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Impact of microphysical processes on ice crystal size distributions

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Cirrus clouds affect the Earth's radiation budget significantly. Their radiative properties depend on the microphysical properties and ice crystal size distribution. Microphysical processes affect the type and structure of ice crystal distributions strongly. However, bulk microphysics schemes are not able to represent changes in distribution type; thus, effects concerning changes in the distribution cannot be investigated using such simplified parameterizations.

A size-resolved bin model was developed to study the influence of microphysical processes on ice crystal size distributions of cirrus clouds. The model is based on a consistent treatment of the relevant processes and ice crystal properties.

Results of 1-D simulations investigating the temporal and spatial evolution of cirrus ice distributions under various idealized environmental conditions are presented. Emphasis is placed on the effects of sedimentation and depositional growth, but other processes such as ice nucleation are also considered in the simulations.