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Partitioning of H_2O and HNO_3 in different type of cirrus clouds

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Model studies on the partitioning of H_2O and HNO_3 in cirrus clouds are performed by using a detailed microphysical box model. The simulations, based on observation data collected during the field campaigns Polstar 1997, CIRRUS-III 2006 and CR-AVE 2006, accentuate the impact of the freezing mechanism and temperature on the temporal evolution of RH_{ice} and HNO_3 inside ice clouds.

High RH_{ice} and substantial amounts of nitric acid inside the particles are present at ice formation in all simulations. Homogeneous ice nucleation produces high ice crystal number densities, which determine a rapid decrease of RH_{ice} after the ice formation. This brings onward a fast partial release of HNO_3 from the interstitial particles. Lower ice crystal number densities generated by heterogeneous freezing, together with higher cooling rates and lower temperatures can lead to supersaturations inside cirrus that persist over longer time periods. Consequently, more HNO_3 is residing longer in the interstitial particles.

HNO_3 in ice stemming from particle freezing depends strongly on the number densities of ice crystals. As a result, in homogeneously formed cirrus the amount of HNO_3 in ice originating from particle freezing is higher than in heterogenously generated ice clouds.