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The indirect aerosol effect of oxalic acid on cirrus clouds

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Heterogeneous ice freezing points of aqueous solutions containing various immersed solid dicarboxylic acids (oxalic, adipic, succinic, phthalic or fumaric) have been measured with a differential scanning calorimeter. The results show that the dihydrate of oxalic acid (OAD) acts as a heterogeneous ice nucleus, with an increase in freezing temperature between 2-5 K depending on solution composition. In several field campaigns, oxalic acid enriched particles have been detected in the upper troposphere. Simulations with a microphysical box model indicate that the presence of OAD may reduce the ice particle number density in cirrus clouds by up to approximately 50 % when compared to homogeneous cirrus formation without OAD. The global net radiative effect caused by this heterogeneous freezing is estimated by the ECHAM4 climate model to be up to -0.3 W/m2.