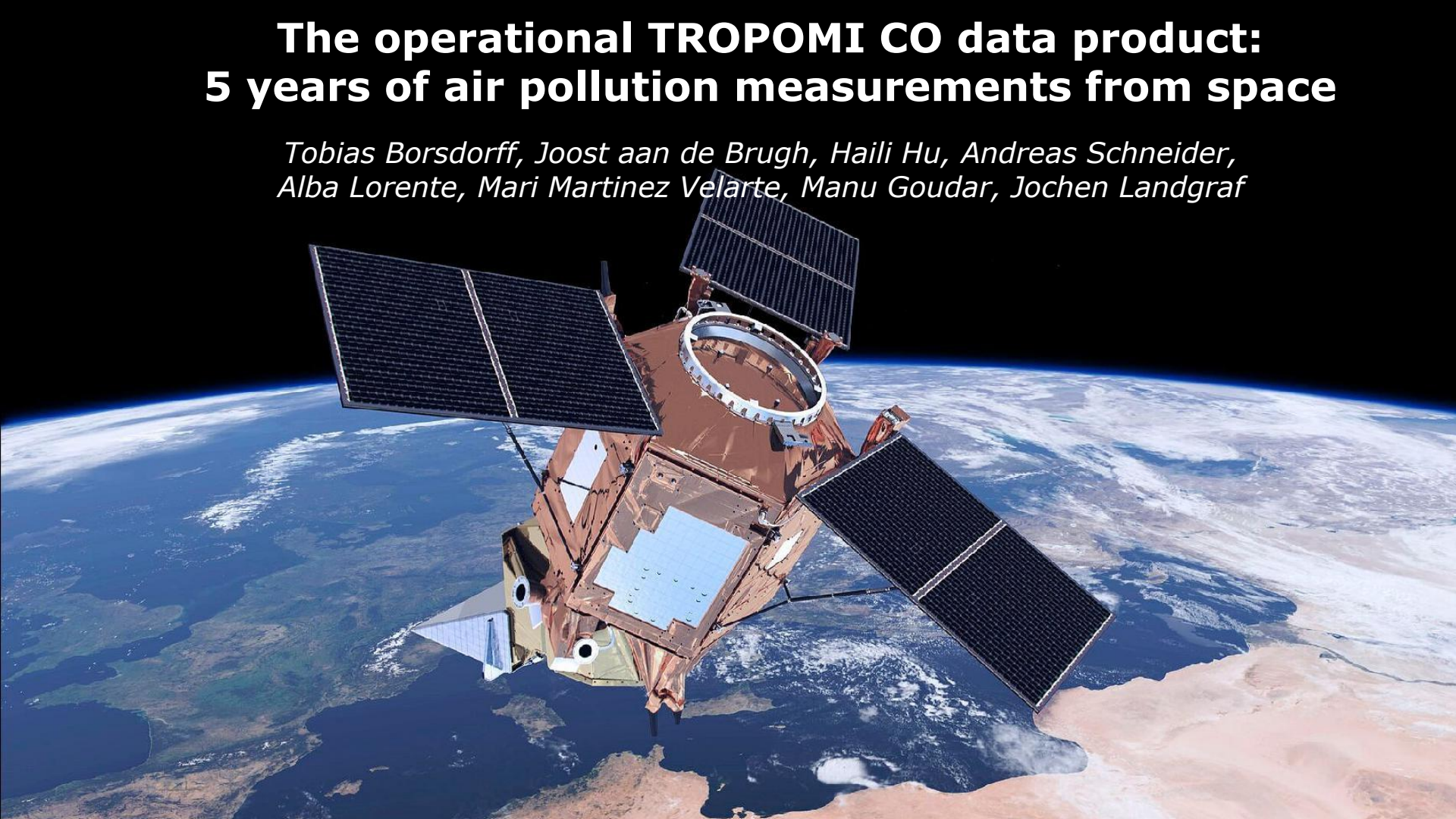
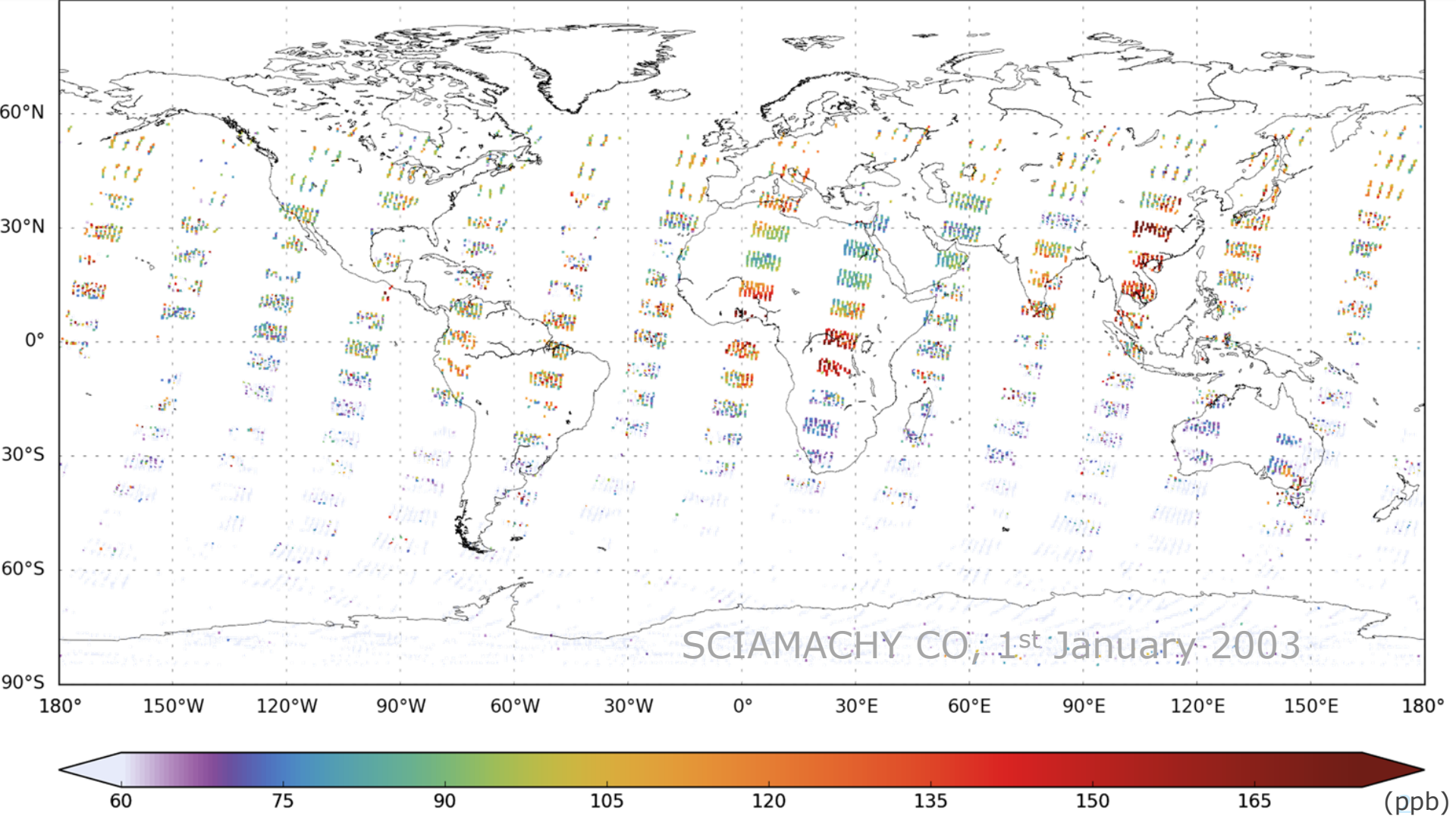
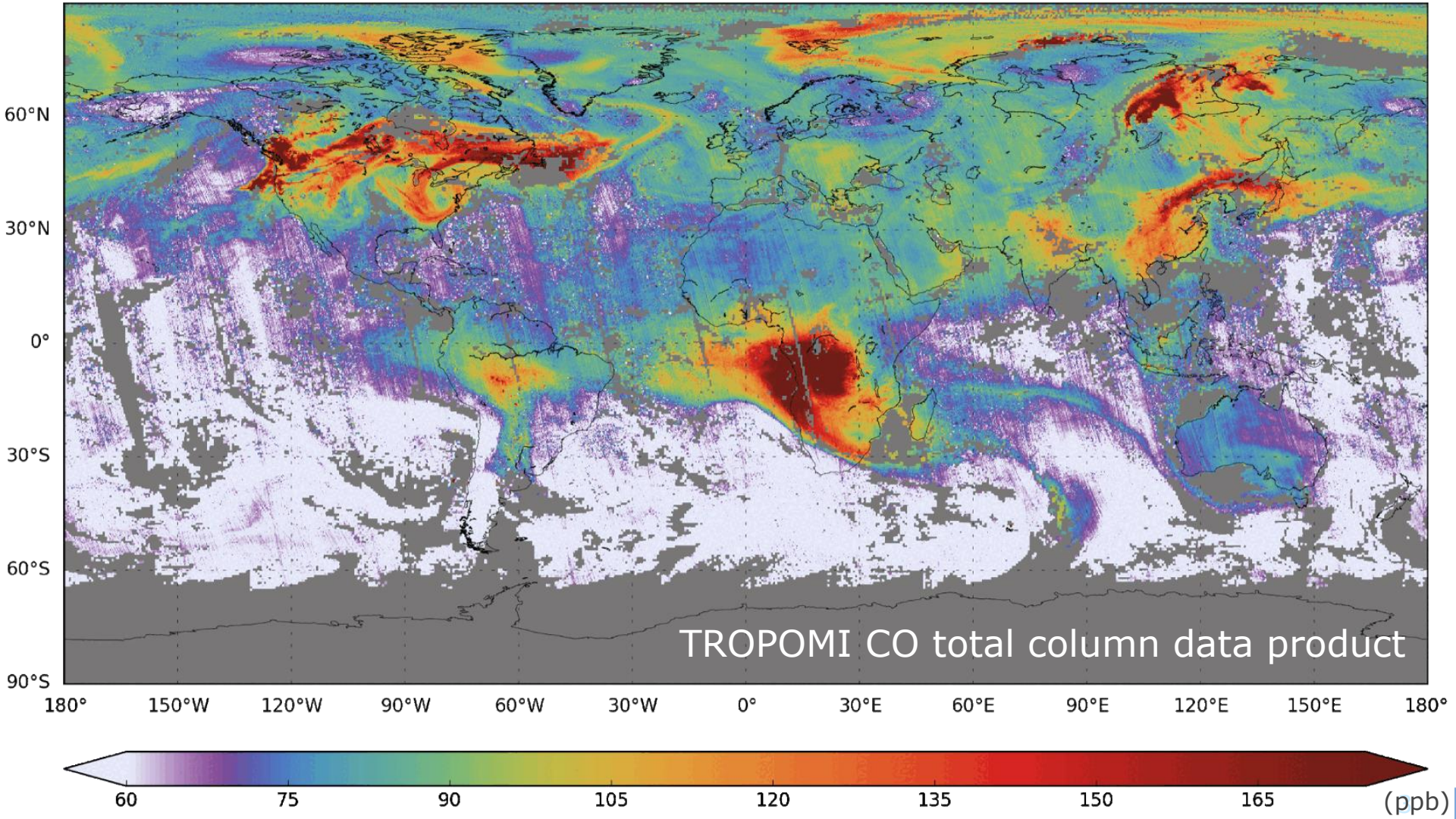
The operational TROPOMI CO data product: 5 years of air pollution measurements from space

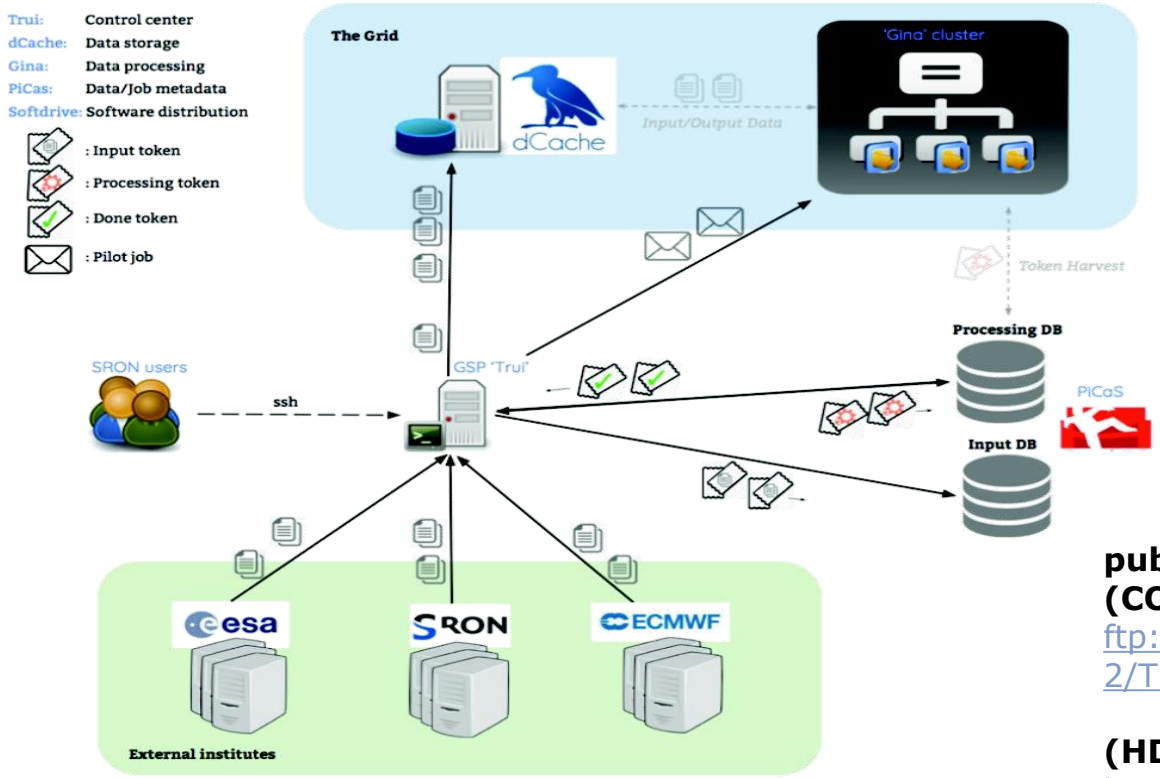
Tobias Borsdorff, Joost aan de Brugh, Haili Hu, Andreas Schneider, Alba Lorente, Mari Martinez Velarte, Manu Goudar, Jochen Landgraf




60°N
30°N
0°
30°S
60°S
90°S
180°
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°
SCIAMACHY CO, 1st January 2003
60
75
90
105
120
135
150
165
(ppb)


60°N
30°N
0°
30°S
60°S
90°S
180°
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°
TROPOMI CO total column data product
60
75
90
105
120
135
150
165
(ppb)

Processing TROPOMI data at SurfSara



400TB disk

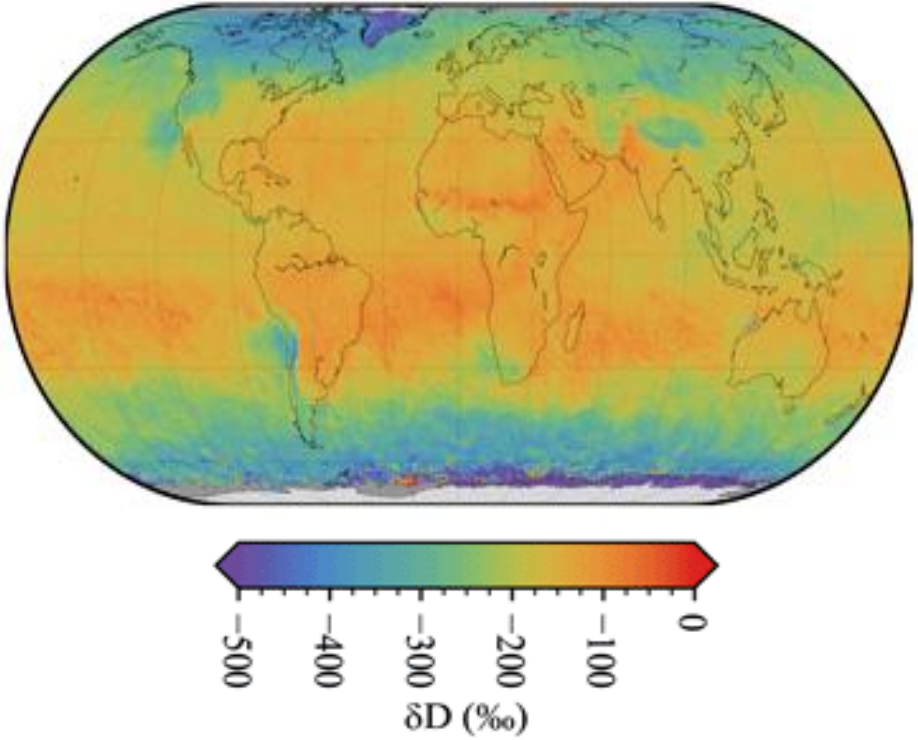
1PB tape +
200TB yearly

8M Grid CPU
core hours

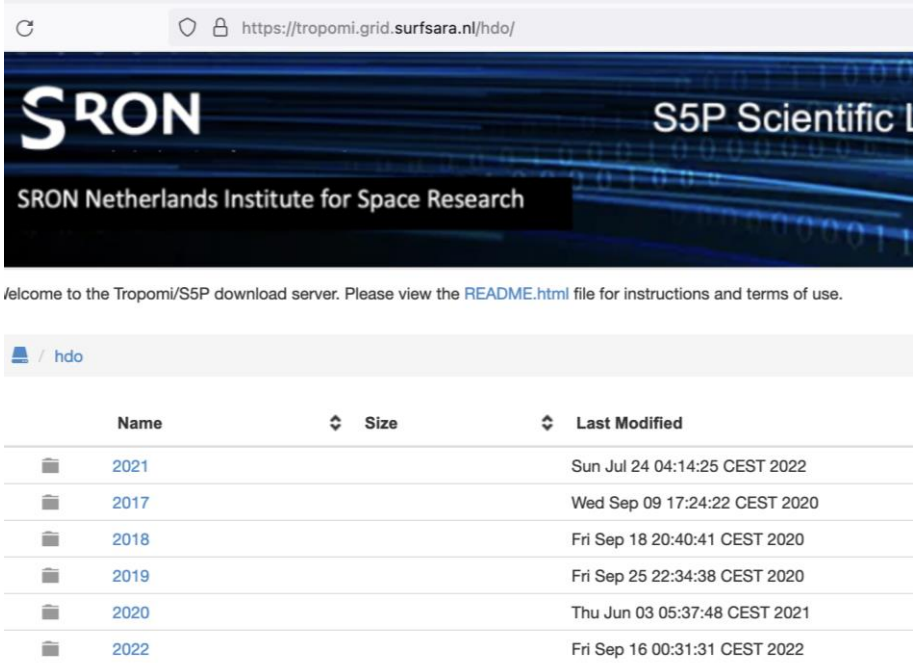
public available datasets
(CO, CH4):
ftp://ftp.sron.nl/open-access-data-2/TROPOMI/tropomi/

(HDO):
https://tropomi.grid.surfsara.nl/hdo/

Scientific TROPOMI HDO data (land and oceans)



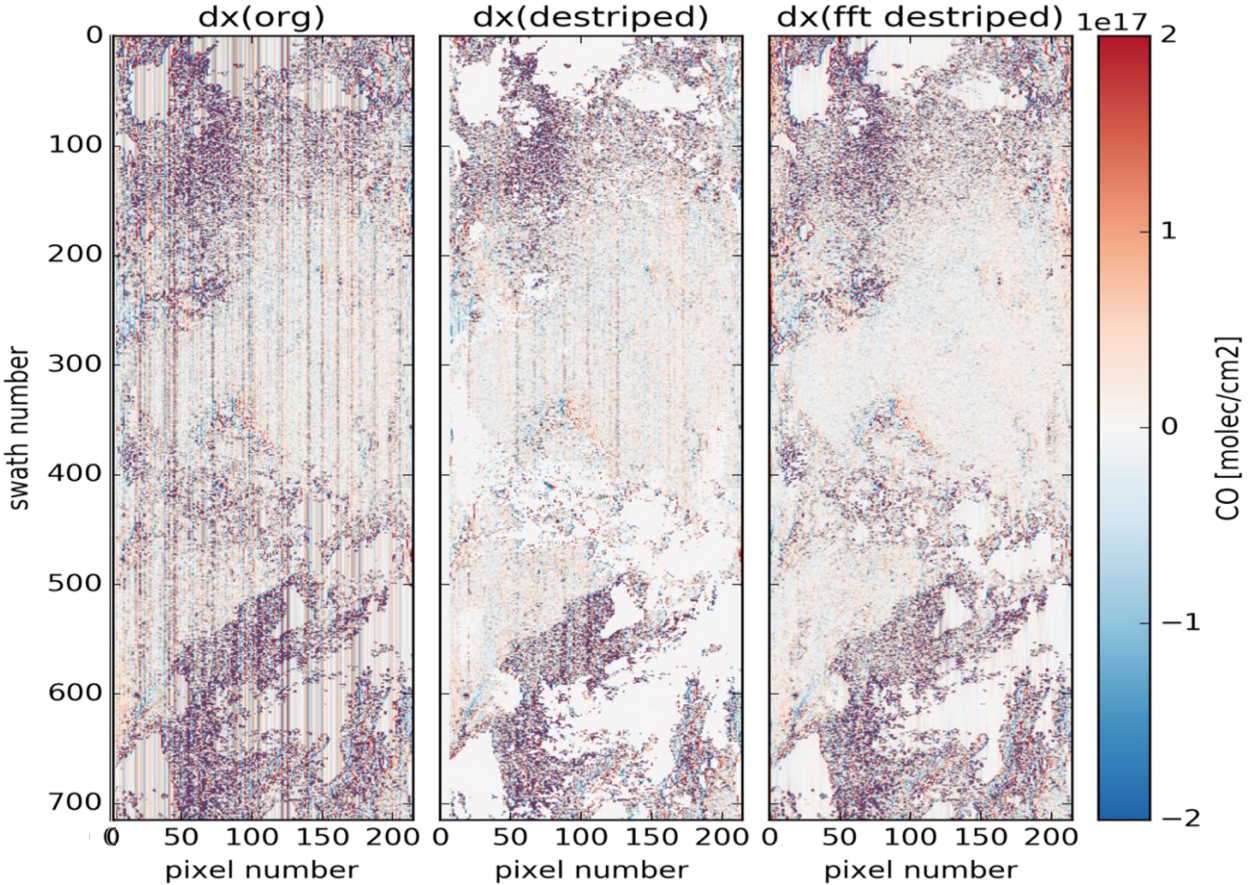
Schneider et al. (2022)



Download:

https://tropomi.grid.surfsara.nl/hdo/

Comparison fixed mask and fft destriping



Available since 2021-07-01

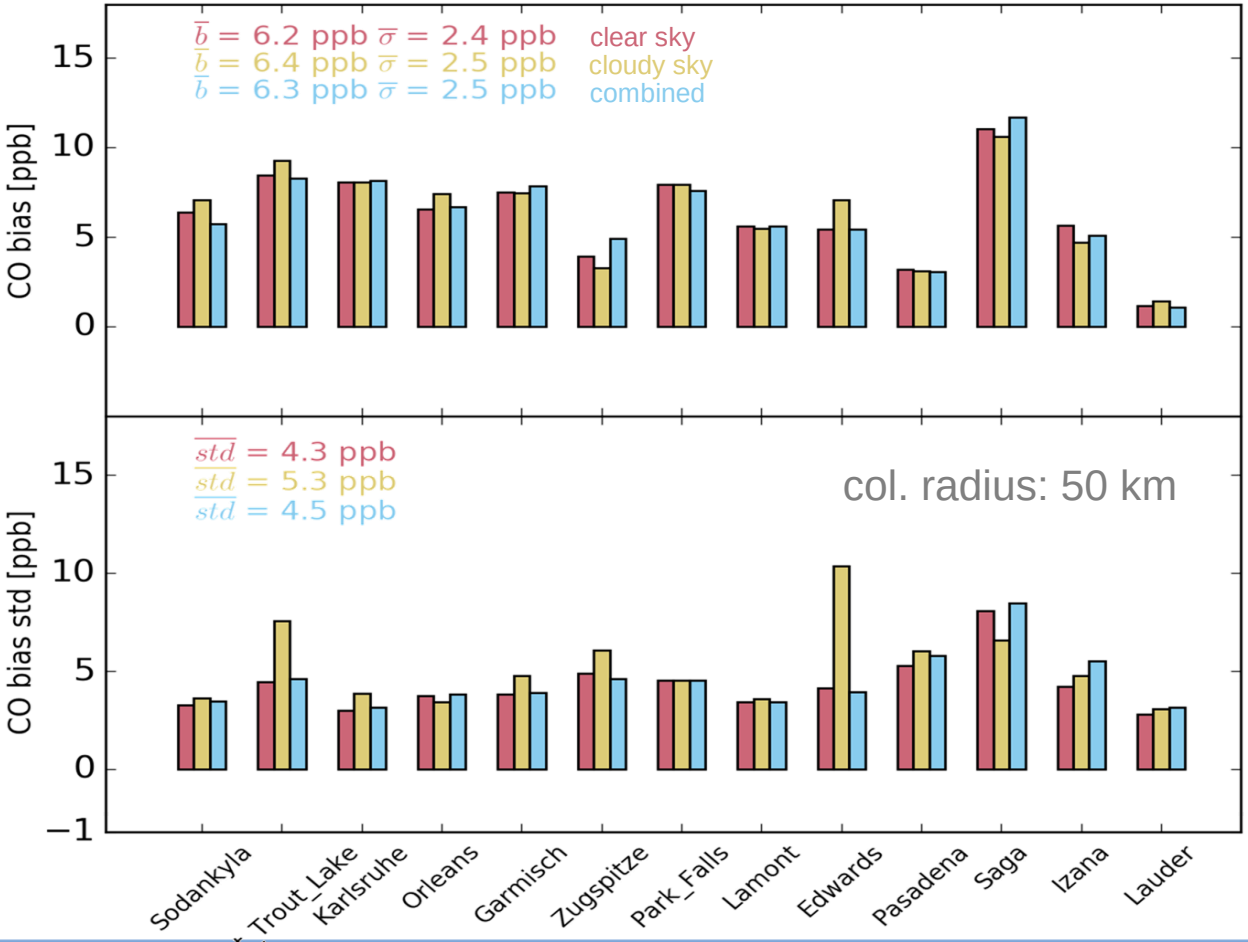
Validation of the TROPOMI CO data product

Using:
HITRAN 2008 +
H2O updates

Scheepmaker et al. (2012)

Clear sky:
6.2 ppb bias
with TCCON

Borsdorff et al. (2019)



Validation of the TROPOMI CO data product

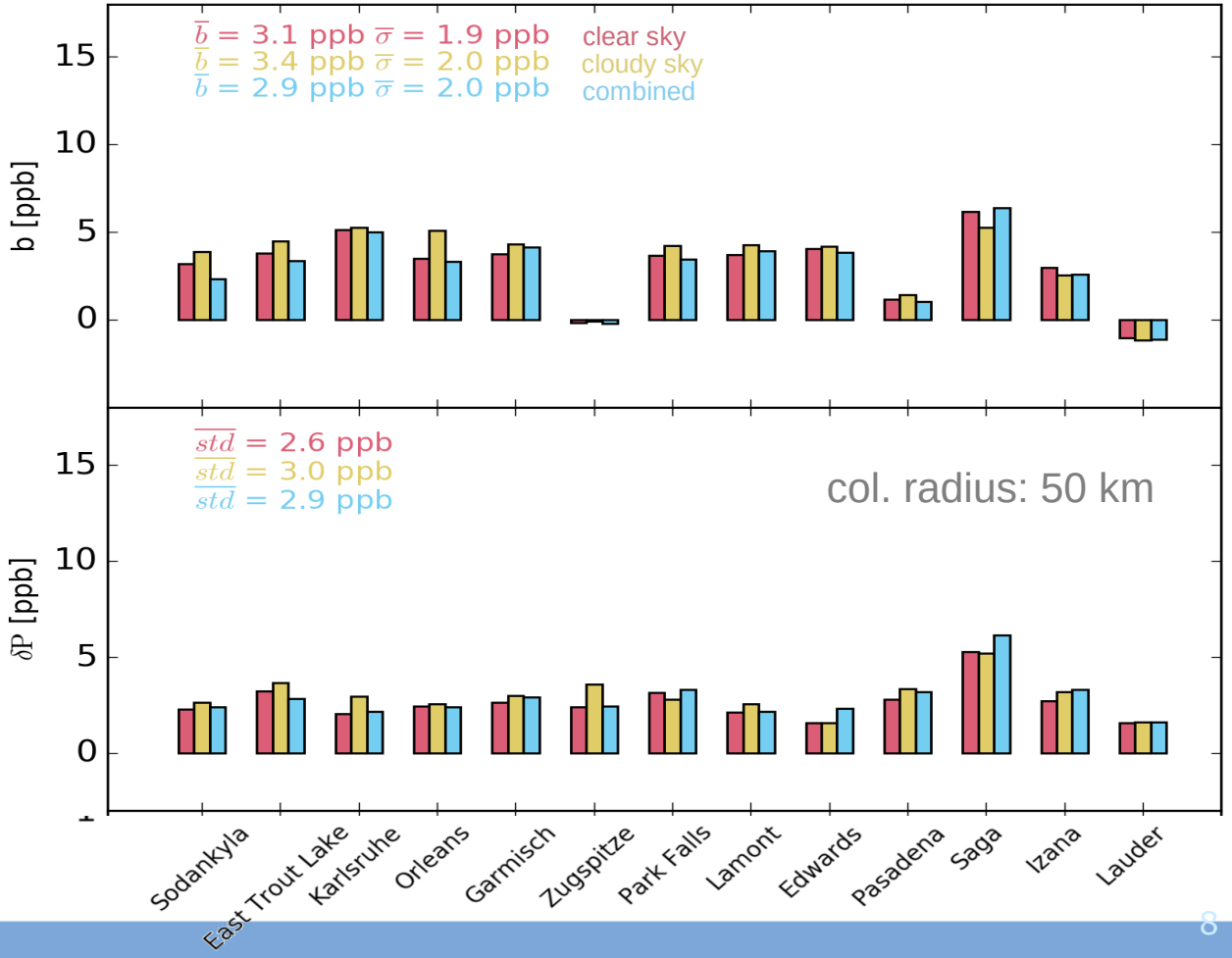
Using:
SEOM-IAS (DLR)

https://zenodo.org/record/1009126#.YJurduvRaL4

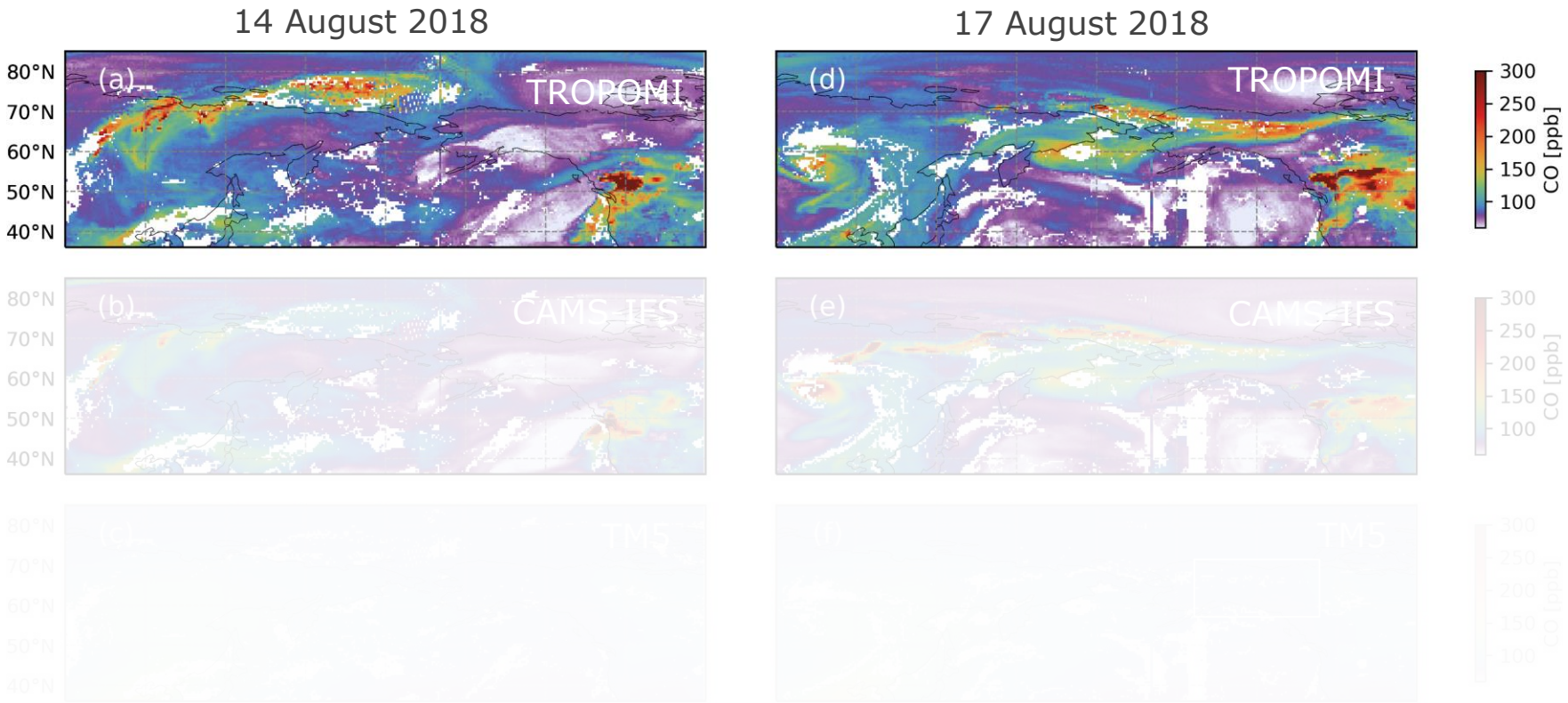
Clear sky:
3.4 ppb bias
with TCCON

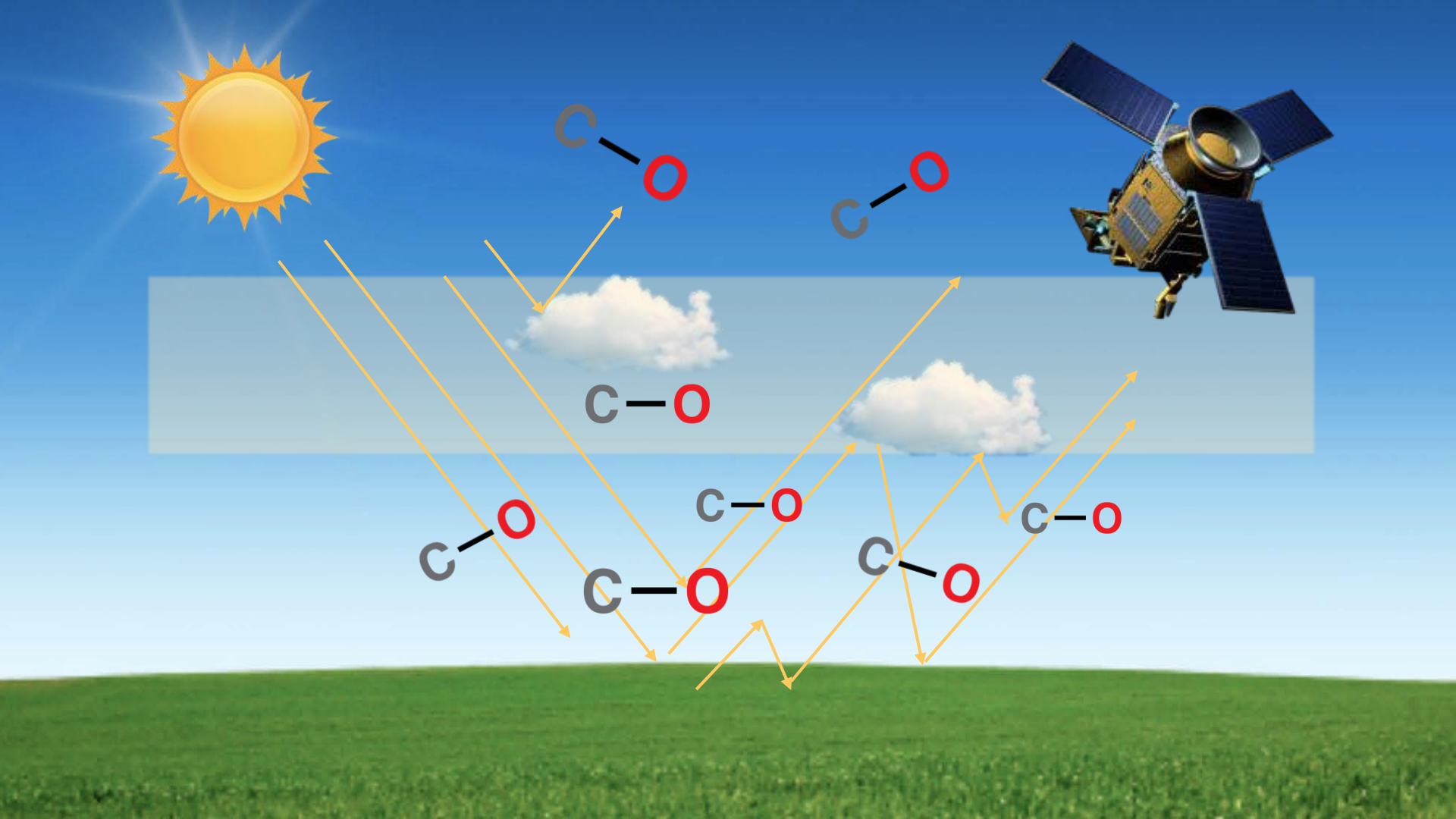
Borsdorff et al. (2019)

Available since 2021-07-01

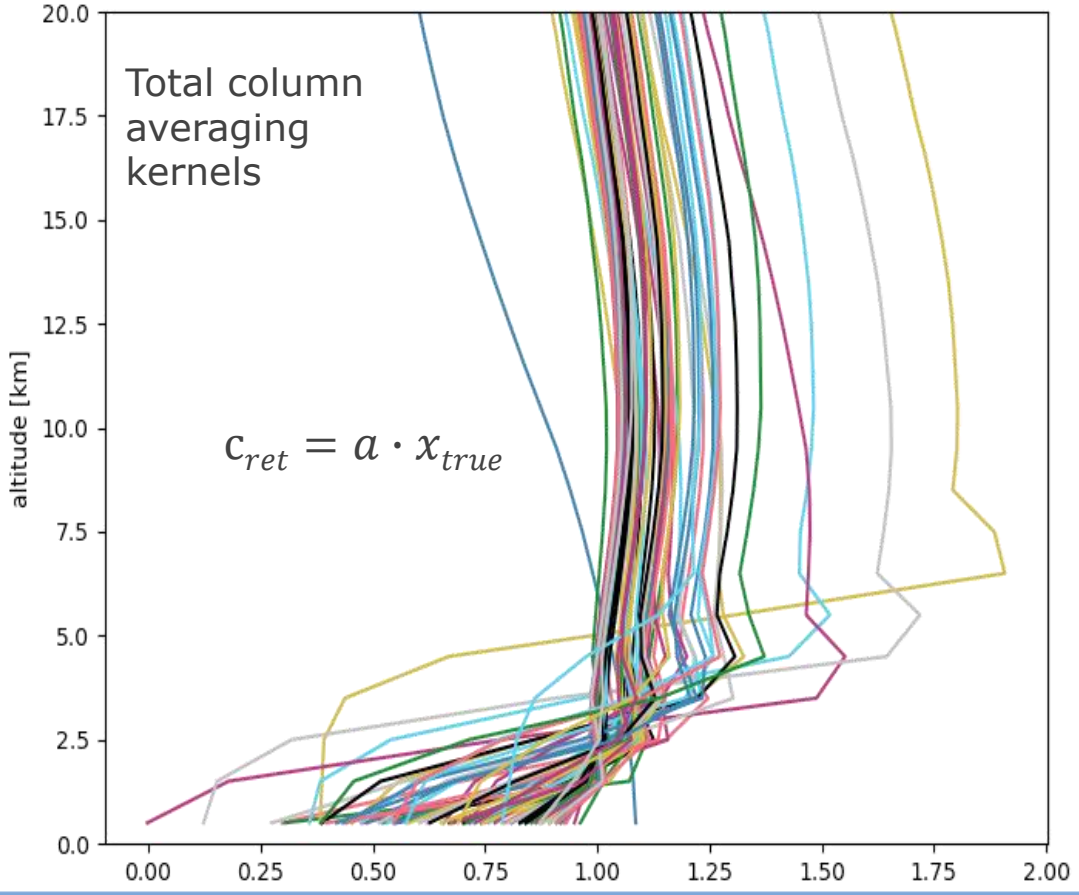


CO over Canada from Siberian wildfires

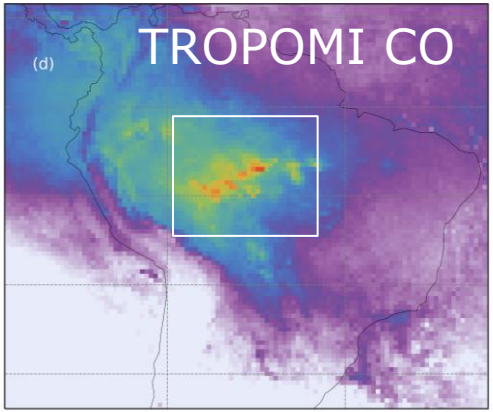


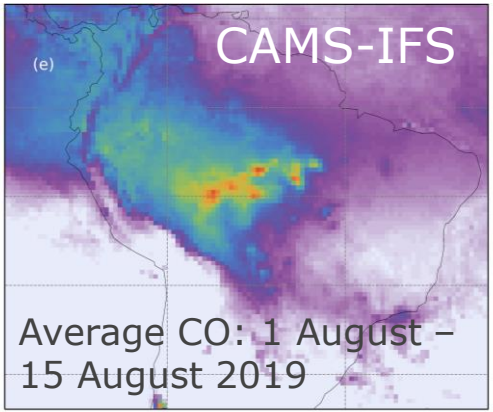

C O
C O
C O
C O
C O
C O
C O
C O

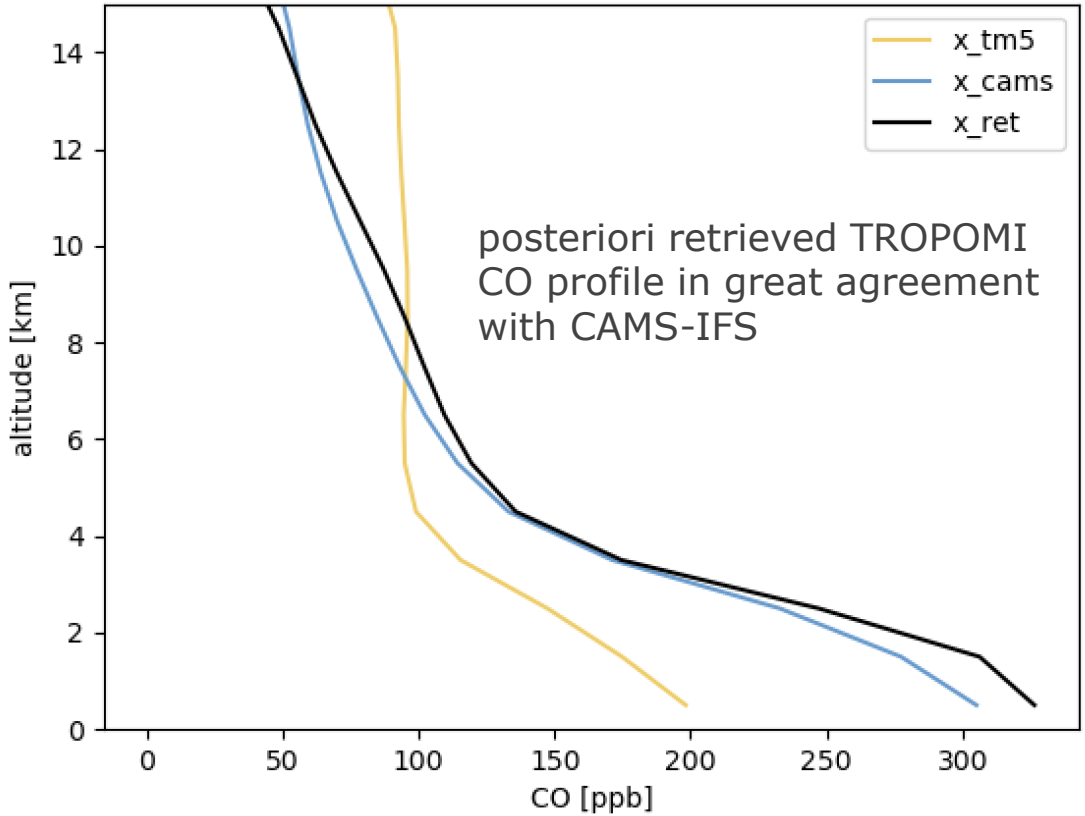
Combining TROPOMI total column retrievals with different sensitivities to estimate a mean vertical CO profile



TROPOMI posteriori profile retrieval over the Amazon during the burning season in comparison with CAMS-IFS

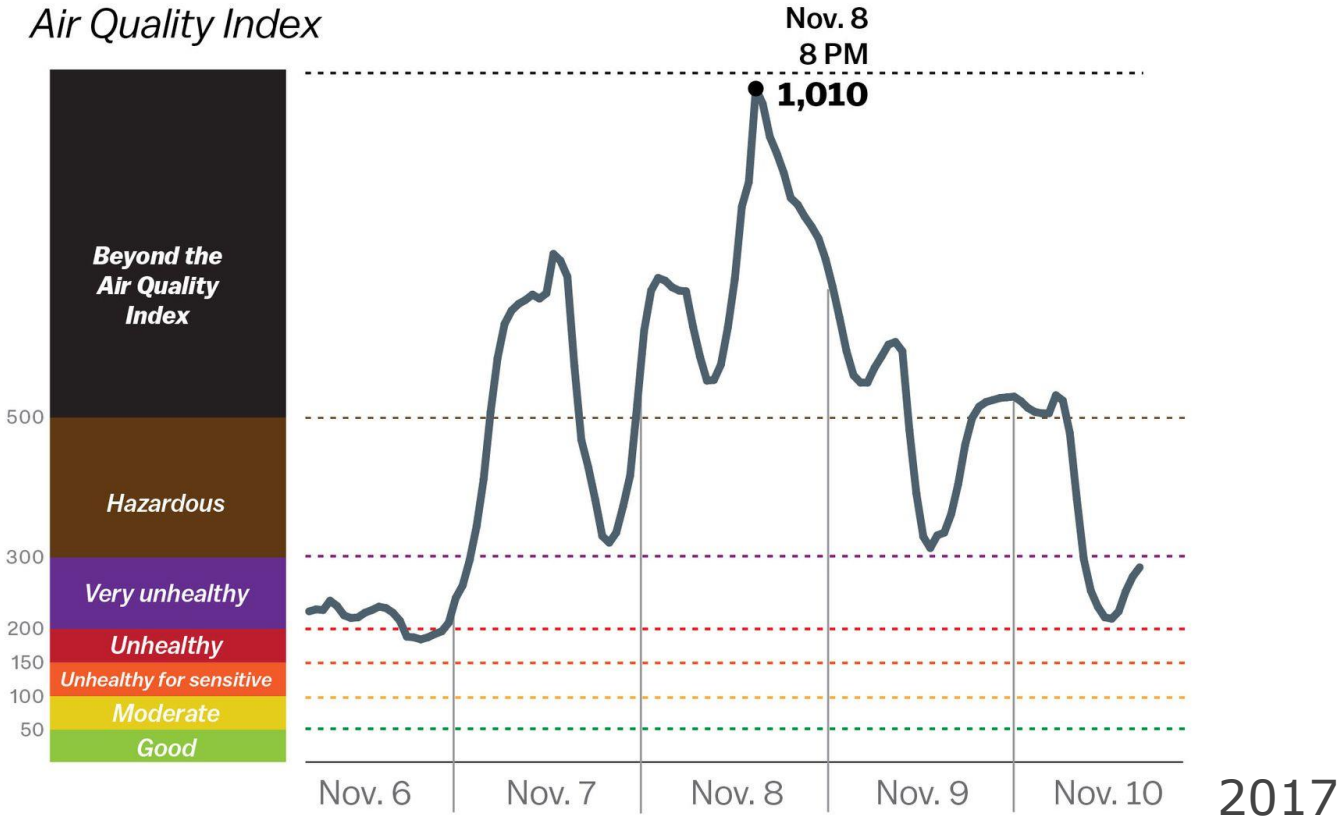






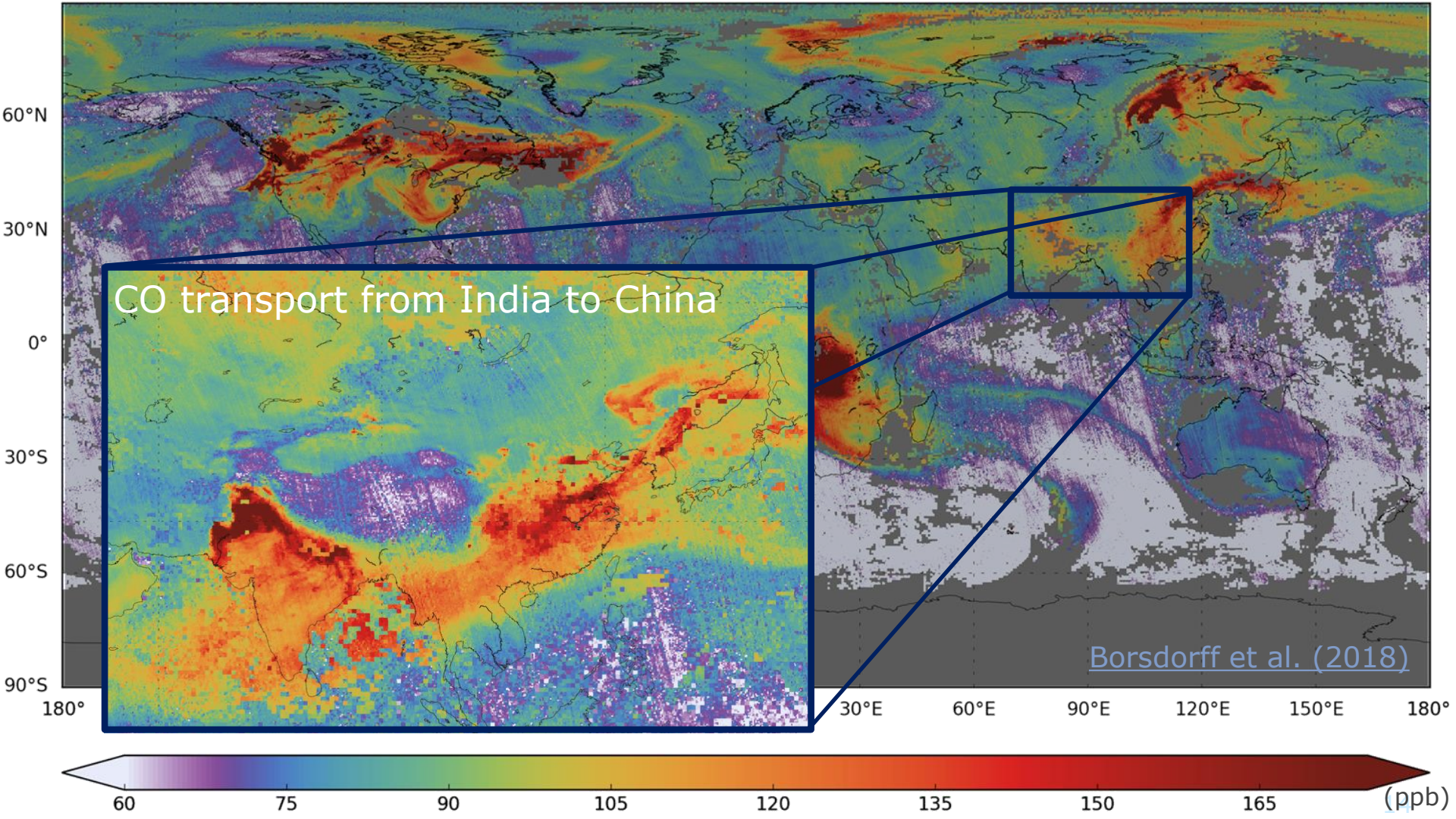
Borsdorff et al. (2022) to be published

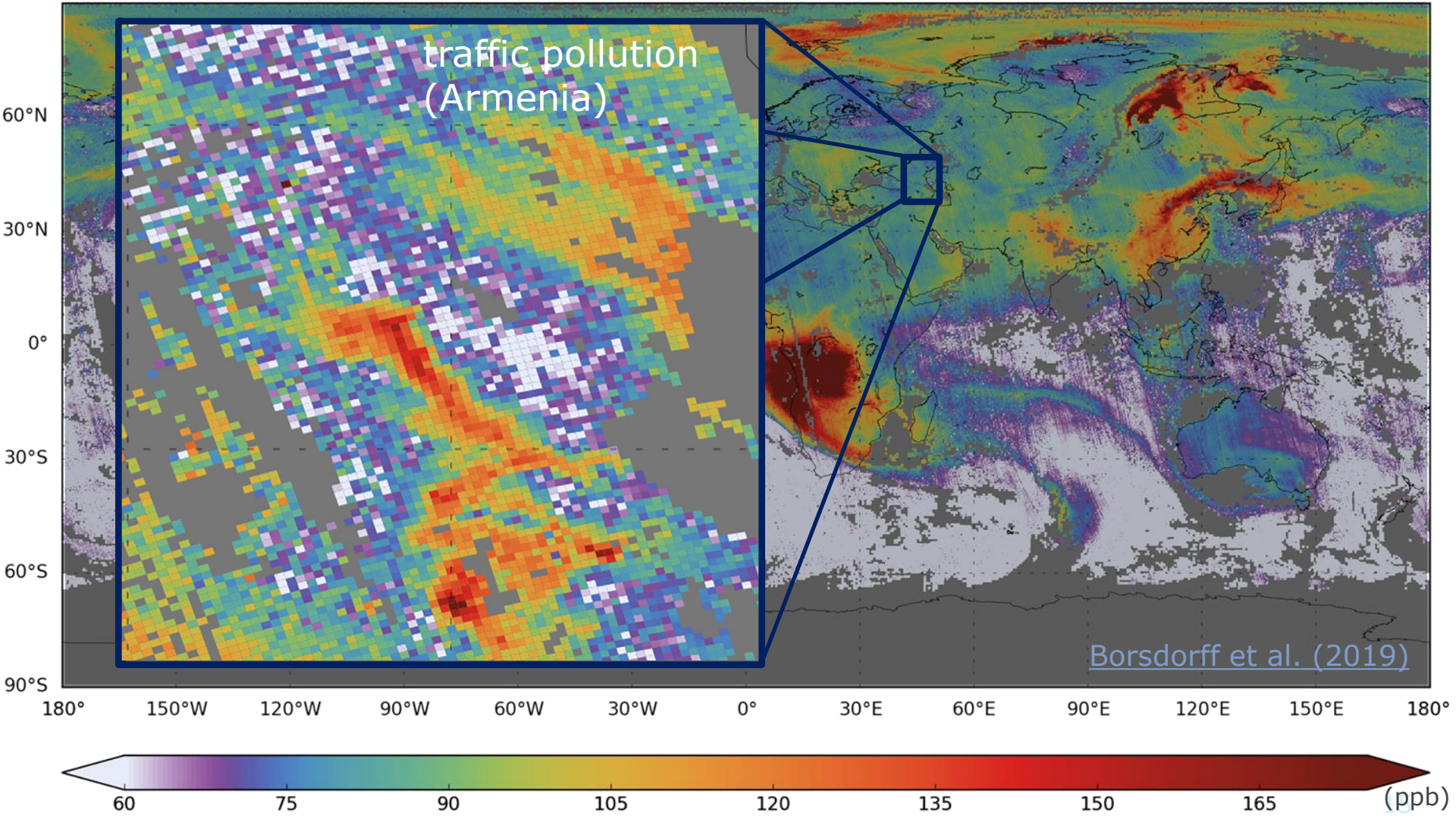
When Delhi became the most polluted city on Earth

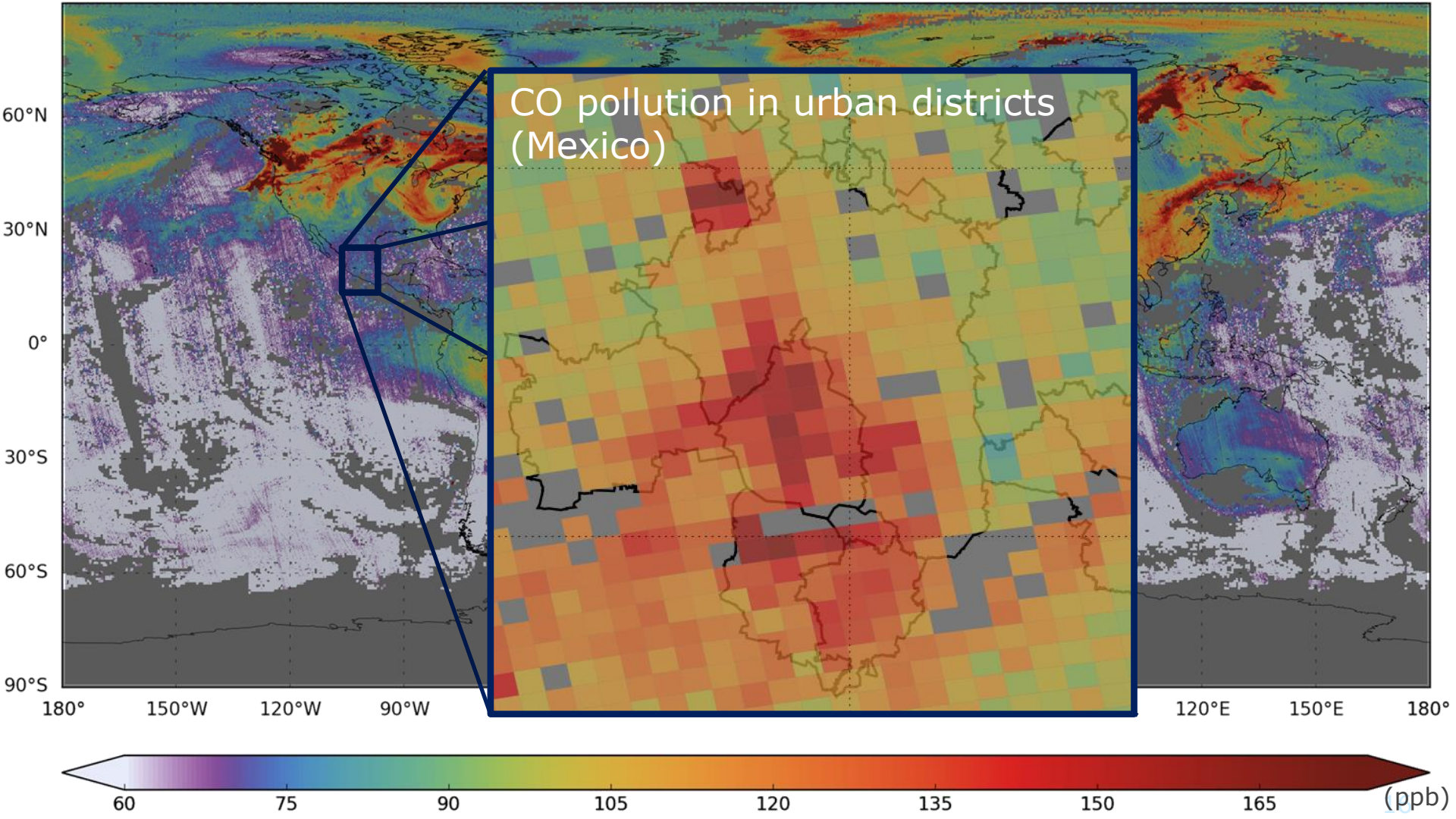


Source: US State Department

Vox

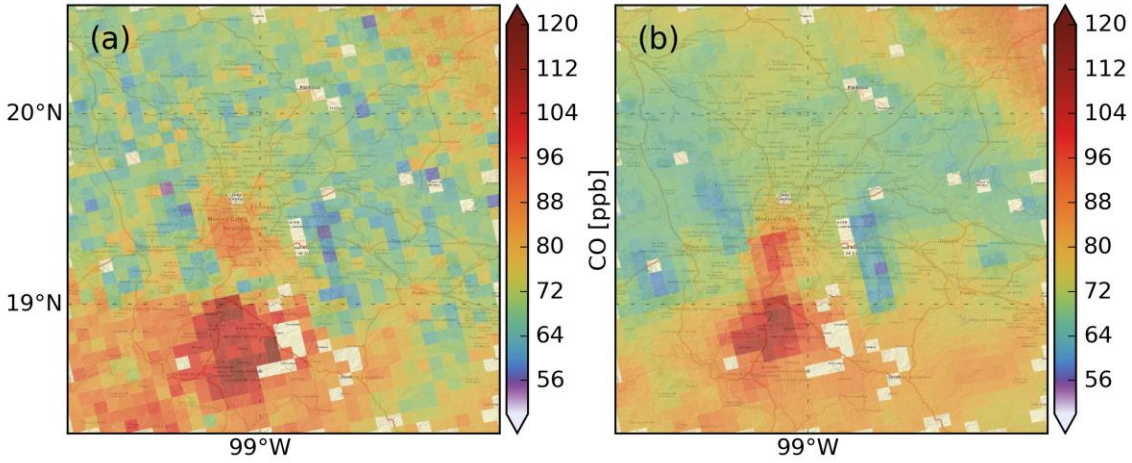

CO transport from India to China
Borsdorff et al. (2018)
60°N
30°N
0°
30°S
60°S
90°S
180°
30°E
60°E
90°E
120°E
150°E
180°
60
75
90
105
120
135
150
165
(ppb)

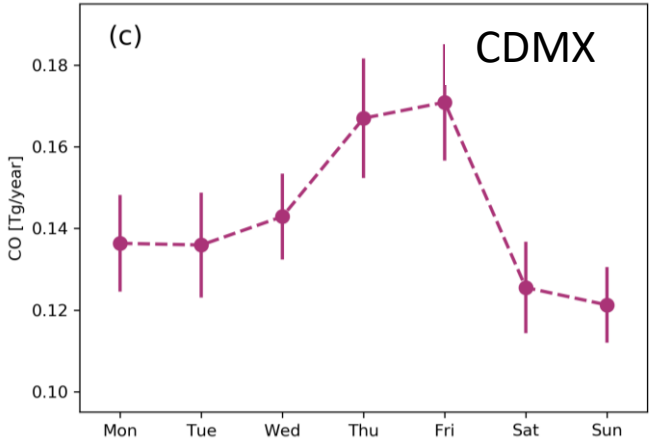

traffic pollution
(Armenia)
60°N
30°N
0°
30°S
60°S
90°S
180°
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°
Borsdorff et al. (2019)
60
75
90
105
120
135
150
165
(ppb)


CO pollution in urban districts (Mexico)
60°N
30°N
0°
30°S
60°S
90°S
180°
150°W
120°W
90°W
120°E
150°E
180°
60
75
90
105
120
135
150
165
(ppb)

Weekly cycle of CO emissions in Mexico City sensed by TROPOMI

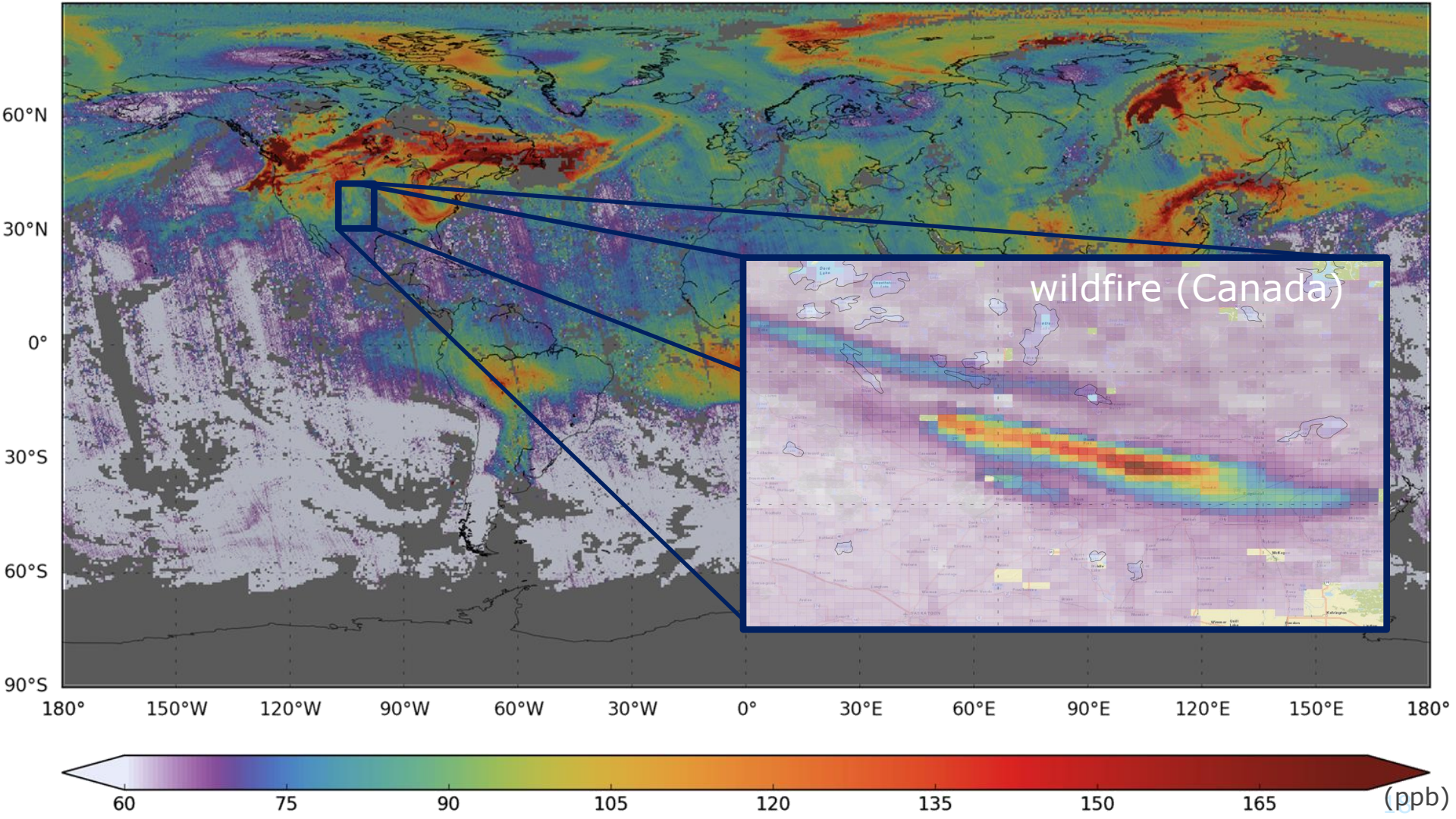
Analysis of 148 overpasses with regional model WRF

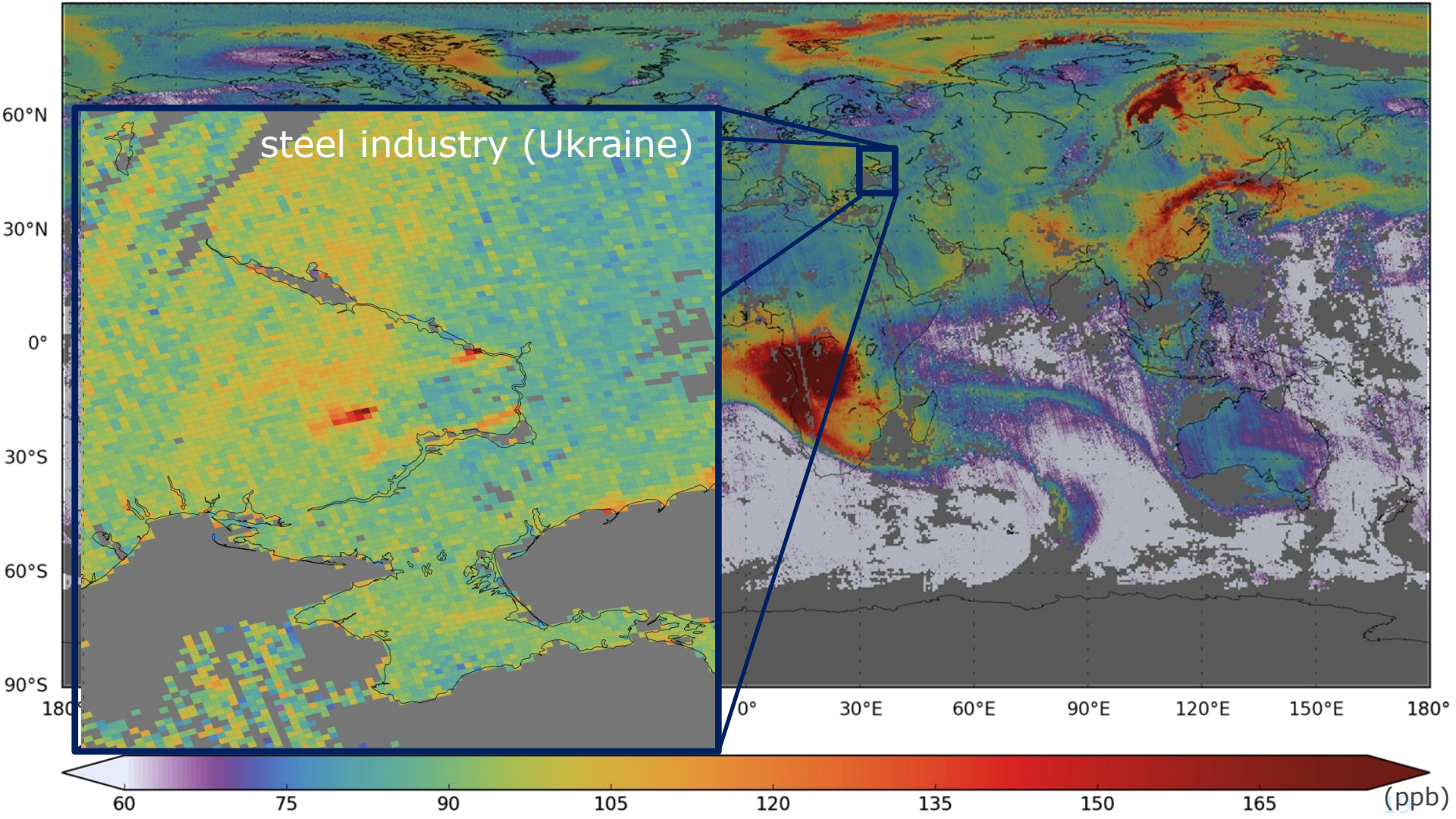




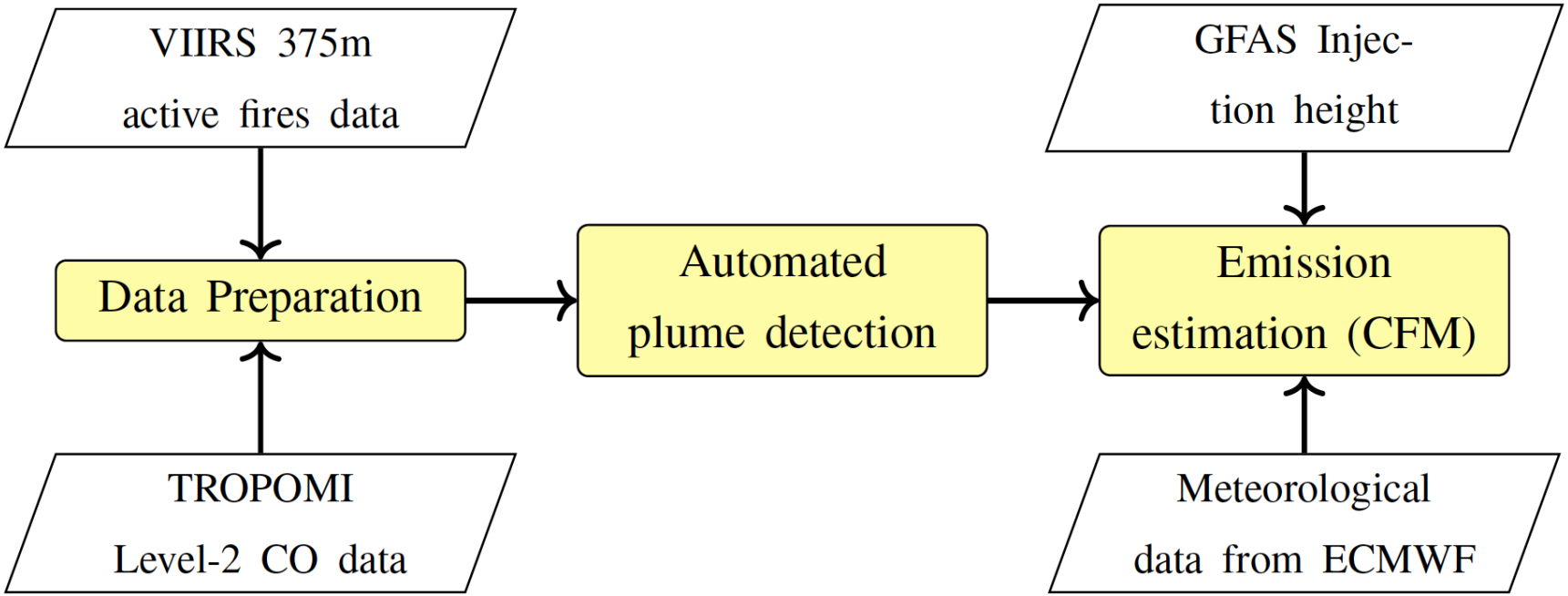
TROPOMI can be used to improve emission inventories for Mexico City on suburb level.

Borsdorff et al. (2020)


wildfire (Canada)
60°N
30°N
0°
30°S
60°S
90°S
180°
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°
60
75
90
105
120
135
150
165
(ppb)

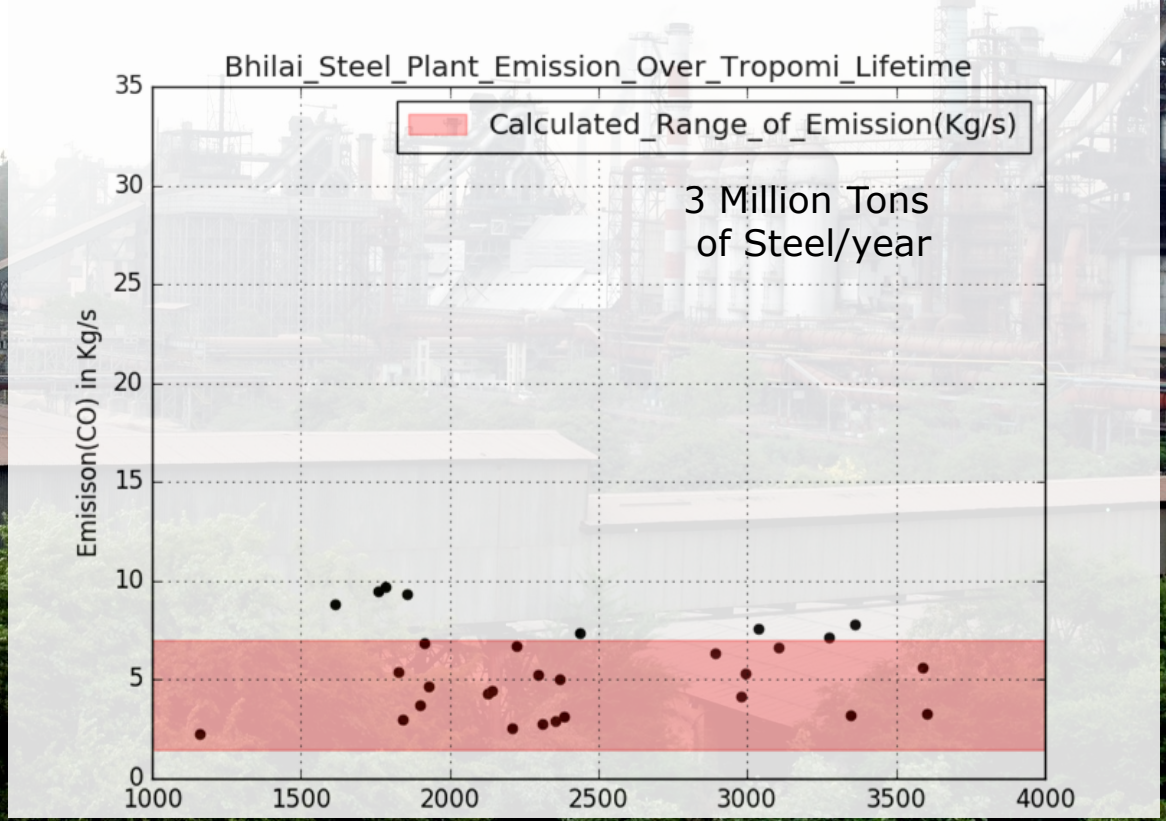

steel industry (Ukraine)
60°N
30°N
0°
30°S
60°S
90°S
180°
0°
30°E
60°E
90°E
120°E
150°E
180°
60
75
90
105
120
135
150
165
(ppb)

Automated Framework for automated plume detection and emission estimation at SurfSara



Goudar et al. (2022) to be published

Emission From Steel Plants, Bhilai India



ECOFYS Netherlands (September 2000)

Conclusions

- Reprocessed TROPOMI CO product (done, available end of the year). Homogeneous dataset (qa values, bias w. TCCON, priori profiles, AK unitless)

- TROPOMI CO will be assimilated by CAMS-IFS (Q2/2023). This will constrain the columns but also the vertical CO field.

- Automated Database of CO pollution events (fires, industries) with emission estimates (work in progress)