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A case study of the microphysical and dynamical processes of fog and in-flight icing environments at Cold Lake Alberta, Canada

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Pilot reports (PIREPs) of in-flight icing have been frequently been issued at Cold Lake airport (CYOD), Alberta, typically during descent on approach or climb after takeoff in the fall and winter seasons. Climatological data also indicate that this location is affected by various fog conditions. In order to better understand these conditions, Environment and Climate Change Canada (ECCC), in cooperation with the Department of National Defense (DND), installed a number of specialized instruments at Cold Lake. The ground based instruments include a Vaisala PWD22 present weather sensor, a multi-channel microwave profiling radiometer (MWRP) and a Jenoptik CHM15k ceilometer. A case study is presented of an icing event and foggy conditions that occurred very close to ground level and temperature changed from -1 C up to 2 C on 24 October, 2016. The microphysical and thermo-dynamical conditions within the boundary layer and aloft that led to these conditions were examined by integrating the ground based measurements with the Geostationary Operational Environmental Satellite (GOES) and the Canadian 2.5 km resolution NWP (HRDPS - High Resolution Deterministic Prediction System) model data. Preliminary results indicate that the ground based in-situ measurements were in agreement with the aviation weather observations (METAR). Both the HRDPS model and MWRP detected supercooled liquid water well during the icing event and its thermodynamic structure that remains to be investigated further. Furthermore, the icing potential and low clouds formation using the GOES Imager data will be compared with HRDPS simulations and verified by PIREPs.