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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.

Anonymous Referee #2

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General comments

The paper discusses the structure of N2O-streamers near the 700K surface in CLaMS and KASIMA model simulations compared to CRISTA-1 observations from early November, 1994. Results are based on short runs of KASIMA and CLaMS from 20 October until November 6. For both models different initializations are tested. Furthermore CLaMS results are evaluated with respect to different mixing parameterizations. The qualitative discussion of streamers present on October 6 is accompanied by an analysis of PDFs derived from CRISTA observations and model runs. Thus differences regarding the streamers' strength and their representation in the models and observations are highlighted.

The authors conclude that results depend significantly on model initialization, spatial resolution and in the case of CLaMS model on the mixing parameterization. With respect to observations the Lagrangian model type seem to be quite preferable while for longer multi-year simulations Eulerian models like KASIMA appear to be sufficient.

The main strength of the paper is the quantification of different streamer representations (models and observations) using PDF diagnostics. This gives valuable information for other model studies with respect to streamer events. A weakness is the different spatial resolutions of models and CRISTA observations. E.g., one must expect that non-Gaussian tail values are underestimated by CRISTA due to a systematic lower resolution compared to CLaMS and KASIMA model. Also, only a single day is analyzed. Therefore the papers conclusion with respect to the nine-year KASIMA streamer climatology is clearly an overstatement and not justified by the results. In general, model climatologies cannot be evaluated using single short term observations only, as is the case for the CRISTA-1 episode (9 days). Even thought I would recommend the publication after some minor corrections.

Specific comments

1. CLaMs is the prominent tool to evaluate streamers in this study. Results are compared to CRISTA observations and KASIMA model. To make both models comparable the reader should be given comprehensive information on the main model characteristics. However for CLaMS an adequate description of the transport-scheme is missing. It is mentioned that transport is carried out on the 675 K isentropic surface. Why wasn't the 700 K surface (CRISTA observations) chosen? Is a correction for diabatic effects applied? In this case, where are the net heating rates taken from? KASIMA uses its own dynamics nudged by ECMWF ERA-15 temperature analysis. This clearly hampers comparability to CLaMS, which is driven by UKMO analysis. It would be preferable to have only one meteorological analysis for both models. At least a sensitivity test, e.g., using CLaMs with KASIMA wind and temperature fields, should be performed. Also, some information on the mapping between the different theta-surfaces of CHRISTA

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and the models should be given (e.g., KASIMA uses log-p coordinates).

2. The discussion of CRISTA observation errors is poor. It is not adequate to use observation errors to argue in favour of the models that are evaluated. A more detailed discussion of systematic (bias) errors and instrument precision of CRISTA would foster the comparisons.

3. As mentioned above, the PDF analysis is hampered by the different spatial resolutions of CLaMS and KASIMA model and CRISTA observations. This point should be made clearer in the discussion. PDFs by definition depend on the distance of correlative pairs used. A convenient mean to investigate this problem further would be to resample all data onto a common grid before calculating PDFs.

4. In the conclusions KASIMA simulations are claimed to provide “a reliable basis for establishing a streamer climatology”. With respect to the analysis of only a single CRISTA episode this is clearly an overstatement. Concerning the PDF analysis no information is given on the exact time interval used. Is it one single day (e.g., November 6) or the complete observing period? Anyway, from the results of this study no conclusions for the KASIMA streamer climatology can be drawn. Respective statements should be skipped (see part 5 conclusions: P.6199, L.14-16 and P.6200, L.15-18).

Technical corrections

P.6191, L.19: "70°W" should be "70°S". P.6195, L.3: "t=h" should be "t=6h". P.6198, L.9: "anomalously" better say "non-Gaussian". P.6211, Fig.6: Date is missing. P.6212, Fig.7: Please add time intervall of PDF analysis.

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