Geophysical Research Abstracts, Vol. 7, 03140, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03140

The impact of increased evaporation of precipitate in mesoscale downdrafts of convective systems on the vertical distribution of water vapor in the chemistry-transport model MATCH

R. Lang (1), and M. G. Lawrence (1)

(1) Max-Planck-Institute for Chemistry (lang@mpch-mainz.mpg.de)

The accurate modelling of the vertical distribution of water vapor is vital for the understanding of the water vapor feedback in global warming, as well as the formation of cloud and precipitation and the Earth's radiation budget. We demonstrate the strong sensitivity of the vertical water vapor distribution in the Model of Atmospheric Transport and Chemistry (MATCH) to the evaporation of upper-level precipitation in midlevel downdrafts of convective systems. We compare the vertical monthly mean distributions of model water vapor from MATCH to tropospheric in situ sonde profiles of the weather centers operational radiosonde network and to upper tropospheric water vapor climatologies from the Microwave Limb Sounder (MLS) onboard the Upper Atmosphere Research Satellite (UARS). We show that an increased and more realistic re-evaporation efficiency, as compared to previous model realizations, significantly improves the model vertical distribution of specific and relative humidity with respect to what has been observed by moistening of mid and lower tropospheric levels in regions of strong convection. We further demonstrate that the more efficient evaporation increases the model's water vapor residence time, reducing the difference with observed mean residence times computed based on the Global Ozone Monitoring Experiment (GOME) water vapor fields and data from the Global Precipitation Climatology Project (GPCP).