Atmos. Chem. Phys. Discuss., 4, S3240–S3243, 2004
www.atmos-chem-phys.org/acpd/4/S3240/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Intercomparison between Lagrangian and Eulerian simulations of the development of mid-latitude streamers as observed by CRISTA" *by* F. Khosrawi et al.

F. Khosrawi et al.

Received and published: 7 January 2005

We thank reviewer 2 for the constructive, helpful criticism. We have addressed to the points of reviewer 2 by presenting a test simulation. A detailed response to the comments of reviewer 2 follows below.

Specific comments:
1. A detailed description of the CLaMS transport scheme can be found in McKenna et al. (2002a). Further, we mistakenly stated that in Figure 1 the CRISTA observations are shown for 700±50 K level. In this figure the CRISTA data on the 675±25 K level is shown. This has been corrected in the text and in the figure caption. All

CLaMS simulations were made in an adiabatic mode. Thus, no diabatic corrections are used. We agree with the reviewer that at least one test case should be shown where the usage of different meteorological data sets is explored. We followed the reviewers recommendation in so far that the paper now contains a test case (Figure 6 and discussion in chapter 4.5) for which the impact of using different meteorological analyses in CLaMS is explored. The use of different data sets do causes differences in the details of the structures of the simulated filaments. However, the use of different meteorological data sets in CLaMS does nor alter the conclusions regarding the differences between CLaMS and KASIMA.

2. We included in the text some information on the errors of CRISTA measurements. For CRISTA Version 3 the systematical and statistical errors at 25 km are 26% and 3%,respectively, and at 30 km 23% and 3.5%, respectively. We also included the citation of Riese et al. (1999). In this paper a detailed description of the CRISTA error analysis can be found. The text reads now (section 3): *Here, we focus on the CRISTA measurements of N_2O. The systematic and statistical errors are 26% and 3%, respectively, at 25 km and 23% and 3.5%, respectively, at 30 km (Version 3 data). A description of the CRISTA error analysis can be found in Riese et al., 1999.*

3. Here, we only partially agree with reviewer 2 that the PDF analysis is hampered by different spatial resolution of the CLaMS and KASIMA model and the CRISTA observations. We did not resample all data onto a common grid before calculating PDFs because such a precedure would lead to an additional numerical diffusion caused by such an interpolation and, consequently, to some spurious mixing. Furthermore, the scale dependence of the PDFs e.g. the dependence of PDFs on the distance between the considered pairs of air parcels is not as pronounced as the reviewer expects. This issue is discussed in Figure 6 in Konopka et al. (2005). This figure shows a weak increase of the PDF width (e.g. the increase of the fat tails) if the CLaMS resolution is increased fromm 200 to 45 km. This is typical for

ACPD

4, S3240–S3243, 2004

the fractal behaviour of the flow. Studying the PDFs of tracer differences, Hu and Pierrehumbert (2001) found a similar weak dependence of the simulated PDFs on the model resolution. We included the following sentence in the manuscript: *In principle, the form of a PDF is not scale independent, that is it is not independent of the spatial resolution of the model in question (Hu and Pierrehumbert, 2001). However, Konopka et al. (2005), have shown (in their Fig. 6) that only a weak increase occurs in the width of the PDFs for a fourfold increase in the CLaMS model resolution. Therefore this issue can be neglected in our further discussion here.*

4. The PDFs were calculated for the complete CRISTA observing period. We include the following sentence in the text (section 4.7): *The PDFs were calculated for the time period of the CRISTA campaign (4-12 November 1994).* The time interval has also been included in the figure caption of Figure 7. The figure caption reads now: *PDFs of N_2O distribution on Θ=675 K observed by CRISTA (gray solid line) and calculated from the KASIMA (black dotted line) and CLaMS simulations using different mixing parameterisations (enhanced mixing (orange), in-situ optimised mixing (green), satellite optimised mixing (red) and reduced mixing (blue)) for the time period of CRISTA measurements (4-12 November 1994).* We agree with Reviewer 2 concerning the critism of our conclusions about the KASIMA streamer climatology. As suggested we skipped the respective statements in the conclusion. However, we included the following sentence: *Although from a case study as the one presented here no conclusions on the validity of a climatology can be drawn, the agreement between the principle features of the CLaMS and KASIMA simulations with the streamer structures observed by CRISTA gives confidence in the ability of KASIMA to simulate the large scale structure of streamers.*

Technical corrections: We have corrected the typing and spelling errors. In the figure caption of Figure 7 we have included the missing date and in the figure caption of Figure 8 we have added the time interval of the PDF analysis.

ACPD

4, S3240–S3243, 2004

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6185, 2004.

ACPD

4, S3240–S3243, 2004

Interactive Comment