Geophysical Research Abstracts
Vol. 14, EGU2012-7321, 2012
EGU General Assembly 2012

Stratospheric Ozone and Temperature Changes in the Past: The Impact of Increased Concentrations of CFCs in Simulations with a Chemistry-Climate Model

S. Meul, S. Oberländer, J. Abalichin, A. Kubin, and U. Langematz
FU Berlin, Meteorologie, Geowissenschaften, Germany (stefanie.meul@met.fu-berlin.de)

Changes in stratospheric ozone between 1960 and the end of the 20th century are investigated analysing simulations with the Chemistry-Climate-Model (CCM) EMAC in FUB configuration (i.e. 39 layers with FUBRad parameterisation). In order to analyse the impact of increasing emissions of chlorofluorocarbons (CFCs) from 1960 to 2000 two sensitivity studies have been performed: a reference simulation with boundary conditions for the year 2000 and one analogue simulation but with CFC emissions reduced to 1960 levels. By comparing to a transient simulation (1960 to 2100) using the CCMVal SCN-B2d scenario it is possible to isolate the ozone changes that are caused by the CFC-increase only and separate the CFC-effect from other processes affecting ozone, e.g. climate change. By applying the method of Garny et al. (2011) the relative ozone changes arising from the CFC-modification can be attributed to changes in transport, chemical production and loss.
Furthermore, it is analysed how the processes related to the CFC-increase contribute to the stratospheric cooling of up to 4K that is simulated by the SCN-B2d run between the 1960s and the 2000s in the upper stratosphere. The temperature change due to increased CFCs is caused by a reduced absorption of solar radiation by decreased ozone concentrations combined with the greenhouse gas (GHG) effect of the CFCs. In the upper stratosphere a cooling of up to 2.5K can be explained by the CFC-increase.