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Development of inflight icing index for aviation

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Water can exist in a liquid state below 0°C if there are no ice nuclei for ice to form around. In the atmosphere this leads to 'super-cooled cloud'. If an aircraft flies through such a cloud, the liquid can freeze on impact, affecting aerodynamics and handling. This, known as inflight icing, presents a danger to aviation and can, in severe cases cause the aircraft to crash. Consequently, global gridded forecasts of regions of inflight icing risk are provided to the aviation community.

A new icing index from the literature is being tested within the Met Office system. This index takes account of four meteorological factors known to be conducive to super-cooled cloud: temperature, vertical velocity, cloud fraction and cloud liquid water.

Verification of icing forecasts is complicated as regions of perceived risk are understandably avoided, hence leading to less incidents and fewer opportunities for a hit when calculating statistical scores using in-situ pilot reports. In addition, the severity is notoriously hard to verify. Although the severity of an icing event is undoubtedly affected by the local meteorology it is also very dependent on other factors. These include: the specific aircraft involved, the presence of de-icing equipment and the temperature of the fuselage, which depends on whether the aircraft is in the ascending or descending phase of flight.

An objective verification system which uses the Met Office satellite icing potential product as a source of truth data is used to assess the skill and reliability of deterministic forecasts. This shows an improvement in the performance of the new icing index compared to the current index.

Additionally, since incidents of icing on aircraft are reported as light, moderate or severe it is useful to visualise the severity with the same 3-level intensity scale. We demonstrate how independent information about the likelihood and severity can be displayed as a single field for the end user. Methods of processing likelihood and severity differently as part of an ensemble prediction system before recombining into a probabilistic icing forecast are explored.