EGU22-7099
https://doi.org/10.5194/egusphere-egu22-7099
EGU General Assembly 2022

In-flight icing: a remote detection tool based on satellite data

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One of the most severe weather hazards to aviation is in-flight airframe icing, i.e. the accretion of ice on airplane's surfaces during flight. In order to increase margins of aviation safety, the early detection of regions affected by icing conditions is a challenging and desirable goal. In the framework of the H2020 EU project SENS4ICE (SENSors and certifiable hybrid architectures for safer aviation in ICing Environment), CIRA has developed a remote detection tool of icing conditions based on satellite data. Specifically, high-resolution satellite products, based on Meteosat Second Generation (MSG) data, have been considered, with spatial and temporal resolutions of about 3 km and 15 minutes respectively. The aim of this tool is to identify areas potentially affected by in-flight icing hazard, giving information about the severity of the phenomenon (light, moderate or severe) and an estimate of the altitude at which this hazard can occur. The developed algorithm also takes into account supercooled large droplets (SLD), which pose a serious threat to aviation and have been the cause of tragic accidents over the last decades. The tool relies on satellite data, to remotely infer the properties of clouds, and a set of experimental curves and envelopes that describe the interrelationship of cloud liquid water content, mean effective diameter of the cloud droplets and ambient air temperature. These curves, provided by the Federal Aviation Administration (FAA), define the atmospheric icing conditions and represent the reference legislation in this field. Furthermore, a nowcasting algorithm based on the extrapolation in time of the current icing conditions has been implemented, in order to perform a forecast over a short period ahead, responding to the great need for timely and location-specific forecasts that are relevant for aviation, e.g. for safety reasons or for planning and routing air traffic. This presentation will provide a preliminary analysis of the performance of the implemented tools, which will be evaluated in relevant icing conditions in the framework of SENS4ICE flight campaigns, planned for 2023.

Acknowledgment: This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 824253 (SENS4ICE project).