

Interactive comment on “The Australian bush fires of February 2009: MIPAS observations and GEM-AQ model results” by N. Glatthor et al.

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We also thank referee 2 for her/his helpful comments.

Reply to general comments:

Referee 2 criticises that “the objectives of the paper are not clearly defined” and that “the paper remains very descriptive of the plume dispersion and pollutant height.” It is suggested that “the observations and the model were exploited more to draw stronger geophysical conclusions.” For example, she/he also wants a discussion of the chemical evolution of the plume. Further, “as currently presented”, she/he is “not fully convinced by the model/observations comparison.” Obviously for this reason a (3) “detailed com-

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parison with the model” is suggested. Moreover, like in the first review it is also criticised that “the explanation of the plume is repeated for each analyzed molecule.” To improve the presentation of the results it is suggested to reorganize the paper into a discussion (1) of the horizontal evolution of the plume, (2) of the vertical extension of the plume, (3) a detailed comparison with the model and (4) a geophysical discussion.

With respect to the criticism of repeated discussion of plume dispersion we refer to our reply to referee 1. We will merge the general description of the plume evolution (Secs. 4.1, 4.2 and 4.3) into one section discussing MIPAS and GEM-AQ C_2H_2 , HCN and HCOOH. For better illustration of the vertical extent of the plume we will present MIPAS profiles and model plume cross sections (or profiles) in original resolution of selected days. Using these illustrations we will discuss measured and modelled plume lofting more in detail. We are not quite sure if referee 2 doubts a good agreement in spatial and temporal expansion of the plume or in absolute mixing ratios. To better convince him of the former, we will present zoomed plots of critical periods (e.g. February 8 and 9) to explain the reasons for apparent differences. For this purpose we will also use GEM-AQ fields for the measurement times of the MIPAS data points under consideration. To “draw stronger geophysical conclusions” we will compare the temporal evolution of measured and modelled volume mixing ratios more in detail. Further, as outlined in our reply to referee 1, we will discuss the temporal evolution of C_2H_2 /HCN and C_2H_2 /HCOOH enhancement ratios and compare with ratios derived from other measurements.

Reply to specific comments:

1) Model data were taken from 12:00 UT only, because the MIPAS data points presented in Figs. 3-10 and Fig. 11 generally cover a wide temporal range. For example, there is always a temporal difference of ~ 11 hours between the points from the eastern and western partial orbits forming the 8-9 narrow V-shaped structures visible in the plots. The authors have taken care not to draw wrong conclusions from temporal

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discrepancies and checked critical aspects by comparison with model data from other time steps. However, since the referee is not fully convinced of a good agreement between the measurements and the model, we will present some plots, in which we compare certain MIPAS data points with the model output for the exact measurement times. These comparisons will also show that the significant differences in model data between 12:00 and 23:00 UT from February 8 are not a problem, but can rather be used to explain apparent discrepancies between MIPAS and GEM-AQ data from 12:00 UT.

2) As outlined in subsection "Smoothing of model data", all model data presented in Table 2 as well as in Figs. 3-10 and 12 were smoothed with averaging kernels representative for the vertical and along-track resolution of MIPAS. Thus, all comparisons were made with smoothed model data. For clarification, we will add respective sentences in the figure captions. Further, the referee wants a comparison between original and smoothed model data. We will check, if such an illustration can be included into the general context, but we do not see much benefit from such a kind of comparison for the paper.

3) Figures 3-10 and 12:

We will try to make the MIPAS observations better visible by e.g. using larger or modified symbols.

4) Page 15017, lines 26-27:

Kaminski et al. (2008) will be provided as reference.

5) Page 15028, lines 18-23:

We will give better reasons for the last conclusion by e.g. directly referring to February

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8 and 9. On both days the model plume would have been better covered by a limb-sounder with an across-track field-of-view (FOV) of several hundred km than by MIPAS, which has an across-track FOV of 30 km only. Provided the locations of the modeled and measured plumes on February 8 and 9 were identical, this would have lead to a better registration of the real plume by some of the measurements of MIPAS.

Technical corrections:

Supplement material:

Axis labels "latitude" and "longitude" will be exchanged.

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