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Numerical simulations of contrail-to-cirrus transition – Part 1: An extensive parametric study

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Abstract. Simulations of contrail-to-cirrus transition over up to 6 h were performed using a LES-model. The sensitivity of microphysical, optical and geometric contrail properties to relative humidity RH_r , temperature T and vertical wind shear s was investigated in an extensive parametric study. The dominant parameter for contrail evolution is relative humidity. Substantial spreading is only visible for $RH_r > 120\%$. Vertical wind shear has a smaller effect on optical properties than human observers might expect from the visual impression. Our model shows that after a few hours the water vapour removed by falling ice crystals from the contrail layer can be several times higher than the ice mass that is actually present in the contrail at any instance.

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