Ice nucleation active particles are efficiently removed by precipitating clouds

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Ice nucleation in cold clouds is a decisive step in the formation of rain and snow. Observations and modelling suggest that variations in the concentrations of ice nucleating particles (INPs) affect timing, location and amount of precipitation. A quantitative description of the abundance and variability of INPs is crucial to assess and predict their influence on precipitation. Here we used the hydrological indicator δ18O to derive the fraction of water vapour lost from precipitating clouds and correlated it with the abundance of INPs in freshly fallen snow. Results show that the number of INPs active at temperatures $\geq$ -10 řC (INPs-10) halves for every 10 % of vapour lost through precipitation. Particles of similar size (>0.5 ţm) halve in number for only every 20 % of vapour lost, suggesting effective microphysical processing of INPs during precipitation. We show that INPs active at moderate supercooling are rapidly depleted by precipitating clouds, limiting their impact on subsequent rainfall development in time and space.
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