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Model studies of midlatitude ozone changes

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The study of the observed decrease in stratospheric ozone at mid-latitudes since 1980 is one of the major issues which has driven recent stratospheric research. These decreases, and their seasonality and interhemispheric differences have not been quantitatively explained, though many possible contributing processes have been identified.

Recently, three-dimensional (3D) models have been used to address this problem through multi-decadel simulations. Off-line chemical transport models (CTMs) are generally powerful tools for understanding past changes but such simulations present a severe test of such models.

We will present results from long simulations with the recently updated SLIMCAT 3D CTM. The model was forced using ECWMF (ERA-40 and operational) analyses and has a detailed stratospheric scheme. The model runs cover to the present day. We will first discuss the effect of different formulations of the model on the quality of the results and show which version of our CTM produces the most realistic stratospheric circulation (i.e. age or air). We will then show the long-term modelled O3 changes and mid (and high) latitudes in both the NH and SH and show sensitivity runs which separate dynamical and chemical effects. We will also use these runs to look at how well the model captures the upper stratosphere ozone changes over this period.