



Ice Formation in Altocumulus Embedded in Saharan Dust: Raman Lidar Observations over Central Europe

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During a major Saharan dust outbreak the formation of ice in an altocumulus layer was observed over Leipzig, Germany, with an advanced Raman lidar that measures profiles of cloud and aerosol extinction and backscatter coefficients at several wavelengths, particle depolarization ratio to identify ice crystal layers, water–vapor mixing ratio, temperature, and relative humidity. The Leipzig lidar is part of the European Aerosol Research Lidar Network (see session AS3.09). The altocumulus clouds formed at heights from 5–6.5 km (-18 to -27 °C) in a pronounced Saharan dust layer. Ice parcels were detected at the edges (bottom and top) of the cloud layer probably caused by contact freezing. Evaporation and enhanced mixing of cloud air with dry Saharan air probably favored ice formation. A gravity wave crossed the field site and triggered the formation of three altocumulus clouds at temperatures from -9 to -16 °C. No ice was detected in these clouds that again formed in Saharan dust. However, strong ice generation occurred in an aged altocumulus at -19 to -25 °C during the downdraft induced by the gravity wave. We suppose that the presence of dust was responsible for the detected strength of ice formation and the formation of a pronounced ice virga (precipitation).