



The advective Brewer-Dobson circulation in three reanalyses (1979-2012)

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Most chemistry-climate models predict an intensification of the Brewer-Dobson circulation in the stratosphere in the last decades, but this trend remains to be confirmed in observational data. In this work the evolution of the advective BDC for the period 1979-2012 is evaluated and compared in three modern reanalyses (ERA-Interim, MERRA and JRA-55). Three different estimates of the BDC are computed for each reanalysis, one based on the definition of the residual circulation and two indirect estimates derived from momentum and thermodynamic balance. The comparison among the nine estimates shows substantial uncertainty in the mean magnitude but significant common variability. The trend analysis suggests an intensification in tropical upwelling throughout the layer 100-10 hPa. Globally, an acceleration of the circulation is observed in both hemispheres, with qualitative agreement among the estimates. The global BDC trends are mainly due to changes in the DJF circulation and can be tracked to changes in the resolved wave drag in both hemispheres, which are highly consistent in the three reanalyses.