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The importance of scavenging and wet deposition in convective clouds

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Deep convective clouds are responsible for intense upward transport of air and consequently of trace species into the upper troposphere, both in the tropics and the midlatitudes. On the other hand, scavenging and downward transport within precipitating hydrometeors represent an opposing transport mechanism in addition to downdrafts and mesoscale subsidence. In global model simulations the convective precipitation and the updraft strength are both determined by the convection parameterisation, a known source of large uncertainties. Beyond this, the scavenging formulation itself, which is also uncertain, is important in determining what fraction of a tracer originating in the boundary layer reaches the upper troposphere.
In this study we analyse the dependency of simulated upper tropospheric trace species mixing ratios on the choice of the convection scheme, focusing on the importance of scavenging processes with the help of the atmospheric global chemistry climate model ECHAM5/MESSy. We discuss various critical aspects, such as the uptake of species into the ice phase, and liquid phase chemical conversions. The results from the global model simulations are compared against each other and against observations.