Atmospheric Chemistry and Physics Discussions

Interactive comment on **"Global peroxyacetyl nitrate (PAN) retrieval in the upper troposphere from limb emission spectra of the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)"** *by* **N. Glatthor et al.**

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We thank L. Millan-Valle for his contributions. In the following our answers to his comments:

Pg. 1392, line 9: We do not want to change "interfering species" into "interfering broadband species", because H_2O and C_2H_2 are not broadband species with wide overlap of their single rotational-vibrational transitions. A differentiation into broadband and non-broadband species would go too far in the Abstract and is performed later in the first

paragraph of page 1398.

Pg. 1392, line 17: Here we actually mean the part of the troposphere above the boundary layer, which in meteorology is called "free troposphere" and starts about 1–2 km above ground level. The free troposphere often is less polluted than the boundary layer, but not generally free of pollution.

Pg. 1395, line 21: For more clarity we will add "full resolution" and the period this mode was applied.

Pg. 1398, line 23: We will correct the sentence.

Pg. 1406, line 6: We will separate the "interfering species" into interfering broadband and non-broadband species.

Conclusions, p. 1407: We will discuss the comparison with MOPITT CO more in detail, but we think implementation of the MOPITT CO plot will go too far. Interested readers can view this plot in the given reference.

Last question: For our retrievals we need a constraint to avoid oscillations, because the altitude spacing of our retrieval grid is finer than the distance between tangent altitudes. We use Tikhonov's regularization scheme and a first derivative operator, along with a zero-apriori profile to avoid mapping of artifacts from the a-priori profile to the retrieved profile. Regularization always causes a certain degree of smoothing, however our constraint generally is chosen such that the highest possible resolution is not substantially degraded. Thus, by this approach the retrieved profile is pushed towards an altitude-independent shape only at heights without information on the target gas. In particular, our regularization matrix does not push the retrieval towards zero.

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