would be informative to show here a figure with the altitude-dependent differences

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for these tests.

P11649L21: 'amount to a maximum of 1.5% in the height range from 15 to 30 km. This is the accuracy we attribute to our HNO<sub>3</sub> linelist calibration procedure.'

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

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

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

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.

Technical:

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

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

P11652L5: '37% weaker' -> should this not read '27% weaker' ?

P11654L14: '... showed that MIPAS-2015 proves clearly the improvement brought by the new database.'

This part of the sentence sounds not really logical.

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 11643, 2015.