



Microphysical characterization of winter cloud systems during a research flight campaign

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The lack of accuracy in the knowledge of cloud microphysics leads to aviation risks, which have caused numerous crashes, mainly owing to aircraft icing (e.g., an EMB-120 crashed in Detroit, Michigan in 1997, and an ATR-72 crashed near Roselawn, Indiana in 1994). Further, this lack is a source of uncertainty in numerical weather forecasting models, since commonly used parameterizations often overestimate ice water content and underestimate supercooled liquid water. This makes the collection of data on cloud microphysical characteristics very useful toward improving the forecasting of icing conditions.

Ten research flights were conducted during the winters of 2011/12 and 2012/13. Their goal was to determine dominant microphysical conditions of winter cloud systems traversing the Guadarrama Mountains in the central Iberian Peninsula. The aircraft was a C-212-200, equipped with a Cloud, Aerosol, and Precipitation Spectrometer (CAPS) under the left wing. Data of temperature and Liquid Water Content (LWC), registered by the CAPS probe, were used in the study. Furthermore, we thoroughly analyzed images taken by a Cloud Imaging Probe Grayscale (CIP-GS), capable of measuring hydrometeors between 25 and 1,550 μm in size, and representing them in a 2D image. The various types of hydrometeors observed during these flights are described, along with microphysical processes inferred from the CIP-GS images.

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