**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

Interactive comment on "Ground-based FTIR and MAX-DOAS observations of formaldehyde at Réunion Island and comparisons with satellite and model data" *by* C. Vigouroux et al.

C. Vigouroux et al.

corinne.vigouroux@aeronomie.be

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We thank the referee for his positive comments that helped us to improve the manuscript.

Restructuring sections 2 to 5: I would prefer to have the description of all data sets in one section with some sub-sections. Like reviewer #1 I see in particular for the description of the ground-based FTIR and MAX-DOAS data sets several similarities which should be explained in one subsection. This holds also for different tables (e.g. Tables 2 and 4) and figures (e.g. Figures 2 and 7) where one can have the information for both instruments in one common table/ figure.

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Reply: We have, as suggested by both referees, presented the OEM and some common information on FTIR and MAX-DOAS in a separate section. And, as suggested by Referee #2, we have used a common Table and a common Figure for the FTIR and MAX-DOAS error budget and averaging kernels, respectively.

Reading the very good result and discussion sections for me only one critical point is missing: The authors did a lot of work to retrieve the right aerosol extinction from there MAX-DOAS observations and correct for that in the MAX-DOAS retrieval of HCHO (by the way, would it be possible to show a time series for the AOD during the 2004 period). But what might be the impact in particular on the satellite results? Depending on the aerosol type and its location (e.g. reflecting aerosol below the HCHO "plume") it should have a huge effect and might explain part of the high day-to-day variability in the satellite data.

Reply: We find that showing a time series of AOD is beyond the scope of our study which is focused on the retrieval of trace gas profiles. Moreover, there are already a lot of figures in our paper. However, in order to address Referee #2's comment, we have included in Figure 5 (now Fig. 6) the AODs corresponding to the six different aerosol profiles. Concerning satellite results, some text has been added in the manuscript: a correction for cloud effects is applied to the dataset (De Smedt et al., 2008). No correction has been explicitly applied to account for the effect of aerosols on the air mass factors. The effect of non-absorbing aerosols is implicitly included through the cloud correction (Boersma et al., 2004), and results in a relatively small error (generally lower than 16%) on the air mass factor calculation. Absorbing aerosols can lead to a reduction of the air mass factor by up to 40% (Fu et al., 2007). The omission of the aerosol correction may thus lead to a significant underestimation of the derived HCHO column by up to 40% over fire scenes. The inclusion of an explicit aerosol correction in the retrieval algorithm will be addressed in future work.

Minor points: In the introduction, the reference to Wittrock et al. (2006), is missing, where satellite and MAX-DOAS observations of formaldehyde have been presented.

Reply: This reference has been included.

Figure 10: The total column averaging kernel for SCIAMACHY looks a bit odd. I would expect a smooth curve.

Reply: In the first version of the manuscript, we have shown a plot of the "mean" of the SCIAMACHY averaging kernels, which gave this odd aspect. We have replaced it by a "typical" averaging kernel, which is indeed much smoother.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 15891, 2009.