



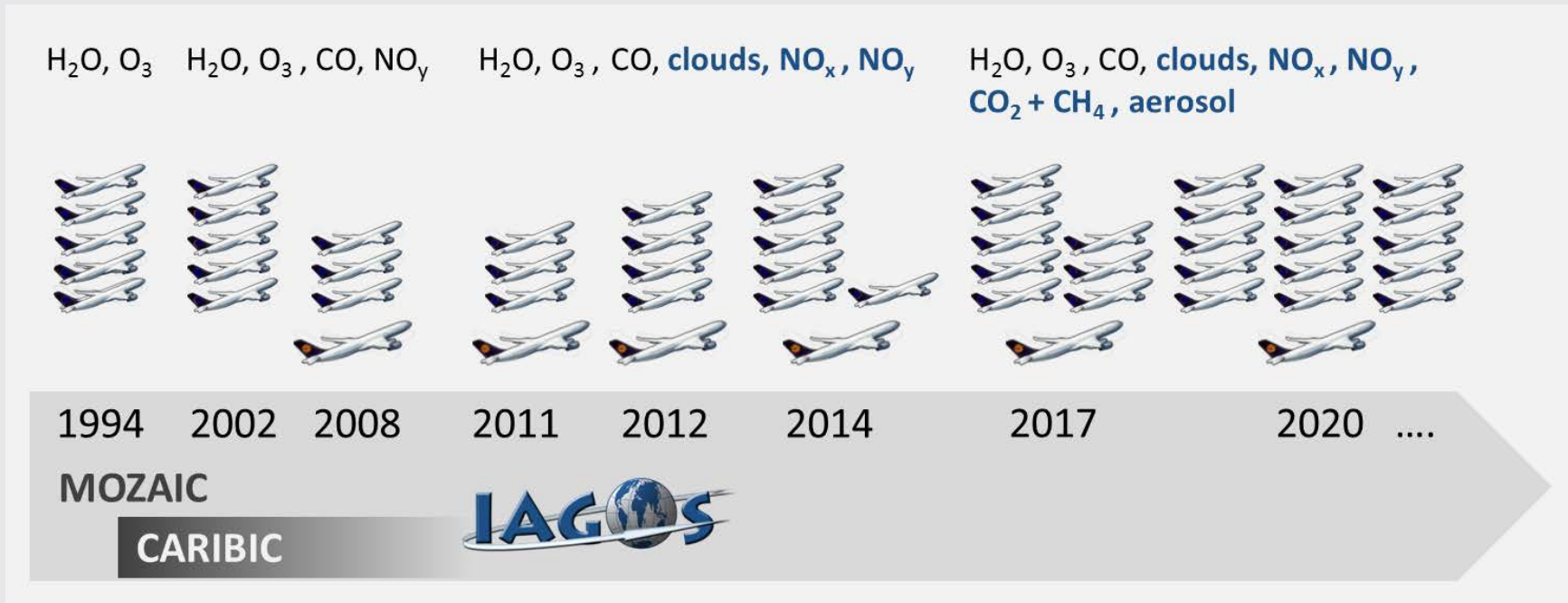
IN-SERVICE AIRCRAFT FOR A GLOBAL OBSERVING SYSTEM

Ozone and Chemical Composition in the Pacific Region Measured by IAGOS

Hannah Clark, Bastien Sauvage, Frank Roux, and the IAGOS Team



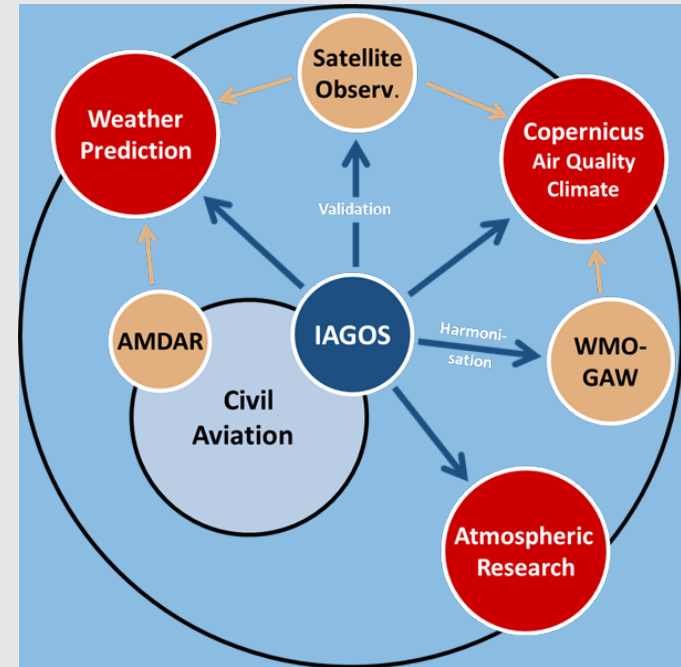
European Research Infrastructure for Earth Observation using passenger aircraft



IAGOS combines the advantages of MOZAIC and CARIBIC:

IAGOS-CORE: Key species (O_3, CO, H_2O) on several aircraft, every day with quasi-global coverage, 500 flights/ac/yr

IAGOS-CARIBIC: Many species for a deeper understanding, on one aircraft, ca. 50 flights/yr, $CO, CFCs, SO_2, VOCs, aerosols$



- Permanent installation of instruments in the avionics bay of Airbus A330/A340
- Continuous operation with 500 flights per aircraft per year
- Regular global-scale in-situ monitoring of atmospheric composition (ozone, water vapour, reactive gases, clouds, greenhouse gases and aerosols)

The IAGOS Fleet 2018



Lufthansa D-AIGT



CORE-1, July 2011

Air France F-GLZU



CORE-3, June 2013

Cathay Pacific B-HLR



CORE-4, August 2013

Lufthansa D-AIKO



CORE-6, March 2015

China Airlines B-18317



CORE-7, July 2016

Hawaiian Airlines N384HA



CORE-8, March 2017

Air France F-GZCO



CORE-9, March 2017

China Airlines B-18316



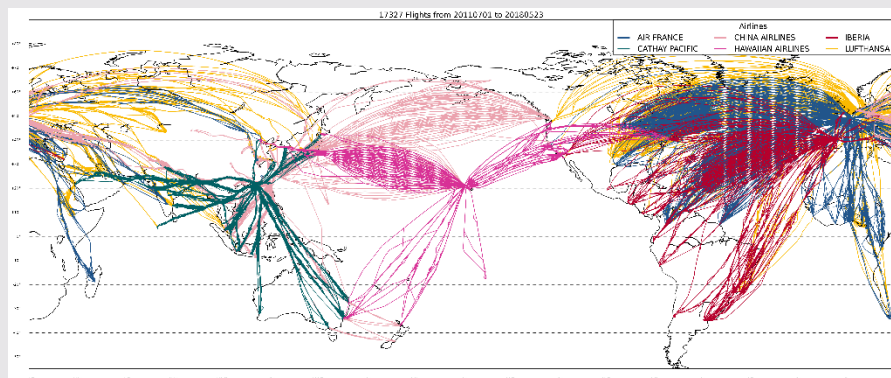
CORE-10, July 2017

Lufthansa D-AIHE

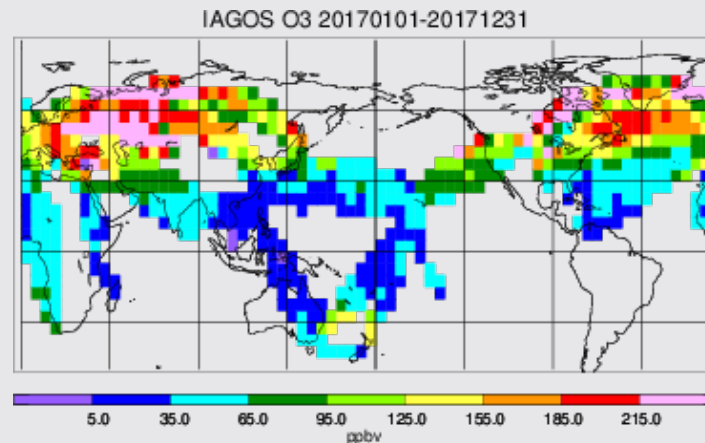


CARIBIC, December 2004

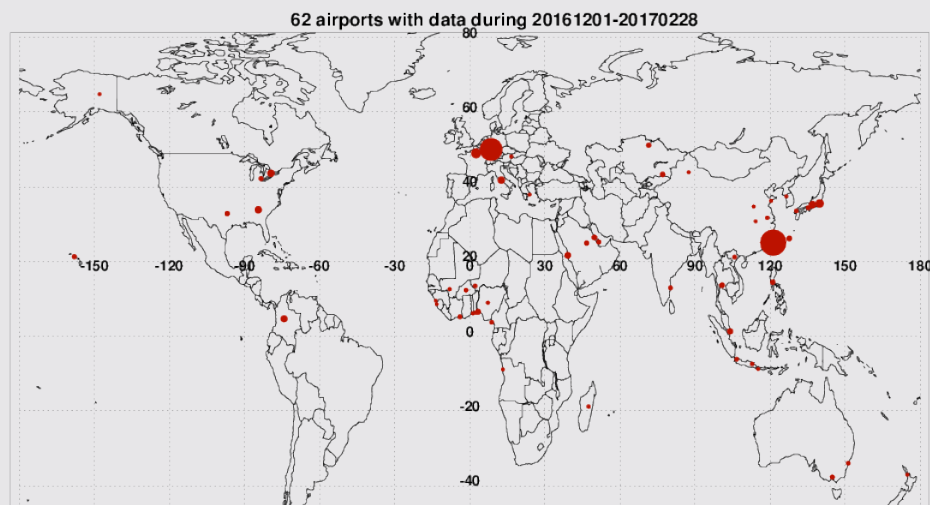
UTLS Flight tracks since 1994



Seasonal Climatology DJF 2017/2018



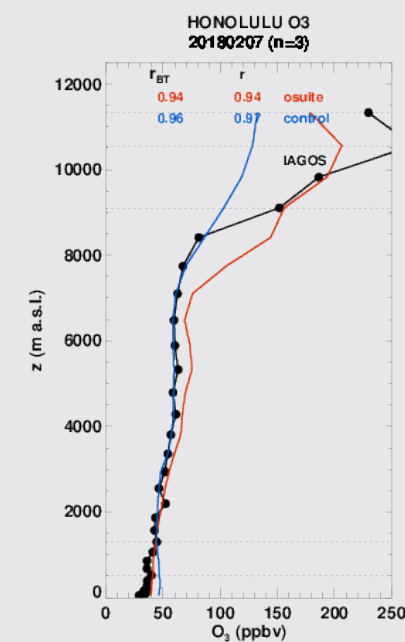
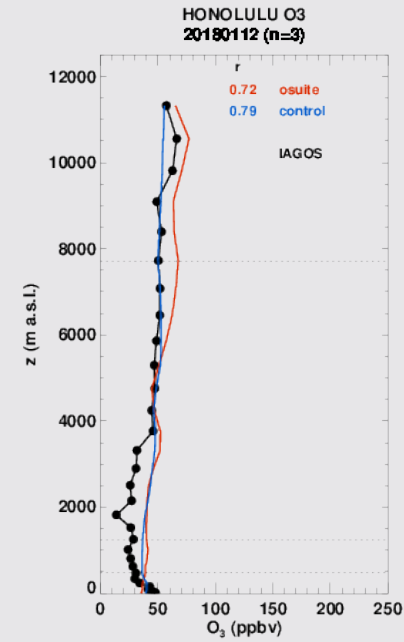
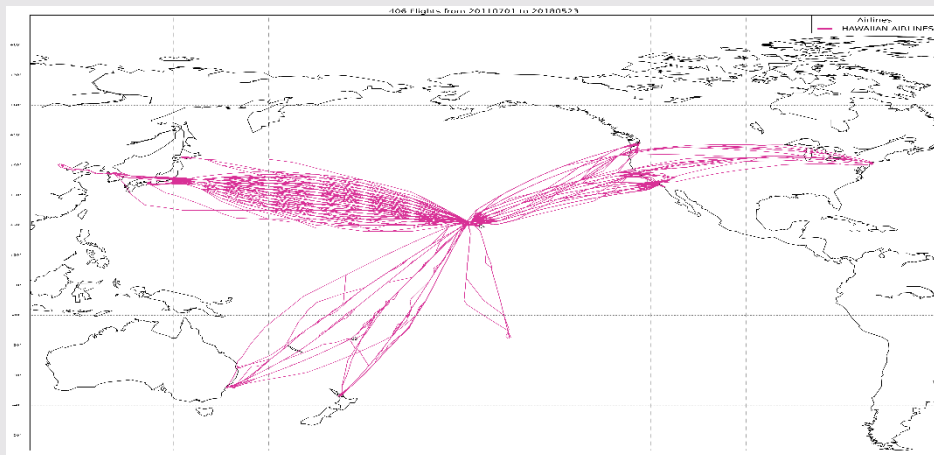
Landing-take off profiles at worldwide airports



Latest profiles shown at www.iagos.fr/cams

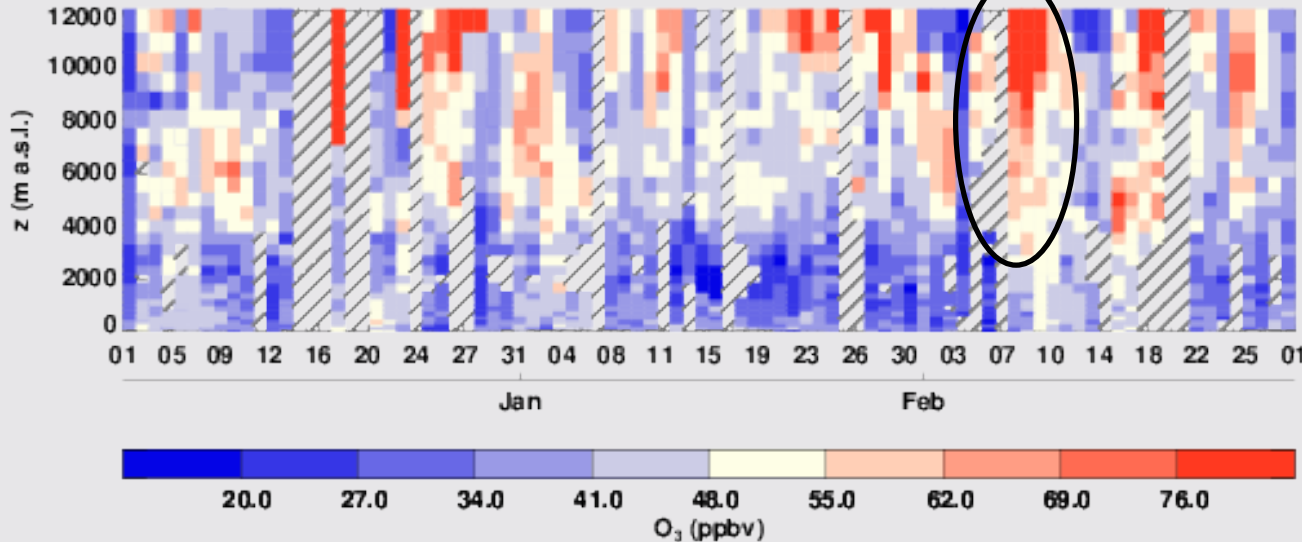
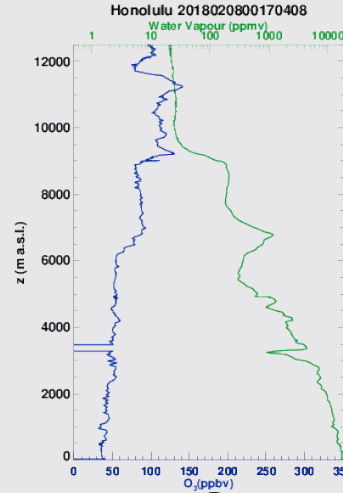
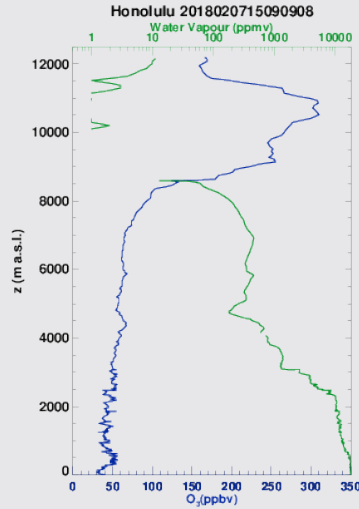
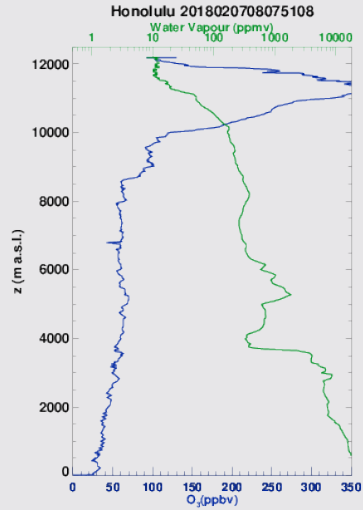


Hawaiian Airlines A330 operational since October 2017



- Daily profiles at Honolulu (21°N)
- New flight tracks over Pacific

Daily Profiles at Honolulu (21°N)



Flake news: It's snowing in Hawaii

Doyle Rice, USA TODAY Published 5:12 p.m. ET Feb. 6, 2018 | Updated 11:09 a.m. ET Feb. 7, 2018



(Photo: Tim Wright, AP)

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Yes, it's snowing in Hawaii.

But don't panic, it's not the end of days. It's only snowing on Hawaii's high mountain volcano summits of Mauna Loa and Mauna Kea on the Big Island.

Both mountains are under a winter storm warning

until Wednesday evening.

The National Weather Service said "fog, ice, snow and very strong winds" will hammer the Big Island summits through Wednesday, with up to 14 inches of snow possible.

"Plan on difficult travel conditions," the weather service warned, with "visibility near zero at times."

High temperatures should be in the 30s and low temperatures in the 20s.

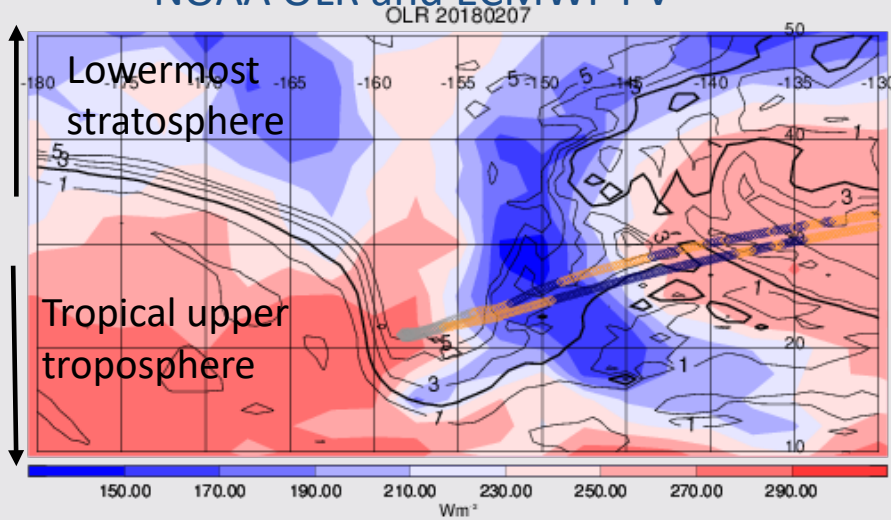
Lower elevations of the Big Island, as well as the rest of the island chain, are under a flash flood watch due to a forecast of pounding rain and thunderstorms.

Though it was snowing at the tops of the Big Island summits, temperatures were mild throughout the rest of Hawaii, with high temperatures forecast in the 70s.

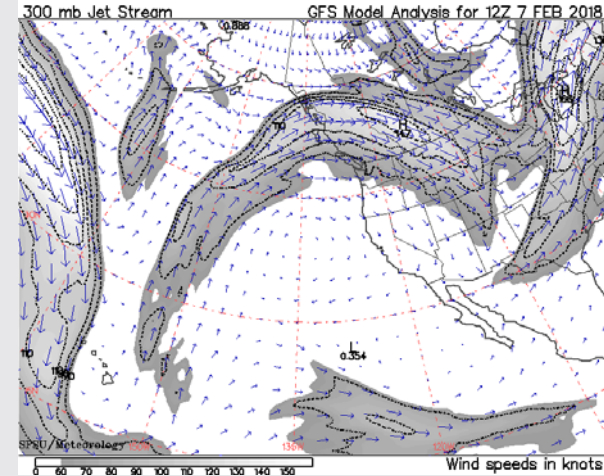


Jet Stream Signature at Honolulu 7/8 February 2018

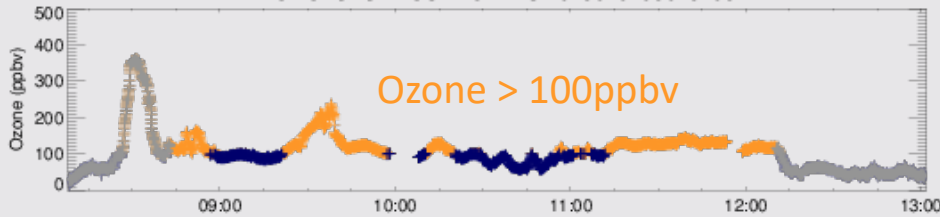
NOAA OLR and ECMWF PV



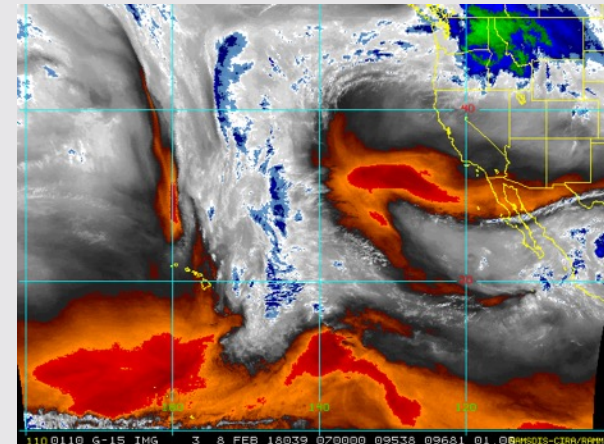
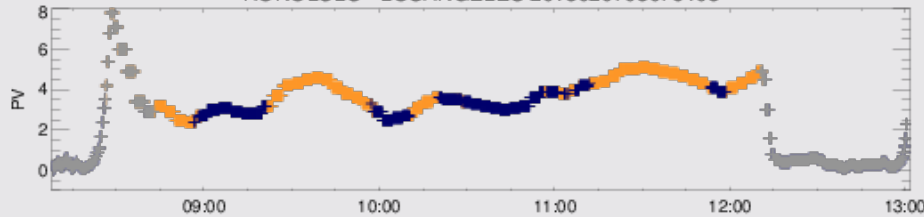
300hPa Jet Stream



HONOLULU - LOSANGELES 2018020708075108

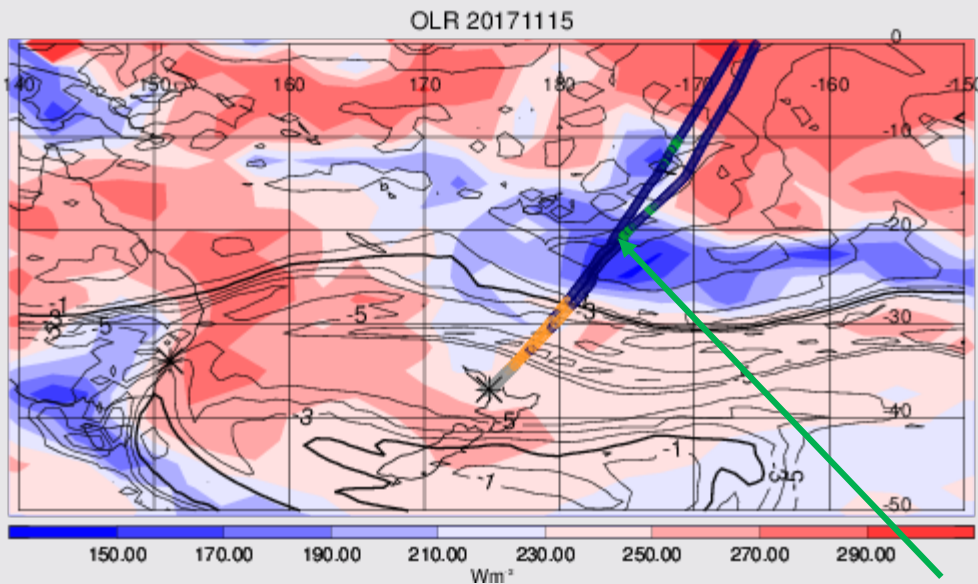


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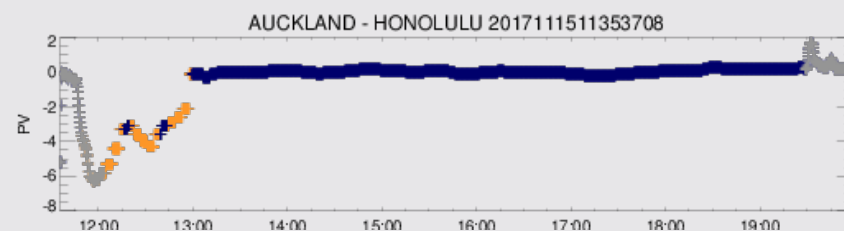
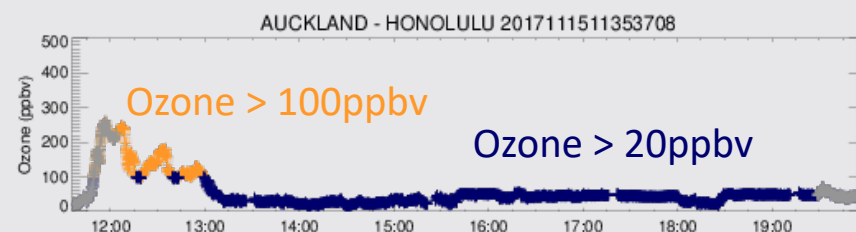
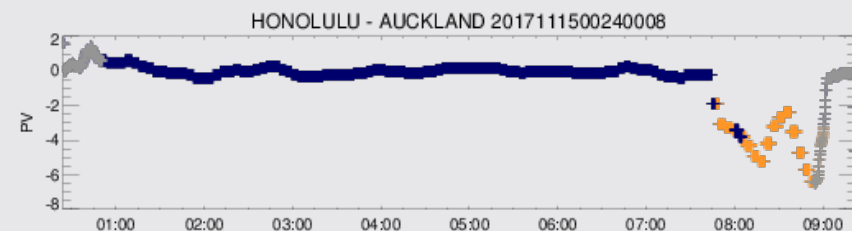
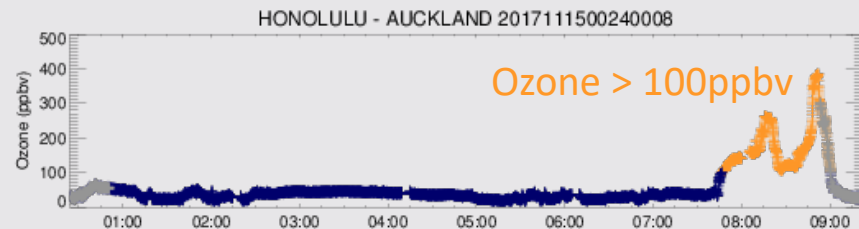
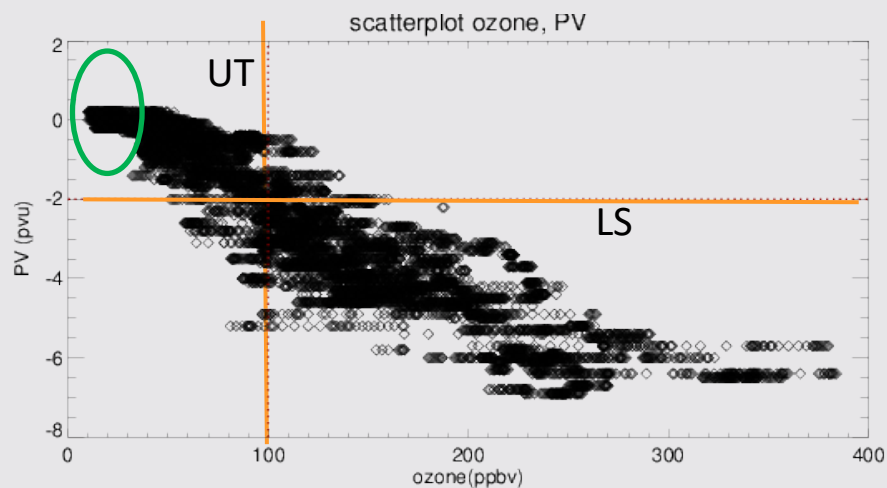


Crossing the jet: Southern Hemisphere

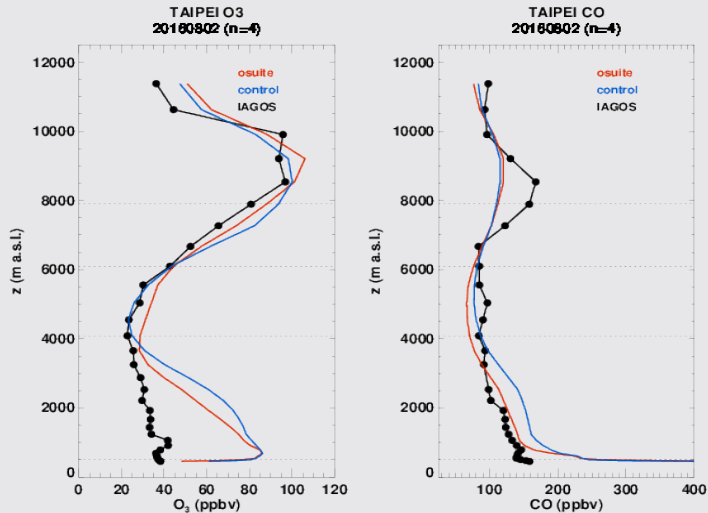
20 flights from Honolulu to Sydney and Auckland



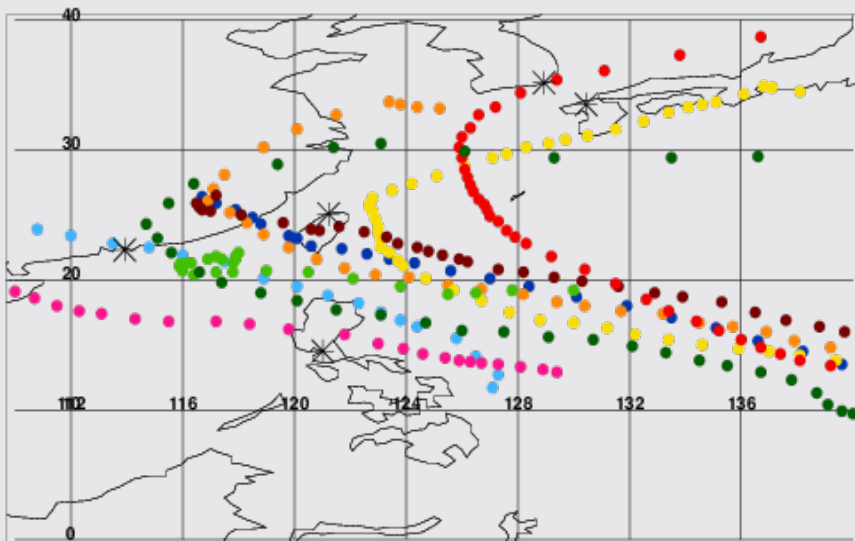
Ozone < 20ppbv in convective region



Impact of Typhoons on atmospheric composition at Taipei July-Oct 2016

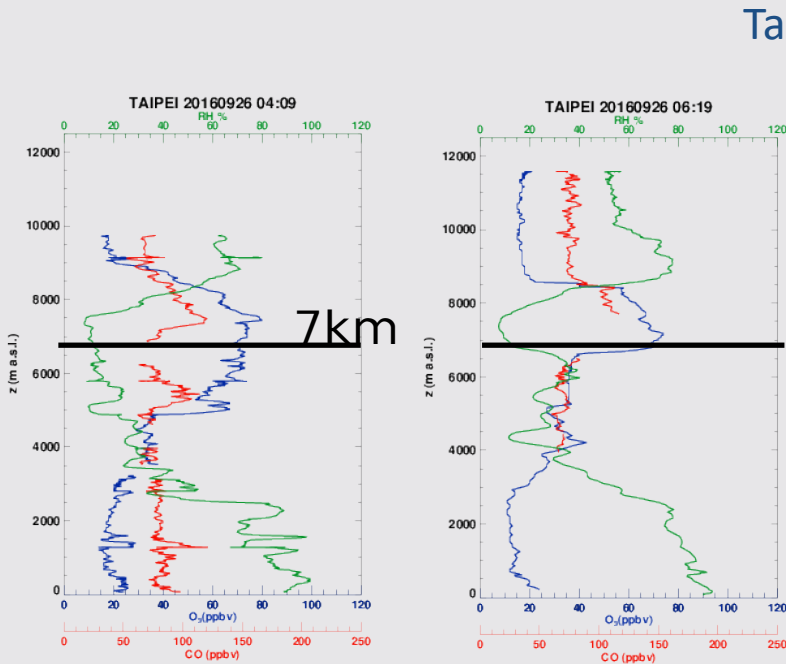


- 2 aircraft daily flights to and from Taipei typhoons season 2016
- Sudden large increases in ozone in the upper troposphere
- Decreases in the amount of CO and ozone in the boundary layer, and throughout free troposphere

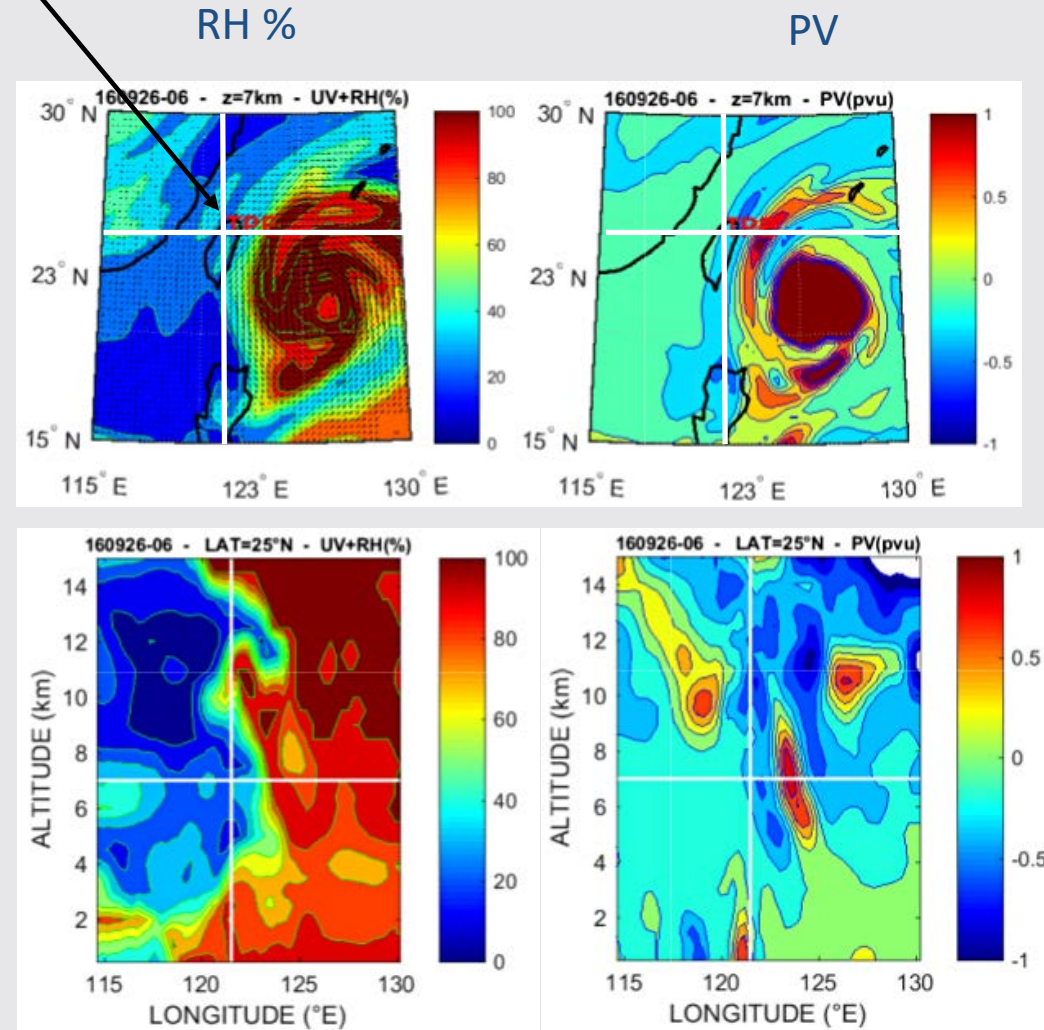


NEPARTAK	20160704-20160710
NIDA	20160729-20160802
MERANTI	20160910-20160917
MALAKAS	20160912-20160920
MEGI	20160923-20160929
CHABA	20160929-20161005
AERE	20161004-20161010
SARIKA	20161013-20161018
HAIMA	20161015-20161023

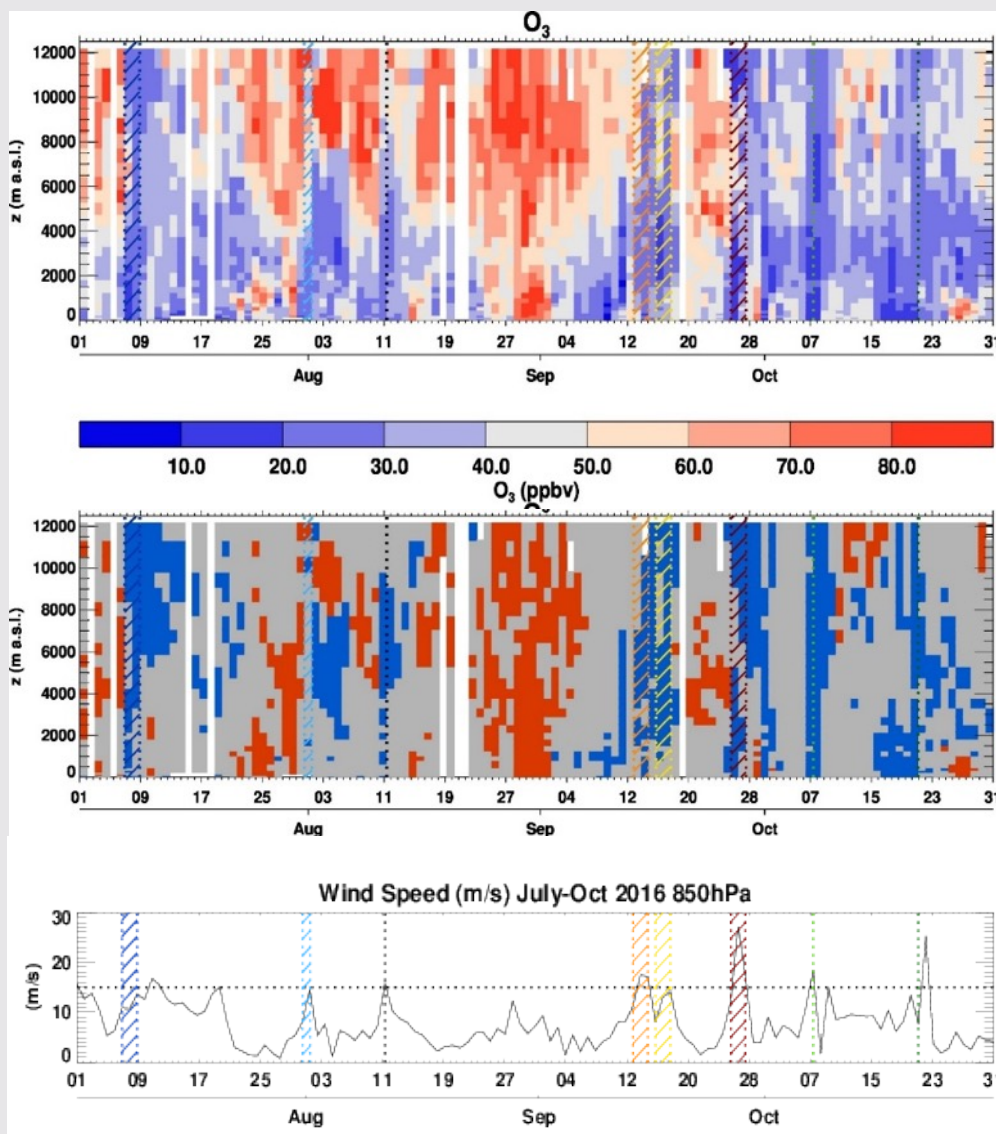
Typhoon Megi 26th September 2016.



- Stratospheric signature ahead of typhoon: Dry Air, high ozone, accompanied by descent and high PV
- Humid air from oceanic boundary layer
- Clean air (low CO, low O₃) throughout mid troposphere



Identifying the Typhoons July-October 2016



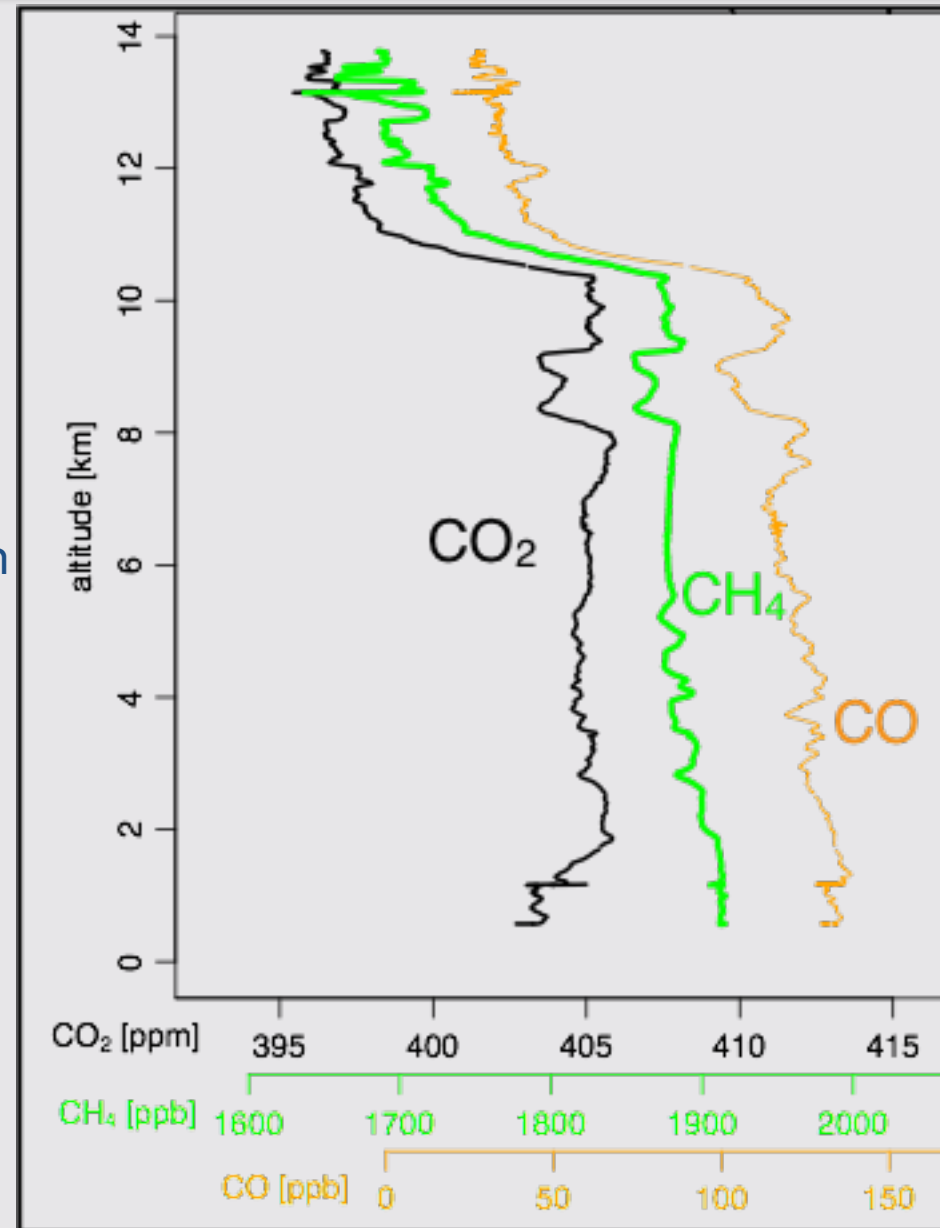
Absolute values ozone

± 1 standard deviation
from climatology

Wind speed

Coming soon: IAGOS Greenhouse gas package

- First flights onboard HALO research aircraft May 2015
- Currently: Flights within CoMet mission onboard HALO May-June 2018
- Planned integration and activation onboard LH A330: June 2018
- P2d SN02-04 production ongoing
- 2019: plans for China Airlines, Hawaiian Airlines, Air France integration



- First flights onboard HALO research aircraft May 2015
- Supplemental type certificate (STC) for A340/A330 obtained end of 2016



SUPPLEMENTAL TYPE CERTIFICATE

10060508

This Supplemental Type Certificate is issued by EASA, acting in accordance with Regulation (EC) No. 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation and in accordance with Commission Regulation (EU) No. 748/2012 to:

GOMOLZIG FLUGZEUG- UND MASCHINENBAU GmbH

Description of Design Change:
A330, A340 Installation of IAGOS P2
The design change related to this STC deals with the Installation of the Package P2d, of IAGOS-P2.

See Continuation Sheet(s)

For the European Aviation Safety Agency
Date of Issue: 16 December 2016

Laurent GRUZ
Deputy Head of
Large Aeroplanes Department

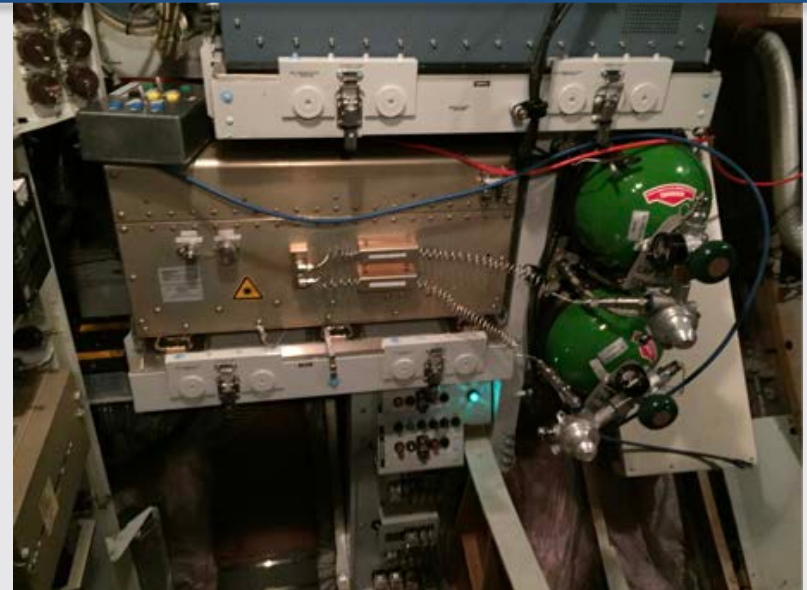


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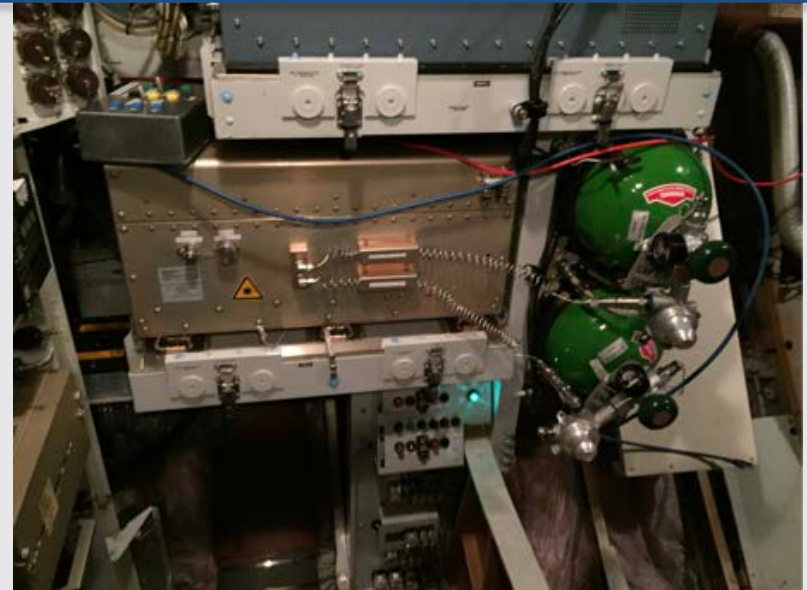
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An Agency of the European Union

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