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Analytical treatment of ice sublimation and test of sublimation parameterisations in two-moment ice microphysics models

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Abstract. We derive an analytic solution to the spectral growth/sublimation equation for ice crystals and apply it to idealised cases. The results are used to test parameterisations of the ice sublimation process in two-moment bulk microphysics models. Although it turns out that the relation between number loss fraction and mass loss fraction is not a function since it is not unique, it seems that a functional parameterisation is the best that one can do in a bulk model. Testing a more realistic case with humidity oscillations shows that artificial crystal loss can occur in simulations of mature cirrus clouds with relative humidity fluctuating about ice saturation.

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