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# Stratospheric circulation in long-term CTM simulations driven by assimilated winds

B. M. Monge-Sanz (1), M. P. Chipperfield (1) and A. Simmons (2)

(1) Institute for Atmospheric Science, School of Earth and Environment, University of Leeds, Leeds, UK, (2) European Centre for Medium-Range Weather Forecasts, Reading, UK (beatriz@env.leeds.ac.uk)

We have used an off-line 3-D chemical transport model (CTM) to study how well different stratospheric wind datasets reproduce atmospheric tracer transport. This is motivated by several recent studies which show that some assimilation products overestimate the strength of the Brewer-Dobson circulation and cause excessive tropical tracer mixing. In particular, the European Centre for Medium-Range Weather Forecasts (ECMWF) has recently produced interim reanalysis datasets using an enhanced data assimilation system which we have tested.

Long-term simulations with the TOMCAT/SLIMCAT off-line chemical transport model have been used to compare UKMO and different ECMWF assimilated wind datasets. The ECMWF products used are: (i) the 3D-Var ERA-40 reanalyses, (ii) the operational 4D-Var analyses and (iii) a recent test assimilation experiment with an updated 4D-Var assimilation system. This is part of the interim reanalysis experiments carried out by the ECMWF for the final period of ERA-40 in order to establish the basis for an eventual new re-analysis series that will succeed ERA-40. Mean age-of-air distributions, backward trajectories and potential vorticity fluxes have been calculated to diagnose the different datasets used to drive our CTM.

Our results show that the recent advances made in the ECMWF forecast and assimilation systems significantly improve the quality of the re-analysis, and that these improvements can be directly translated into an improved representation of the stratospheric circulation for long CTM simulations. The mean age-of-air distributions obtained with operational and interim (re)analyses are older and more realistic than with ERA-40 fields, indicating that the most recent ECMWF products solve to a large ex-

tent the overestimation of the Brewer-Dobson circulation when used for multiannual CTM simulations. Also, our trajectory experiments show that the tropical isolation is much better represented by the new ECMWF products than by UKMO, ERA-40 winds, or the GEOS-4 winds used in *Schoeberl et al.* [2003]. Overall this leads to a more positive prospect of performing long-term studies with analysed winds than that given by *Schoeberl et al.*