

Interactive comment on “Climatological features of stratospheric streamers in the FUB-CMAM with increased horizontal resolution” by K. Krüger et al.

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Received and published: 16 December 2004

I have three critical remarks about this article that relate to the climatological meridional ozone gradient, Eulerian versus Lagrangian techniques to assess stratospheric ozone variability and terminology.

1) The authors assume that "tropicsubtropical streamers mark the entry of ozonepoor air from the tropics into midlatitudes" (p. 6807 line 23). This is not generally true. The climatological meridional ozone gradient points to the north only in the lower stratosphere up to about 25 km (20 hPa). Above that level, the gradient is reversed and tropical air masses contain more ozone than air masses at the same altitude in midlatitudes (see for instance Fig. 10.4 in the textbook "Middle Atmosphere Dynamics" by

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Andrews et al.). Therefore the low-PV filaments for instance in Fig. 2 are most likely not poor in ozone but enriched compared to typical midlatitude values. In Fig. 8 the tropicalsubtropical streamers at 15-20 km altitude can indeed be considered as poor in ozone, but not so the ones between 25 and 40 km. Clearly, the averaging between 15 and 40 km (as done in Fig. 7) does not make sense when trying to explain midlatitude ozone behavior.

2) The paper claims to investigate "the role played by these largescale structures on the interannual and seasonal variability of the observed negative ozone trend in northern midlatitudes" (abstract line 10). However, I can not find results on and a discussion of this issue in the paper. The paper presents a climatology of streamers but does not relate the findings to the question of ozone variability and trends. Is there a trend in the frequency of streamers that explains parts of the observed ozone trend? In any case, a streamer climatology might not be the ideal way of considering the link between large-scale transport and ozone variability. The streamer climatology only considers low (or high)-ozone features with a particular shape. However, for mid-latitude ozone it does not matter whether the subtropical air mass (containing anomalous low ozone below about 25 km and anomalous high ozone above that level) arrives as a streamer or in any other geometrical shape. Therefore a purely Lagrangian technique, that considers the meridional transport history of mid-latitude air masses might be more meaningful to understand the stratospheric ozone variability. Two such studies have recently appeared and their results should be discussed in this paper:

Calisesi, Y., H. Wernli and N. Kaempfer, 2001. Midstratospheric ozone variability over Bern related to planetary wave activity during the winters 1994-95 to 1998-99. *J. Geophys. Res.*, 106, 7903-7916

Koch, G., H. Wernli, J. Staehelin and Th. Peter, 2002. A Lagrangian analysis of stratospheric ozone variability and long-term trends above Payerne (Switzerland) during 1970-2001. *J. Geophys. Res.*, 107(D19), 4373, doi:10.1029/2001JD001550.

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These studies have clearly shown that a large part of the wintertime ozone variability in midlatitudes can be understood when considering meridional transport from the polar and subtropical regions.

3) Maybe a minor point, compared to the previous ones is the issue of terminology. However, I am bit confused about the use of terms like filament, streamer, tongue, exchange ... in the present paper. To my knowledge, the term streamer has been used first for 2000-3000 km long and 200 km narrow filaments of high PV in the tropopause region by Appenzeller and Davies:

Appenzeller, C., and H. C. Davies, 1992. Structure of stratospheric intrusions into the troposphere. *Nature*, 358, 570-572

Appenzeller, C., H. C. Davies, and W. A. Norton, 1995. Fragmentation of stratospheric intrusions. *J. Geophys. Res.*, 101, 1435-

Later, Offermann et al. (1999) used it for very long (10000 km) and narrow (1000 km) structures in the stratosphere. Here "streamers" refer to "tongues" and are distinguished from "fingerlike filaments" (p. 6792 line 7). The latter seems to correspond to the Appenzeller-streamers, but here the term seems to refer to something with a larger scale. Later (p. 6794 line 19) the "possible role of air mass exchange by stratospheric streamers" is mentioned. What is meant here by "exchange"? Meridional excursions of low/high PV tongues, in principle, can be perfectly reversible (the air in a subtropical streamer might go back into the subtropics), so I don't see the point of having an "exchange".

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 4, 6789, 2004.

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