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Interactive comment on "Stratosphere-troposphere exchange in a summertime extratropical low: analysis" *by* J. Brioude et al.

J. Brioude et al.

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In this paper trace gas measurements collected during two flights of the MOZAIC program are analysed according to their potential for irreversible stratosphere-troposphere- transport in a summertime extratropical low pressure system. Multi-faceted auxiliary information based on satellite pictures, as well as detailed back-trajectory and RDF calculations are used for the interpretation of the O3 and CO time series. The paper itself is well written, the analysis sound and it contains sufficient novelty with regard to STE so that I recommend publication after some modifications:

Major points:

The paper could be significantly improved by a more quantitative comparison between the in-situ trace gas measurements (in particular O3) and the RPV signal from the RDF calculation. While figure 7 includes a trace of the analysed PV along the flight track, a similar trace of RPV is missing. Adding the RPV signal could provide additional - quantitative - information to what extend small scale structures in O3 are correlated with a stratospheric origin of the airmasses, since O3 and PV are generally well correlated in the stratosphere. A critical parameter for the RPV calculation is the chosen backward-trajectory length, since it determines the degree of fine scale structure. This point should be discussed in more detail, e.g. by a sensitivity study using different trajectory length.

Reply: We suppose that the referee is speaking of Figure 5 and not of Figure 7. The referee misunderstood this point. Indeed, the initial Figure 5 included a trace of the RPV signal from the RDF calculation. Perhaps the caption of Figure 5 was not enough clear, we have corrected the caption. Furthermore, in order to answer to an inquiry of another referee, we put in the revised version of Figure 5 both the analysed PV and the RPV signals along the flight track. We agree that the choice on trajectory length can be explained in more details in the paper. According to the sensitivity study we did on the trajectory length, the correlation between ozone and the RPV signal from the RDF calculation is 0.30, 0.31, 0.53, 0.45, and 0.38 for 0, 15, 30, 45 and 60 hours trajectory lengths, respectively. We then choose the 30-hours length trajectory that provides the best correlation between ozone and PV. The correlation increase from 0 to 30 hours is mainly due to finer scale structures being displayed on the trace of RPV. The correlation decrease beyond 30 hours indicates that no additional useful information comes with longer time periods. This result agrees with the Beuermann et al. (2002) paper you ask us to refer by the way. The revised paper

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contains these details.

Minor points:

A similar study of an extratropical summertime tropopause fold has been published by Beuermann et al. (GRL, 29, NO. 12, 1577, 10.1029GL014162, 2002) based on STREAM data over Canada in July 1998. Since the analysis tools are very similar to those used in the present paper (in-situ airborne observations, trajectory analysis, and RDF calculations) a reference to the Beuermann et al. paper should be made.

Reply: The reference to the Beuermann et al. paper (that escaped us) has been made in introduction and in the RDF section of the revised version of the paper.

Technical comments:

Typo on page 12467, line 7: recent study of individual CTMs

Reply: Corrected

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 12465, 2005.