

Trace gas measurements in the warmpool region in the Pacific at Palau Island (7.4°N, 134.5°E)

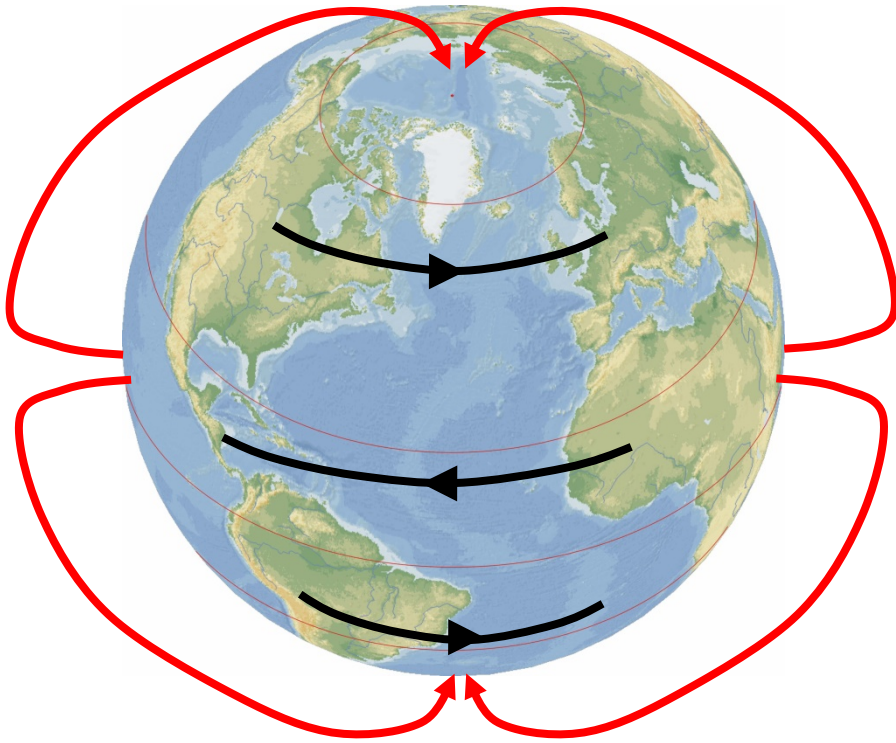
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Institute of Environmental physics



Why going to Palau ?



Brewer-Dobson-circulation

horiz. velocities: ~ 5 m/s

vert. velocities: ~ 0.5 mm/s

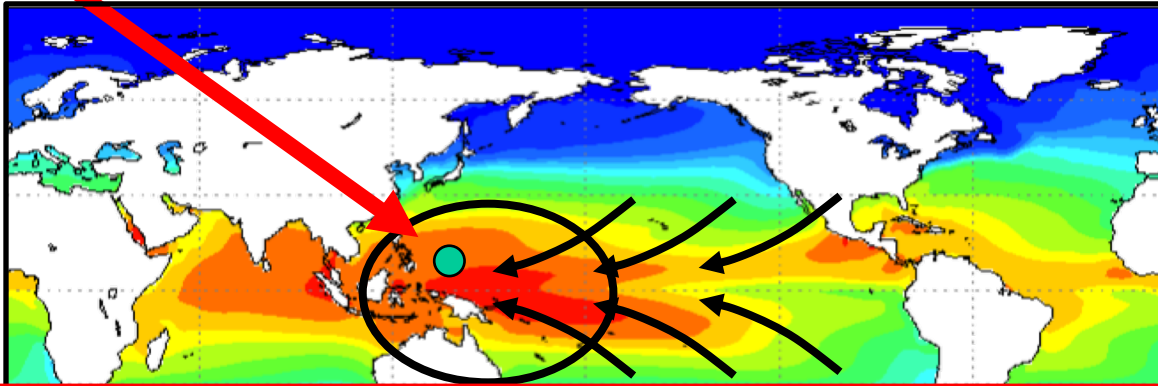
- Air enters the stratosphere (15 - 40 km) in the tropics
- Composition of tropical troposphere (0 - 15 km) determines the composition of the whole stratosphere

Why going to Palau ?

Long term annual mean sea surface temperature [°C]



Palau



The composition of the troposphere in the warm pool region determines the composition of the global stratosphere

Ocean in 'warm-pool region' warmest on earth

→ Strong uplift of tropospheric air into stratosphere

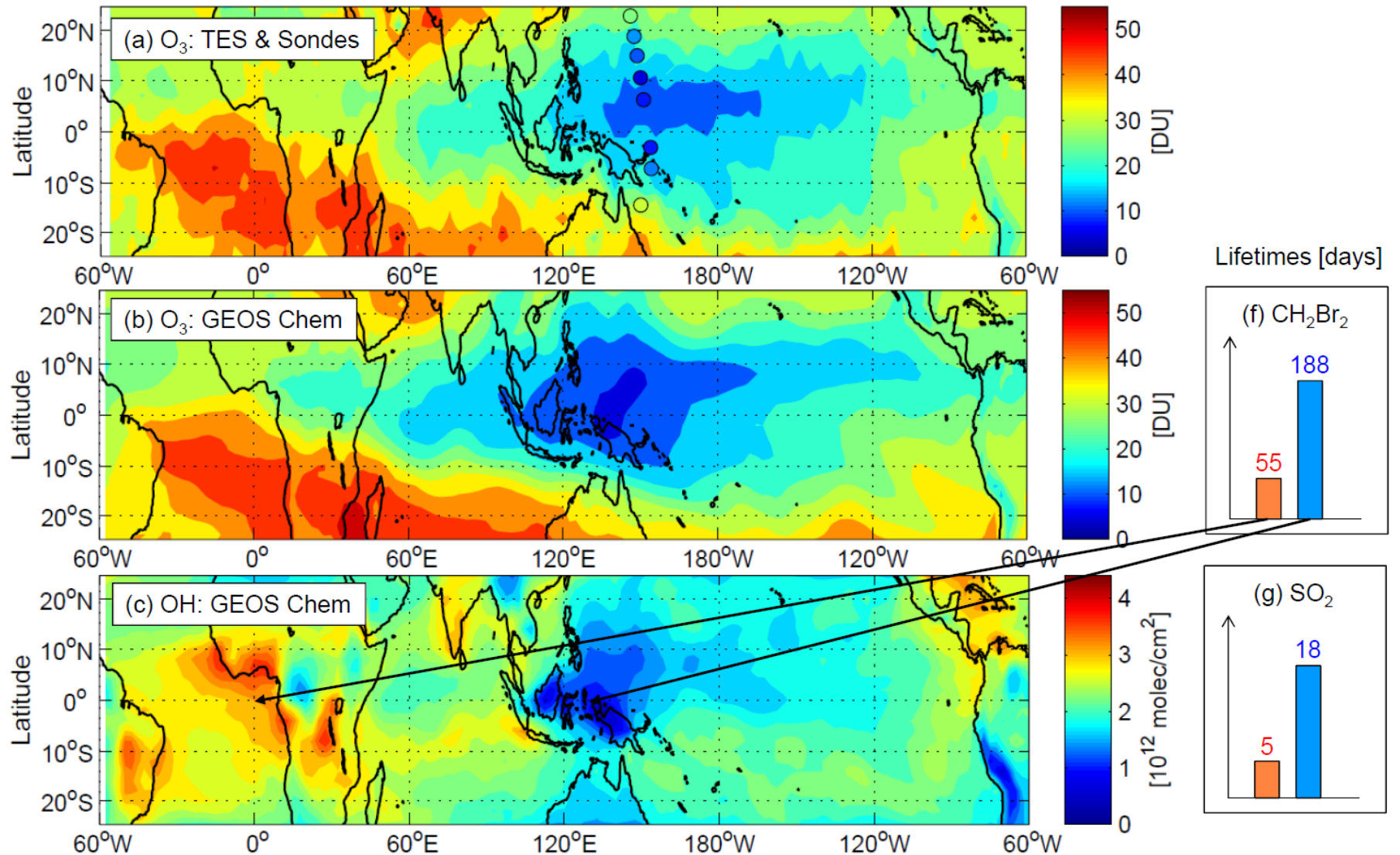
Trade winds from east, continents far away

→ no pollution → clean air and no aerosols

→ large (liquid) droplets → no lightning → no N_2 photolysis → no radicals (O_3 , NO_x)

→ Long lifetime of trace gases → transport of tropospheric gases into the stratosphere

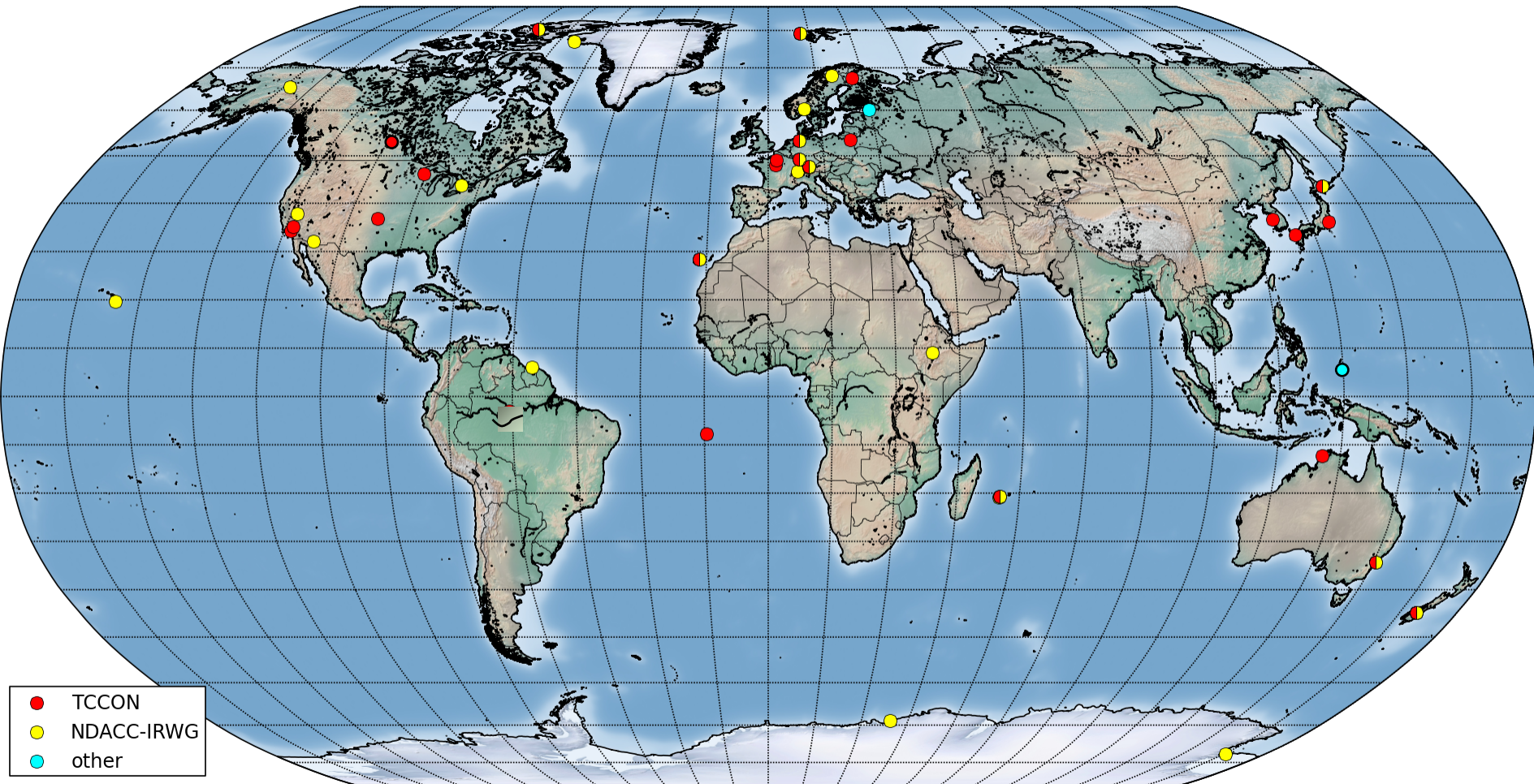
Lifetime of tropospheric trace gases



(Rex et al., 2014)

TCCON and NDACC

Total Carbon Column Observing Network (since 2004)
Network for Detection of Atmospheric Composition Change (since 1992)



Trace gas measurements in Palau

- Observations in cooperation with Alfred-Wegener-Institute for Polar and Marine Research
- Funding by EU-project StratoClim (until end of 2019)
Most probably continuation by BMBF funding (ROMIC-2)
- Bruker 125M, Bruker solar tracker
Thermostated container
Sterling cooled InSb detector
- Lidar aerosol observations
- O₃-ballon sondes
In-Situ observations (OCS for a few months by FZ Jülich)

Running Palau remotely, cloudy

awi019-messpc - TightVNC Viewer

http://172.19.0.4:5000/

Control panel Console

feh [1 of 1] - /home/pi/temp/temp2.jpg

Container Pi Web Interface - error

Plot System Pressure	Plot Meteo Station Data
Open Plot	Open Plot

Hatch Control


Open Hatch	Close Hatch	Relax Hatch	Wind ok?
Hatch Status: Hatch closed		... insert storm sensor re	

Fan Control

Ozone fan ON	Ozone fan OFF	Lamp fan ON	Lamp fan OFF
Ozone Fan Status: ON		Lamp Fan Status: OFF	

FTIR Control

Cryo Detector ON	Cryo Detector OFF
Cryo Detector Status: OFF	



Zur Suche Text hier eingeben

01:16
20.05.2019

Running Palau remotely, sunny

The screenshot shows a remote control interface for a telescope named 'Palau'. The main window displays a live video feed of the telescope's structure against a clear blue sky. On the left side, there are several control panels:

- Ozone fan control:** Includes a button labeled 'Ozone fan ON' and a status indicator 'Ozone Fan Status: ON'.
- FTIR Control:** Includes a button labeled 'Cryo Detector ON' and a status indicator 'Cryo Detector Status: OFF'.
- GPS / NTP control:** Contains several empty input fields.
- Indoor Sensors:** Contains several empty input fields.

At the bottom left, there is a PDF icon and a file name '190521_ifs...'. The bottom of the interface features a Windows taskbar with various application icons and a search bar.

On the right side, a terminal window is open, showing the following commands and output:

```
bi@AWI019p11 ~/bin $ ./Sky_Pic
bi@AWI019p11 ~/bin $ ./Sky_Pic
bi@AWI019p11 ~/bin $ ./Sky_Pic
bi@AWI019p11 ~/bin $ ./Sky_Pic
```

Below the terminal, a table of data is visible:

Date	Time	Temp
05-22-2019	21:07:30	Temp: 26.2
05-22-2019	21:07:45	1009.34
05-22-2019	21:07:45	Temp: 26.2

Running Palau remotely, sunny

awi019-messpc - TightVNC Viewer

0 EWS Solar Tra

Mode Tracking Mode

and Entry Menu

and line ttm

Commands INI=0

Code	Level	Sender/Answ
781	W	Solar Tracker
782	W	Solar Tracker

Solar Tracker Data

Position Sun

Tracking Mode

Left Flip Position

7,887°

3,397°

3,537°

65,258°

3921

3362

Intensity Dy: 125

Total Intensity: 1118

Send FLP Flip Position Solartracker Left Flip Position [System Volume Information] [temp] [totaland]

Interferometer

Auto Align

Fine Auto Align

X Motors Y

0 0

Restore

Save Peak Position

Scale Display

Scan range

Show

Store mode

Interferogram

Spectrum

ADC Count

Amplitude: 8661 Position: 175535

(176415.924, -1.1456)

Accept & Exit Cancel Help

For Help, press F1 No Active Task CAP NUM SCRL

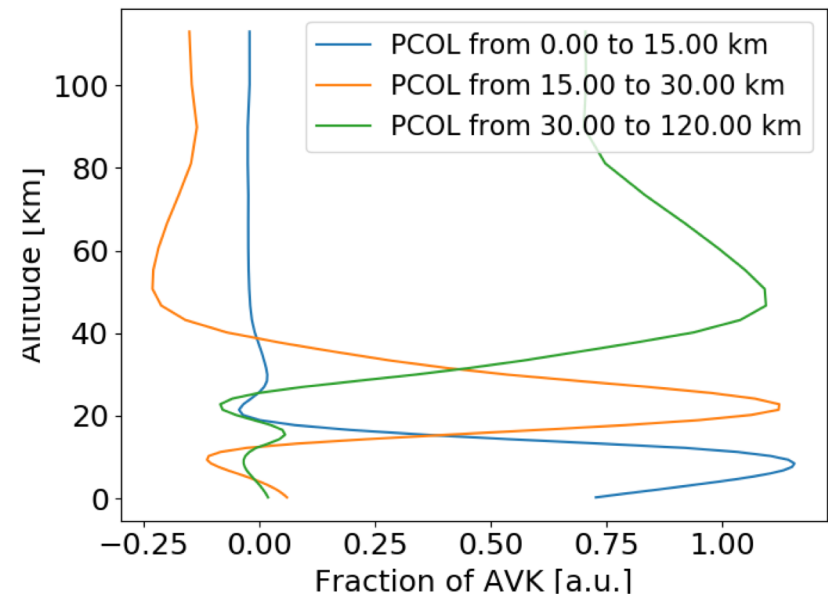
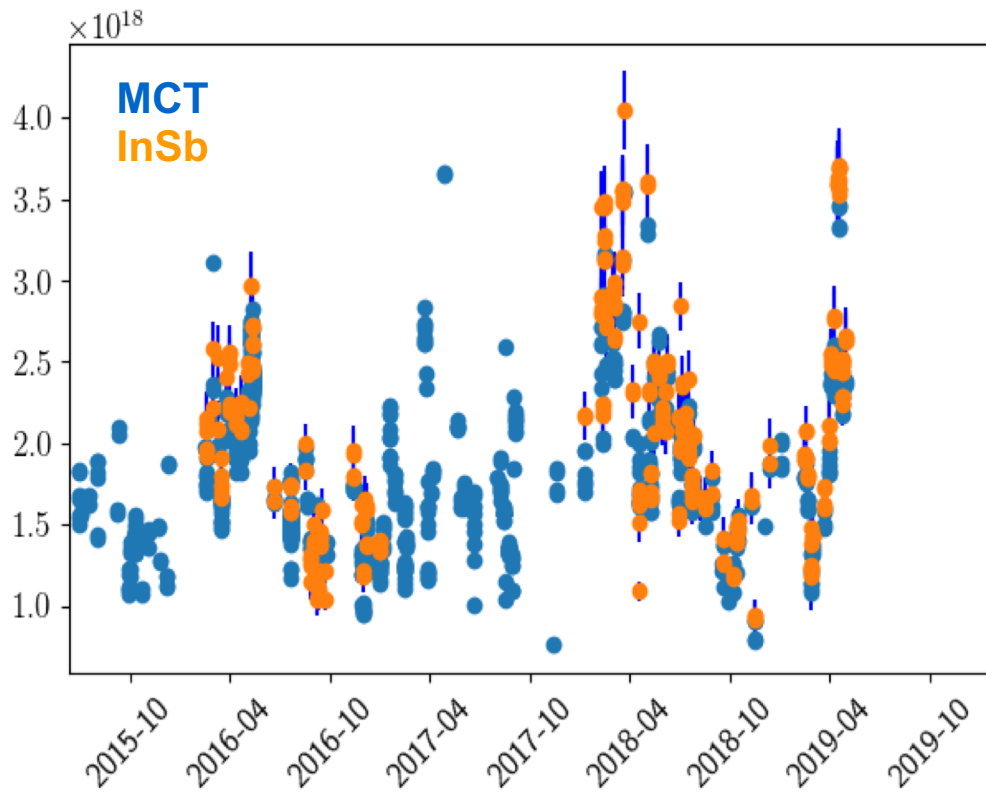
```
p11 ~/bin $ ./Sky_Pic
p11 ~/bin $ ./Sky_Pic
p11 ~/bin $ ./Sky_Pic
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p11 ~/bin $ ./Sky_Pic
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```

awcam - Preview

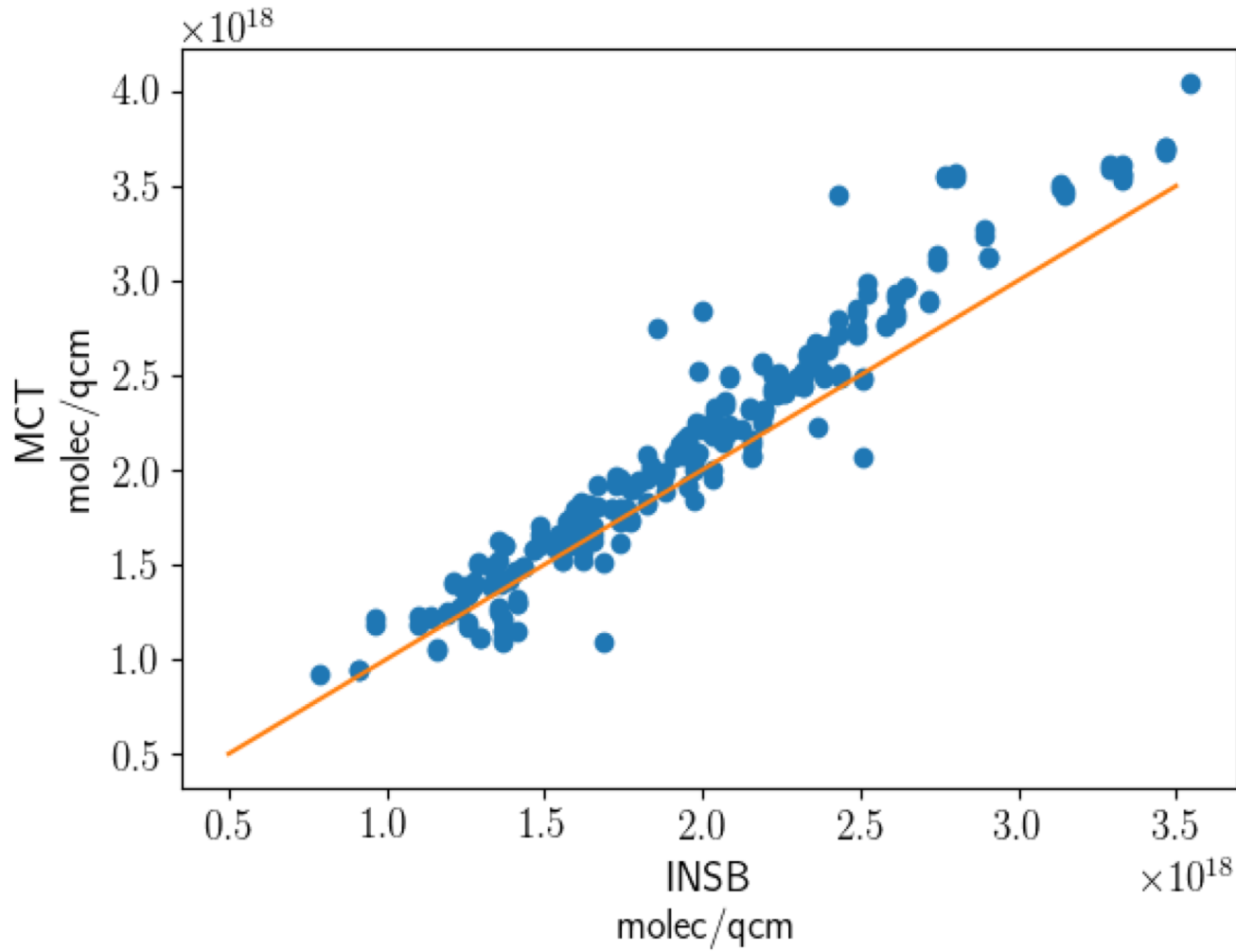
O₃ profile comparison MCT to InSb region (Bremen)

INSB

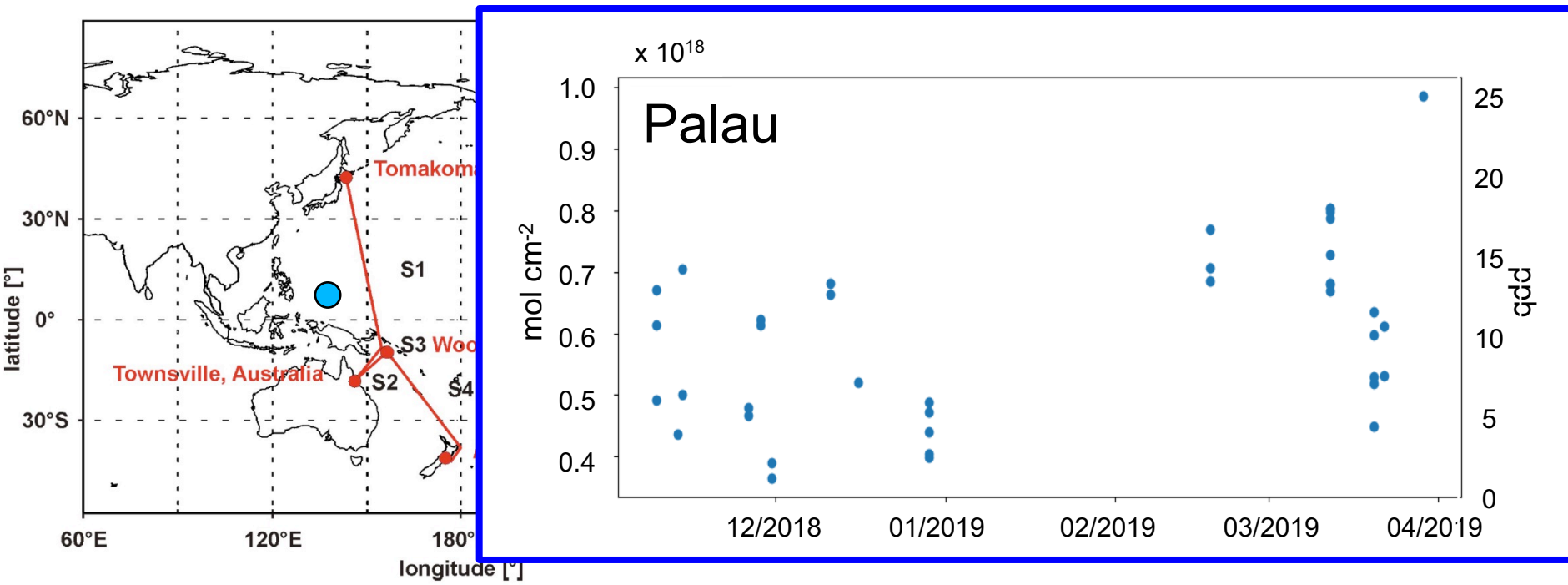
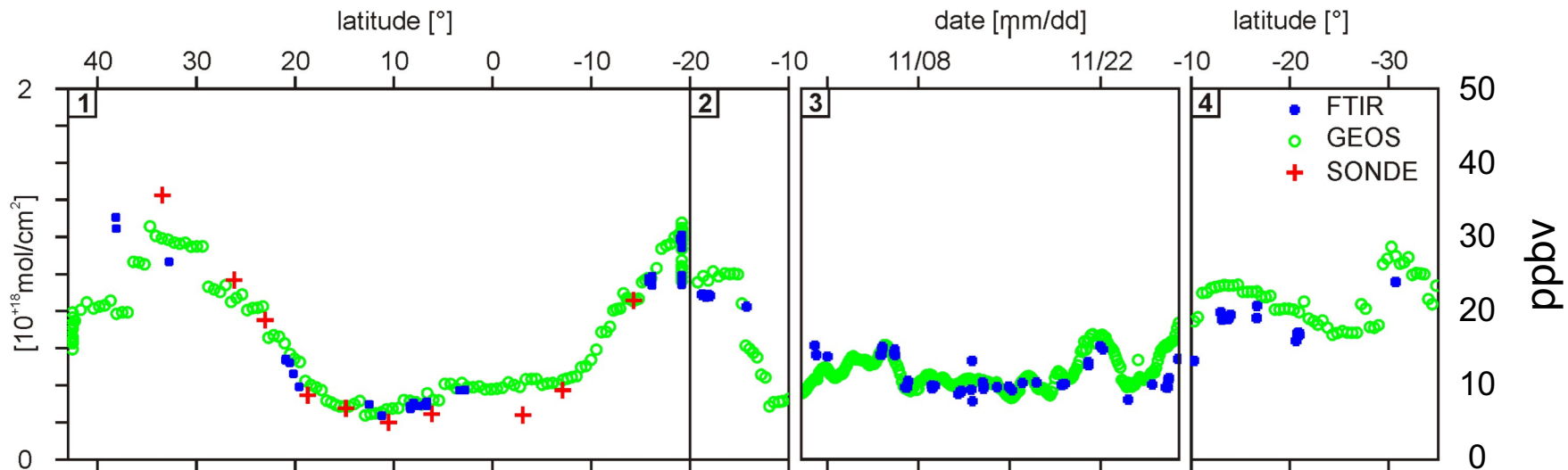
- 2108 – 2019 cm⁻¹
- Interfering gases: H₂O, CO, CO₂
- DOFS: 3-4



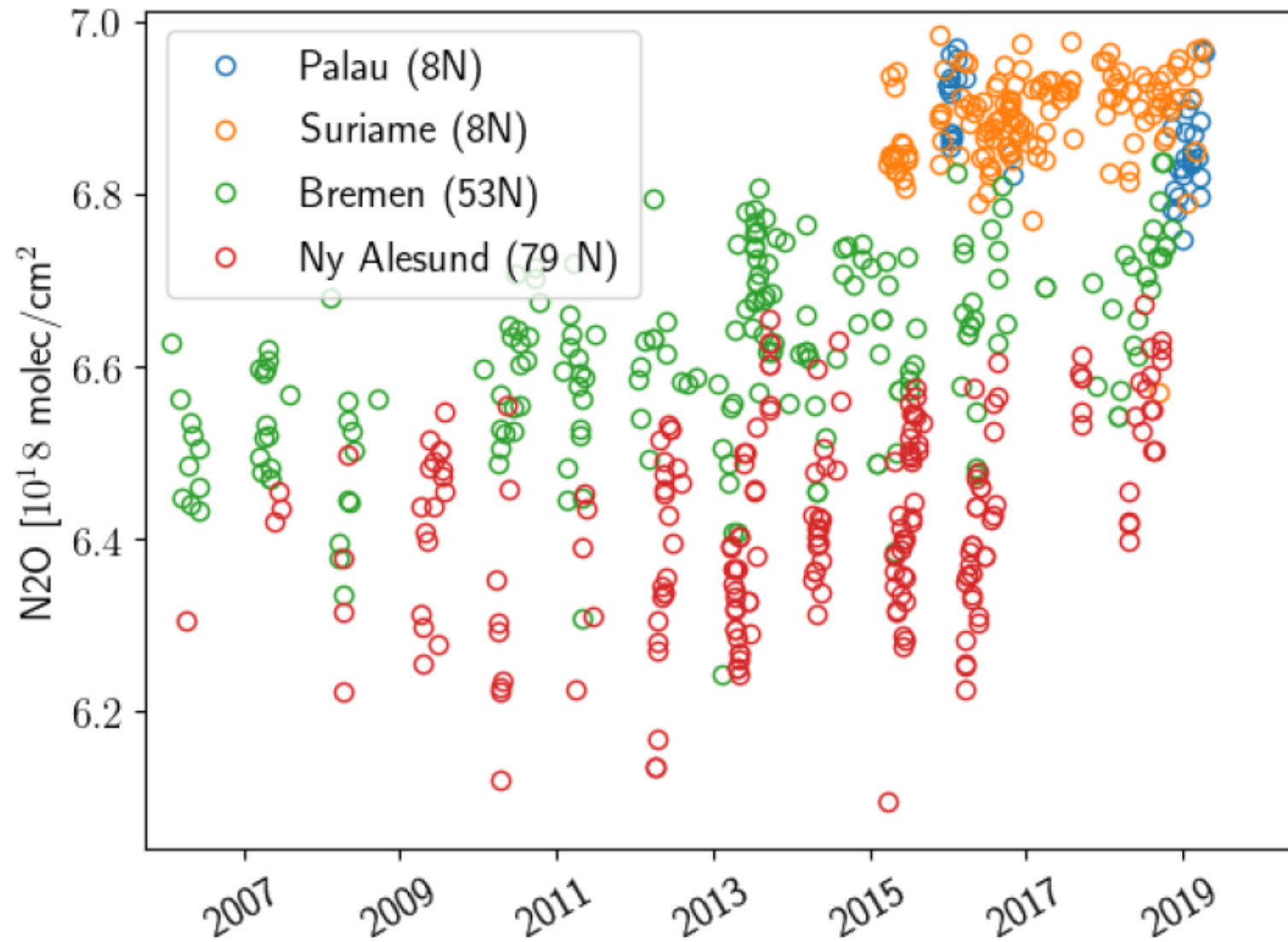
O₃ profile comparison MCT to InSb region (Bremen)



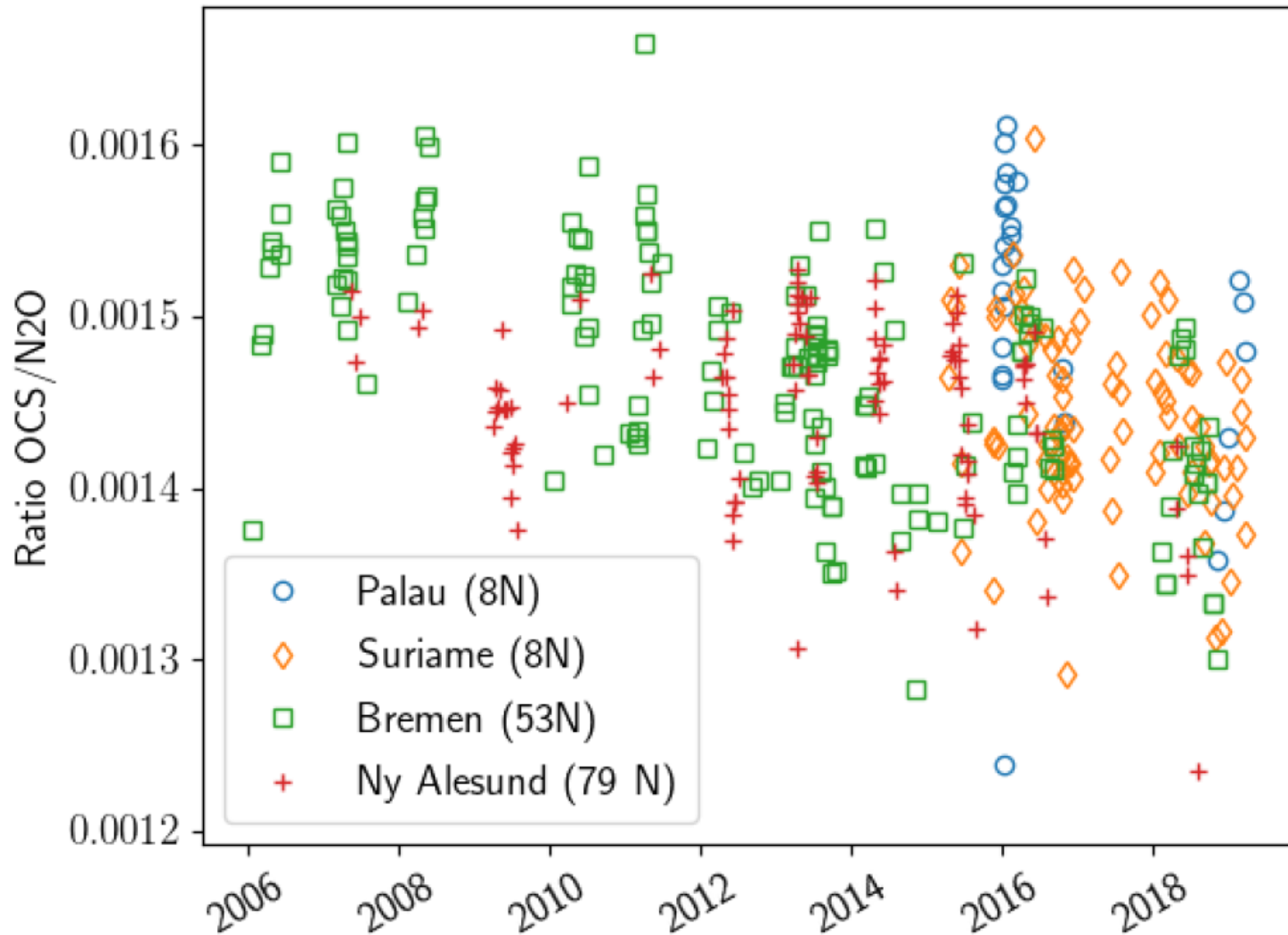
Tropospheric O₃ during ship-cruises in 2009



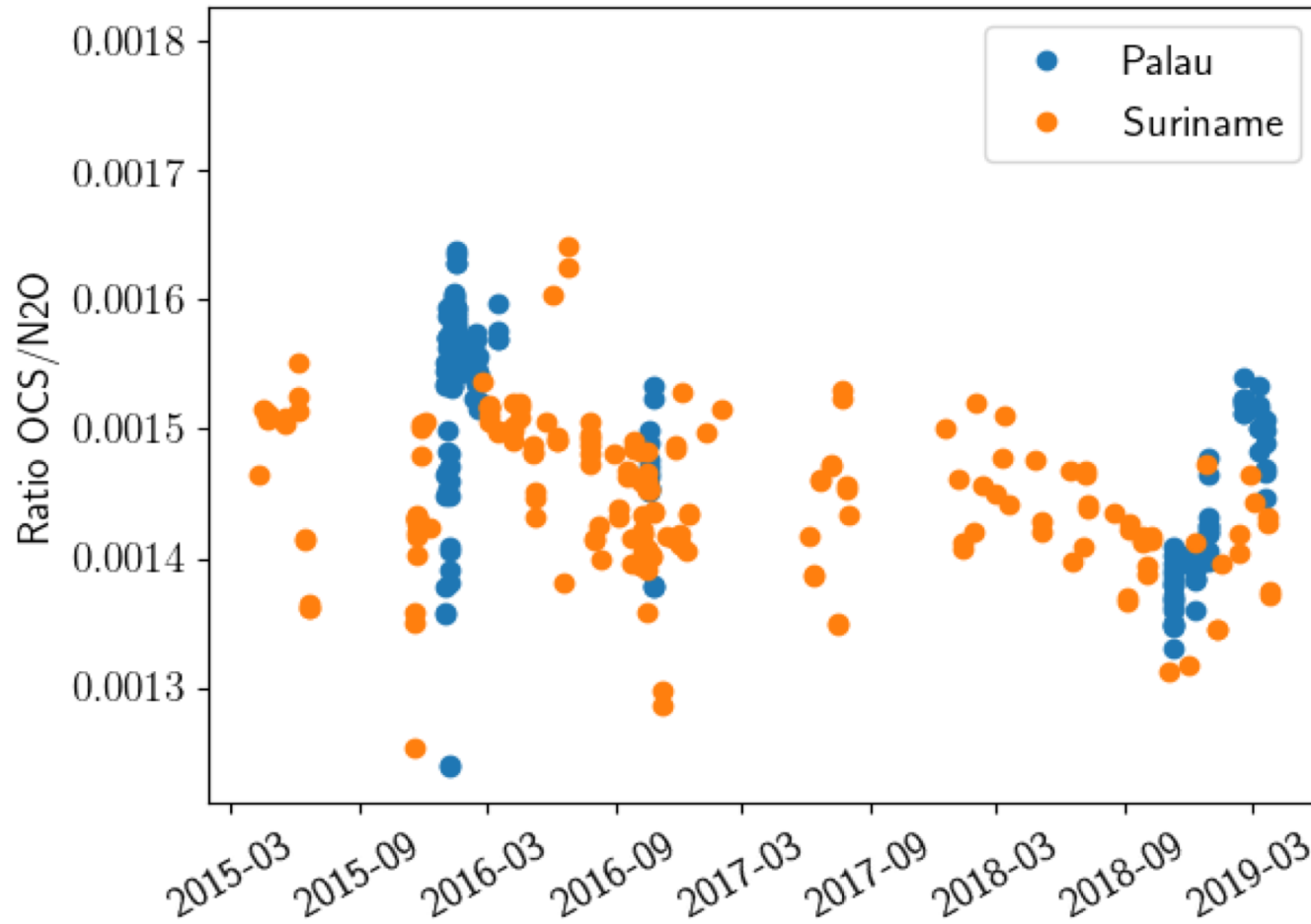
N₂O at four sites



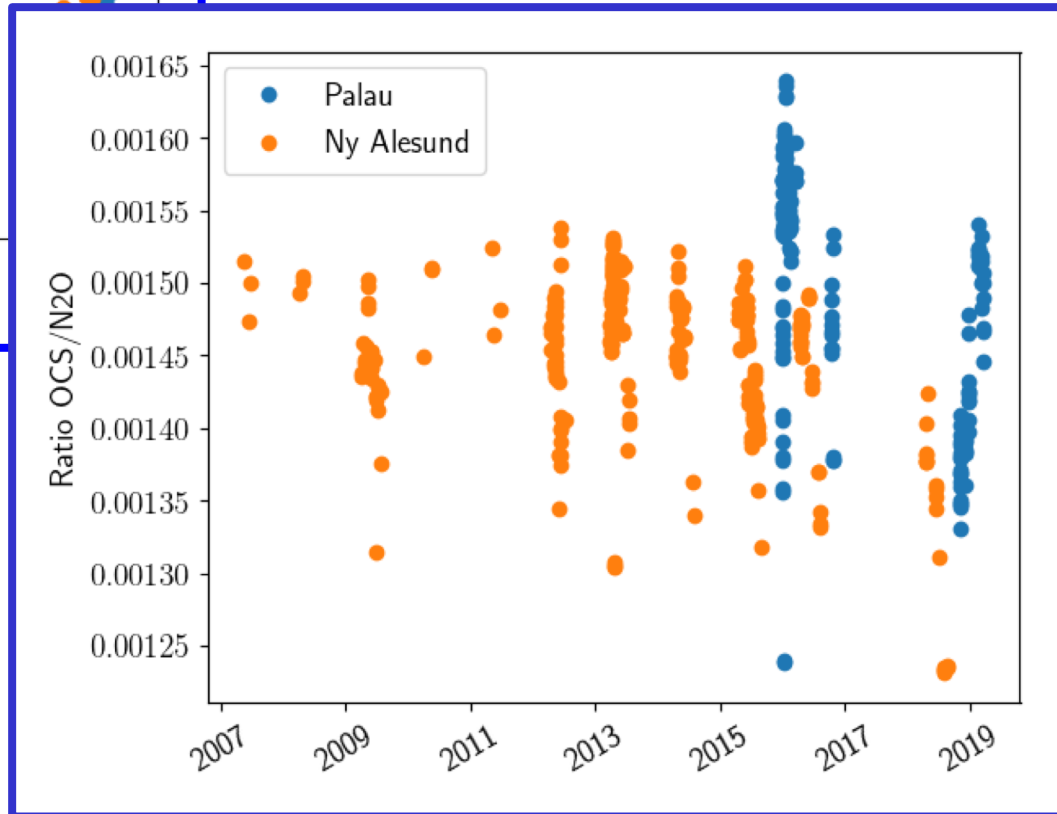
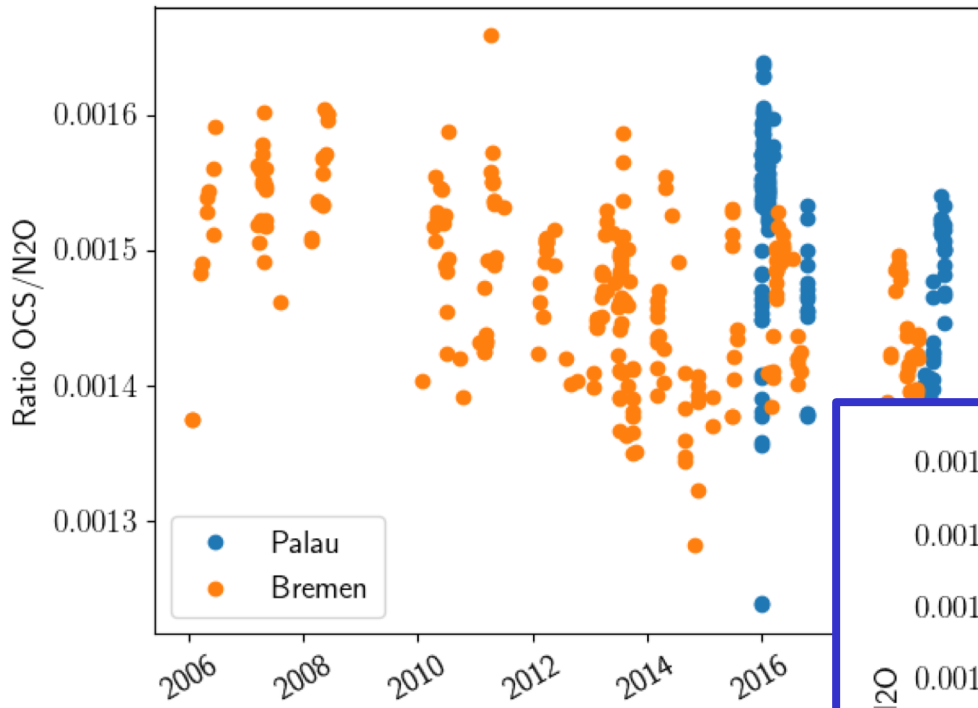
OCS/N₂O at four sites



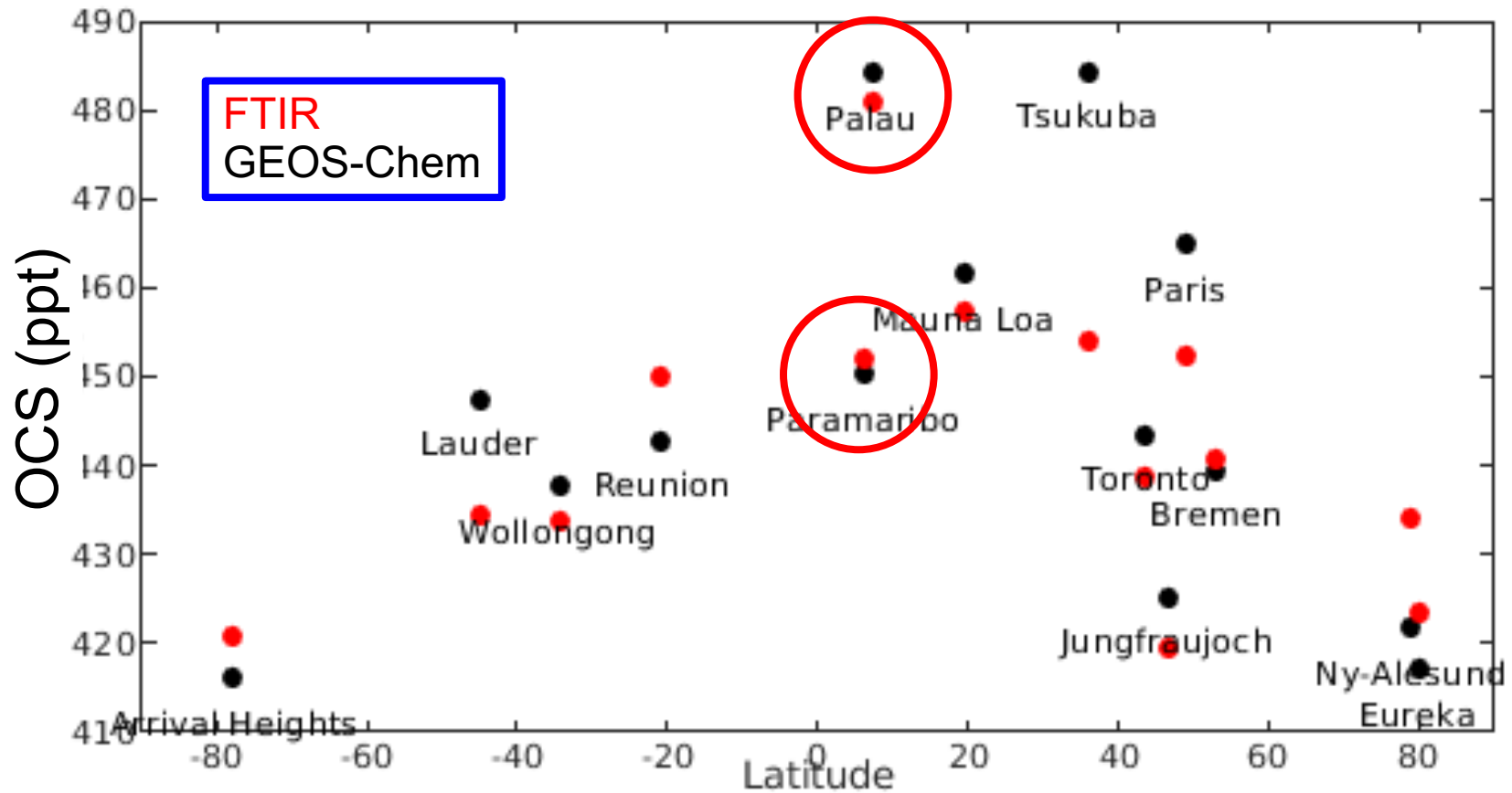
OCS/N₂O in Palau (7°N) compared to Suriname (6°N)



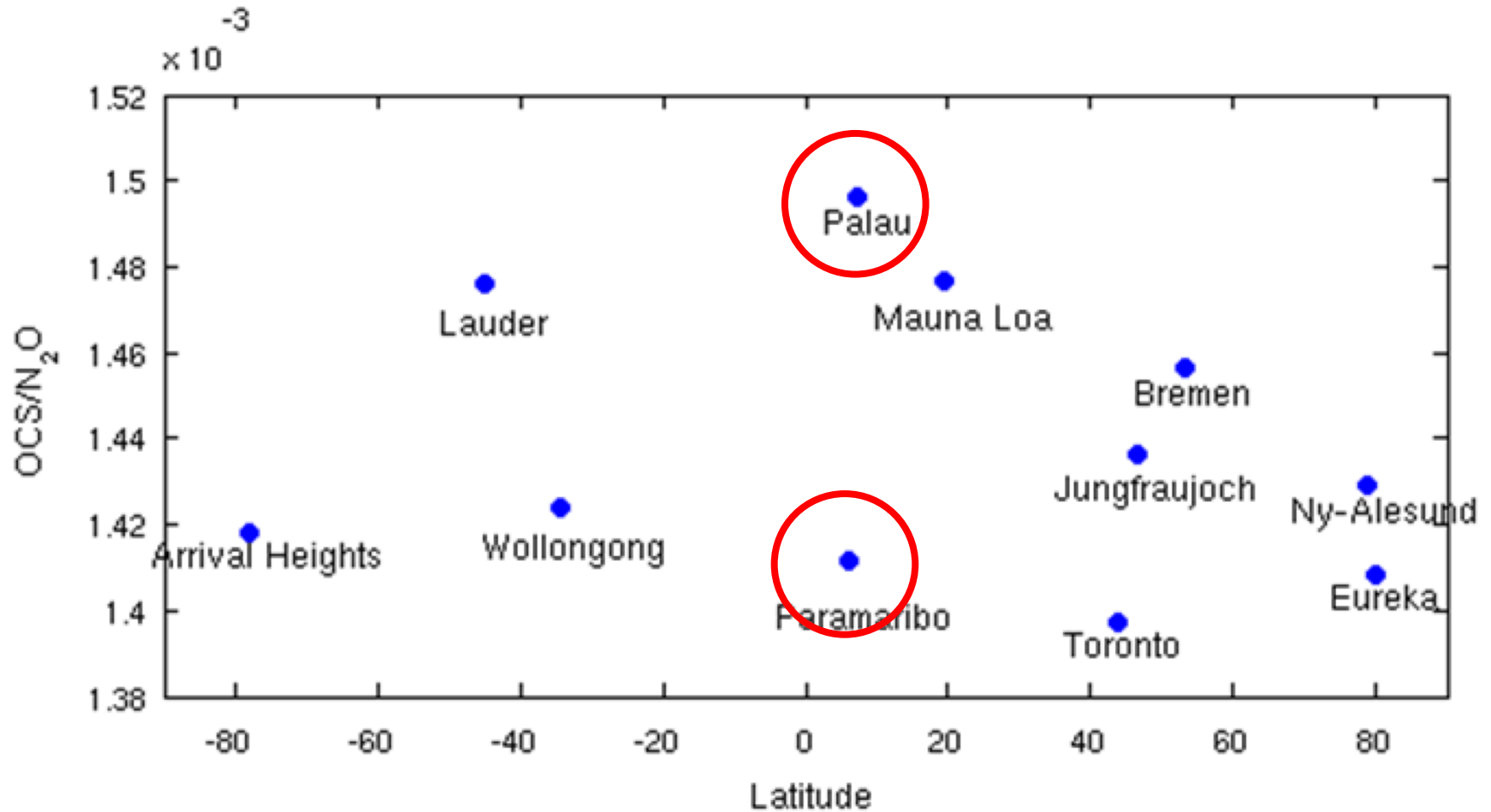
OCS/N₂O in Palau compared to Bremen and Ny-Ålesund



Latitudinal variability of OCS and model



Latitudinal variability of OCS/N₂O



Future plans

Hopefully continuation for three more years (2020- 2023)

Use of LN-cooled detectors (MCT and InSb)

Investigating aerosol budget by studying OCS
→ not enough sulphur to maintain aerosol budget

Studying transport of tropospheric trace gases into stratosphere
→ Lifetime of tropospheric gases is long