Geophysical Research Abstracts
Vol. 12, EGU2010-8411-1, 2010
EGU General Assembly 2010

The evolution of stratospheric ozone from 1960-2100 in simulations with the Chemistry-Climate-Model EMAC

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First results of research performed within the new DFG Research Unit Stratospheric Change and its Role for Climate Prediction (SHARP) will be presented. SHARP investigates past and future changes in stratospheric dynamics and composition to improve the understanding of global climate change and the accuracy of climate change predictions. SHARP combines the efforts of eight German research institutes and expertise in state-of-the-art climate modelling and observations. Within the scope of the scientific sub-project SHARP-OCF (Ozone-Climate-Feedback) the future evolution of stratospheric ozone will be investigated.

After a steady decrease in total column ozone from the late 1970s until the middle 1990s, some increases in ozone have been observed in the upper stratosphere (e.g. Steinbrecht et al., 2006). This turnaround is possibly linked to the starting decline of ozone depleting substances (ODSs) in the stratosphere. However, the return of ozone to pre-1980 levels may not occur at the same time as the return of ODSs to pre-1980 levels (WMO, 2007). Changes in atmospheric composition and dynamics since 1980, in particular the increase of greenhouse gases (GHGs), additionally affect the time of the return of ozone to 1980 values.

Here, we will present a detailed analysis of the future evolution of ozone in a simulation with the EMAC Chemistry-Climate Model (CCM). The model has been integrated from 1960 to 2100 following the SCN2d scenario recommendations of the SPARC CCMVal initiative for the temporal evolution of GHGs, ODSs and sea surface temperatures as well as sea ice. For estimating the impact of increasing GHG concentrations on the timing of stratospheric ozone recovery, the SCN2d-results will be compared with a second ‘non-climate change’ (NCC) simulation, in which greenhouse gases have been kept fixed at their 1960 concentrations.