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Parametrization of Lagrangian convection in a global model of the atmosphere

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A new parametrization of atmospheric convection using a Lagrangian transport algorithm for use in a general circulation model of the atmosphere is introduced. Due to the increasing demand for including interactive tracer in climate simulations with interactively coupled chemical models it becomes necessary to use global models which meet the needs of a fast and exact tracer transport scheme. Describing the transport of tracer by a Lagrangian transport scheme offers several advantages compared to an Eulerian transport method: Mass conservation and absence of numerical diffusion. These advantages become most important in case of strongly inhomogenic tracer fields, where strong gradients ought to be smoothed by physical and not by numerical diffusion processes. We implemented the Lagrangian convection module to the climate model system ECHAM5/MESSy coupled with the Lagrangian transport algorithm ATTILA (Atmospheric Tracer Transport in a Lagrangian Model, Reithmeier and Sausen, 2002). The new Lagrangian parametrisation of convection, originally designed for passive tracer, is extended to include the Lagrangian convective transport of water vapour, cloud water and ice. This work is done with a view of improving the simulated distribution of water vapour in the upper troposphere/lower stratosphere compared to observations. First results will be presented.