Long-term measurements of UT/LMS aerosol particles by the IAGOS-CARIBIC observatory: (size) distributions, elemental composition, and black carbon

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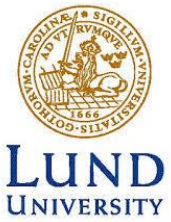
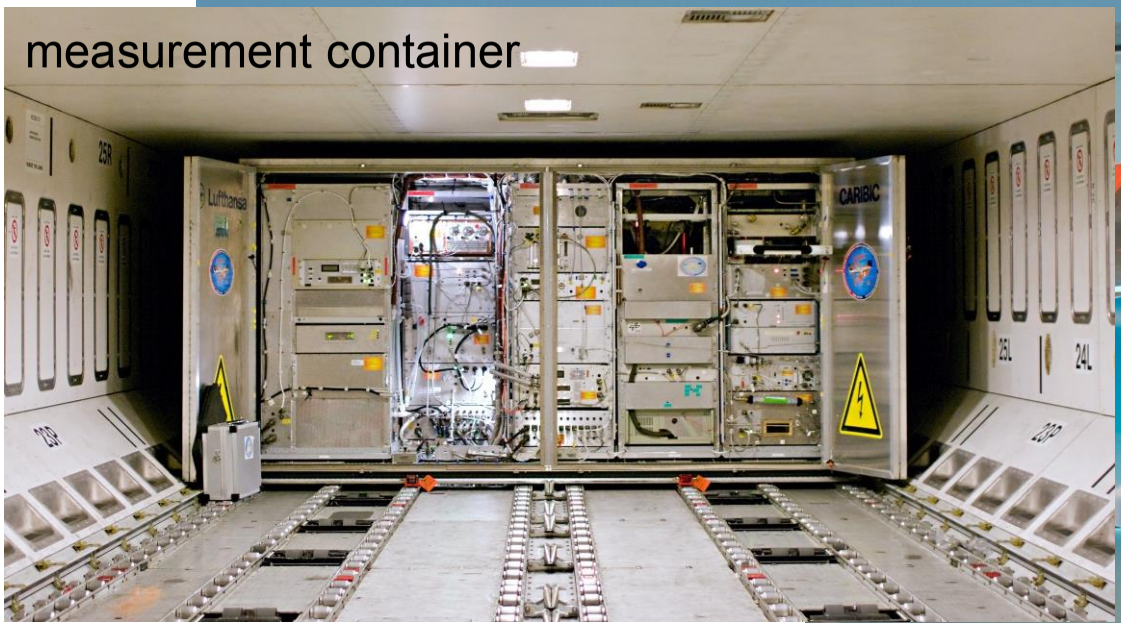
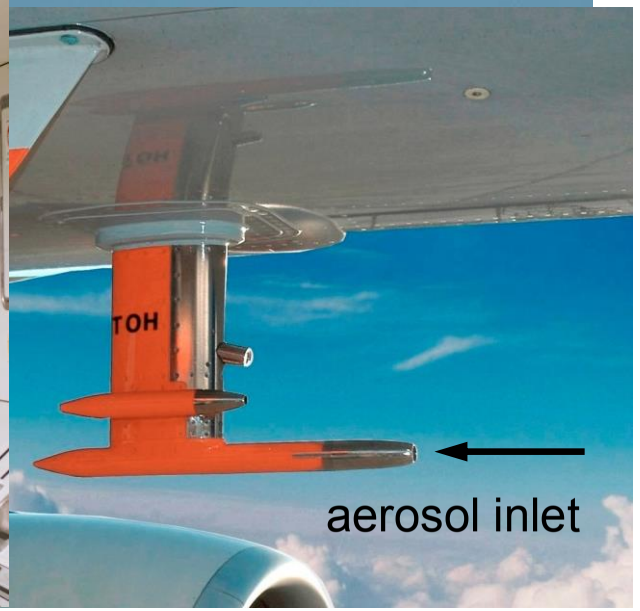
SSiRC Workshop
April 2016

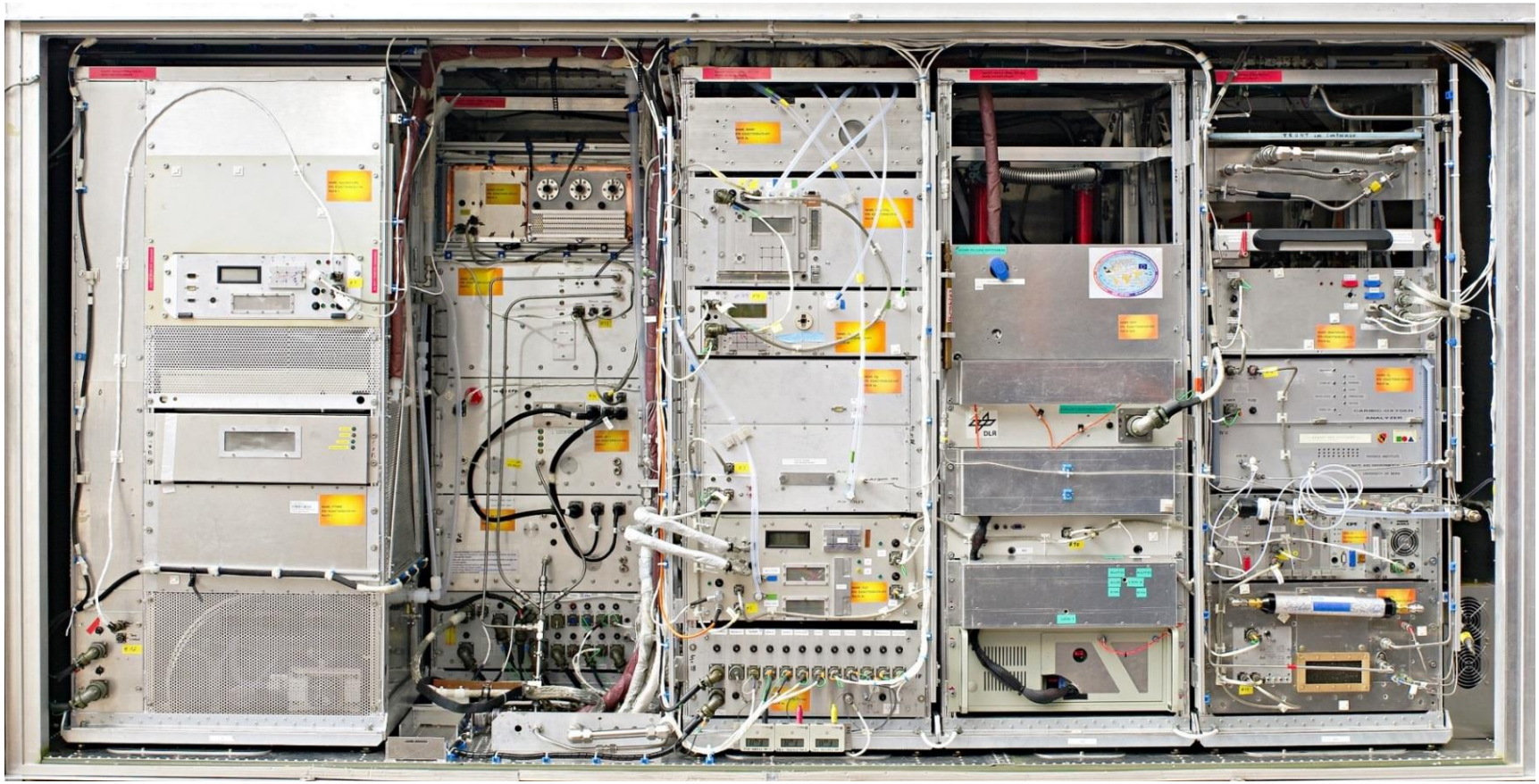


IAGOS-CARIBIC research infrastructure





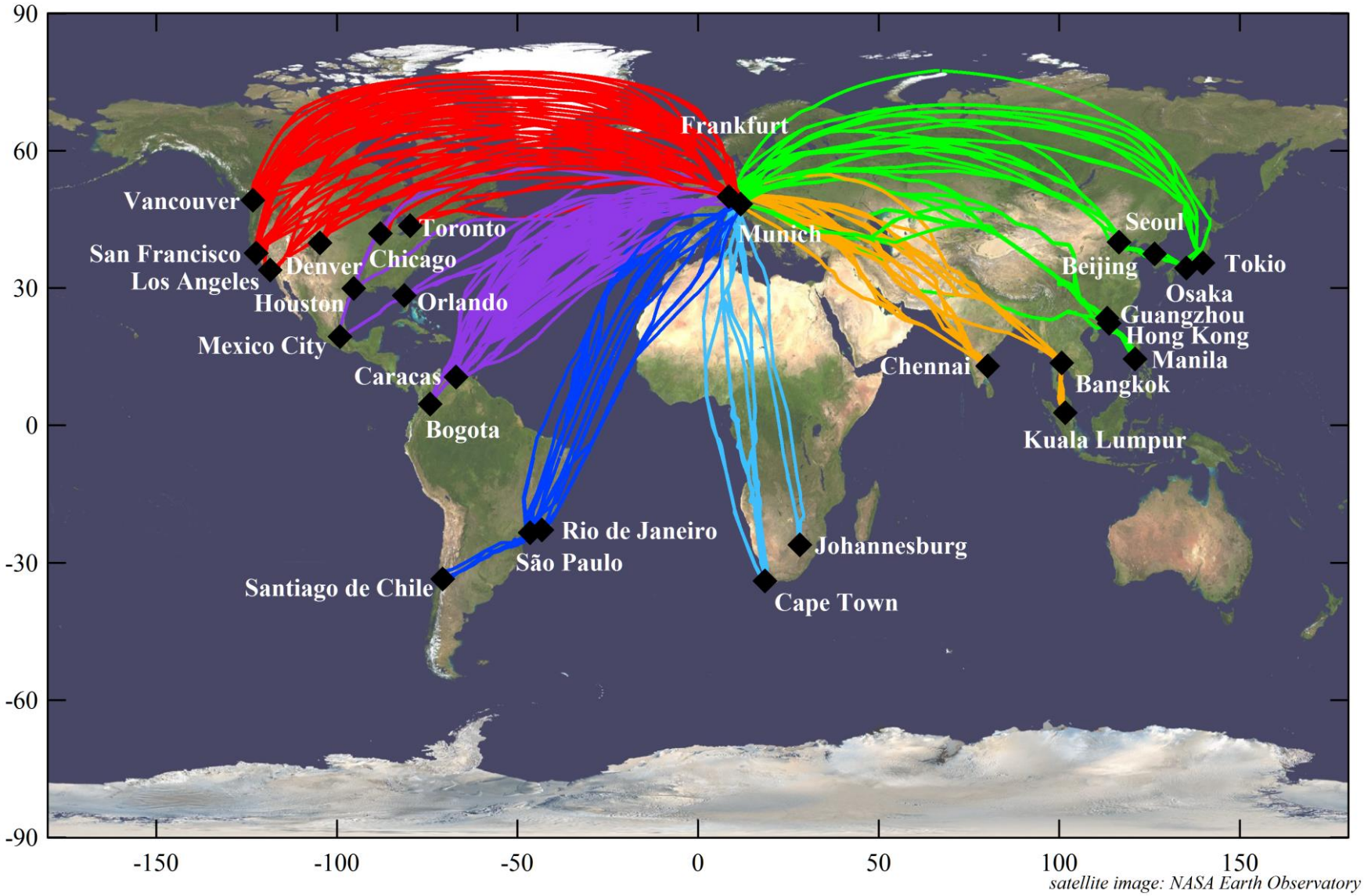
CARIBIC container



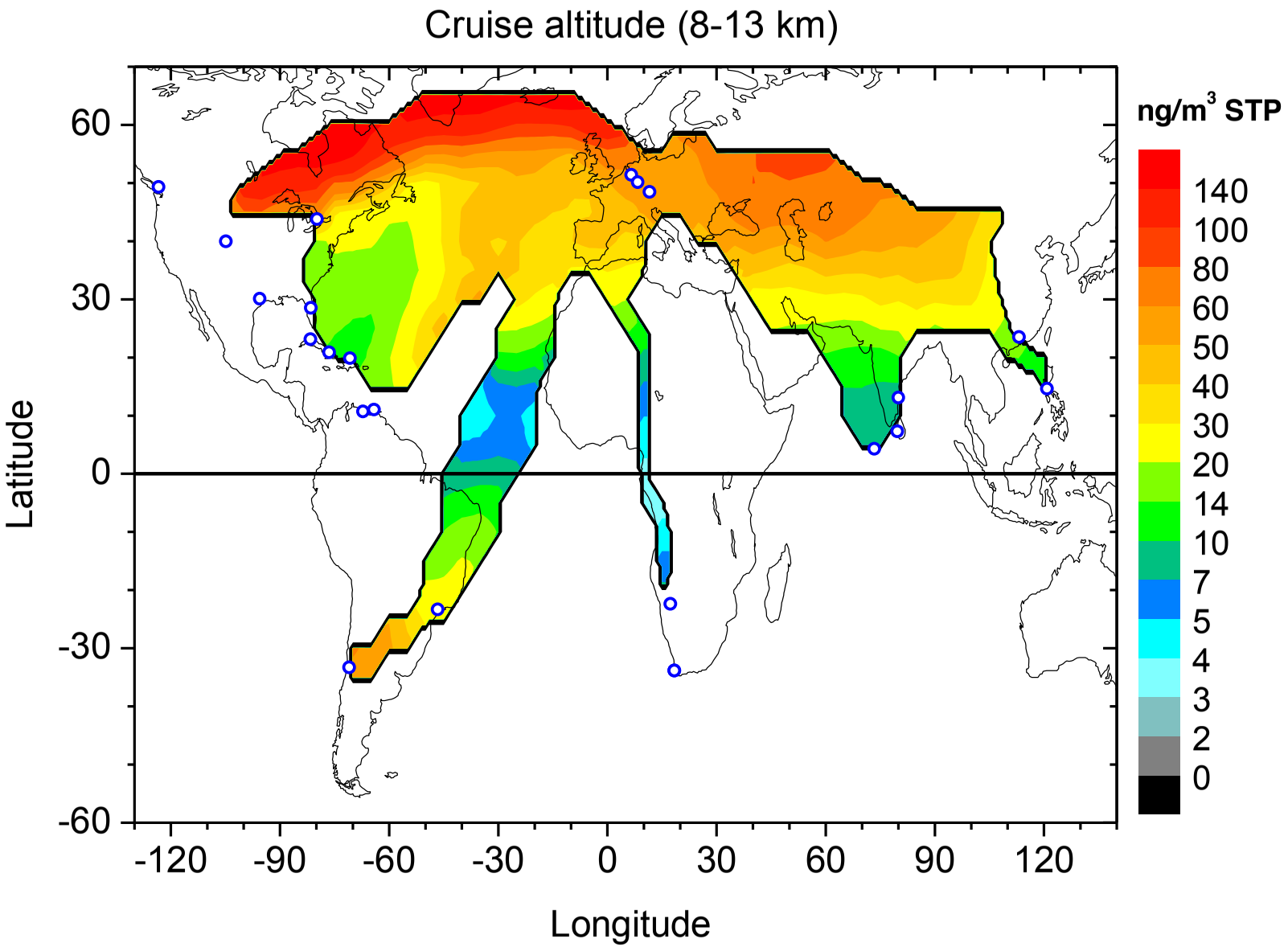
- Aerosol particles: **number concentration** (CPCs), **size distribution** (OPSS), **elemental composition** (impactor + PIXE/PESA), **soot concentration** (SP2)
- Trace gases: O_3, CO, CH_3CN, H_2O_{gas}, H_2O_{tot}, OCS, …

Brenninkmeijer et al., ACP, 2007

CARIBIC flights 2005-2015



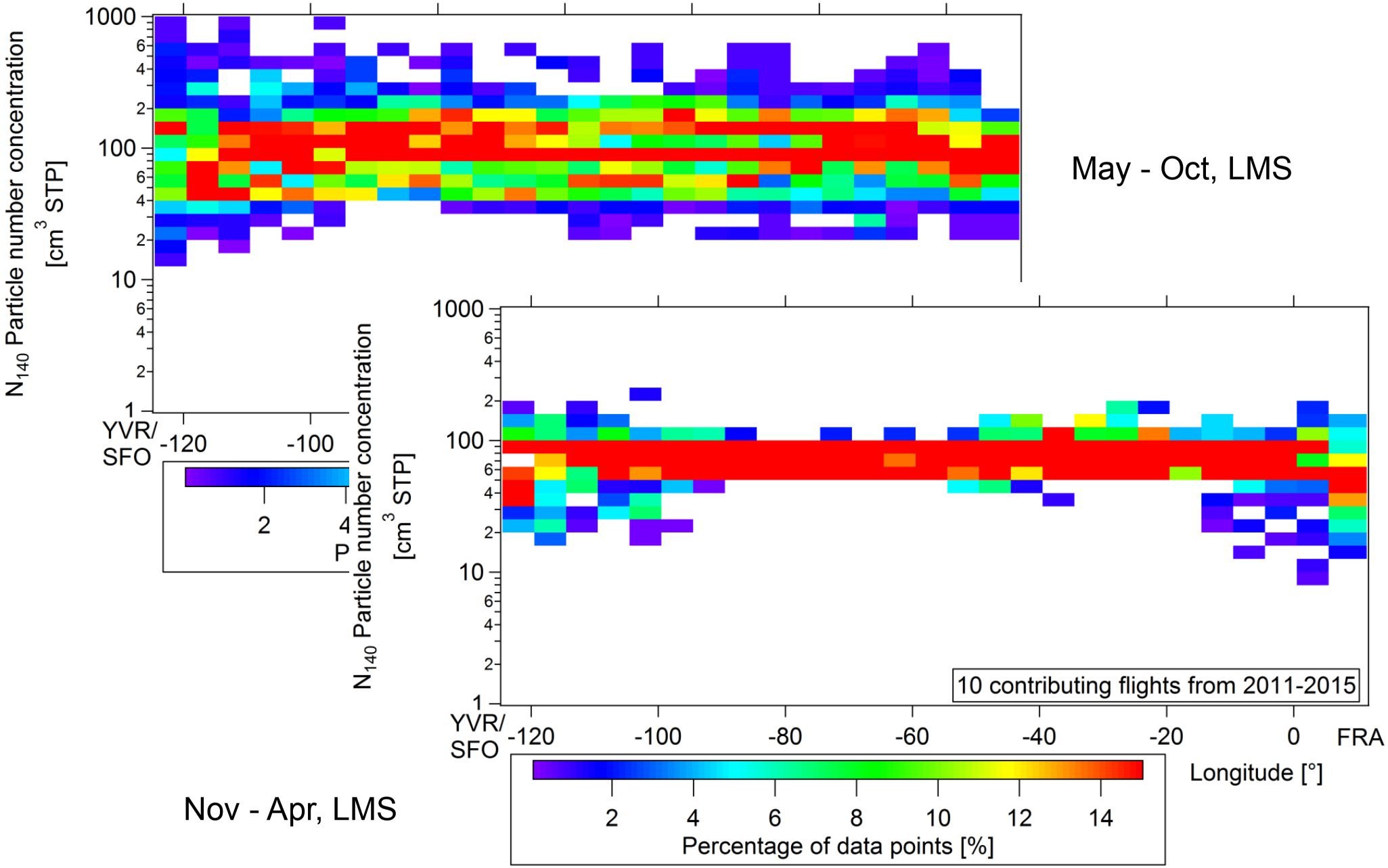
Particulate sulfur concentration



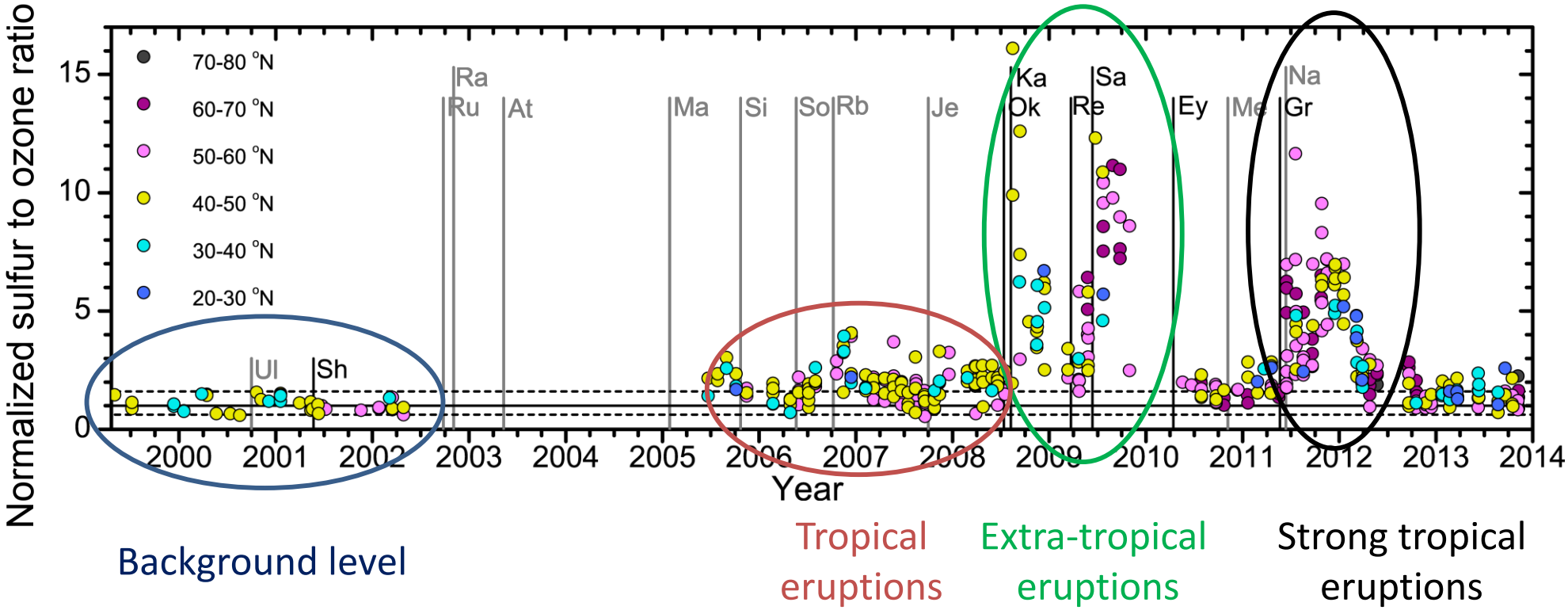
Detected elements (selection)

Element	H	C	N	O	S	K	Ca	Ti	V	Cr	Mn	Fe	Ni
MDL (ng/m^3 STP)	1	15	3	7	2	0.1	0.4	0.05	0.03	0.02	0.03	0.1	0.03
Detection Frequency (%)	94	71	90	97	97	45	21	21	11	11	11	44	45

Accumulation mode probability density function
Europe – North America



LMS particulate sulfur concentration

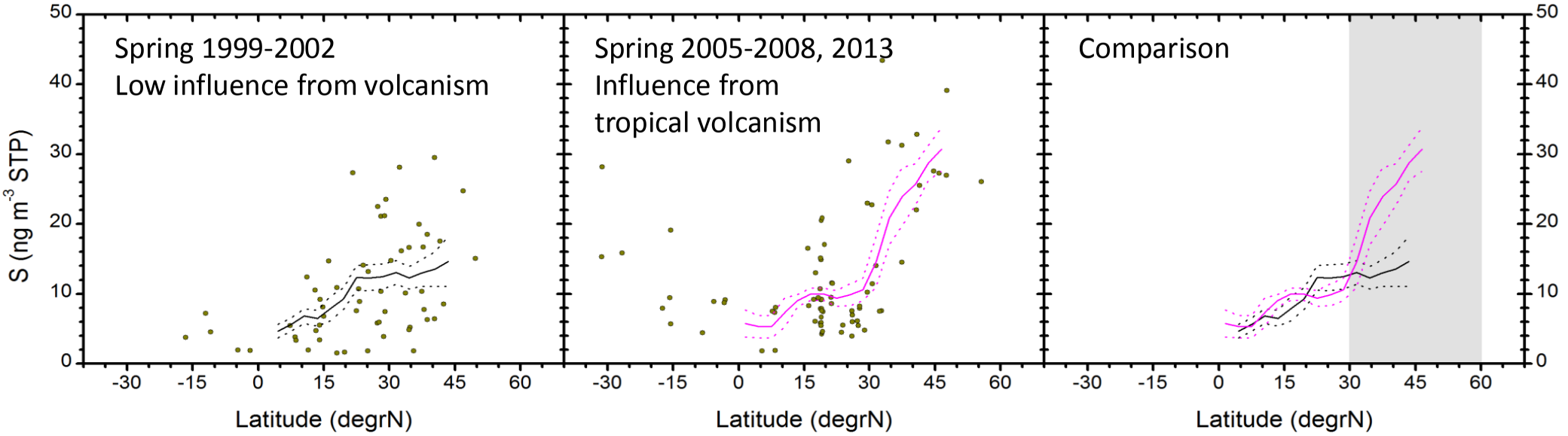


Deviations mainly caused by volcanism.

Andersson et al., ACP, 2013 ; Andersson et al., Nat. Commun., 2015

Volcanic influence on mid-latitude cirrus clouds?

PV < 1.5 PVU

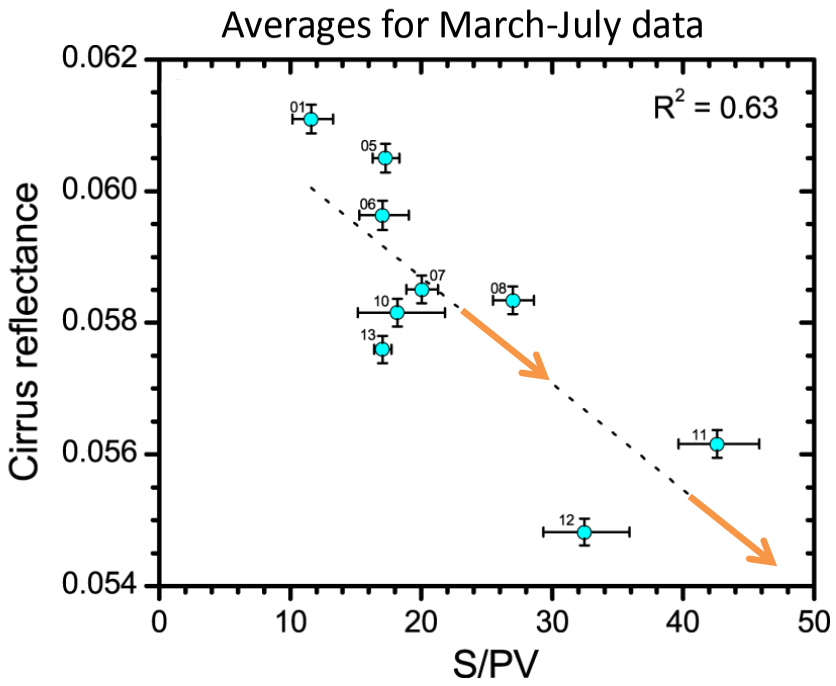


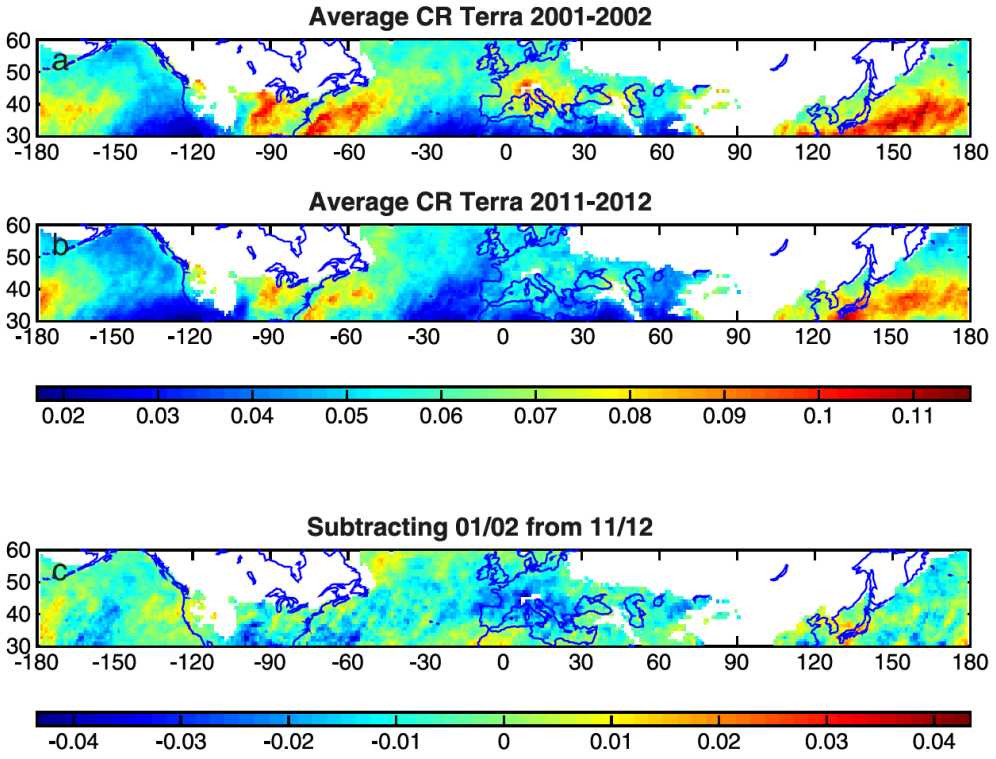
- Tropical volcanism doubled spring UT sulfur @ 45°N → cirrus clouds?

- Use of MODIS satellite data
- Combine 0.66 and 1.38 µm channels info to receive cirrus reflectance (CR)

Friberg et al., Earth and Space Science, 2015

Volcanic influence on mid-latitude cirrus clouds!

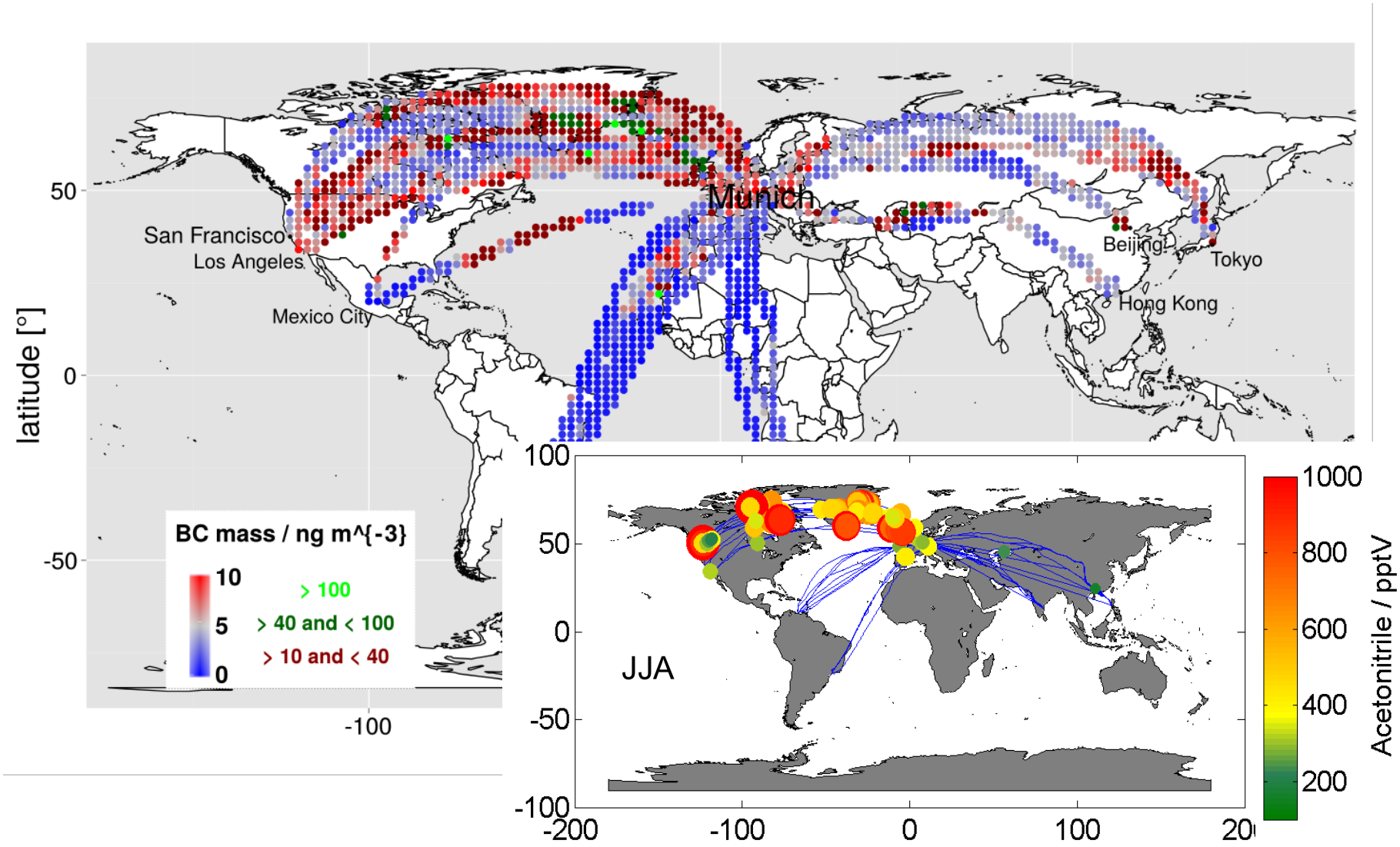




- CR **decrease** associated with subsidence of volcanic sulfate
- Optically thinner cirrus indicate cooling
- Decrease in cirrus radiative forcing could be in the Wm^{-2} range

Friberg et al., Earth and Space Science, 2015

Black carbon distribution:
aircraft, biomass burning, or vertical transport?



work in progress

New IAGOS aerosol instrumentation 2017

IAGOS-CARIBIC:

Aerosol mass spectrometer

Florian Rubach

MAX-PLANCK-INSTITUT FÜR CHEMIE

SO_4, NH_4, NO_3, organics ; 60 s time resolution

IAGOS-CORE: Aerosol package

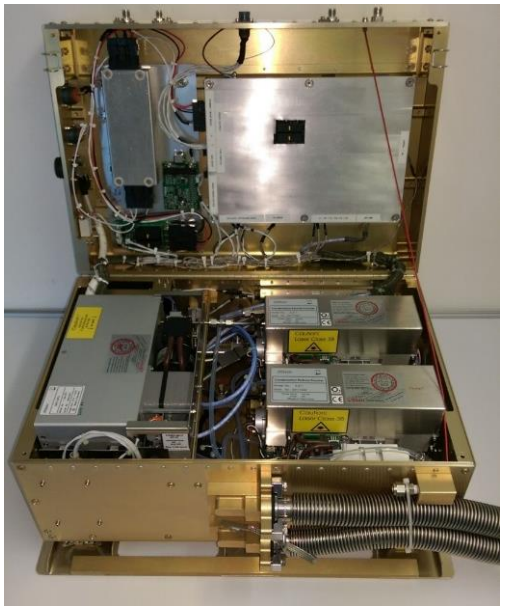
Andreas Petzold

JÜLICH FORSCHUNGSZENTRUM

complementary data by

2 x CPCs, 1 x OPSS, and 1 x thermodenuder

up to five aircraft ; daily measurements



Please use our data

Thank you

www.iagos.org www.caribic-atmospheric.com

Karlsruhe Institute of Technology

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