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Unravelling impact factors for changes in the Brewer-Dobson Circulation in the near future

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Model simulations indicate an acceleration of the Brewer-Dobson circulation (BDC) with increasing future greenhouse gas (GHG) concentrations. However, most observational datasets do not show a strengthening in mass transport for the recent past. Moreover, future projections vary concerning the magnitude of and the causes for BDC changes.

In this study we show near future changes in the BDC in dependence of different external forcings, namely GHG concentrations and ozone depleting substances (ODS) as well as prescribed sea surface temperatures (SSTs) and sea-ice concentrations (SICs). The separation is based on sensitivity simulations with the chemistry-climate model (CCM) EMAC.
BDC changes are assessed by using different diagnostics like the tropical upward mass flux and the age of stratospheric air (AoA). To look for the mechanisms of the future acceleration of the residual mean circulation we will present changes in the propagation and dissipation of atmospheric waves. By applying the 'downward control principle' (after Haynes et al., 1991) to our model data we account for the attribution of different wave types. Changes in the mean AoA and in particular in age spectra allow us an estimation of the impact of mixing processes on the future BDC changes.