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# Analysis of Microphysics Mechanisms in Icing Aircraft Events: A Case Study

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The appearance of Supercooled Large Drops (SLD) can give way to icing aircraft. In these cases, atmospheric icing causes an unusual loss of support on the aircraft due to the rapid accumulation of ice on the wings or measurement instruments.
There are two possible ways that SLD can be formed: The first is through a process called "warm nose", followed by "resupercooling". This process is usually associated with the entrance of warm fronts. The second possibility is that drops are formed by the process of condensation, and they grow, to sizes of at least 50 $\mu$m through processes of collision-coalescence, in environments with temperatures inferior to 0ºC at all times, but without being able to produce a freezing process. Some authors point out that approximately 75% of gelling precipitation events are produced as a consequence of this second situation.
Within the framework of the TECOAGUA Project, a series of scientific flights were performed in order to collect data in cloud systems capable of producing precipitation during the winter period and their capacity to create environments favorable to "icing aircraft". These flights were carried out making use of a C 212-200 aircraft, belonging to the National Institute of Aerospatial Techniques (INTA), with a CAPS installed.
On 1 February 2012, the C 212-200 aircraft took off from the airport in Torrejón de Ardoz (Madrid), flying about 70 km to stand upright on the northern side of the Central System, finding itself at a flight level of 3500 m, an elevated concentration of SLD at temperatures around -12ºC, with liquid water content up to 0.44 g/m3, which provoked the accumulation of ice on the outline of the aircraft's wings, which required a cancellation of the flight. Surrounding the flight area, a microwave radiometer (MWR) was installed. An area of instability between 750 hPa and 600 hPa was identified in the vertical MWR profiles of temperature and humidity during the hour of the flight. It is mainly in this layer where cloudiness develops, and where the airplane suffered icing conditions. The CAPS detected a high concentration of SLD at 650 hPa.
The use of MM5 applied on this day allowed us to detect two dynamic anomalies in the tropopause, giving way to intrusions of dry air that were also detected by MSG images. The convergence of these two gave way to an accumulation of humidity in the area where the C 212-200 detected an elevated concentration of SLD. The mesoscale analysis led us to detect a mesolow on the leeward side of the Central System. Finally, this anomaly collaborated with providing sufficient liquid water so that SLD could form and accumulate via collision-coalescence processes.

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