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Atmospheric Chemistry and Physics Discussions

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

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Review of "Source classification of upper tropospheric pollution . . ."

by Glatthor et al.

Review by Bob Yokelson

Generally a very good paper, but some sections are hard to follow and/or glean the most important point. Specific comments follow (P=page, L=line):

P16198, L5
Here and elsewhere: It was never really clear to me why 54 days out of 2003-4 were chosen. Is the satellite still in orbit?

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Interactive Discussion

Discussion Paper

P16198, L18
Here and elsewhere: The northern hemisphere tropics (Sahel, Indochina, Yucatan/Central America, etc...) experience a strong biomass burning season during Feb-May (Yokelson et al., 2007). Some explanation should be given for the lack of HCN during that time. Does it stay in the boundary layer?, low fire counts in 2004? Etc.

P16198, L22
"agreement" could be more precise as "spatial overlap" or "similar distribution" etc.

P16199, L5
biofuel use has a high C_2H_6/HCN ratio (Bertschi et al., 2003) and occurs year round in areas also characterized by large amounts of open burning.

P16199, L22-23
Yokelson et al (2007) and Crounse et al (2009) carefully consider the potential for non biomass burning sources of HCN and essentially rule them out.

P16200, L12:
More recently, Singh et al (2000, 2001) have shown that methanol is the second most abundant organic trace gas in the troposphere.

P16202, L6
It may be useful to insert a sentence that explains if these are final versions of the data.

P16202, bottom half
The HCN microwindows are in the region 715-783, which also features absorbance by some other biomass burning species that would be presumably be co-emitted and may live long enough to include in spectral fits. E.G.: C2H2 $\sim$729, CH3Cl $\sim$732.2, Furan 744.5, phenol 752.1. Some of these features are listed in Yokelson et al (1997) and other papers by our group. The figures are way too small in the print version to get a sense for the quality of the fit.

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P16203, L14 – P16204, L15
When I read the text here, it is not clear to me what the overall uncertainty of the mixing ratios is. There is the altitude uncertainty shown in Figure 2b, uncertainty in line intensity (5-10%), and uncertainty in line broadening (5-10%). Are those 3 uncertainties then propagated to obtain the "total retrieval error" in Figure 2c?

P16204, L23
do the words "analyzed so far" indicate that these are preliminary results that are already clear, but that much more similar data is to come in the future?
I would eliminate the phrase "temporarily non-averaged data" and just use single scans. Then give the amount of time required to obtain the single scan.

P16205, L13
It seems late in the year for it, but is upper left of Fig 4 possibly showing evidence of boreal forest burning above 60 degrees? It appears to be an airmass with a low C_2H_6/HCN ratio.

P16205, L16-19
The concept of excess amounts in plumes and total amounts is a little blurred by the use of the word "enhanced" to describe both an amount above background in L16 and a total amount in L19.

P16207, L12
"Caribic" should be "Caribbean Sea"?

P16208, L16-25
The rough lifetime agreement with the model of Li et al is a nice result. It is probably worth mentioning that Li et al calculated a lifetime for the global troposphere much of which is closer to the ocean (main sink) than the high altitude samples considered. I think that means we expect the MIPAS lifetime to be a little longer, which is in fact observed.

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P16210, L1
It might be interesting to see if a reasonable HCN/CO ratio emerges from comparing MIPAS HCN with MOPITT CO with just a limited effort. Characteristic emission ratios for HCN/CO have been published for southern Africa (Yokelson et al., 2003) and Brazil (Yokelson et al., 2008). Also, further down this page: Does thinking of biomass burning as an annual pulse that decays to an approximately stable long-term background near 180 ppt at all allow an estimate of total global biomass burning?

P16212, 3 general comments:
I found the figures hard to understand. It may be worth mentioning the C_2H_6 lifetime of $\sim$50 days? Is there any way to quote an annual magnitude for the industrial sources presumed to cause the C_2H_6 enhancements on (P16212, L21; P16213, L9; 16214, L15).

P16215, L28
might replace “a sample of representative” with “selected”

P16216, L11-13
One commonly sees papers describing long range transport of pollution from Asia to the West Coast of North America. Is the possibility that the west coast also receives pollution from Indonesia and/or northern South America a new finding?

P16216, L18-19
Again, regions of the former biomass burning plume where cooking fires are common (Africa) would be expected to produce a high C_2H_6/HCN ratio after the hotspots are done.

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