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The development of the stratospheric polar ozone distribution performed in EMAC-long term simulations with different boundary conditions for CO2, CH4 and N2O

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We have performed a long term simulation from 1960 to 2050 with boundary conditions from the IPCC-A1B scenario [IPCC, 2001] and the WMO-Ab scenario [WMO, 2007] with the chemistry-climate-model ECHAM5/MESSy Atmospheric Chemistry (EMAC) [Joeckel et al., 2006]. For the present study we have used EMAC (version 1.7) with a horizontal resolution of T42 and 39 vertical layers which cover the atmosphere from the surface up to 80 km. We have applied the chemistry of the Stratosphere and Mesosphere and a new parameterisation of polar stratospheric clouds (PSC) based on the efficient growth and sedimentation of NAT-particles [Kirner, 2010].

Moreover we have performed four additional sensitivity simulations from 2000 to 2050 using the rerun files of the simulation mentioned above. For these sensitivity simulations we used the same model setup as in the long term simulation from 1960 to 2050 but changing the boundary conditions for the greenhouse gases CO2, CH4 and N2O. In the first sensitivity simulation we fixed the mixing ratios of CO2, CH4 and N2O in the boundary conditions to the amounts of the year 2000. In each of the free another sensitivity simulations we fixed the boundary conditions of only one of these free greenhouse gases to the mixing ratios of the year 2000.

We present the results of these simulations with a focus on the long term development of polar stratospheric clouds and polar ozone depletion. Comparisons between the five EMAC-long term simulations are illustrated.