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Large-eddy simulations of contrail-to-cirrus transition in atmospheric turbulence ROBERTO PAOLI, ODILE THOURON, JORIS PICOT, DANIEL CARIOLLE, CERFACS — Contrails are ice clouds that form by condensation of water vapor exhaust from aircraft engines and develop further in the wake as they are entrained by the airplane trailing vortices. When contrails spread to form cirrus clouds, they can persist for hours and become almost indistinguishable from natural cirrus. This talk focuses on the role of atmospheric turbulence in determining the characteristics of these "contrail cirrus." Large-eddy simulations are carried out using the atmospheric model Meso-NH with the goal of identifying the processes driving the contrail-to-cirrus transition as a function of contrail age. To that end, the effects of atmospheric turbulence, microphysics, and radiative transfer are analyzed separately. Turbulent fields are first generated by means of a stochastic forcing technique that reproduces the atmospheric conditions encountered in the upper troposphere. Contrails generated by a model aircraft are then inserted on the top of these fields. Finally, ice microphysics and radiative transfer are activated to find out on which spatial and temporal scales the vertical motion prevails over the essentially horizontal motion induced by atmospheric turbulent diffusion.

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