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Numerical simulations of microphysical processes in pyro-convective clouds

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Deep convection induced by vegetation fires plays an important role for the transport of aerosol particles and trace gases into the upper troposphere and lower stratosphere. Additionally, due to the emission of a large number of aerosol particels from forest fires, the microphysical structure of a pyro-convective cloud is clearly different from that of ordinary convective clouds. To investigate the aerosol-precipitation-interaction in pyro-convective clouds we perform numerical simulations of idealized fires using the Active Tracer High resolution Atmospheric Model (ATHAM) and an air parcel model with detailed cloud microphysics.

Using different microphysical schemes within ATHAM and initializing the air parcel model from the full 3-dimensional model simulation, we investigate the influence of the number concentration of aerosol particles on the formation of cloud and rain droplets, their size distribution and transition to the ice phase. Based on the detailed cloud-parcel model, the results from the microphysical schemes within ATHAM will be evaluated. The two-way interaction between the dynamics of the pyro-convective clouds and the cloud microphysics will be explored.