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## Regional modelling of tracer transport by tropical convection – Part 2: Sensitivity to model resolutions

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**Abstract.** The general objective of this series of two papers is to evaluate long duration limited-area simulations with idealised tracers as a possible tool to assess the tracer transport in chemistry-transport models (CTMs). In this second paper we analyse the results of three simulations using different horizontal and vertical resolutions. The goal is to study the impact of the model spatial resolution on convective transport of idealized tracer in the tropics. The reference simulation (REF) uses a 60 km horizontal resolution and 300 m vertically in the upper troposphere/lower stratosphere (UTLS). A 20 km horizontal resolution simulation (HR) is run as well as a simulation with 850 m vertical resolution in the UTLS (CVR). The simulations are run for one month during the SCOUT-O3 field campaign. Aircraft data, TRMM rainrate estimates and radiosoundings have been used to evaluate the simulations. They show that the HR configuration gives generally a better agreement with the measurements than the REF simulation. The CVR simulation gives generally the worst results. The vertical distribution of the tropospheric tracers for the simulations has a similar shape with a ~15 km altitude maximum for the 6h-lifetime tracer of 0.4 ppbv for REF, 1.2 for HR and 0.04 for CVR. These differences are related to the dynamics produced by the three simulations that leads to larger values of the upward velocities on average for HR and lower for CVR compared to REF. HR simulates more frequent and stronger convection leading to enhanced fluxes compared to REF and higher detrainment levels compared to CVR. HR provides also occasional overshoots over the cold point dynamical barrier. For the stratospheric tracers the differences between the three simulations are small. The diurnal cycle of the fluxes of all tracers in the Tropical Tropopause Layer exhibits a maximum linked to the maximum of convective activity.

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