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Modelling of cirrus clouds – Part 1a: Model description and validation

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Abstract. A double-moment bulk microphysics scheme for modelling cirrus clouds including explicit impact of aerosols on different types of nucleation mechanism is described. Process rates are formulated in terms of generalised moments of the underlying a priori size distributions in order to allow simple switching between various distribution types. The scheme has been implemented into a simple box model and into the anelastic non-hydrostatic model EULAG. The new microphysics is validated against simulations with detailed microphysics for idealised process studies and for a well documented case of arctic cirrostratus. Additionally, the formation of ice crystals with realistic background aerosol concentration is modelled and the effect of ambient pressure on homogeneous nucleation is investigated in the box model.

The model stands all tests and is thus suitable for cloud-resolving simulations of cirrus clouds.

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