

EGU2020-8992

<https://doi.org/10.5194/egusphere-egu2020-8992>

EGU General Assembly 2020

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## Vertical distribution, seasonality and troposphericity of ice-supersaturated air masses in the northern mid-latitudes from regular in-situ observations by passenger aircraft

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The vertical distribution and seasonal variation of water vapour volume mixing ratio ( $H_2O$  VMR), relative humidity with respect to ice ( $RH_{ice}$ ) and particularly of regions with ice-supersaturated air masses (ISSR) in the extratropical upper troposphere and lowermost stratosphere are investigated at northern mid-latitudes over the regions Eastern North America, the North Atlantic and Europe for the period 1995 to 2010.

Observation data originate from regular and continuous long-term measurements of  $H_2O$  VMR, temperature and  $RH_{ice}$  by instrumented passenger aircraft in the framework of the European research program MOZAIC which is continued as European research infrastructure IAGOS (from 2011; see [www.iagos.org](http://www.iagos.org)). The observation data are analysed with respect to the thermal and dynamical tropopause, as provided by ERA-Interim. Additionally, collocated  $O_3$  observations from MOZAIC are used as tracer for stratospheric air masses.

Our key results provide in-depth insight into seasonal and regional variability and tropospheric nature of ice-supersaturated air masses at various distances from the tropopause layer. For the vertical distribution and seasonal variation of ISSR occurrence we show a comparison of our results to radio soundings and to satellite observations of cirrus cloud occurrence from AIRS and TOVs Path B instruments. Finally, for all three regions, we investigate the trends and the dependencies of ISSR occurrence on the North Atlantic Oscillation (NAO) index.