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Sensitivity of convective idealized tracer transport to the model resolution and convective parameterization: impact in the troposphere-stratosphere exchange of chemical compounds.

J. Arteta (1), V. Marecal (1), and E. Riviere (2)

(1) CNRS and Université d'Orléans (joaquim.arteta@cnrs-orleans.fr), (2) Université de Reims

Tropical deep convection plays an important role in the upper troposphere/lower stratosphere chemical composition. It is known that the species emitted in the planetary boundary layer are carried into the upper troposphere by deep convection from which part of them, then, reach the lower stratosphere by large scale transport. A concurrent pathway to the lower stratosphere is via the most intense deep convection, called "overshooting" convection, which is able to directly inject tropospheric air in the stratospheric overworld, as was illustrated by ice particles at 420 K observed during EU FP7 project SCOUT-O3.

However, the detailed processes leading to troposphere-to-stratosphere transport (TST) and their quantification are still debated. The large scale processes are generally well handled by global Chemistry Transport Models (CTMs) which are forced by dynamical fields from state-of-art weather forecast models. In most current CTMs the subgrid-scale convection is parameterized and the associated tracer transport is taken into account in a consistent manner. Convection is known to be one of the major sources of uncertainty in CTMs through the uncertainty on the convective parameterizations themselves and through the fact that their dynamics is constrained by global meteorological model outputs. To study TST in the tropics using a CTM it is therefore required to assess the quality of the representation of transport and chemistry processes associated with tropical convection at small scale, including overshoots.

In this context, the aims of this study, conducted in the framework of the project SCOUT-O3 is to use long duration regional simulations over the tropics in order to evaluate the sensibility of idealized tracer transport to different convective parameterizations, and their impact in the troposphere-stratosphere exchange of chemical compounds, and in the budget of the stratospheric overworld. Regional long duration simulations, performed with the CATT-BRAMS model, will be able to explicitly represent convective processes as synoptic circulation. Using idealized tracers in the CATT-BRAMS model, budget calculation of the exchange of species between troposphere and stratosphere over large tropical domains using different parameterizations and resolutions are performed. The simulations are validated against available field campaign data and satellite observations.