



Thin and subvisible cirrus and contrails in a subsaturated environment

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The frequency of occurrence of cirrus clouds and contrails, their life time, ice crystal size spectra and thus their radiative properties depend strongly on the ambient distribution of the relative humidity with respect to ice (RH_{ice}). Ice clouds do not form below a certain supersaturation and both cirrus and contrails need at least saturation conditions to persist over a longer period. Under subsaturated conditions, cirrus and contrails should dissipate. During the mid-latitude aircraft experiment CONCERT 2008 (CONtrail and Cirrus ExpeRiment), RH_{ice} and ice crystals were measured in cirrus and contrails. Here, we present results from 2.3/1.7 hours of observation in cirrus/contrails during 6 flights. Thin and subvisible cirrus with contrails embedded therein have been detected frequently in a subsaturated environment. Nevertheless, ice crystals up to radii of $50 \mu\text{m}$ and larger, but with low number densities were often observed inside the contrails as well as in the cirrus. Analysis of the meteorological situation indicates that the crystals in the contrails were entrained from the thin/subvisible cirrus clouds, which emerged in frontal systems with low updrafts. From model simulations of cirrus evaporation times it follows that such thin/subvisible cirrus can exist for time periods of a couple of hours and longer in a subsaturated environment and thus may represent a considerable part of the cirrus coverage.