Atmos. Chem. Phys. Discuss., 4, S4007–S4009, 2004
www.atmos-chem-phys.org/acpd/4/S4007/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A review of the Match technique as applied to AASE-2/EASOE and SOLVE/THESEO 2000" *by* G. A. Morris et al.

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Received and published: 17 May 2005

Ozone loss from ozone-trace gas correlations Ozone loss from ozone-trace gas correlations is not the main focus of this paper; nonetheless some discussion of this issue appears in the introduction. The subject of this comment is the statement in the introduction that "Plumb et al. (2000) show that even in the absence of chemical processes, conservative trace gas-ozone correlations will evolve due to continuous dynamical mixing processes."

First, it should be noted that in the model studies discussed by Plumb et al. (2000) it is implicitly assumed that the same tracer-tracer relations hold inside and outside the polar vortex. Müller et al. (2001) have argued that this is not the case for the ozone-tracer correlation and that this fact has important consequences for the assessment of

the impact of mixing across the vortex edge on ozone loss estimates. Namely, mixing in of outside-vortex air into the polar vortex should lead to an underestimate rather than an overestimate (as argued by Plumb et al. (2000)) of the chemical ozone loss.

****We thank the reviewer for her comments. We do note that at the altitudes of the Match studies (20 km and below), the ozone amounts outside the vortex are lower than those inside the vortex in early winter due to the descent of the ozone peak inside the vortex. As a result, mixing of air into the vortex from outside the vortex brings low ozone air into the vortex, which would lead to an overestimate of the ozone loss rate. Therefore, we feel that the Plumb et al. (2000) assessment is correct and is the appropriate reference here.

Second, Plumb et al. (2000) use the results of a "simple conceptual model" to discuss the temporal behaviour of a tracer-tracer relationship over the life-time of the polar vortex. These model results indicate that continuous mixing across the vortex edge may drastically alter tracer-tracer relationships across the vortex edge. However, a drastic change of the ozone-tracer relation due to mixing across the vortex edge is in contrast with the measurements of the ILAS instrument in the Arctic winter 1996-97. The temporal development of the O3/N2O relation in the ILAS data over January 1997 shows a rather constant relation (Fig. 7, in Tilmes et al., 2003). A change to lower ozone concentrations starts slowly in February and accelerates in late February and early March 1997. Such a behaviour is consistent with chemistry as the cause of the change and not mixing across the vortex edge (Tilmes et al., 2003).

Of course, the tracer-tracer method for determining ozone loss has its disadvantages and advantages as any other method. Nonetheless, the chemical ozone loss deduced using this method for the winters 1991-1992 and 1999/2000 (Tilmes et al., 2004) may be helpful as an independent value to be compared with the ozone loss estimates deduced here by Morris et al.. Note that the tracer-tracer method is independent of any model calculation of trajectories or decent rates.

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Interactive Comment

****Again, we thank the reviewer for alerting us to her papers on the tracer-tracer work she has done. We have modified the paper to include references as appropriate.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4665, 2004.