

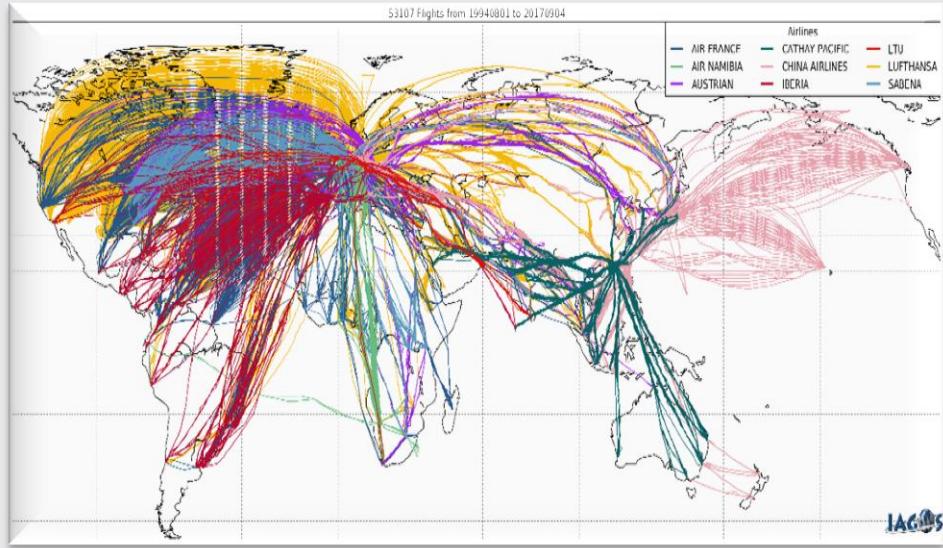


GLOBAL-SCALE MONITORING OF ATMOSPHERIC COMPOSITION BY PASSENGER AIRCRAFT

www.iagos.org

IAGOS AISBL | Rue du Trône 98 | 1050 Brussels

European Research Infrastructure for Earth Observation using Passenger Aircraft



- partners from science, industry and meteorological services
- regular in-situ monitoring of essential climate variables with global coverage
- > 15 long-haul aircraft + 1 flying laboratory
- long-term deployment envisaged (20 yrs)

- provision of data in near real time
- open data policy (CAMS/GEO/GEOSS)
- longest time series for
 - tropopause temperature (> 20 yrs)
 - H_2O , O_3 (> 20 yrs)
 - CO (> 12 yrs)

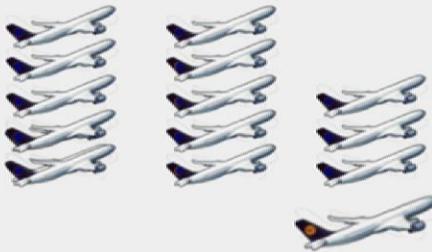
IN-SERVICE AIRCRAFT FOR A GLOBAL OBSERVING SYSTEM

Association Internationale sans but lucratif



European Research Infrastructure for Earth Observation using Passenger Aircraft

H₂O, O₃ H₂O, O₃, CO, NO_y H₂O, O₃, CO, NO_x, NO_y, clouds H₂O, O₃, CO, NO_x, NO_y, clouds, CO₂, CH₄, aerosol



1994 2002 2008

MOZAIC

CARIBIC



IAGOS



2011 2012 2014



2017 2020



THE IAGOS – CORE SYSTEM



MOZAIC Progression
Permanent installation in the
avionic bay of Airbus A340/A330

Weight : 160 kg
Operation : continuous
Flights per aircraft : 500/year

THE IAGOS – CORE SYSTEM



THE IAGOS - CORE FLEET 2017

Lufthansa D-AIGT



CORE-1, July 2011

China Airlines B-18806



CORE-2, June 2012

Air France F-GLZU



CORE-3, June 2013

Cathay Pacific B-HLR



CORE-4, Aug 2013

Iberia EC-GUQ



CORE-5, Feb 2014

Lufthansa D-AIKO



CORE-6, March 2015

China Airlines B-18317



CORE-7, July 2016

Hawaiian Airlines N384HA



CORE-8, Feb 2017

Air France F-GZCO



CORE-9, Apr 2017

China Airlines B-18316



CORE-10, July 2017



IAGOS – CARIBIC

THE FLYING LABORATORY



**Instrumented cargo container on
Lufthansa Airbus A340-600**
Weight : 1.6 tons (15 instruments)
**Operation : 4 consecutive flights
per month**

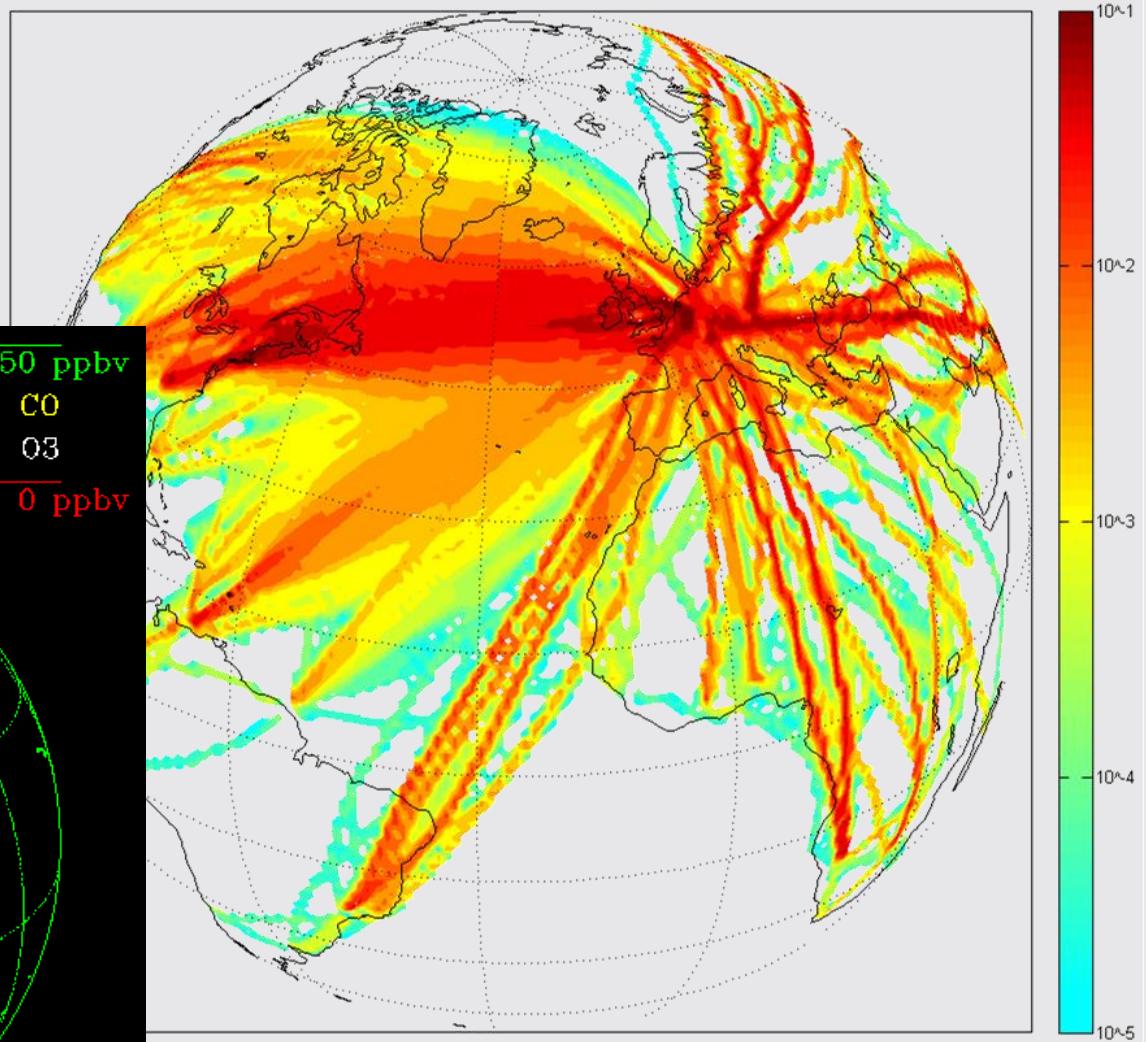
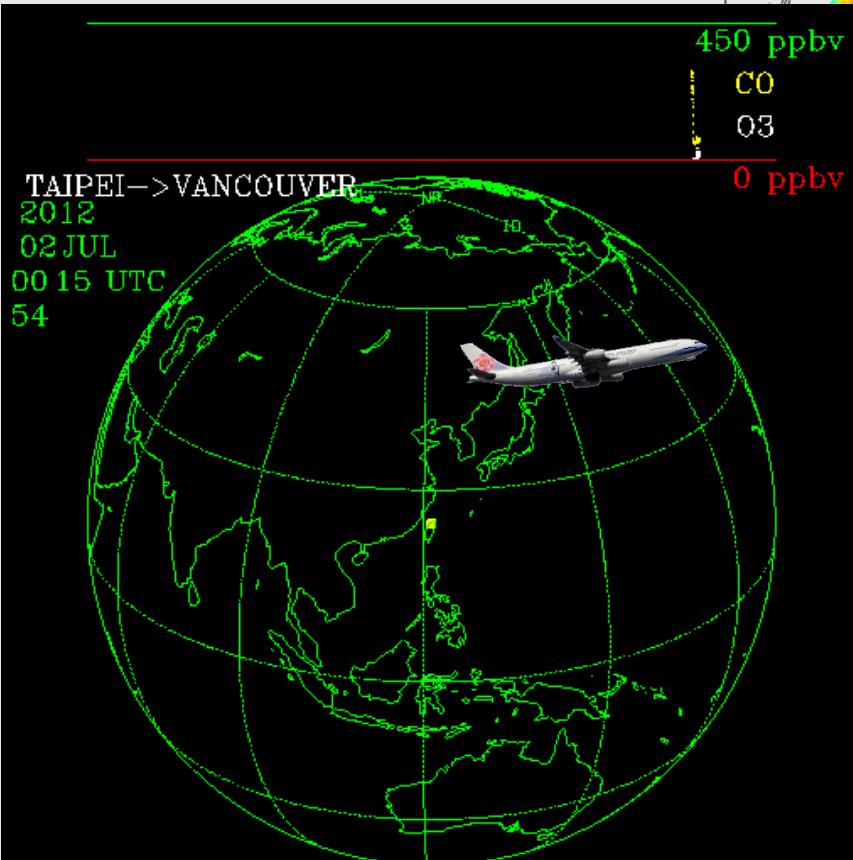


CARIBIC flights 2005 – 2016



THE IAGOS DATA SET

IAGOS Data Time Series



Global Data Coverage in %

Global-Scale Atmospheric Observations

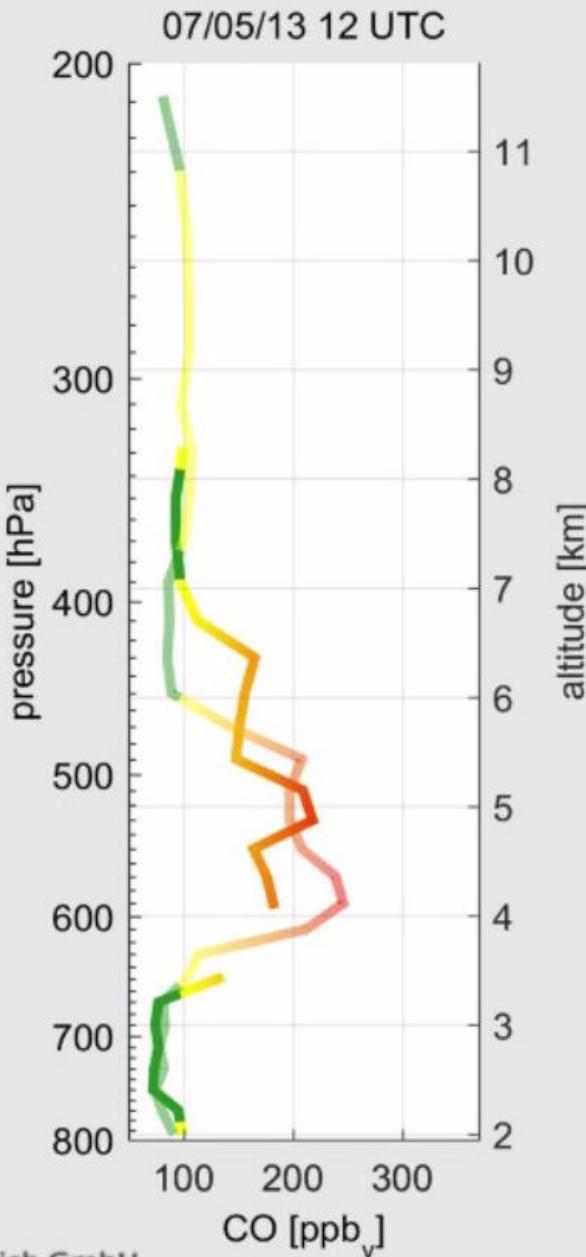
Forest Fires in Canada in July 2013

Large-scale forest fire plumes were transported across the North Atlantic to Europe within one week.

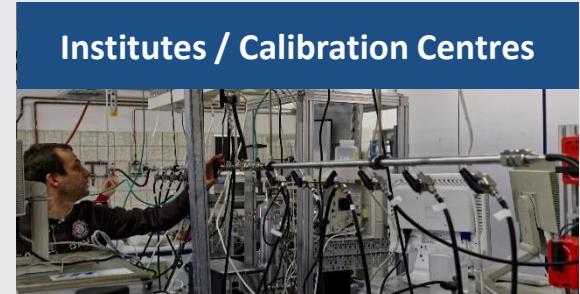
Copernicus forecasted trans-Atlantic transport of smoke plumes.

ACTRIS Lidar stations followed the evolution of smoke plumes by remote sensing techniques.

IAGOS aircraft collected in-situ observations of smoke plumes when descending into airports in Europe.



IAGOS DATA SERVICES



Institutes / Calibration Centres



meta
data

IAGOS Data Centre
hosted by AERIS
(CNES-CNRS/INSU)
in Toulouse

near
real
time
data
NRT
for
Copernicus
model
validation

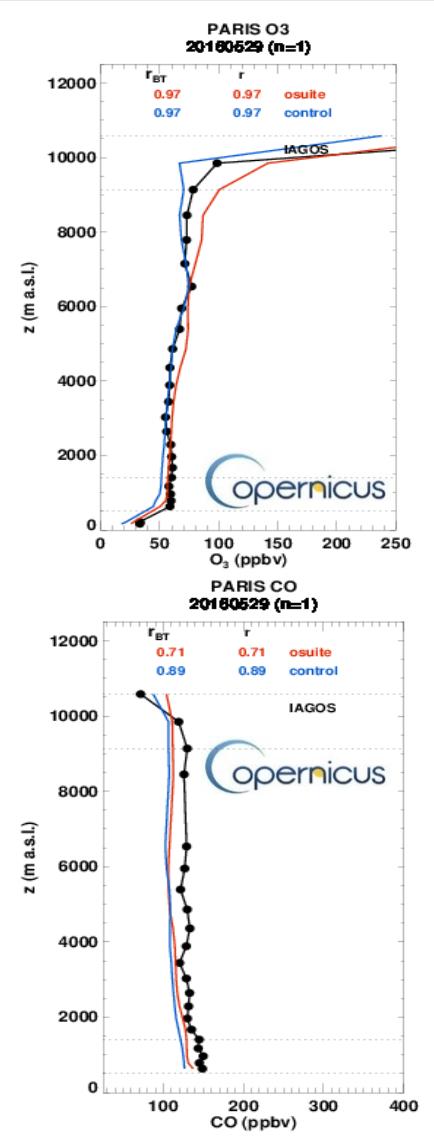
calibration maintenance

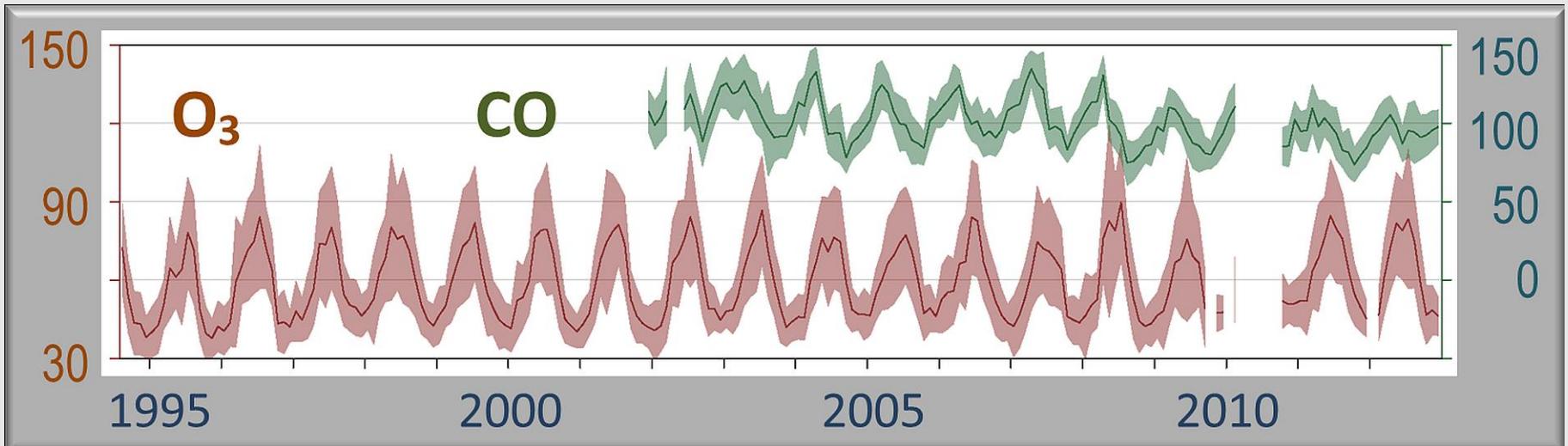


data



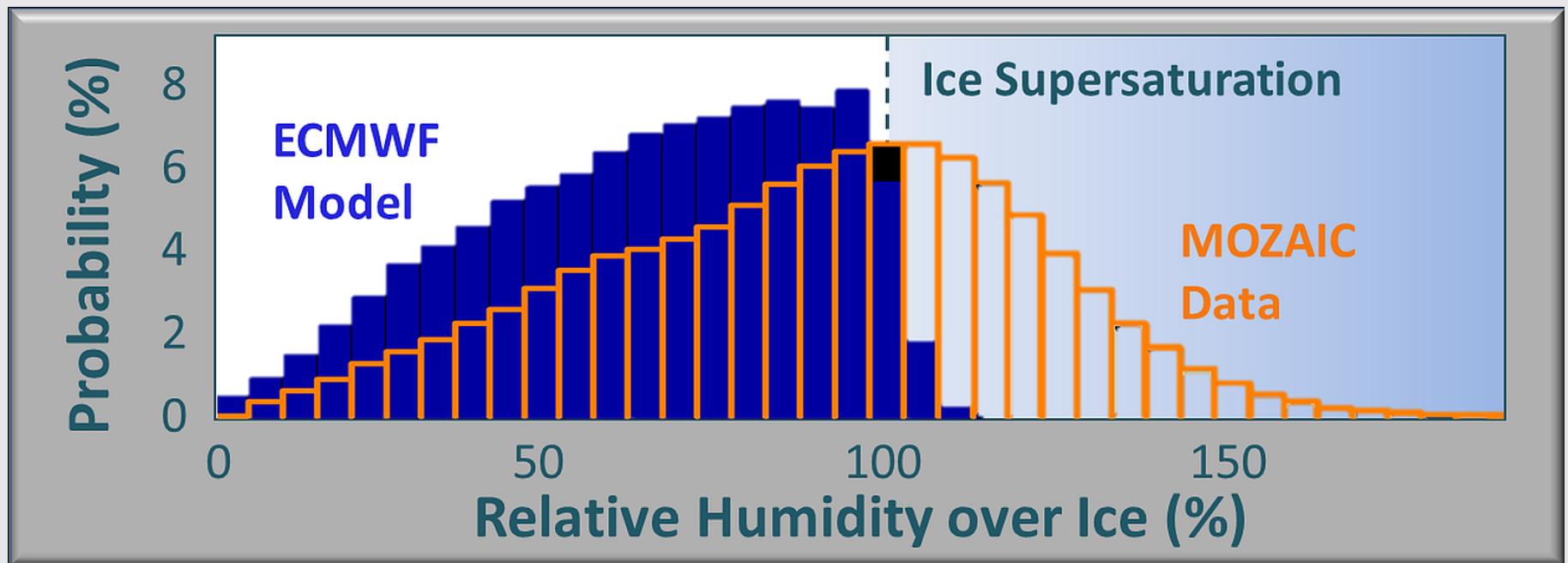
IAGOS data products



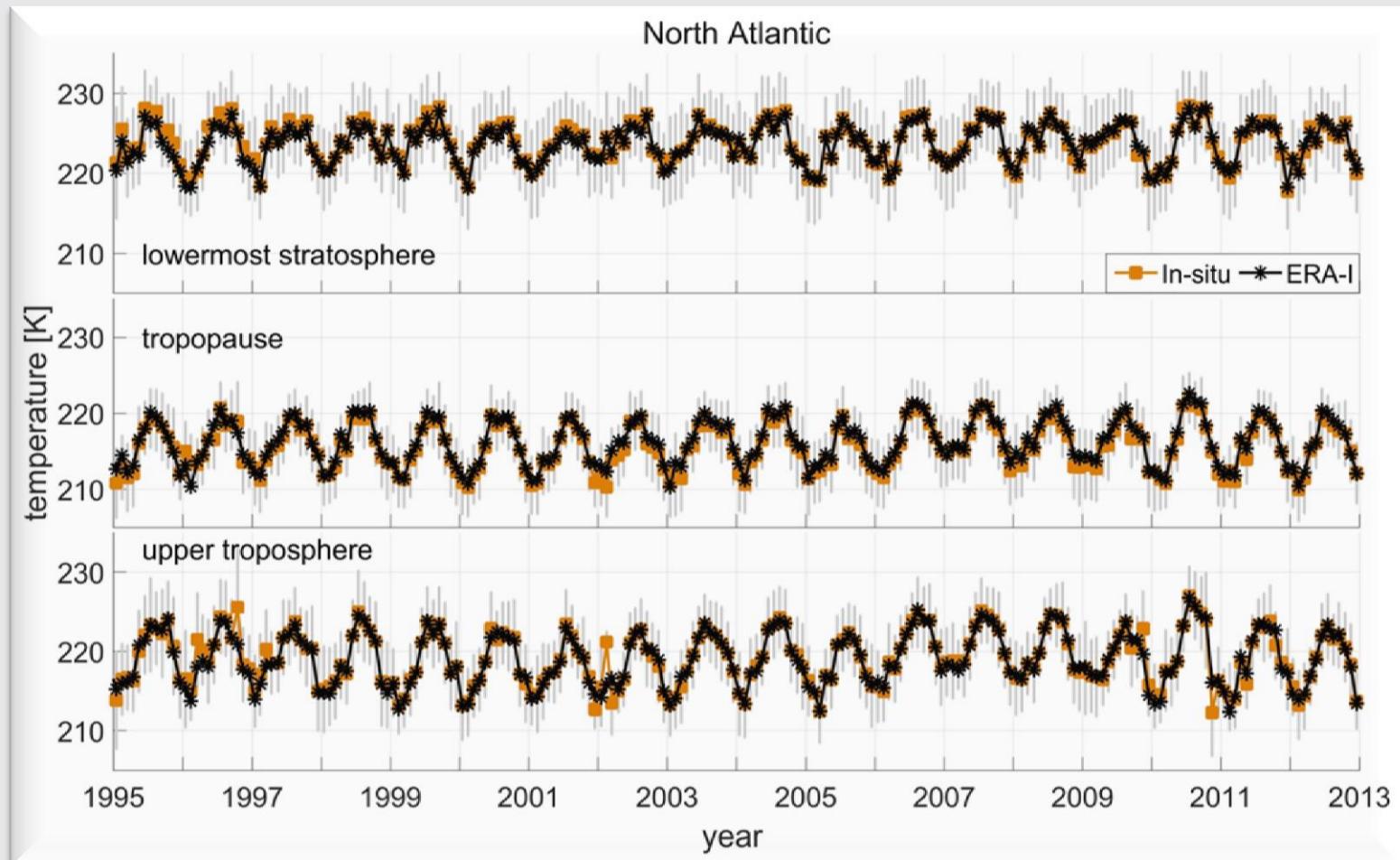


IAGOS provides essential information on long-term changes in chemical composition around the tropopause (10-13 km).

Over Europe, CO concentrations decreased significantly, while ozone remained relatively constant.

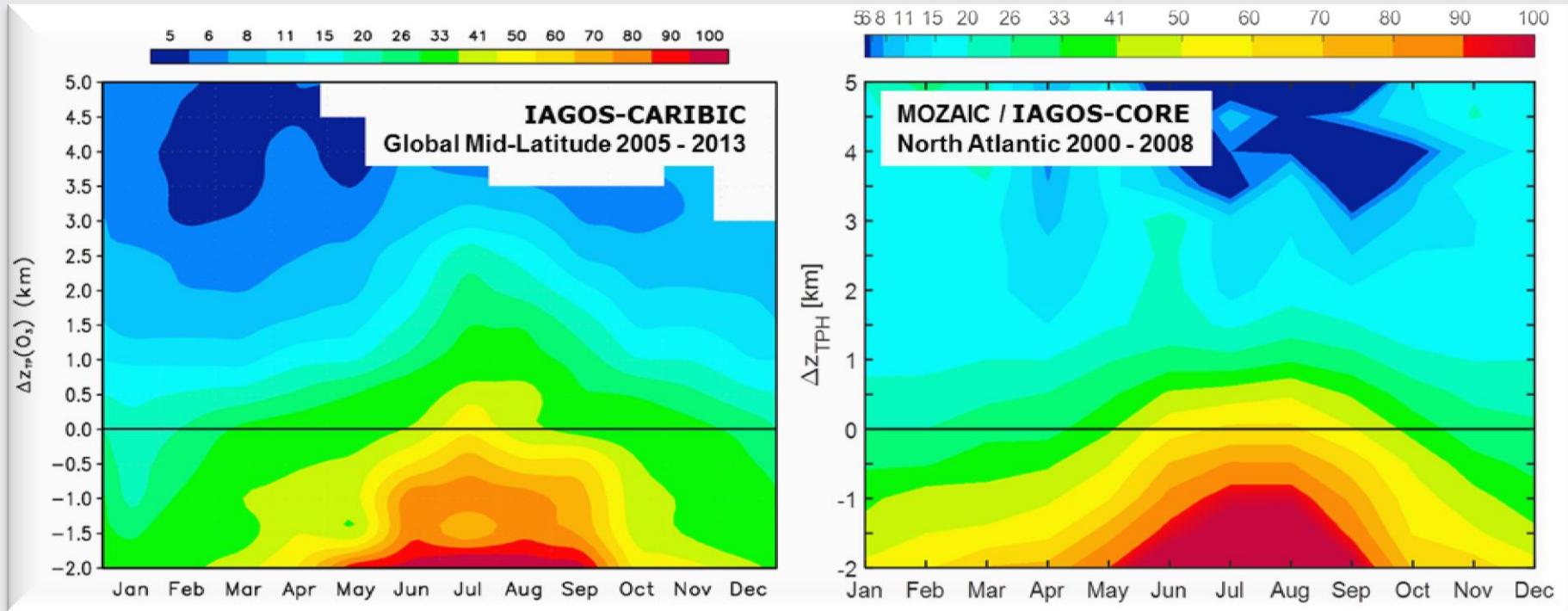


The large abundance of ice supersaturation in the upper troposphere, an unpredicted feature with implications for weather prediction.

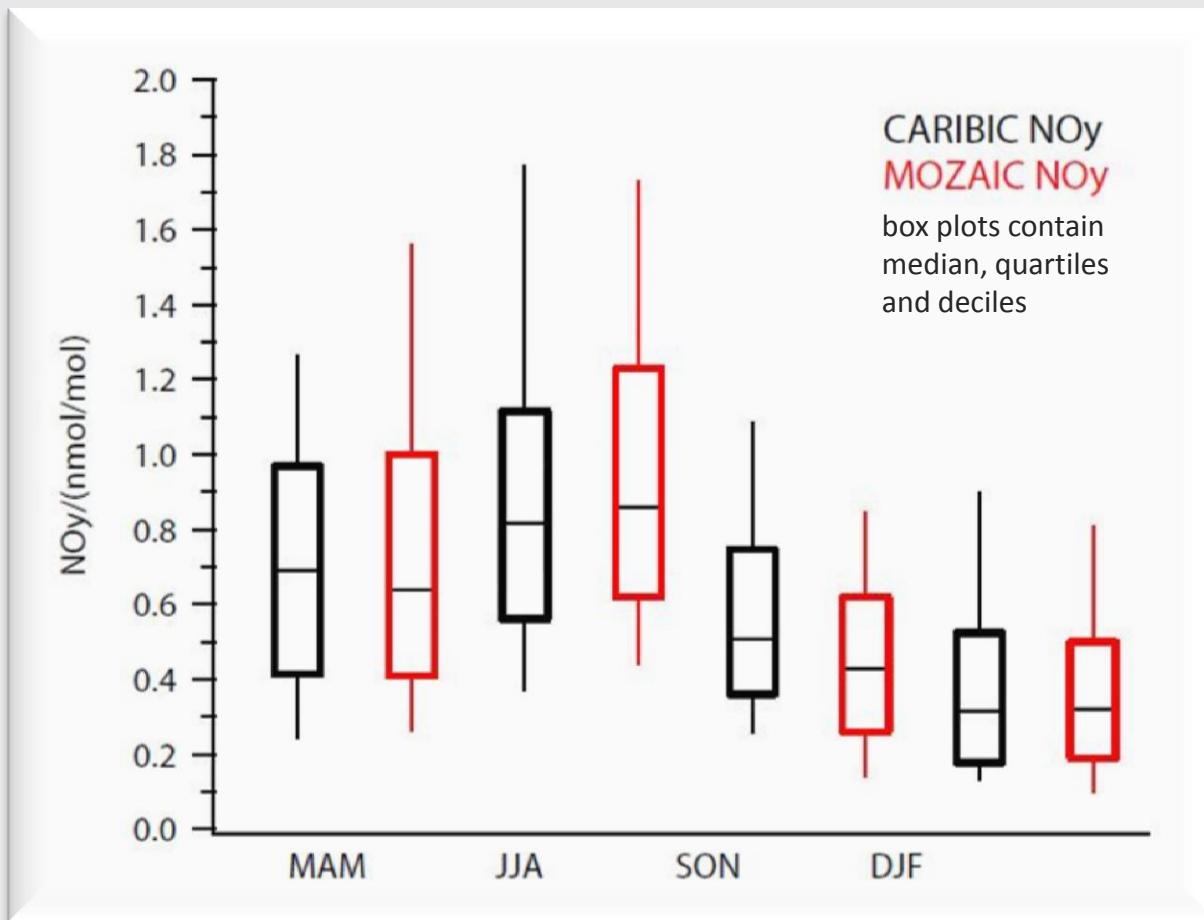


Temperature in the upper troposphere and lowermost stratosphere did not change over the North Atlantic in the past 20 years.

RESEARCH HIGHLIGHTS



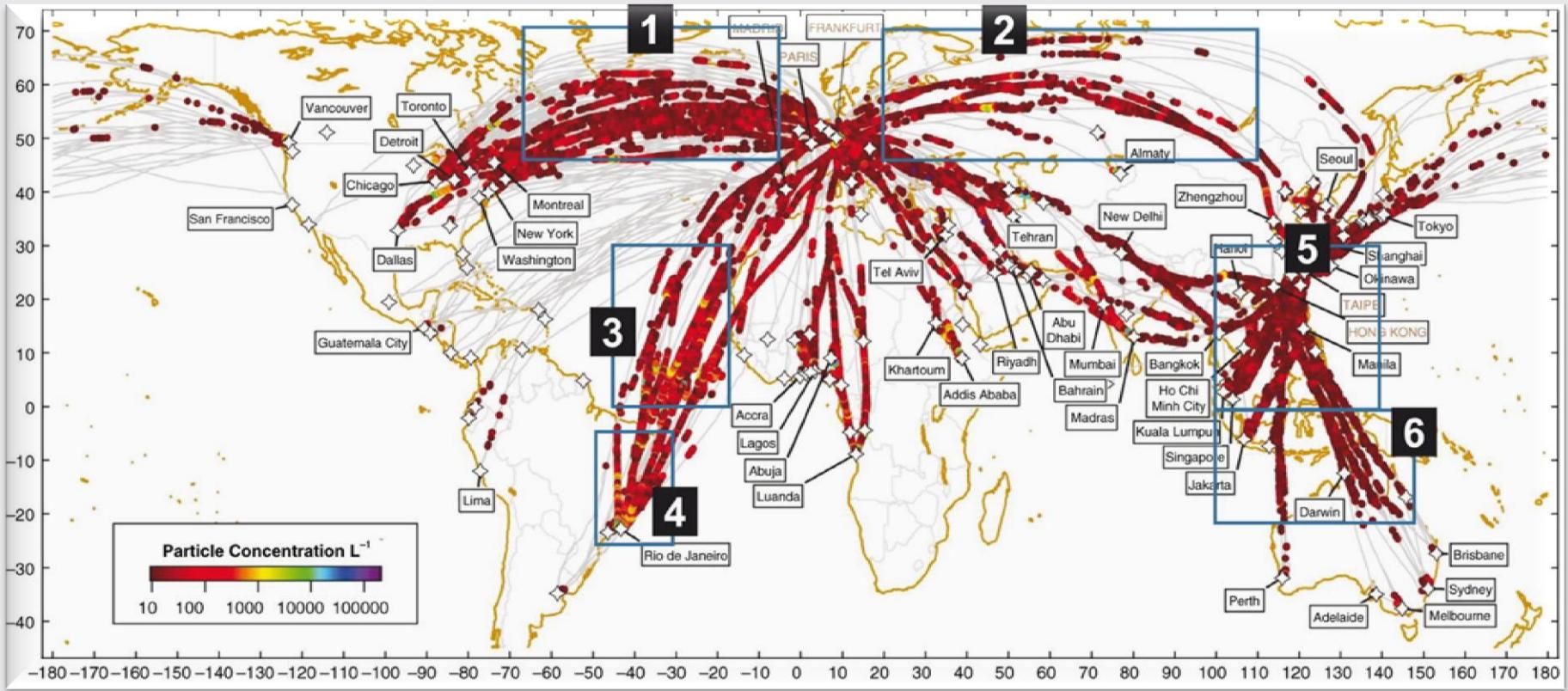
Seasonal variation of the mean monthly median H_2O VMR (in ppmv) at mid-latitudes in distance relative to the tropopause height z_{TPH} indicate more humid lowermost stratosphere in summer.



Comparison of tropospheric climatologies of nitrogen oxides (NO_y) over Europe from CARIBIC (2005 – 2013) and MOZAIC (2001 – 2005).

Stratmann et al., 2016

RESEARCH HIGHLIGHTS



Global coverage by cirrus clouds; the filled circles mark cloud encounters, the color is proportional to the ice crystal number concentration.

THE PARTNERSHIP



Forschungszentrum Jülich, D
Coordination



Laboratoire d'Aérologie, CNRS, Toulouse, F
Coordination



Karlsruher Institut für Technologie, D



Max-Planck-Gesellschaft, D



University of Manchester, U.K.



Deutsches Zentrum für Luft- und Raumfahrt, Oberpfaffenhofen, D



Leibniz-Institut für Troposphärenforschung, Leipzig, D



Météo France, Toulouse, F



enviscope GmbH, Frankfurt, D



AIRBUS, Toulouse, F



World Meteorological Organization, Geneva, CH



Bundesministerium
für Bildung
und Forschung



MINISTÈRE DE
L'ENSEIGNEMENT
SUPERIEUR ET DE
LA RECHERCHE



CENTRE NATIONAL D'ÉTUDES SPATIALES



THE TEAM



*IAGOS-IGAS joint meeting, 16-20 November 2015
Centre International de Conférences - Météo-France - Toulouse*

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Association Internationale sans but lucratif



The Official Airline for
Climate Monitoring

CHINA AIRLINES