Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 4, 1797-1811, 2004
www.atmos-chem-phys.net/4/1797/2004/

Modelling tracer transport by a cumulus ensemble: lateral boundary conditions and large-scale ascent

M. Salzmann[1], M. G. Lawrence[1], V. T. J. Phillips[2], and L. J. Donner[2]
[1]Max-Planck-Institute for Chemistry, Department of Atmospheric Chemistry, PO Box 3060, 55020 Mainz, Germany
[2]Geophysical Fluid Dynamics Laboratory, NOAA, Princeton University, PO Box 308, Princeton, NJ 08542, USA

Abstract. The vertical transport of tracers by a cumulus ensemble at the TOGA-COARE site is modelled during a 7 day episode using 2-D and 3-D cloud-resolving setups of the Weather Research and Forecast (WRF) model. Lateral boundary conditions (LBC) for tracers, water vapour, and wind are specified and the horizontal advection of trace gases across the lateral domain boundaries is considered. Furthermore, the vertical advection of trace gases by the large-scale motion (short: vertical large-scale advection of tracers, VLSAT) is considered. It is shown that including VLSAT partially compensates the calculated net downward transport from the middle and upper troposphere (UT) due to the mass balancing mesoscale subsidence induced by deep convection. Depending on whether the VLSAT term is added or not, modelled domain averaged vertical tracer profiles can differ significantly. Differences between a 2-D and a 3-D model run were mainly attributed to an increase in horizontal advection across the lateral domain boundaries due to the meridional wind component not considered in the 2-D setup.

Final Revised Paper (PDF, 1869 KB) Discussion Paper (ACPD)

Citation: Salzmann, M., Lawrence, M. G., Phillips, V. T. J., and Donner, L. J.: Modelling tracer transport by a cumulus ensemble: lateral boundary conditions and large-scale ascent, Atmos. Chem. Phys., 4, 1797-1811, 2004. Bibtex EndNote Reference Manager

News
Sister Journals AMT & GMD
Financial Support for Authors
Journal Impact Factor
Public Relations & Background Information

Recent Papers
01 | ACPD, 05 Mar 2009: Taklimakan dust aerosol radiative heating derived from CALIPSO observations using the Fu-Liou radiation model with CERES constraints
02 | ACP, 05 Mar 2009: Operational climate monitoring from space: the EUMETSAT Satellite Application Facility on Climate Monitoring (CM-SAF)
03 | ACP, 05 Mar 2009: SCIAMACHY formaldehyde observations: constraint for isoprene emission estimates over Europe?