Atmos. Chem. Phys. Discuss., 8, S3671–S3674, 2008
www.atmos-chem-phys-discuss.net/8/S3671/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The influence of natural and anthropogenic secondary sources on the glyoxal global distribution" *by* S. Myriokefalitakis et al.

S. Myriokefalitakis et al.

Received and published: 12 June 2008

We thank the reviewer for the careful reading and the thorough remarks that helped improving our manuscript. We have taken them into account, including the proposed English corrections, when revising the paper as follows (see also reply to reviewer #1 comments):

The rounding problem in the glyoxal destruction breakdown has been corrected.

A new simulation (S4) has been performed with primary emissions over land and has been included in the discussion. See details in our reply to Reviewer #1 first major comment.

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Most simulations have been performed using the low horizontal resolution of the model. However, 'The basic simulation has been also performed with the high resolution version TM4 for more accurate comparison with observations.' For clarity, this sentence has been now added in the model description.

As proposed by the reviewer, to investigate the sensitivity of the model results to the adopted Henry law coefficient for glyoxal an additional simulation (S5) has been performed with reduced Henry coefficient (text added in sections 2.3 and 4.5). We evaluate that consideration of the low Henry coefficient does not significantly affect glyoxal tropospheric burden. The computed tropospheric column of glyoxal is increased by less than 2% whereas the impact of wet deposition is reduced by about 8%. This is now mentioned in the discussion of the results.

We have decided to keep the numbering of the various simulations since S1 is rather similar with the earlier published work of our group (Wittrock et al., 2006 paper).

As stated in the manuscript 'normalisation is necessary for many GOME and SCIAMACHY products to compensate for offsets introduced by the solar reference measurements and interference from other absorbers (Richter and Burrows, 2002). More details on the CHOCHO analysis can be found in (Wittrock et al., 2006).' We thank the reviewer for attracting our attention to this number that has been mistyped; the correct value is 0.5E14 and has been now corrected. Normalization is a technique by which spectra are collected on a daily basis above a pacific region where the column of the species of interest is expected to be close to zero, in order to deal with the measurement artefacts (e.g changes in solar irradiance, diffuser plate). Specifically for the current study and for the latitudinal region 30N-30S and the longitudinal region 165E-165W, the CHOCHO vertical columns (VCD) are set to the value equal to 0.5E14 molecules.cm-2. This value is an interpretation of our knowledge mainly emanating from modeling studies as, currently, no measurements of CHOCHO above these regions are found in the literature. Here it should be noted that this value is not constant with latitudinal changes as it is the case of the Reference Sector Method (RSM).

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The typical retrieval error of the VCD columns, consisting of different individual errors, is estimated to be equal to 5.E14 molecules.cm-2. Nevertheless is should be noted that the total error depends on the information enclosed of each individual retrieval and therefore it is different for the one pixel to the other. For this study we use the monthly means of VCDCHOCHO. The spatial and temporal averaging minimized the error to about 2.E14 molecules.cm-2.

The model produced the vertical columns of CHOCHO as a mean value for the intervals of 10 and 11 am (mentioned at the end of section 2.3). End of section 3.2 we now clarify: 'To produce comparable to the global model image of experimental values, the SCIAMACHY data, which initially are gridded to 0.125 x 0.125, have been gridded to the grids set by the finest analysis of the model.'

Glyoxal surface observations are associated with an error of at least 15% as derived from the publications mentioned in Table 2. This is now stated in the caption of the Table.

Figures 1c,d have been modified: binned data are shown together with standard deviations for the studied simulations. Some additional explanation is given for the binned data. On the other hand the new Figure 1e, as clearly stated in the text and the figure caption shows mean values over specific 'hot spot' areas (see also reply to reviewer #1).

We have a short note in section 4.2 to the Sinreich et al. (2007) paper showing CHOCHO in the outflow form the continents. Unfortunately there are few CHOCHO published observations in the marine environment. However, phytoplankton bloom areas could release significant amounts of VOC in the atmosphere. Such emissions are not taken into account in the present study, although could produce CHOCHO in the marine environment.

The discussion on the potential involvement of CHOCHO in aerosol formation has been modified: 'indicative order of magnitude' is now provided. Reference is also made to

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a paper on this topic by Fu et al. (2008) that is in press in J. Geophys. Res. and has been communicated to us.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1673, 2008.