

Interactive comment on “Stratospheric age of air computed with trajectories based on various 3-D-Var and 4-D-Var data sets” by M. P. Scheele et al.

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1. Major comments

This is a nice little study addressing a technical but nevertheless very important aspect of transport model calculations using off-line winds. It is shown that the age of air in the stratosphere is underestimated using various datasets from ECMWF. Importantly, it is shown that the underestimates strongly depend on which datasets are used and that using longer series of forecasts improves the age-of-air as compared to that obtained from a series of analyses or short forecasts. Of all datasets, the 4D-Var assimilation set gives the best results, which is encouraging because this is the most modern as-

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simulation and is now operational at ECMWF.

Two other studies have been published recently (Stohl et al. 2004; Tan et al. 2004) that address different flavors of the same problem and that the authors may wish to consult. Overall, a consistent picture emerges from these papers, showing that the transport properties are influenced significantly by the data assimilation and that analysis fields have significant systematic biases.

On page 4491 it is said that the preprocessing of the ECMWF winds to guarantee mass conservation in a CTM causes errors in the vertical winds. Isn't this also true for the horizontal winds? This perhaps depends on the type of preprocessing, but as far as I know this normally involves some iterative procedure that adjusts all the wind components.

Also on page 4491 it is said that the "assimilation of new observations in the ECMWF model slightly disturbs the physical balance". Is this true (and if so, to what extent) also for the 4D-var technique?

It would have been good to also present a 4D-Var experiment (e.g., in Table 9) with 1x1 degree resolution.

Page 4496, line 11: 5-year back trajectories are calculated with actual data from only one year. At the beginning of a year, trajectories are continued with data from the end of the same year. Doesn't this cause a significant inconsistency (shock) in the trajectories? I would like to see this discussed/explored a little more.

2. Minor comments

The language of the manuscript is not too bad, but could be improved in places. Please check carefully again.

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Page 4493, line 8: trajectories HAVE reached

Page 4497, line 11: better THAN WHAT?

Page 4499, line 5: I would assume that 1.87 is not significantly larger than 1.84?

3. References

Stohl, A., O. R. Cooper, P. James (2004), A Cautionary Note on the Use of Meteorological Analysis Fields for Quantifying Atmospheric Mixing, *J. Atmos. Sci.*, 61, 1446-1453.

Tan W. W., M. A. Geller, S. Pawson, A. da Silva (2004), A case study of excessive subtropical transport in the stratosphere of a data assimilation system, *J. Geophys. Res.*, 109, D11102, doi:10.1029/2003JD004057.

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