



## **First IAGOS-CORE greenhouse gas observations from commercial airliners**

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Within the framework of IAGOS-ERI (In-service Aircraft for a Global Observing System - European Research Infrastructure), a cavity ring-down spectroscopy (CRDS)-based measurement system for the autonomous measurement of the greenhouse gases (GHGs) CO<sub>2</sub> and CH<sub>4</sub>, as well as CO and water vapour was deployed on a Lufthansa Airbus A330 for the first time starting September 2018. The IAGOS-CORE rack integrated in the avionics bay of several Airbus A330 and A340 contains all necessary provisions for installing fully automated instruments for the measurement of ozone, and carbon monoxide (Package 1), humidity (ICH) and cloud particles (BCP). Package 2d (P2d) for greenhouse gas measurements is one of four additional Package 2 options, of which only one can be installed at a time in a given aircraft, provided that Package 1 is installed which is necessary for data transmission. The P2d system uses components of a commercially available CRDS instrument (G2401-m, Picarro Inc.). To enable robust and autonomous operation of the IAGOS-CORE GHG package over 6-month deployment periods, numerous technical issues had to be addressed. This includes an inlet system providing ram-pressure to allow for operation to ceiling altitude without a sample compression pump, and the use of a two-standard in-flight calibration system to allow for trace gas measurements to be fully traceable to WMO calibration scales.

The first deployment on a Lufthansa A330 showed minor problems related to accurate temperature control, a prerequisite for accurate measurements. These initial problems have been addressed by modifications of the power management in order to improve temperature control; these modifications were included in a minor change of the supplemental type certification (STC) of Package 2 for Airbus A330 and A340 aircraft.

First IAGOS GHG data will be presented, and the availability of GHG data to the research community will be discussed. Future deployments on aircraft from further airlines providing regular, long-term GHG observations covering major parts of the globe will also be explained.