Interactive comment on "Source classification of upper tropospheric pollution by MIPAS HCN and C_2H_6 global distributions" *by* N. Glatthor et al.

N. Glatthor on behalf of all co-authors

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We thank referee 1 for his helpful and comprehensive comments. With respect to his suggestions we will perform the following changes:

Reply to general comments:

The referee critisises the instrument's "poor geographical coverage". We do not quite agree here. MIPAS provided full global coverage with 1000 limb sequences per day for the original measurement mode and produces even 1300 limb sequences per day for the actual mode. Of course tropospheric limb measurements, as presented here, are often cloud contaminated. But the HCN and C_2H_6 distributions presented for September and October exhibit nearly complete global coverage. The somewhat poorer coverage of the December and March data can be improved by analysing additional days.

Reply to specific comments:

1) Title:
We will change the title into "Large-scale upper tropospheric pollution observed by MIPAS HCN and C_2H_6 distributions".

2) Measurement period:
The measurements presented here cover the period from September 2003 to March 2004 only, because at the time the paper was written no further HCN and C_2H_6 data had been analyzed at IMK. Due to instrumental failure there is in fact a data gap from April to December 2004, but a lot more MIPAS spectral data are available for the time periods September 2002 to March 2004 and from 2005 until present and we intend to expand our HCN and C_2H_6 datasets. Then we will be able to present long-term observation and to perform comparisons with other spaceborne instruments.

3) Retrieval description:
We did not give a comprehensive description of the retrieval performed with the IMK/IAA processor, because this was done in several earlier papers we cite in Section 3 (e.g. von Clarmann et al., 2003; Steck, 2002; Glatthor et al., 2004). Further we do not feel the description of the retrieval including error estimation, covering 2 and half a page of the manuscript, is so limited. The "additional interfering species" were not fitted, because their influence on the HCN and C_2H_6 volume mixing ratios is small. We will add a sentence to

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the first paragraph on page 16203 to make this clear. For the same reason, namely error contributions smaller than 1%, “additional interfering species” do not appear in Figure 1, bottom left, except for CO_2 above 40 km. We will add a sentence in the discussion of Figure 1 to clarify this. Further we will additionall display the radiance contributions of the major interfering species, either as a new plot or in an update of Figure 2.

4) Vertical resolution:

As already mentioned in the paper, one reason for the low vertical resolution around the tropical tropopause (17 km) might be the cold temperatures of 190K prevailing there. In the stratosphere the vertical resolution becomes better again due to temperatures increasing up to the stratopause. However, especially for minor species like HCN and C_2H_6 one has to consider that the vertical resolution derived from FWHM is a somewhat sensitive parameter. Indeed, the height resolution estimated for other geolocations can well look different to a certain degree – partly due to different atmospheric conditions but also due to above reason.

4) Figure 3 and section 4.1:

We do not like to remove Figure 3 and Section 4.1, because they show that MIPAS gives a fairly good coverage of the upper troposphere and displays the typical global pattern of pollution even for one day. We will point this out more specifically in the paper and discuss the features a little more in detail, being critical with respect to scatter in the distributions.

4) HCN lifetime at 14 km:

One reason for the longer lifetime of HCN at 14 km might be the locally longer residence time of air masses than at lower tropospheric altitudes, from where HCN is transported faster downward and removed by ocean uptake. Another reason might be slower reaction of HCN with OH due to colder temperatures. We will include this reasoning in the manuscript.

4) Figures 3 to 6 and 8:

The latitude-longitude bins used for Figures 3, 5, 6 and 8 have the size $5^\circ \times 15^\circ$ and the latitude bands in Figure 4 are 5° wide. The number of data points added up per latitude-longitude bin and per pressure level shown is up to 20, with typically 5-15 profiles per bin in the biomass burning plume. The number of data points added up in the latitude bands (Figure 4) amounts up to 380 at altitudes above 10 km at midlatitudes and in the subtropics. Typical values are between 20 and 170. We will add similar information in the text at the

beginning of Section 4.2.

Technical corrections:

All technical corrections will be performed as suggested.