Geophysical Research Abstracts
Vol. 13, EGU2011-7515, 2011
EGU General Assembly 2011

Simulation of the chemical composition of the upper troposphere with a regional chemistry-transport-model

Sarah Schmitz (1), Roland Ruhnke (1), Heike Vogel (1), Bernhard Vogel (1), Christoph Knote (2), and Dominik Brunner (2)

(1) Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany (sarah.schmitz@imk.fzk.de), (2) Laboratory for Air Pollution/Environmental Technology, Empa –Materials and Science, Duebendorf, Switzerland

The UTLS (Upper Troposphere Lower Stratosphere) is a very climate-sensitive region and shows strong vertical gradients and large horizontal inhomogenities in its chemical structure. To get a sufficiently accurate representation of these gradients enabling the examination of the important interaction between dynamical and chemical processes in this altitude range, regional models with a high resolution are needed.
The Institute for Meteorology and Climate Research at the Karlsruhe Institute of Technology has developed in close co-operation with the German Weather Service the model system COSMO-ART (Consortium for Small-scale Modeling - Aerosols and Reactive Trace gases, Vogel et al., 2009) to examine meteorological, chemical, and microphysical processes on a regional scale in the boundary layer and troposphere.
In this paper, COSMO-ART is used for the first time to investigate the chemical structure in the UTLS-region. These simulations are compared with those of the global Chemistry Climate Model EMAC (ECHAM5/MESSy Atmospheric Chemistry Model) and with data measured by aircrafts within the framework of the CARIBIC-project (Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrumental Container). For the investigation period in October 2008 the regional as well as global simulations of vertical profiles from the ground up to 20 km and of horizontal distributions in different altitude ranges of key chemical tracers like O_3, CO or NO_x are shown for the region Central and Southern Europe and compared with measurements from the CARIBIC-project in the tropopause region.
The aim of these investigations is to analyze the ability of COSMO-ART to simulate trace gas distributions in the UTLS region. If the simulations are accurate enough it is one of the first numeric models that can be used for regional process studies involving trace gases in that altitude range. On the other hand the comparisons will show where the model has to be extended for example by adding additional reactions to its chemistry.