CONTRAIL project used for validating GOSAT and Modeling

T. Machida[1], Y. Sawa[2,3], Y. Niwa[1], T. Umezawa[1], K. Tsuboi[2], K. Ishijima[2], H. Matsueda[2]

1 NIES, 2 MRI, 3 JMA

CONTRAIL

CONTRAIL Project since 2005

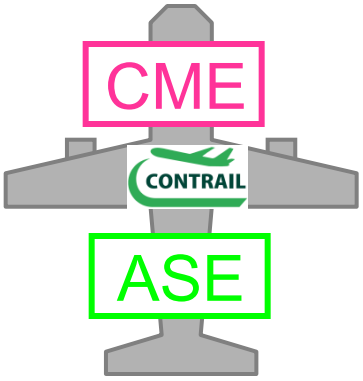
MSE: Manual Air Sampling Equipment,

CME:
Continuous CO_2 Measuring Equipment
0.2 ppm

ASE: Automatic Air Sampling Equipment, for CO_2, CH_4, CO, N_2O, SF_6, H_2, isotopes

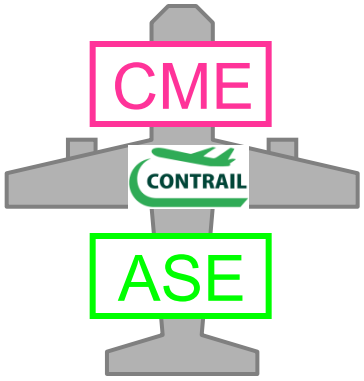
Machida et al. JTECH-A (2008)

Eight 777-200ER and two 777-300ER by JAL



777-200ER
(JA705J)
Jun/2006-

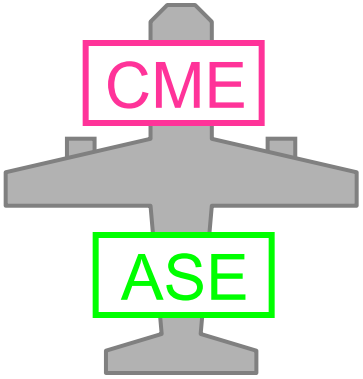
777-200ER
(JA703J)
Oct/2006-



777-200ER
(JA707J)
Nov/2006-

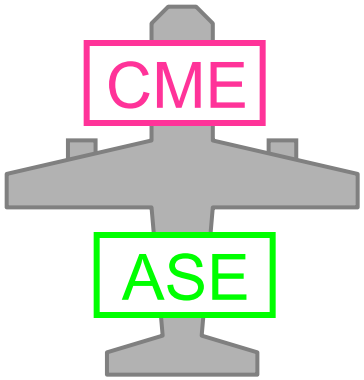
777-200ER
(JA708J)
Jun/2012-

777-300ER
(JA734J)
Feb/2015-

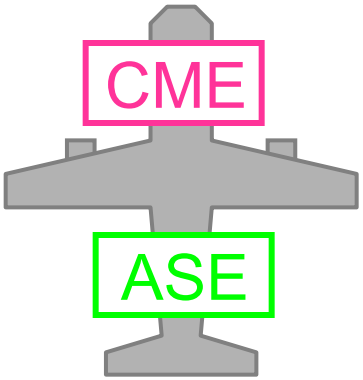


777-200ER
(JA709J)
Sep/2012-

777-200ER
(JA702J)
Mar/2013-



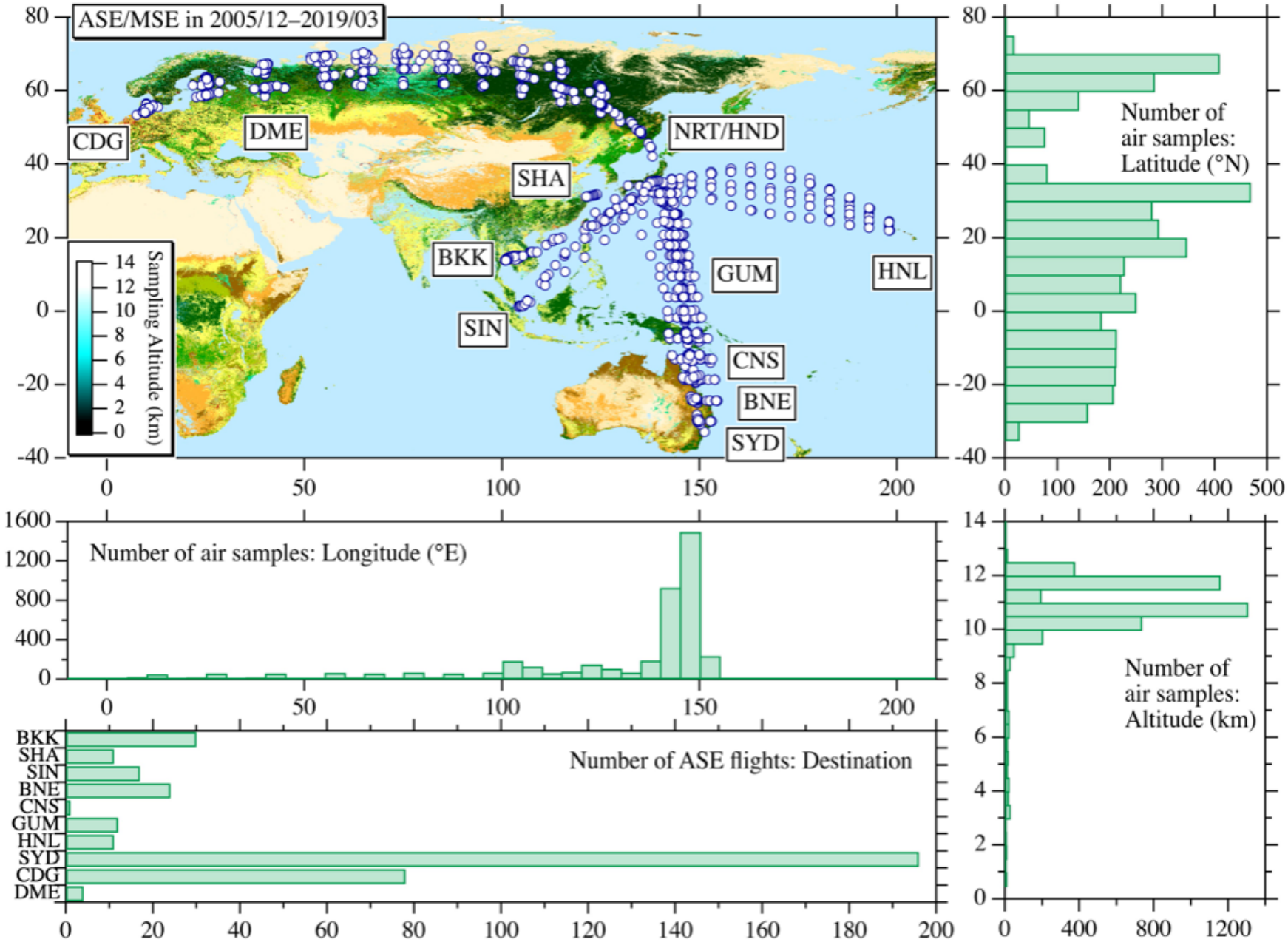
777-200ER
(JA710J)
Jul/2013-



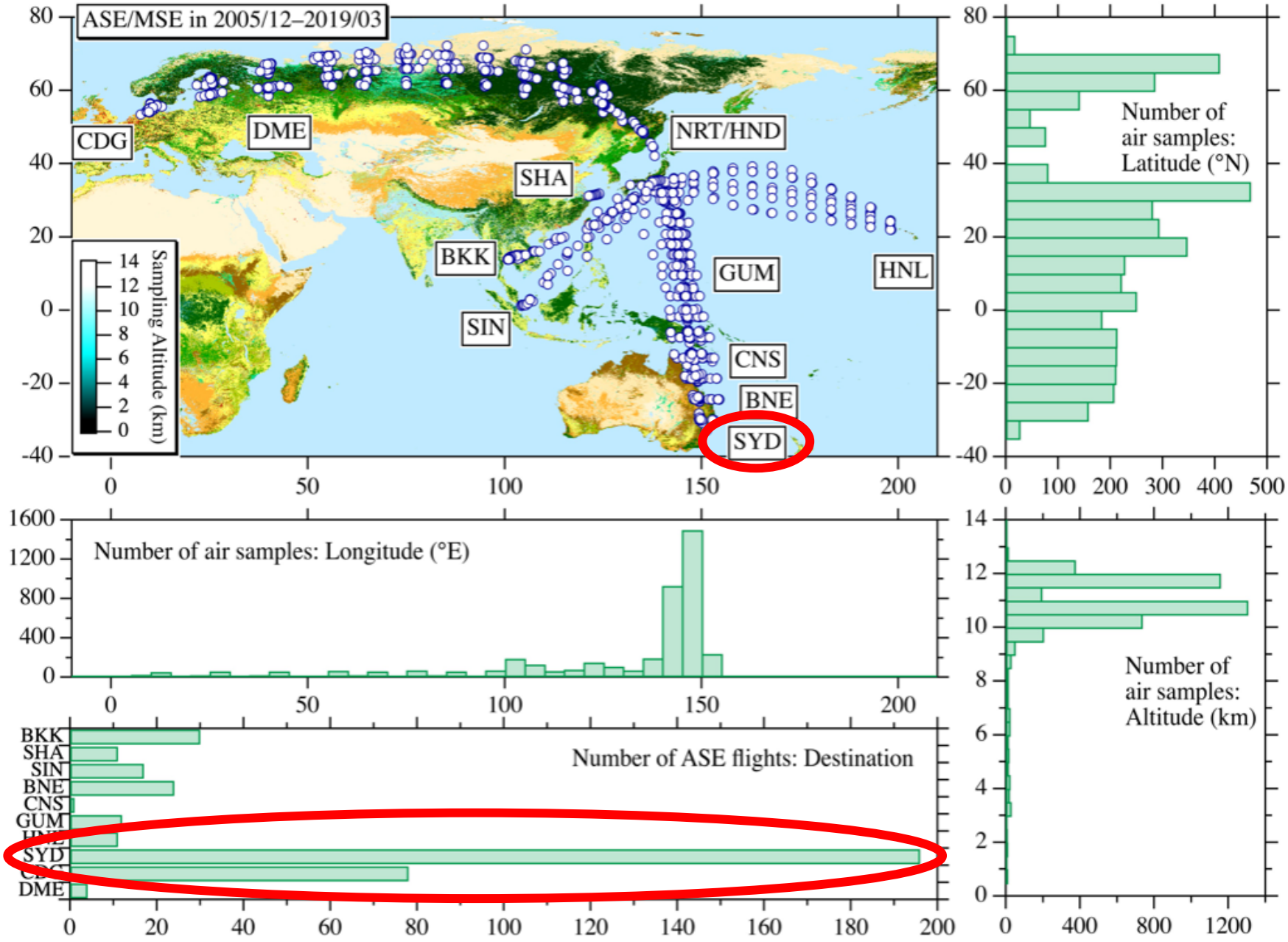
777-200ER
(JA711J)
Aug/2013-

777-300ER
(JA733J)
Feb/2016-

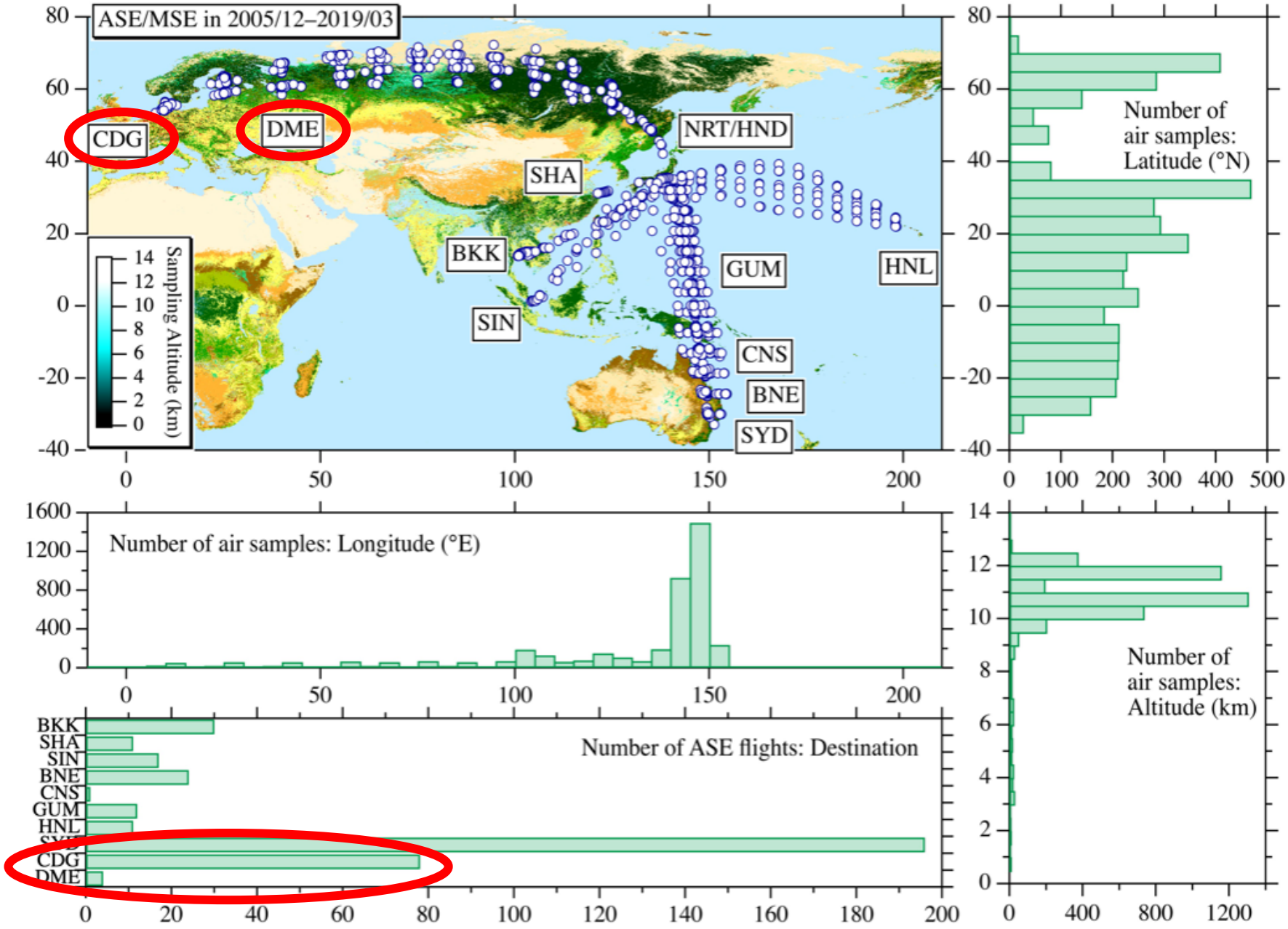
ASE/MSE whole air sampling (2005-2019)



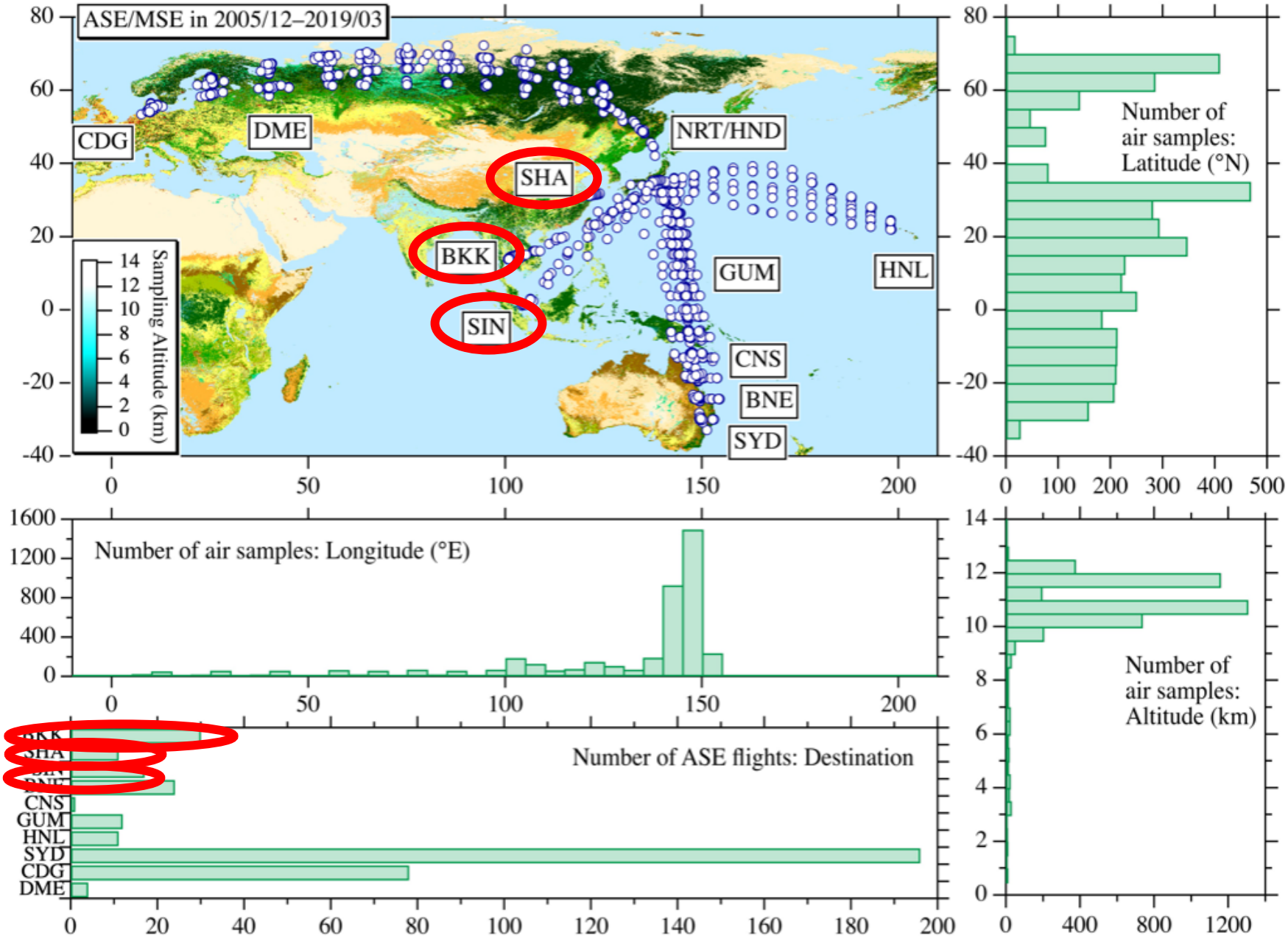
ASE/MSE whole air sampling (2005-2019)



ASE/MSE whole air sampling (2005-2019)



ASE/MSE whole air sampling (2005-2019)



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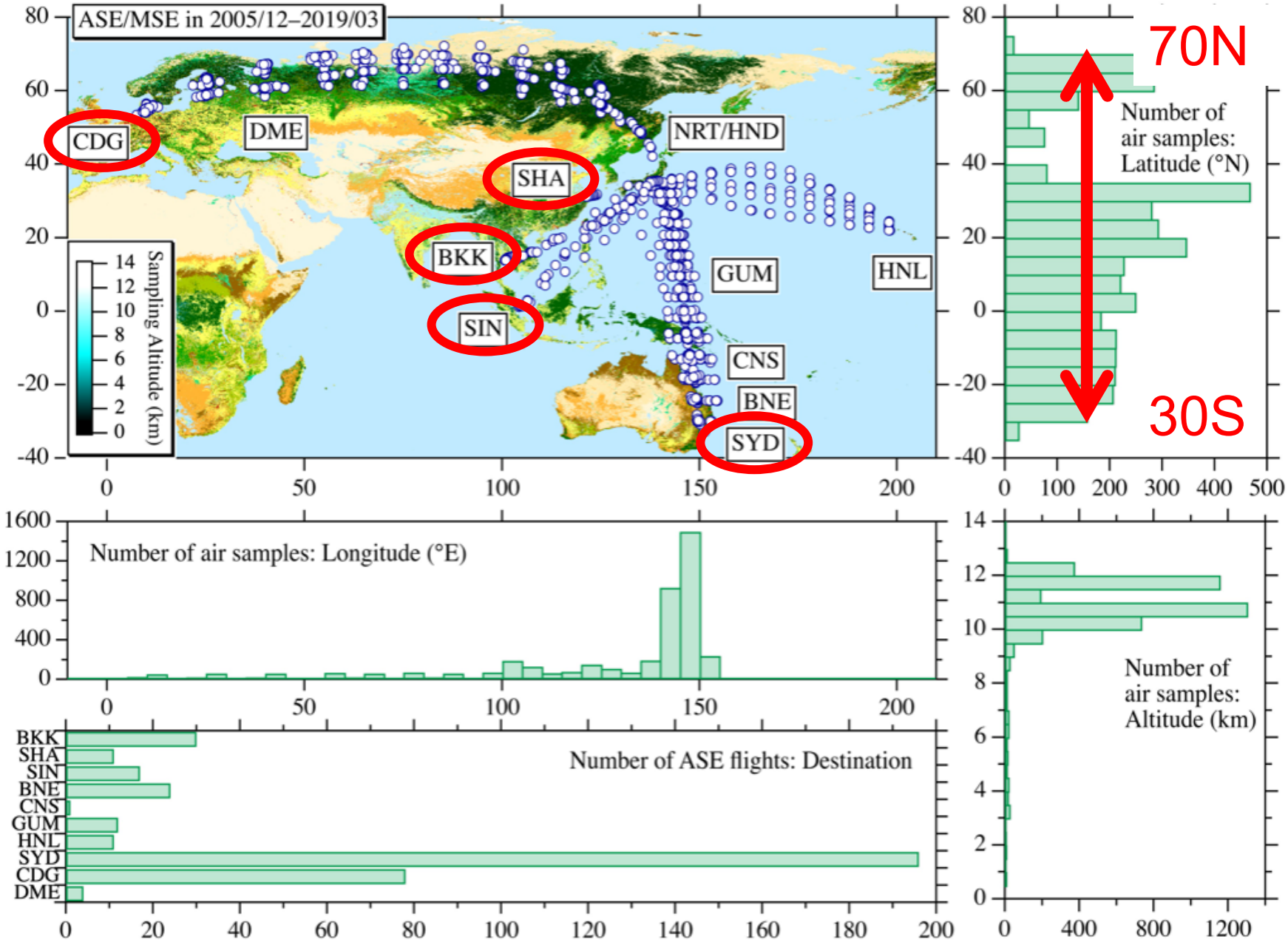
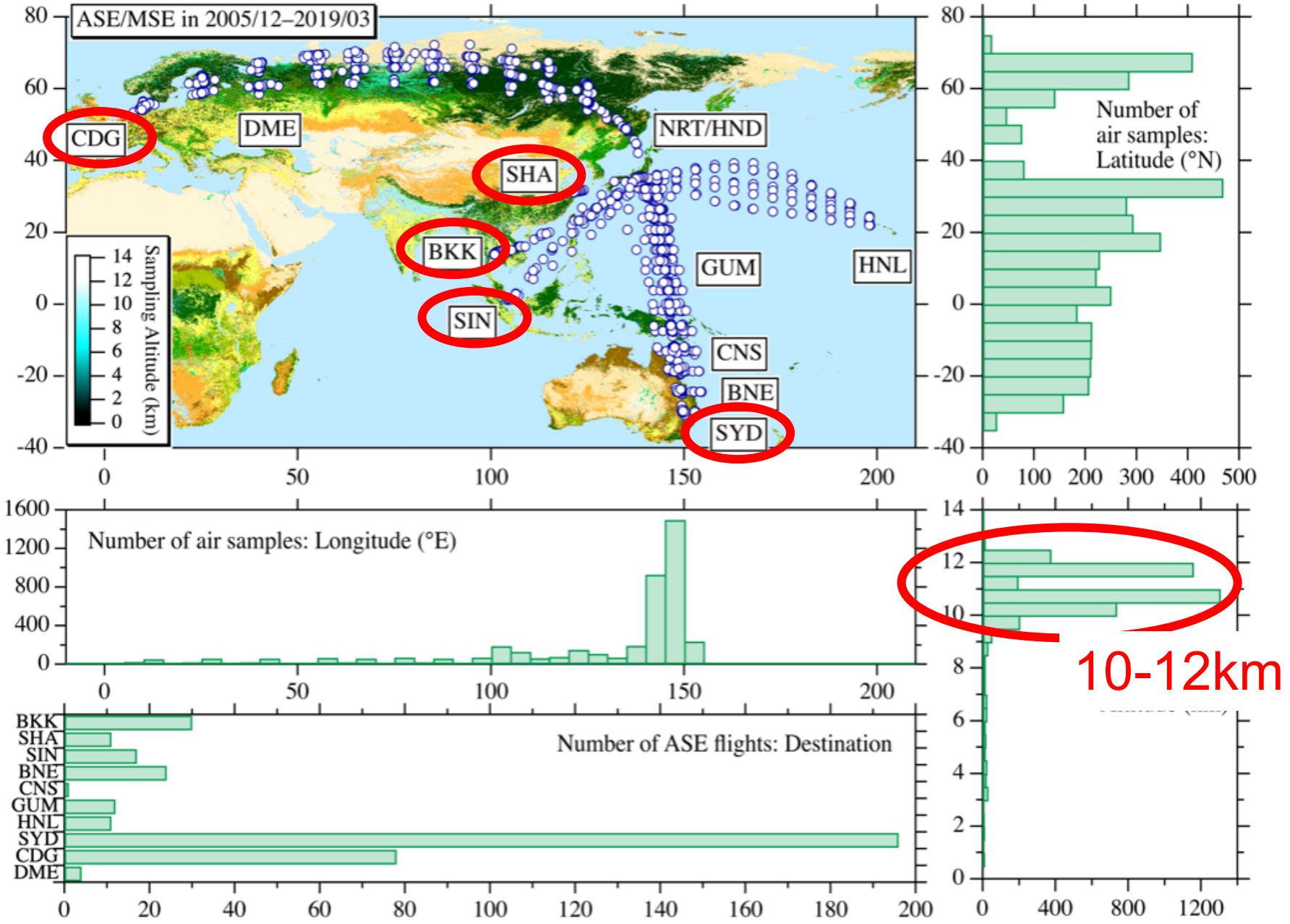
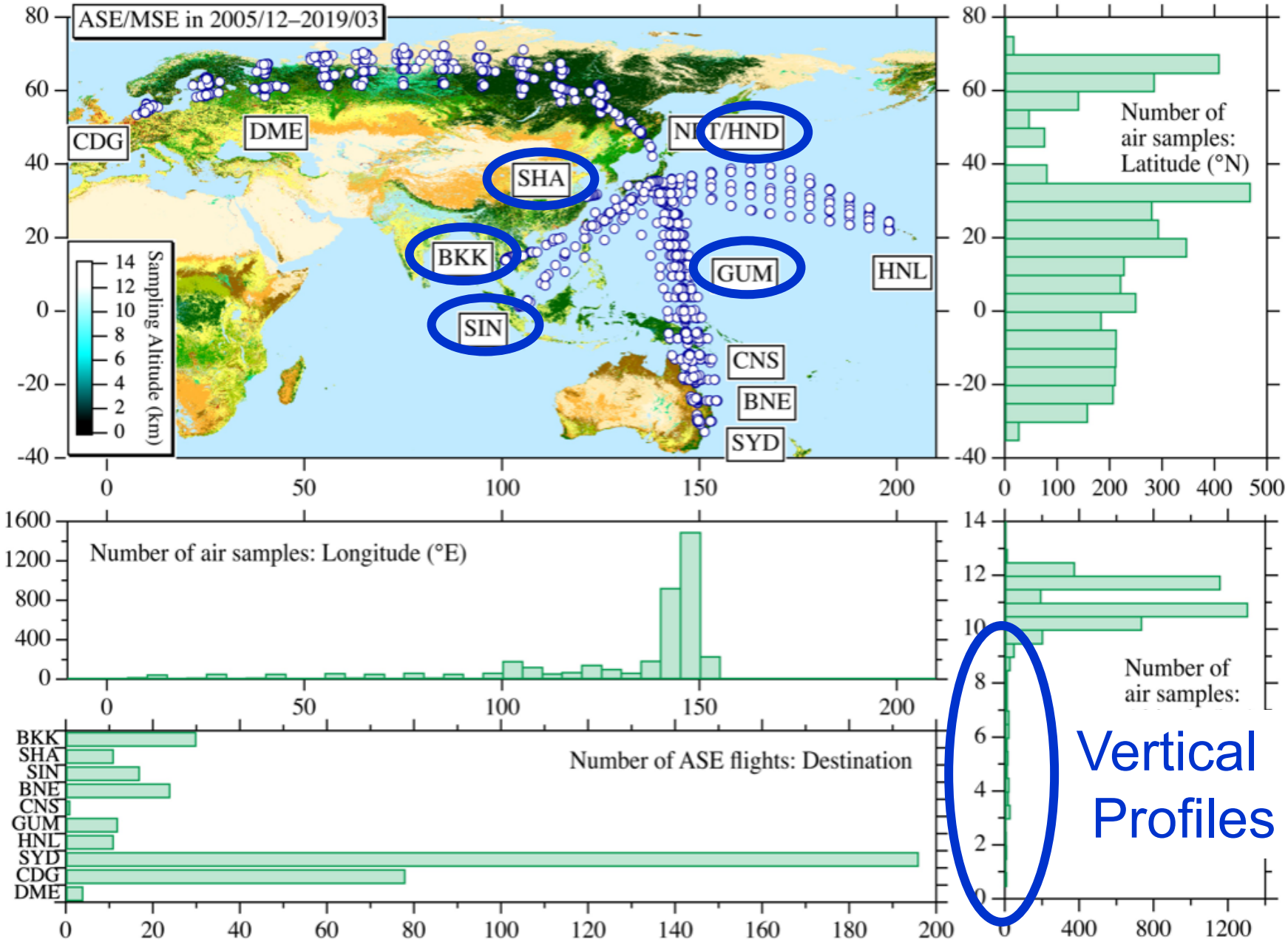


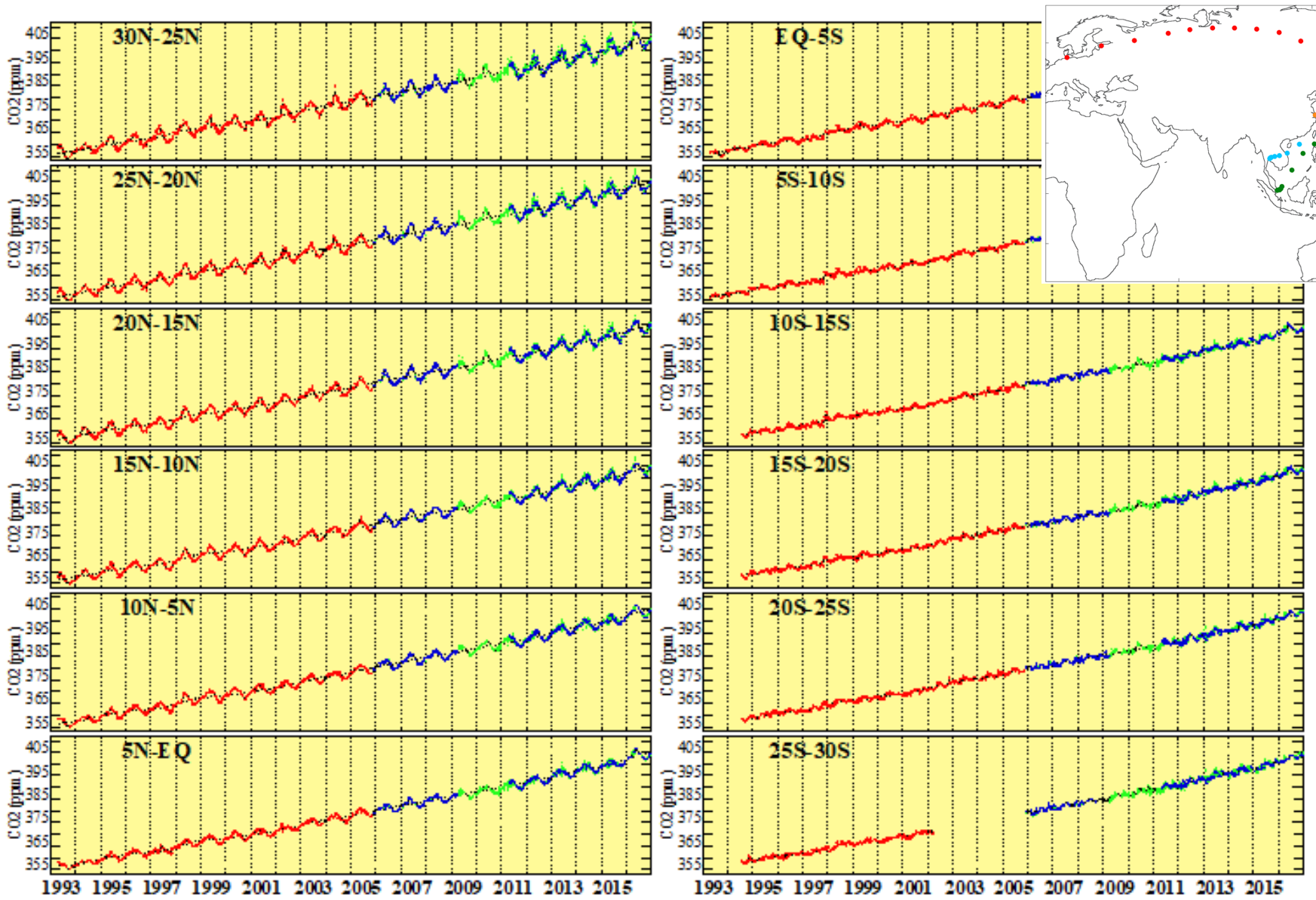
ASE/MSE whole air sampling (2005-2019)

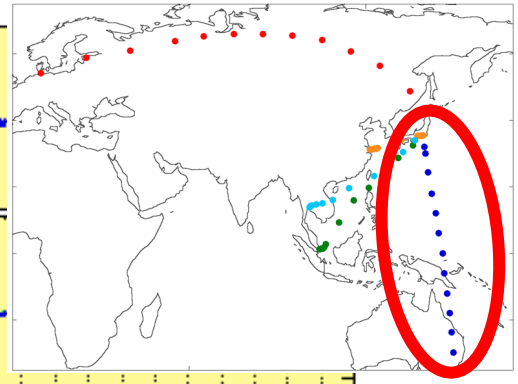


ASE/MSE whole air sampling (2005-2019)



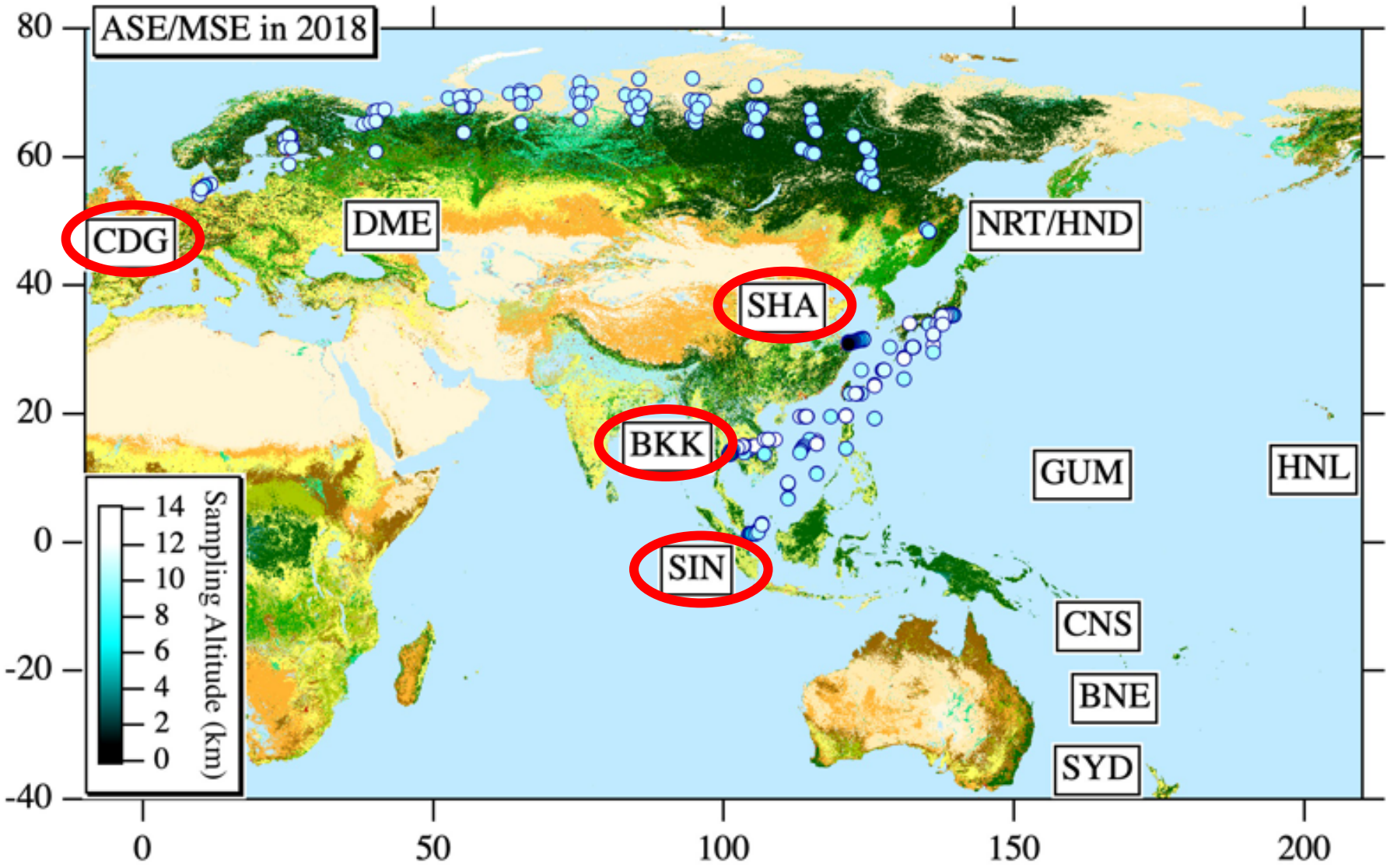
Time series of CO_2 in UT from 30N to 30S by SYD flight





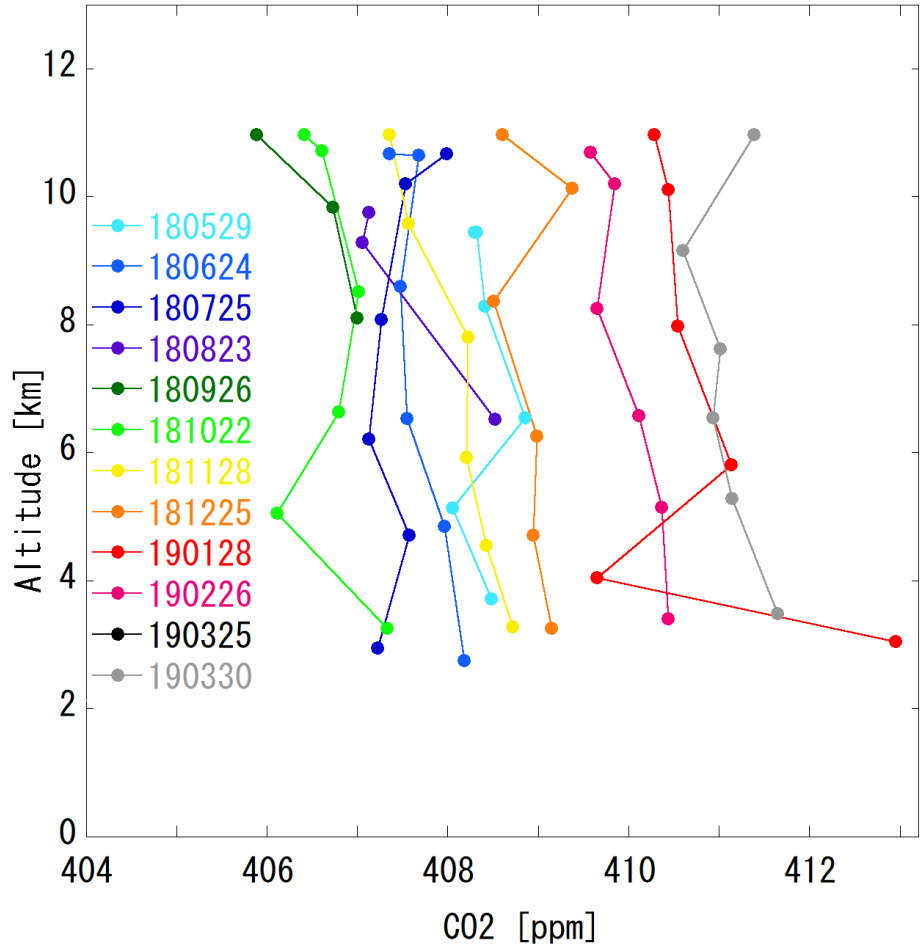
Matsueda et al. GRL (2015)

ASE/MSE sampling in 2018

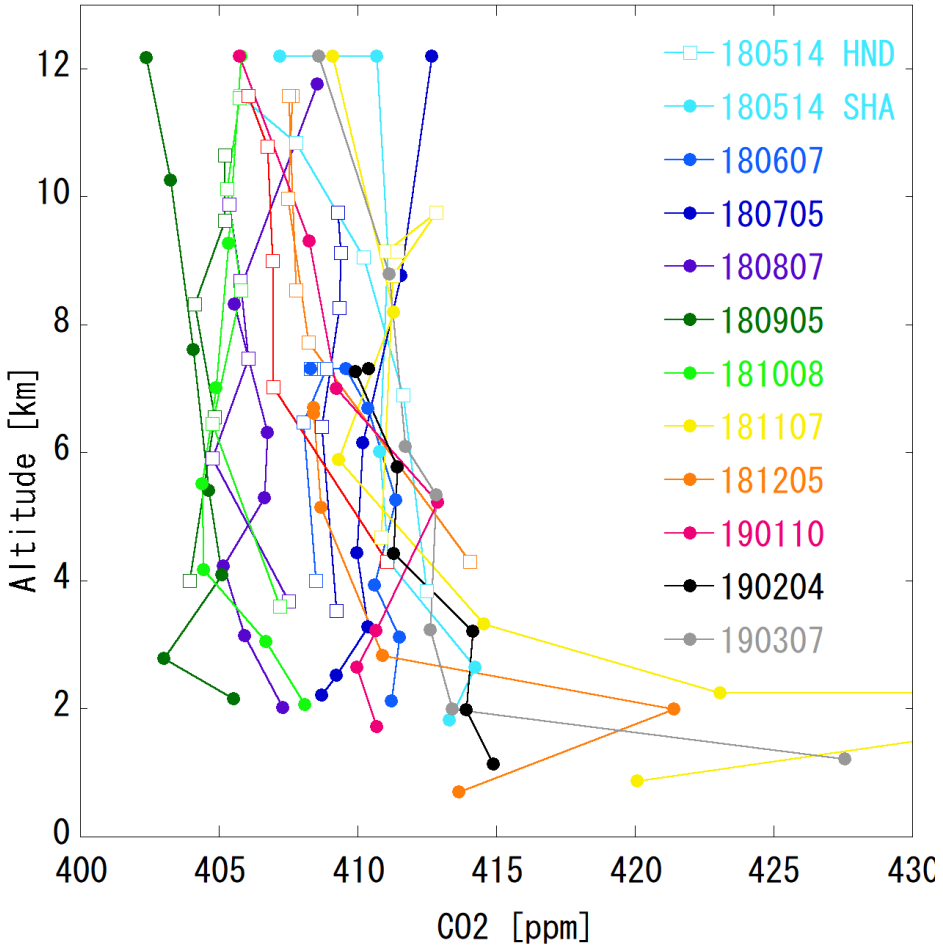


Vertical profiles of CO_2 over SIN, SHA and HND

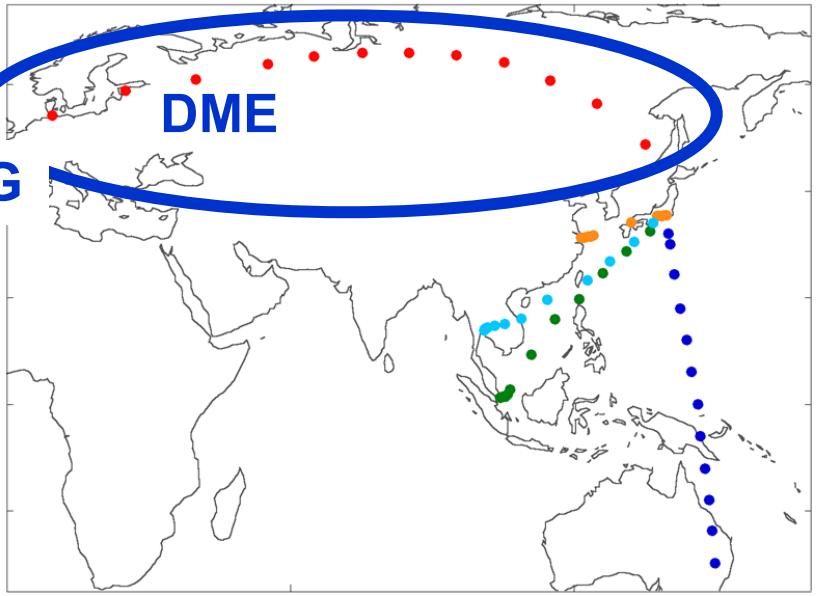
SIN

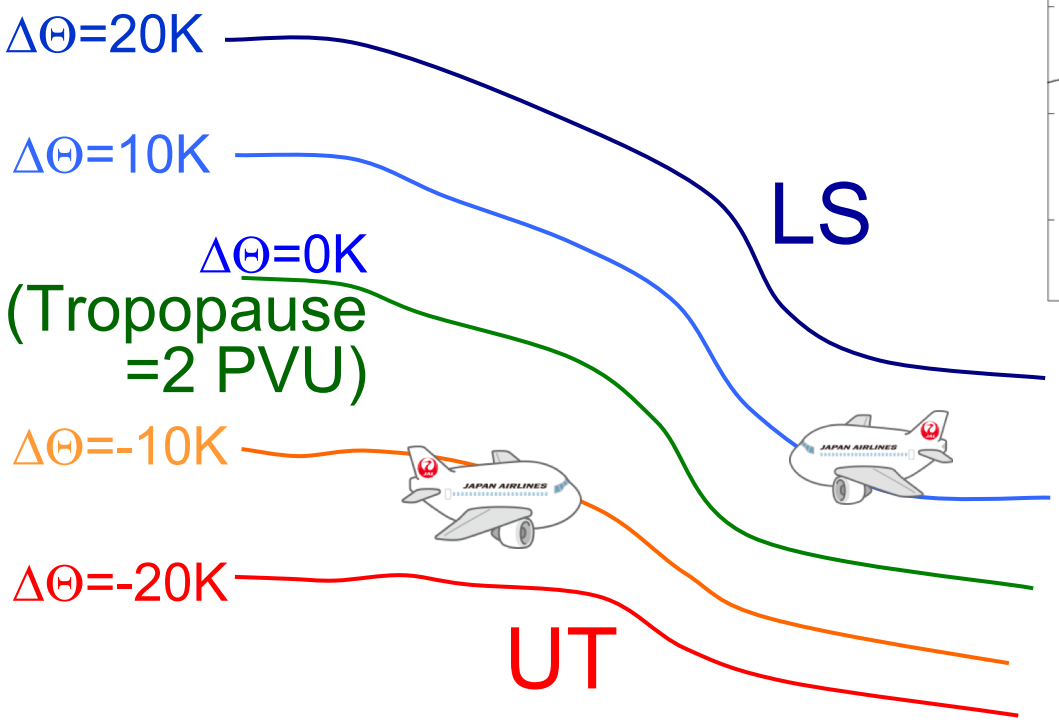


SHA and HND



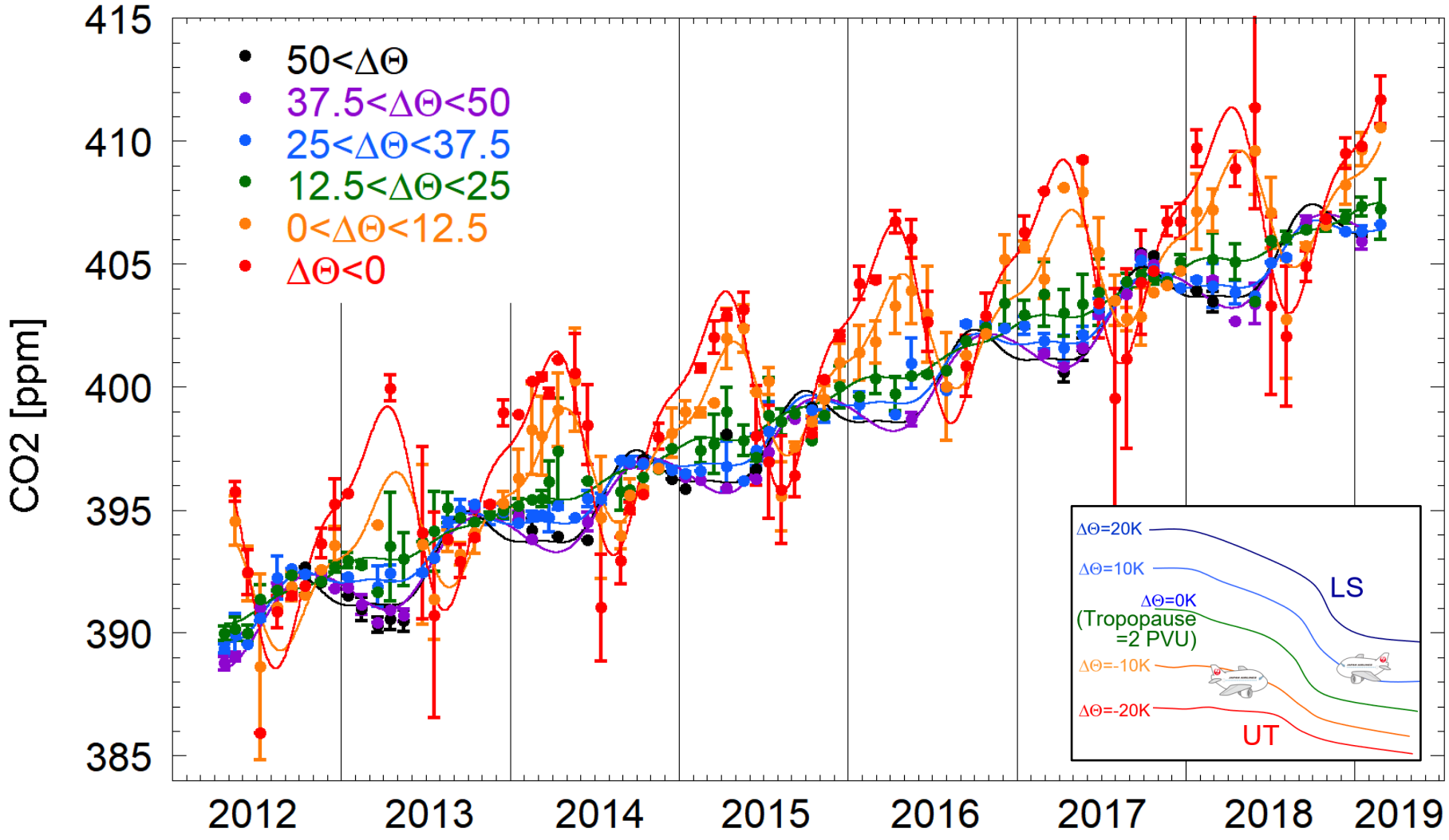
UT and LS observation in CDG/DME flight





Low Latitude ⟷ High Latitude

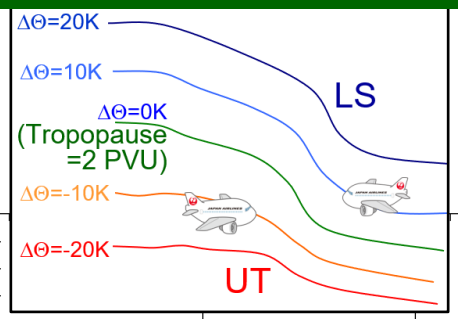
Time series of CO_2 in UT/LS



CONTRAIL

Sawa et al. GRL (2015)

Time series of CH_4 in UT/LS



CH4 [ppb]

1950
1900
1850
1800
1750
1700
1650
1600

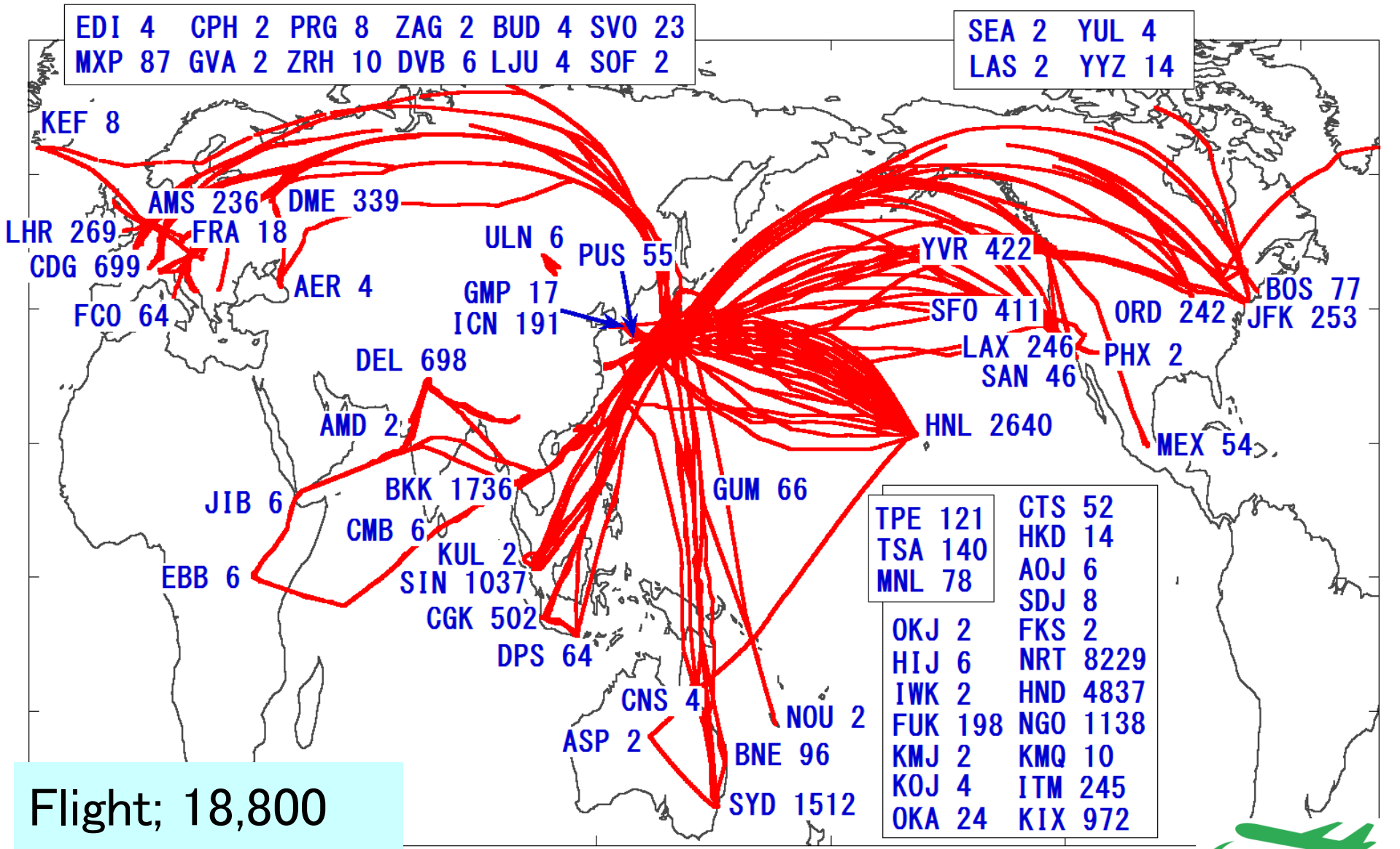
2012 2013 2014 2015 2016 2017 2018 2019

Tropopause is crucial for CO_2 and CH_4

CONTRAIL

Sawa et al. GRL (2015)

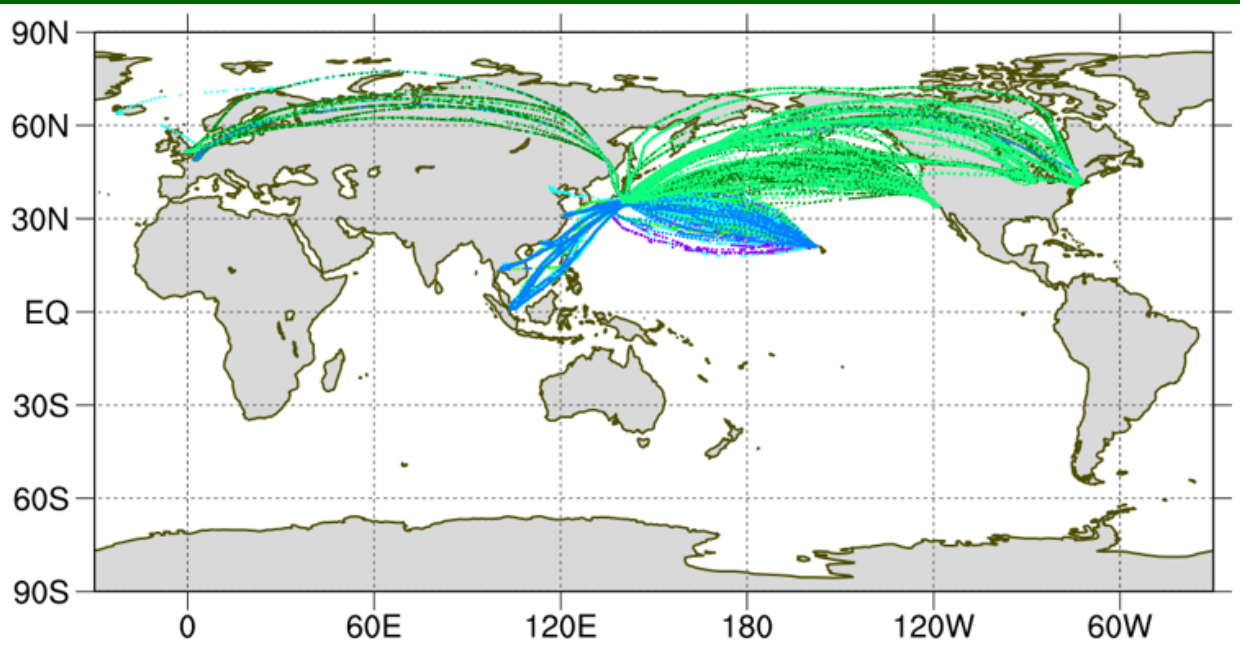
Observation area and frequency of CME

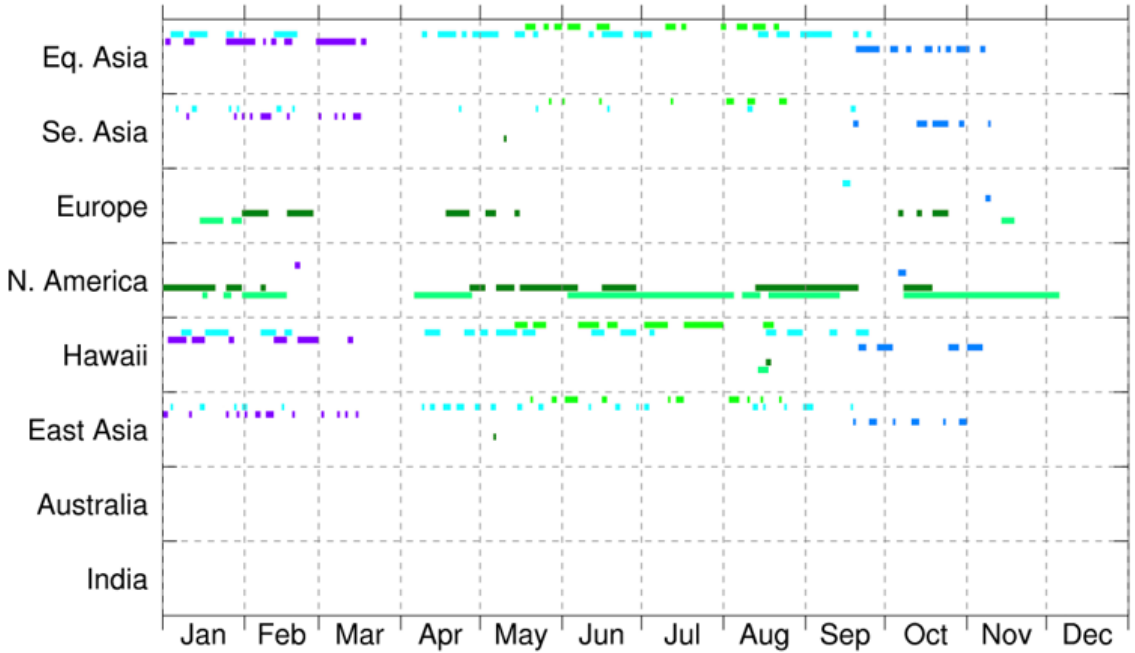


Flight; 18,800
Profile; 29,700

CONTRAIL

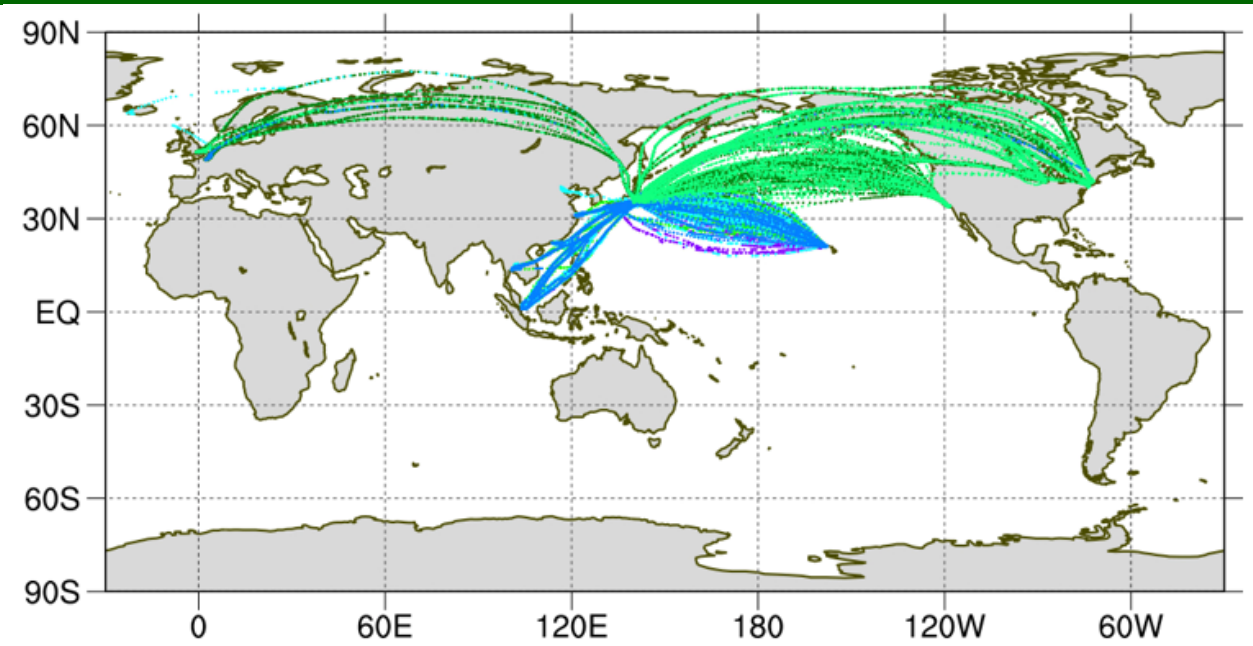
CME observation in 2018

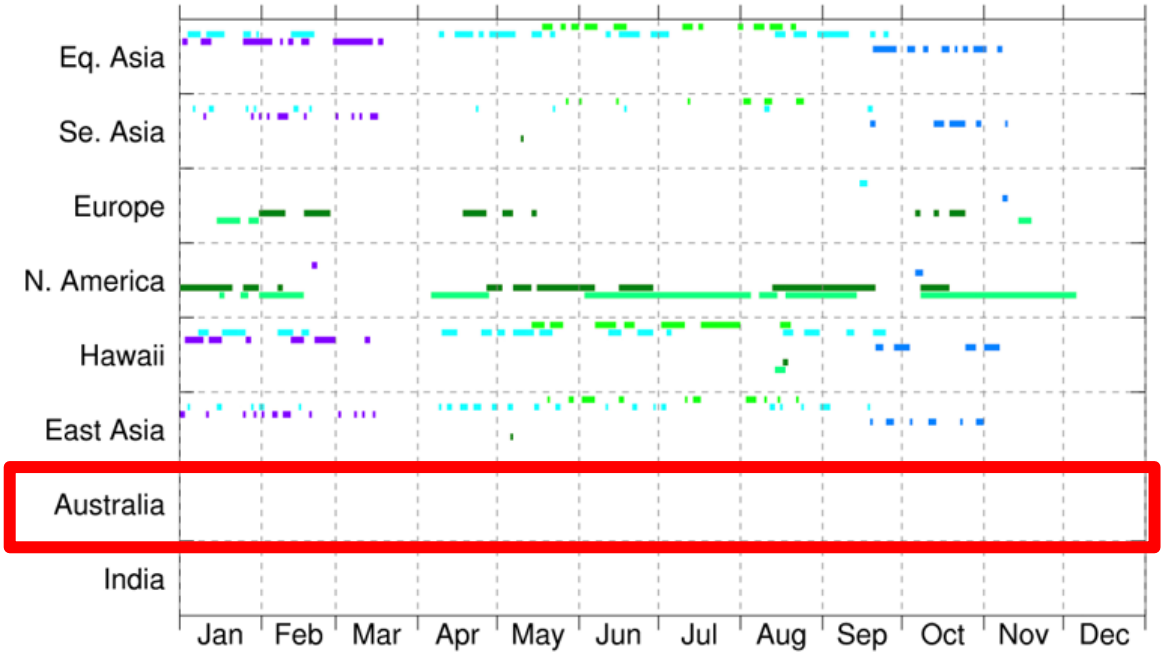




CONTRAIL

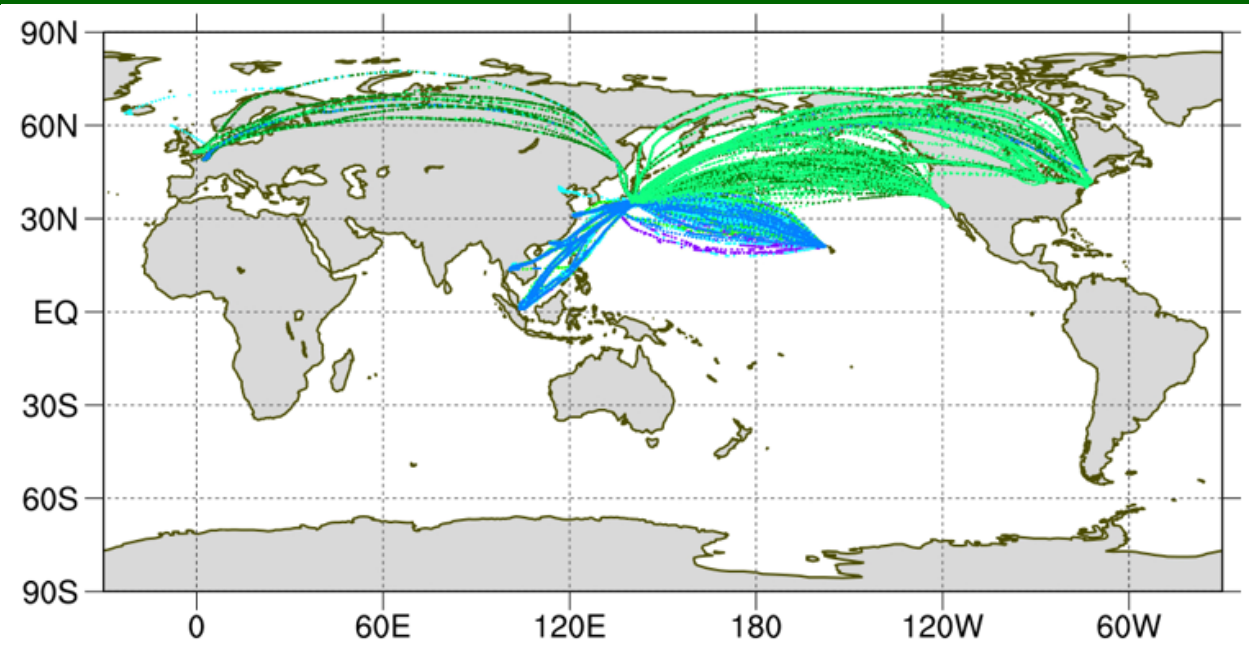
CME observation in 2018

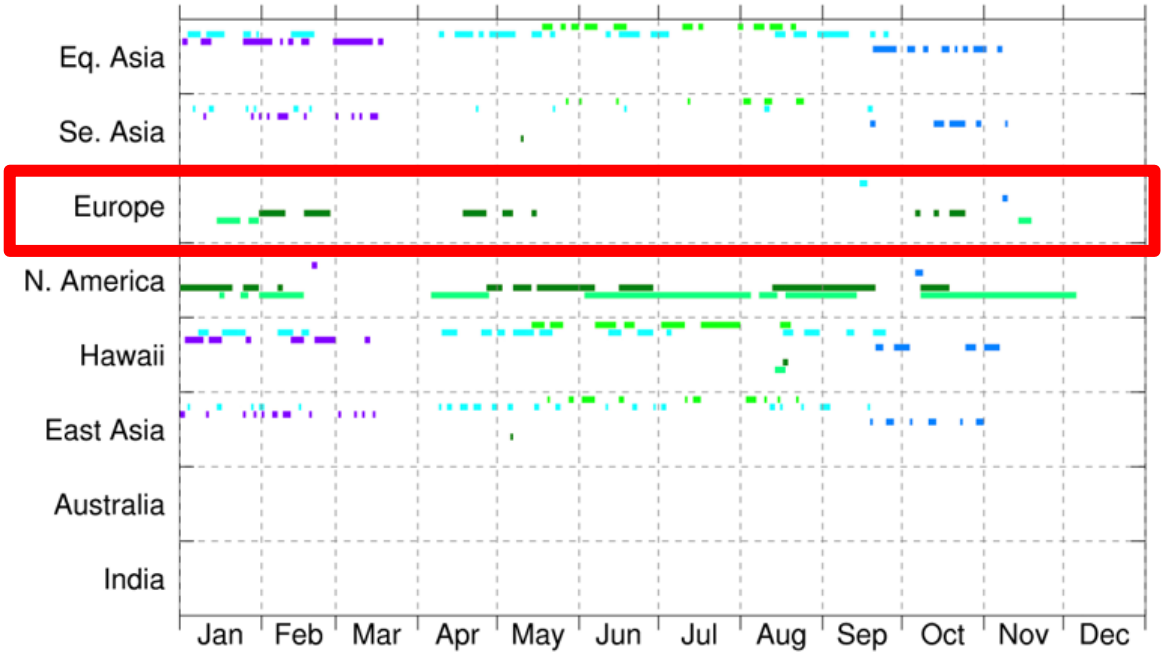




CONTRAIL

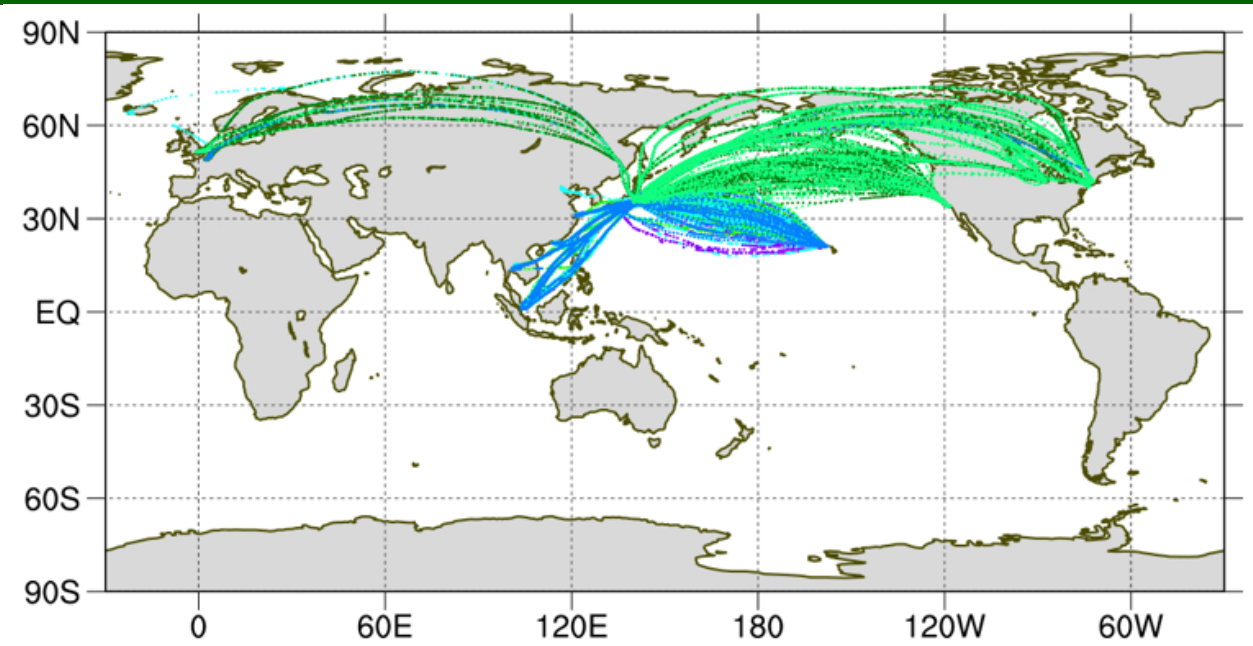
CME observation in 2018

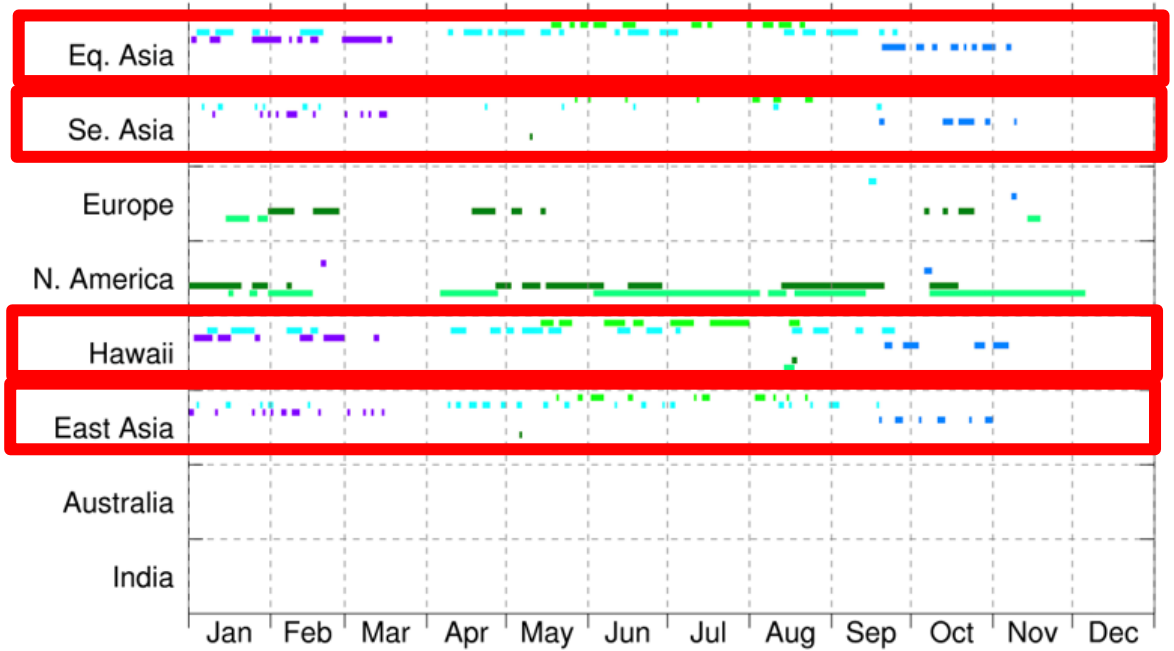




CONTRAIL

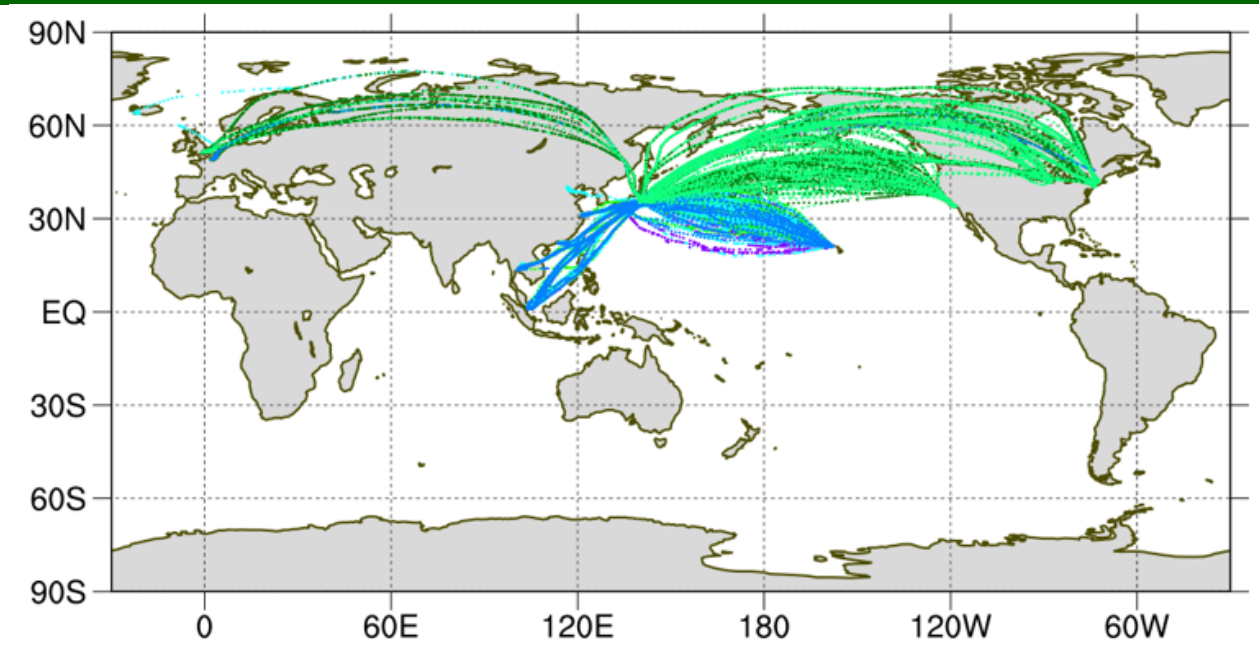
CME observation in 2018

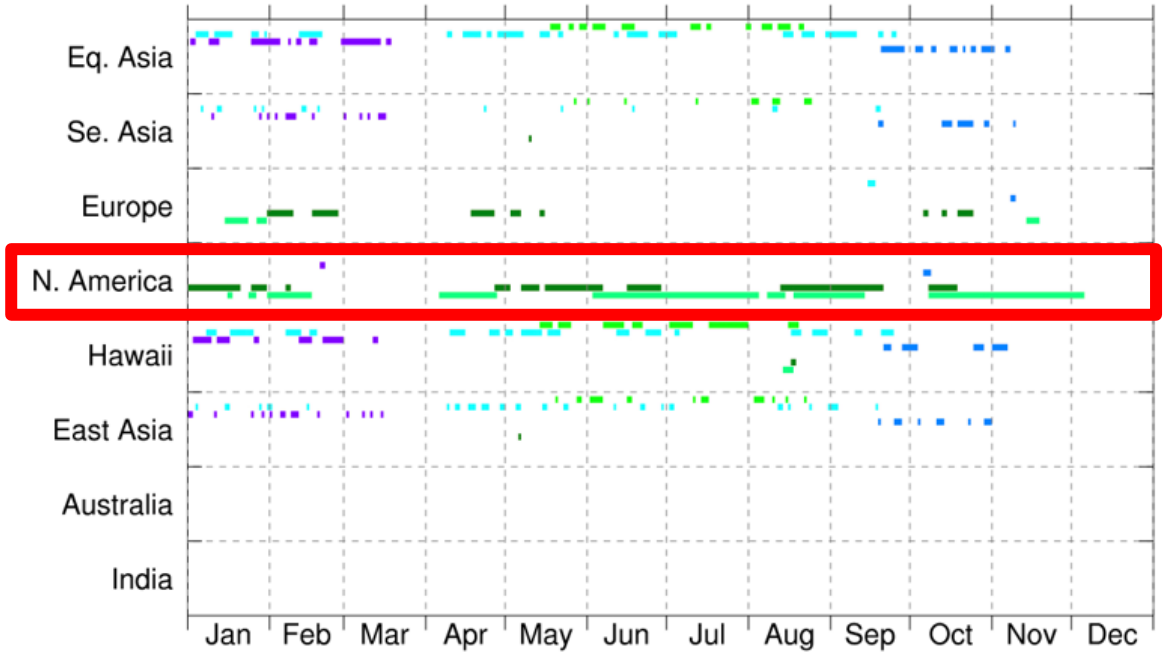




CONTRAIL

CME observation in 2018

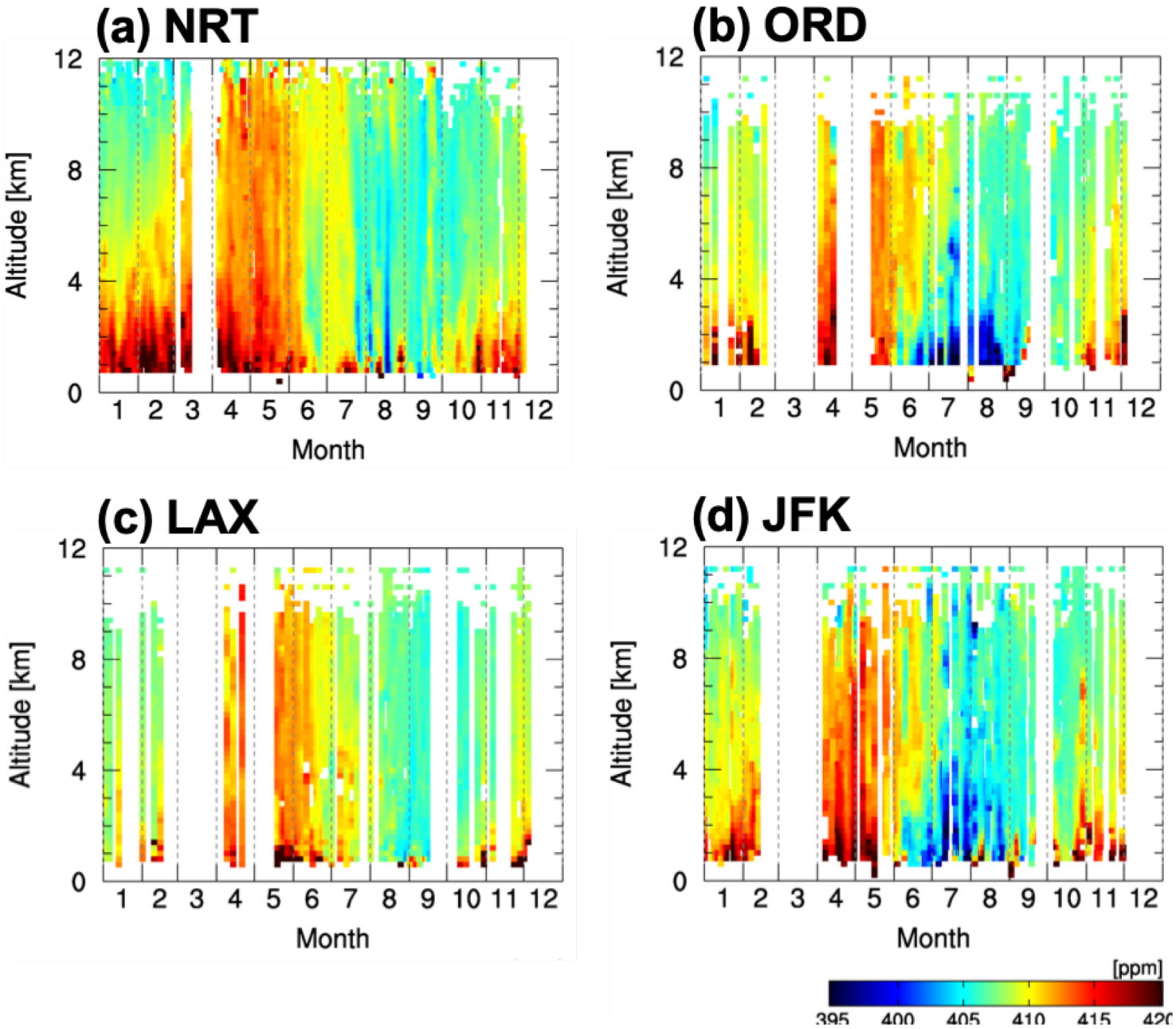




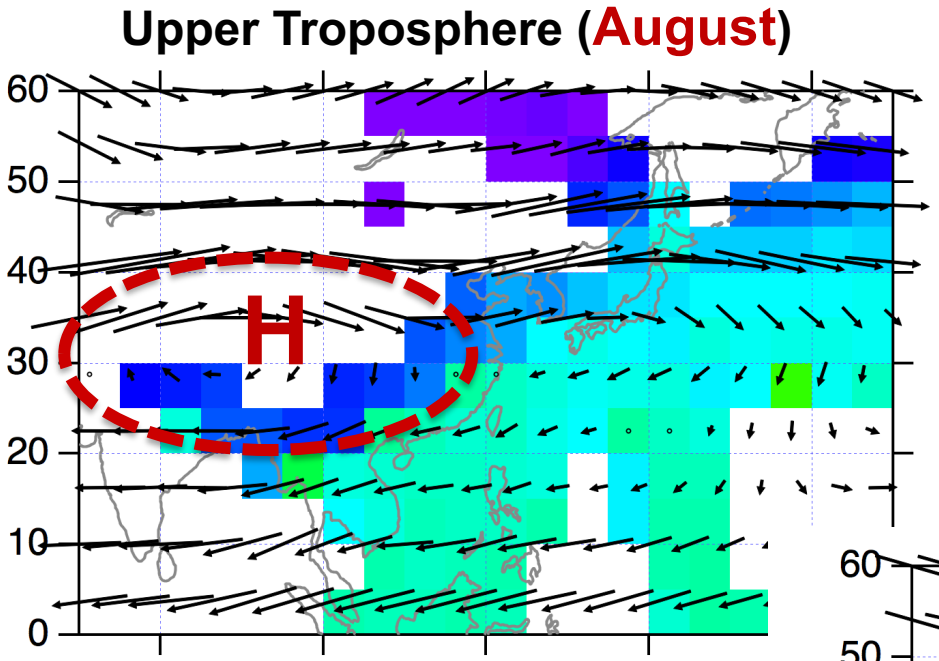
JFK, ORD,
LAX, SFO

CONTRAIL

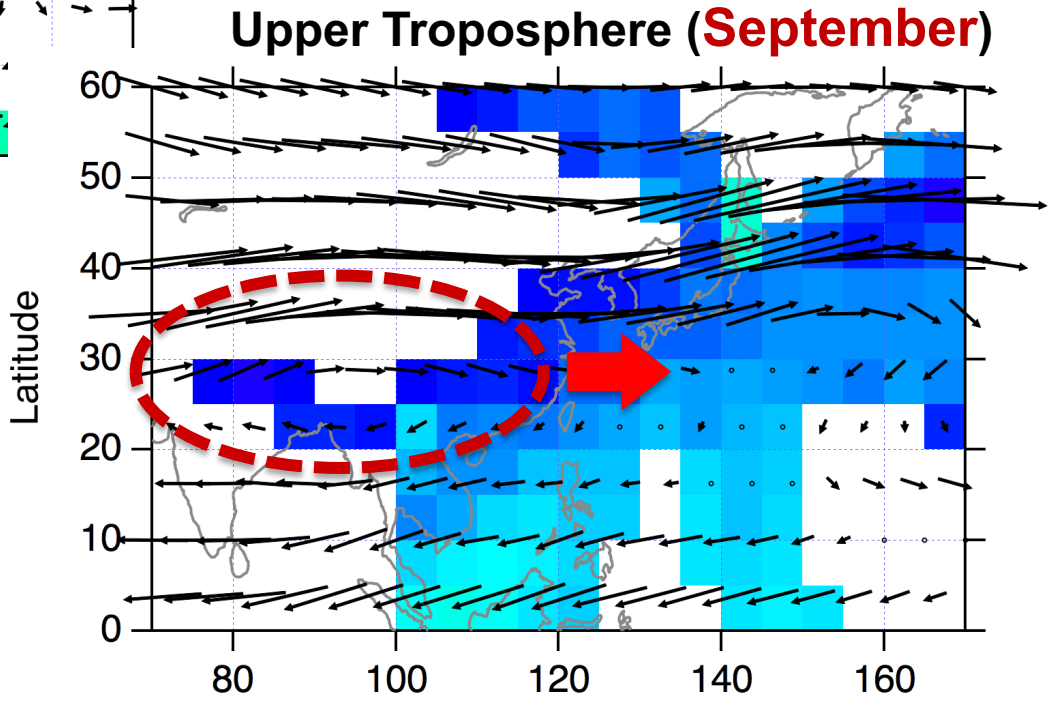
Vertical profiles of CO_2 over Japan and N. America



CO_2 in upper troposphere over Asia-Pacific region



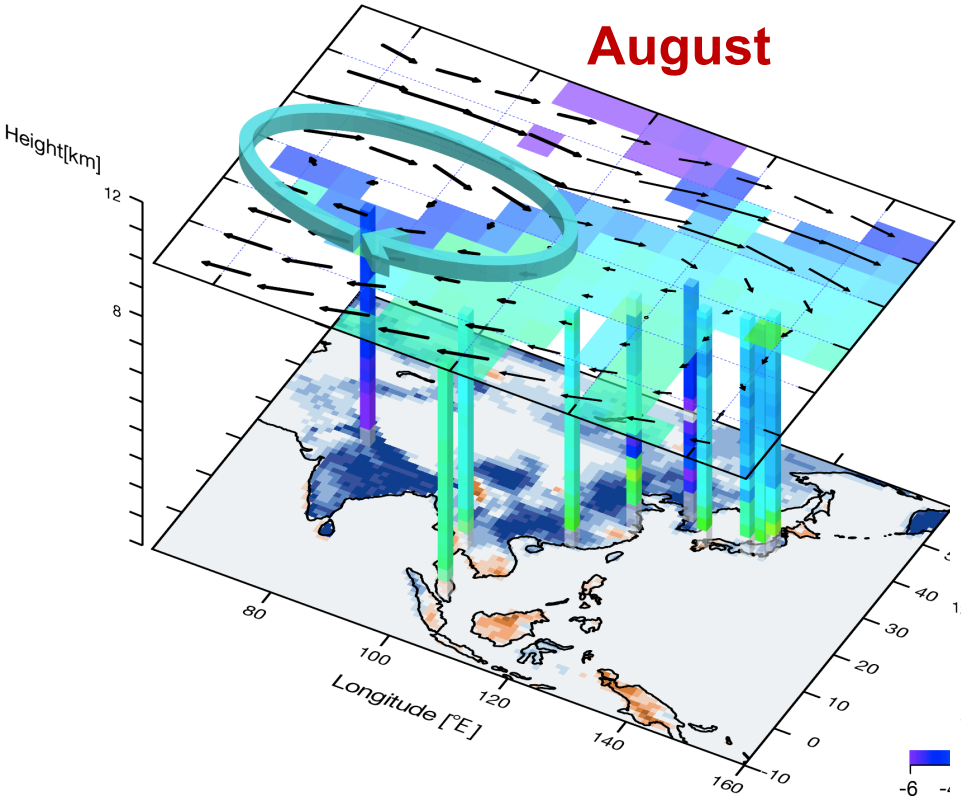
Ground signal is trapped in monsoon anticyclone in August



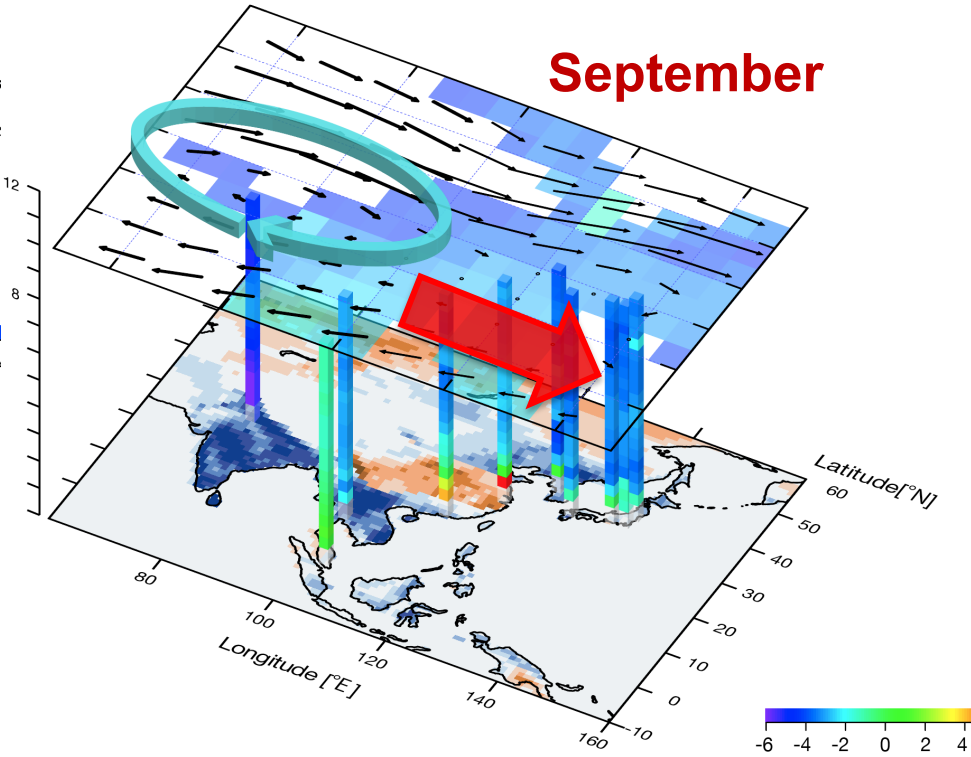
Ground signal spreads to Pacific region in September

Umezawa et al. ACP (2018)

3-D distrubutions of CO_2 over Asia-Pacific region



Ground signal is trapped in monsoon anticyclone in August



Ground signal spreads to Pacific region in September

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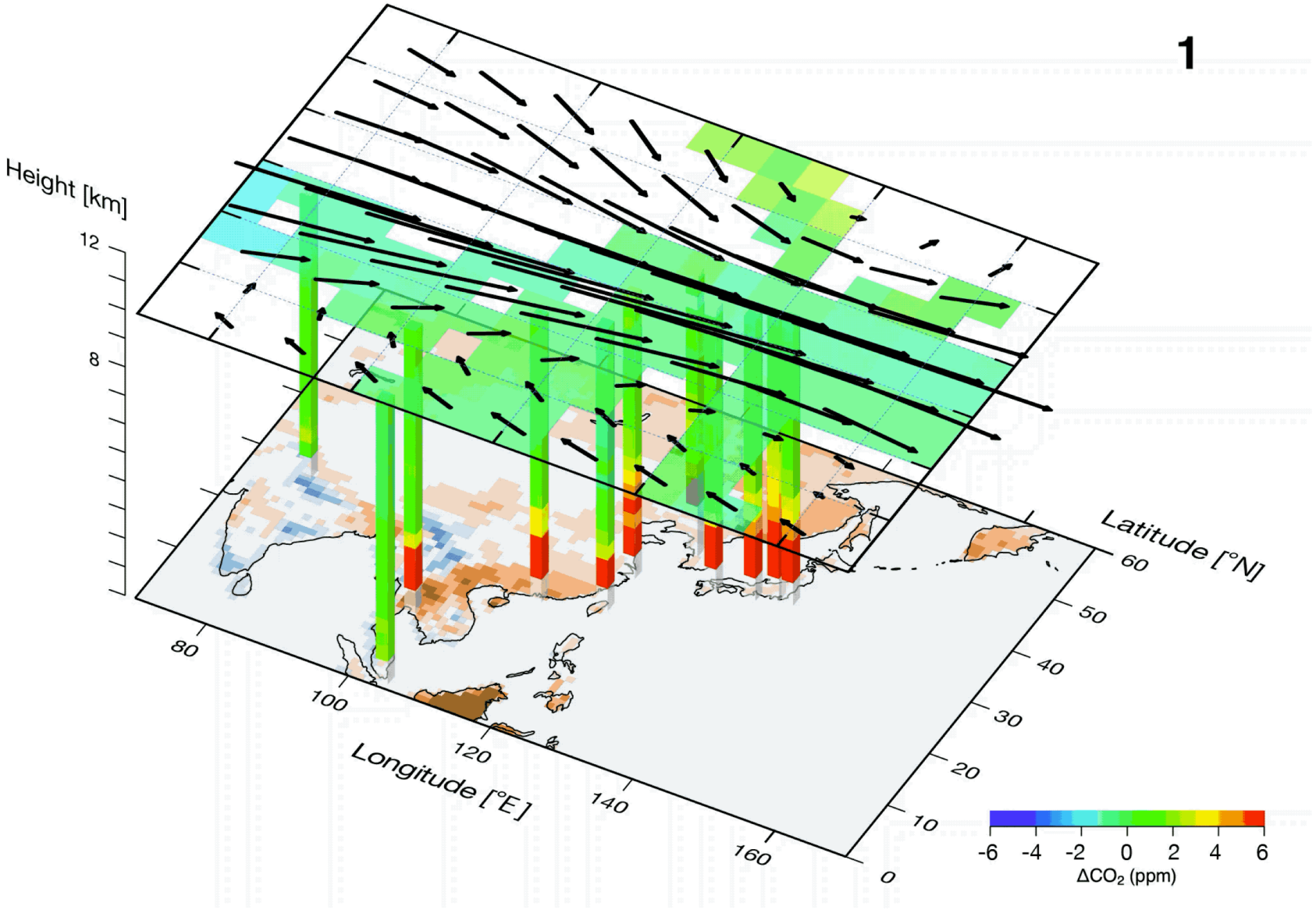
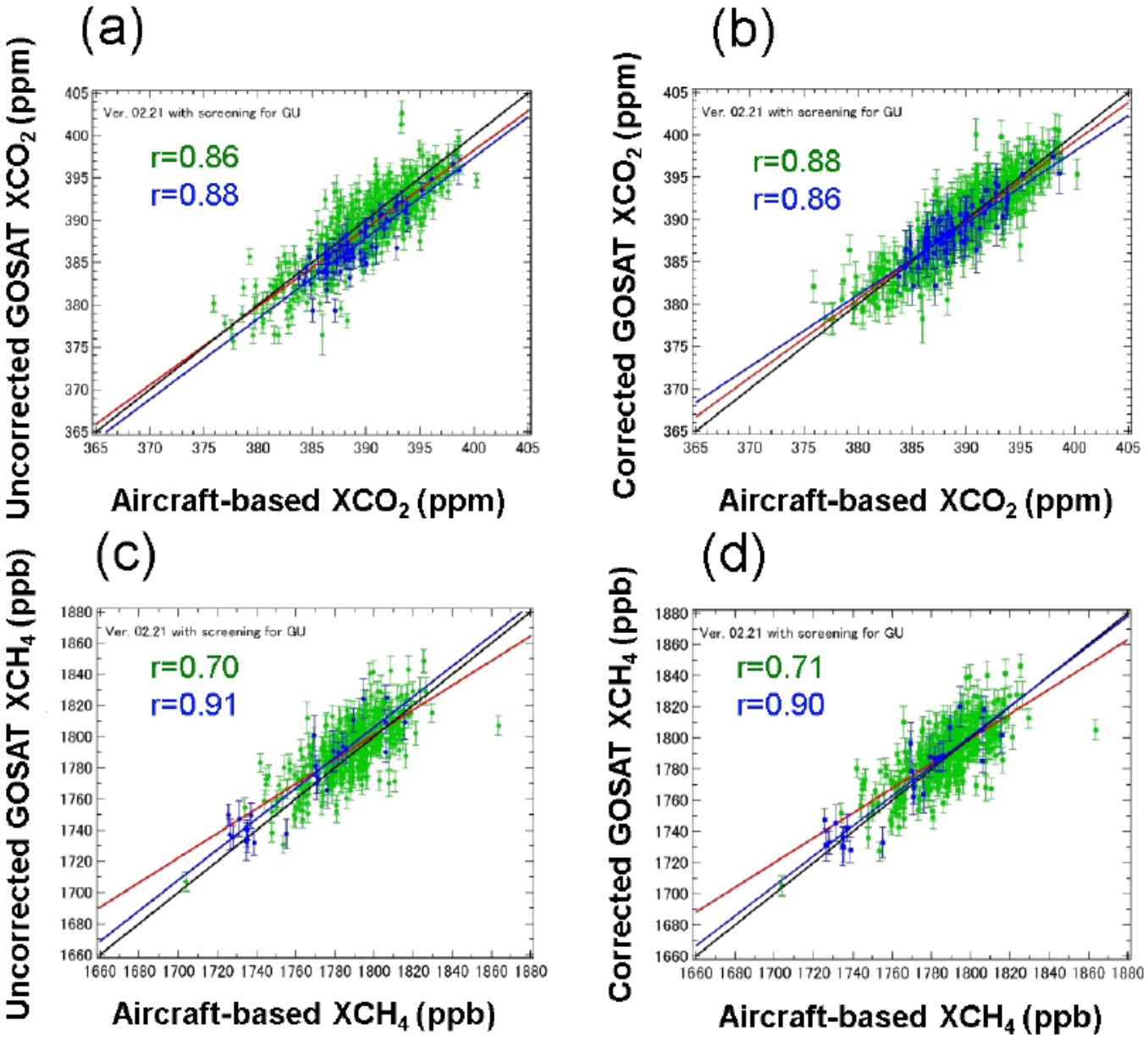


Validation for GOSAT XCO_2 and XCH_4



Inoue et al., 2016

CONTRAIL-CME data are available with DOI

Atmospheric CO2 mole fraction data of CONTRAIL-CME

Click Here to Download

This data set contains CO_2 mole fractions observed by Continuous CO_2 Measuring Equipment (CME) onboard commercial aircraft under the CONTRAIL (Comprehensive Observation Network for TRace gases by AirLiner) project. The project started in 2005 with two Boeing 747-400 aircraft and three 777-200ER aircraft operated by Japan Airlines (JAL) between Japan and Europe, Asia, Australia, Hawaii and North America. As of 2017, eight 777-200ER and two 777-300ER aircraft are used for the CME observation. The mole fraction values are obtained from 10-second average values of the CME signals for the ascending and descending portion of the flight and from 1-minute averages for the cruise.

Description | Data Set | Contributors | References | Terms and Conditions of Use* | Advisory Service

Description

Creator	Toshinobu Machida*1, Yousuke Sawa*2, Hidekazu Matsueda*2, Yosuke Niwa*1 *1Center for Global Environmental Research (CGER), National Institute for Environmental Studies (NIES) *2Meteorological Research Institute
Release date	2018/02/08
Temporal coverage	2005/11/05 - 2016/12/31
Data provider	NIES Email: cgerdb_admin(at)nies.go.jp

CONTRAIL NIES

Data have been available since Feb. 2018.

Updated data are opened in Mar. 2019.

doi:10.17595/20180208.001

ASE data will be opened soon (in 2019).

Summary

- CME data → Horizontal in UT and Vertical CO_2
- ASE/MSE data → Horizontal in UT and Vertical CO_2, CH_4 and other gases
- ASE data in SE. Asia and E. Asia from 2018
- Tropopause is crucial for CO_2 and CH_4
- N. American continent as net sink in summer
- Summer Monsoon anticyclone accumulate ground signal in August
  →Such signal spreads to Pacific region in Sep.
- CONTRAIL-CME data are available with DOI.
  doi:10.17595/20180208.001
- ASE data will be opened soon (in 2019).

CONTRAIL NIES

Thank you.

Please consider to use JAL
for your next travel to Japan.