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Microphysical characterization of clouds during the research flight dated 23rd of march, 2017

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In the context of aviation weather hazards, the study of meteorological conditions associated to aircraft icing is very important because of several accidents attributed to this cause over recent decades. Supercooled large drops (SLD), which are liquid drops with a diameter larger than 50 μm located in a region at temperatures below 0ºC, constitute the principal source of aircraft icing. Numerical Modelling often overestimate the ice water content (IWC) and underestimate the supercooled liquid water content (SLW). This fact makes the collection of data about microphysical characteristic of clouds vital to improve the forecasting of icing conditions.

Within the framework of a research flight campaign carried out in Rozas (located in Lugo, Spain) to determine the dominant microphysical conditions of clouds, an episode of aircraft icing was registered on 23rd of March, 2017. The aircraft used during the research flight was a C-212-200, being the Cloud, Aerosol and Precipitation Spectrometer (CAPS) installed under its left wing. Data of temperature and Liquid Water Content (LWC) registered by CAPS probe were used in this study. Moreover, we have done an analysis of the images taken by the Cloud Imaging Probe Grayscale (CIP-GS), which role is to measure hydrometeors concentration and size between 25 and 930 μm, representing them in a 2D image. The different hydrometeors observed during the flight path are showed in the various altitudes that the aircraft flew, besides the characteristic of those hydrometeors found.

In this research, Weather Research and Forecasting (WRF) model was used for analyzing an aircraft icing episode. Initial and boundary conditions were provided by the National Centers for Environmental Prediction (NCEP) reanalysis. Three nested domains were defined, with a grid spacing of 27, 9, and 3 km, respectively.

Horizontal and vertical cross sections were used to analyze the IWC and the SLW estimated by the WRF model on the target area. We present the mesoscale meteorological analysis of this episode, showing the hydrometeors detected by the CAPS and the output of modelling over the tracks flight by the C 212-200. The tools developed in this research could be useful in the field of aircraft safety in order to avoid regions where numerical models forecast icing conditions.

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