

Ozone and halogen recovery times in the future stratosphere calculated by the CCSR/NIES CCM under the CCMVal-REF2 scenario

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Recovery times of ozone and halogen concentrations are examined using the outputs of the CCSR/NIES Chemistry-Climate Model (CCM). The CCM calculation for the future atmosphere was performed for the period 1975-2100 under the CCMVal-REF2 scenario. A sensitivity test of a no-climate-change run for the future atmosphere was also performed, where the concentrations of CO₂, CH₄, and N₂O were fixed to those for 1975 and the sea surface temperature was fixed to that for the 1970-1979 mean while the halogen concentration changed following the REF2 scenario. A comparison of the recovery times is made of these two runs. The recovery time of the total ozone in the no-climate-change run corresponds to that of Cly+60Bry at 50 hPa within 5 years in the Southern Hemisphere and tropics. In the Northern Hemisphere, however, the recovery time of the total ozone occurs earlier than that of Cly+60Bry at 50 hPa or rather closer to those of Cly at 50, 30, and 10 hPa. In the REF2 run, the recovery times of Cly and Cly+60Bry occur a little earlier than those in the no-climate-change run and the recovery time of the total ozone occurs much earlier than those of Cly+60Bry and Cly. These are consistent with the strengthening of the residual circulation and stratospheric cooling in the CCM for the future atmosphere. The recovery times are also investigated at a few specified levels in the lower and middle stratosphere in terms of the ozone and Cly+60Bry mixing ratios. The results are consistent with the effectiveness of chlorine and bromine ozone destruction cycles at these levels.