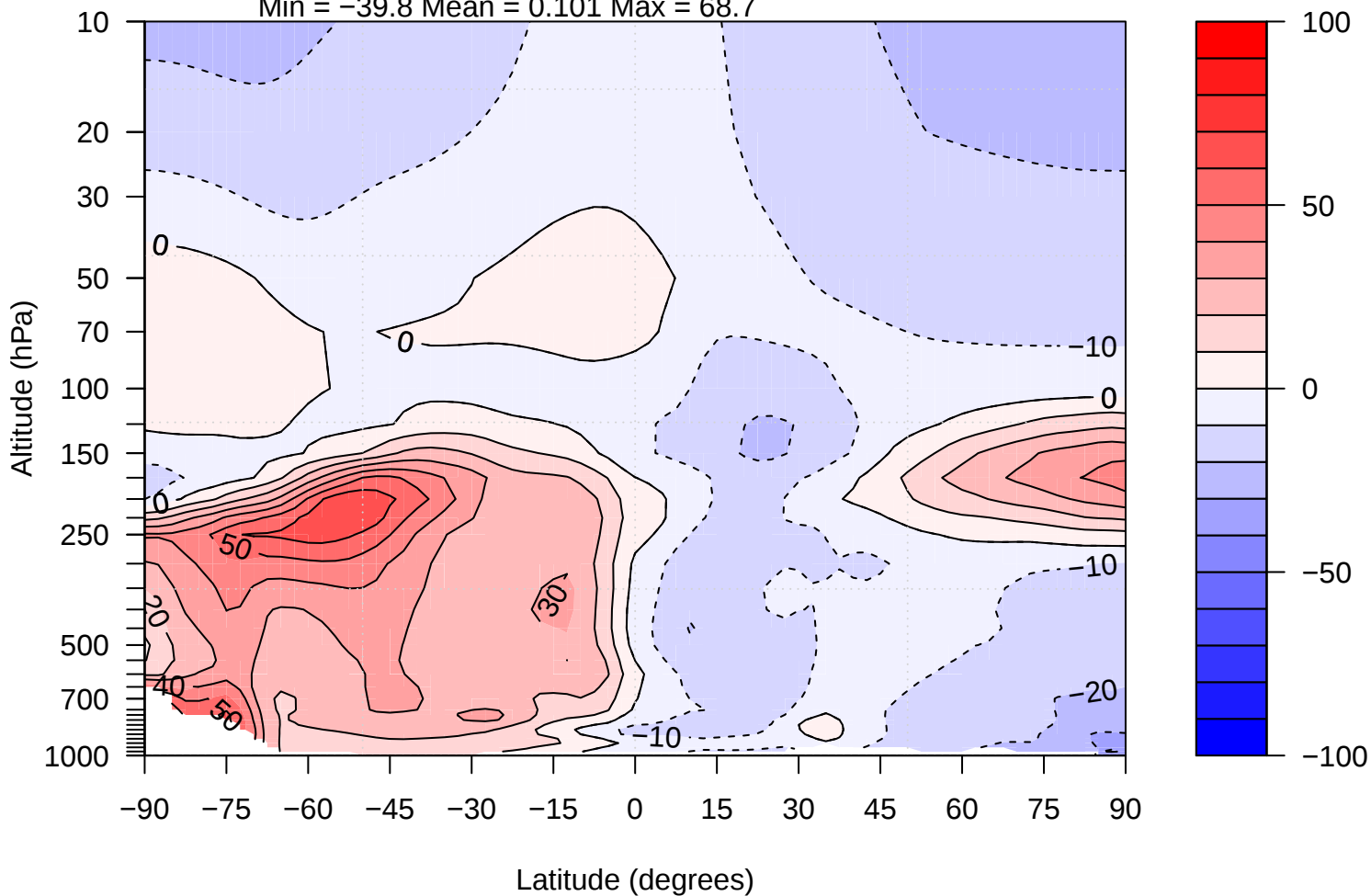


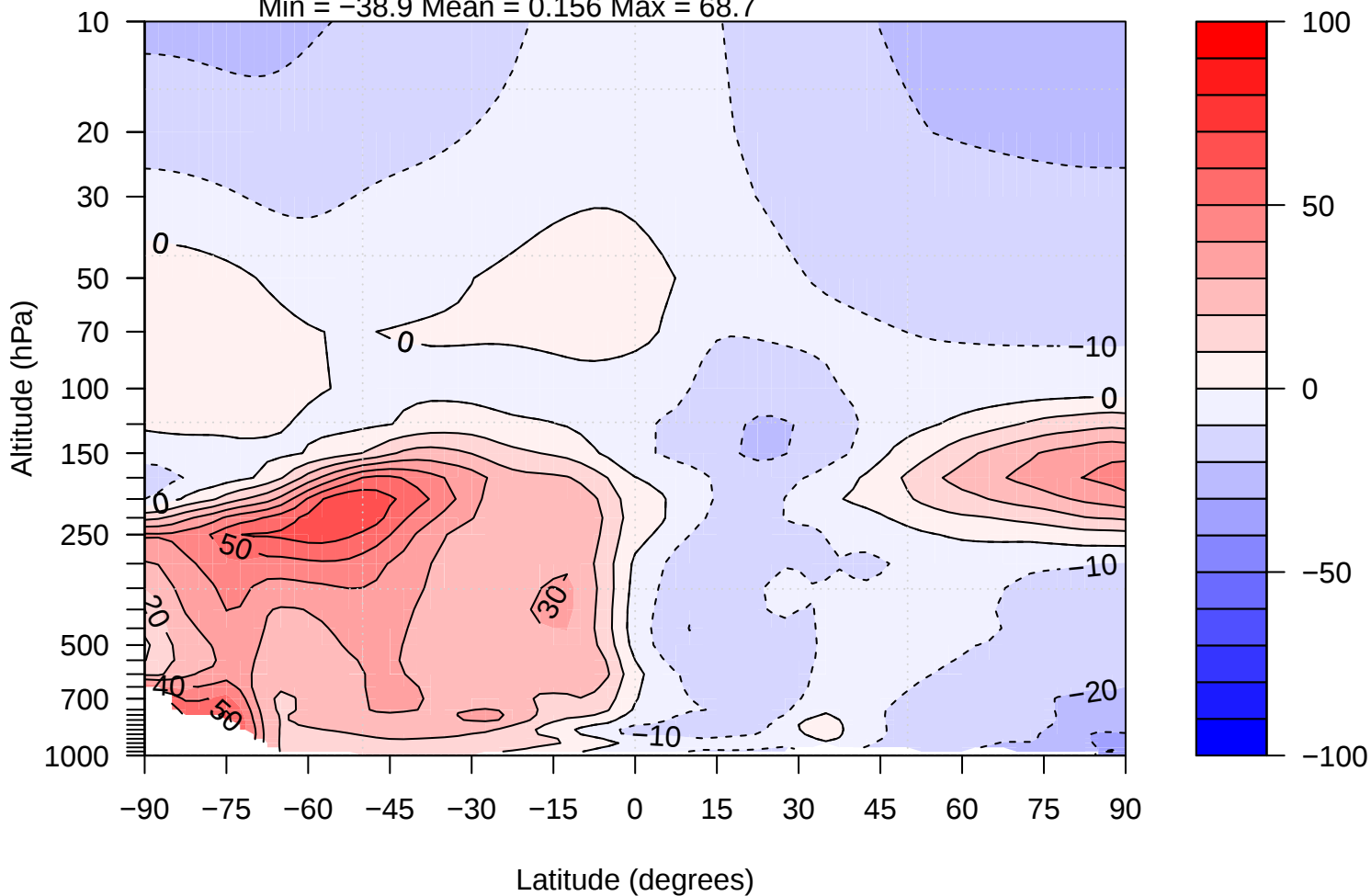
br633 – ERA Q bias

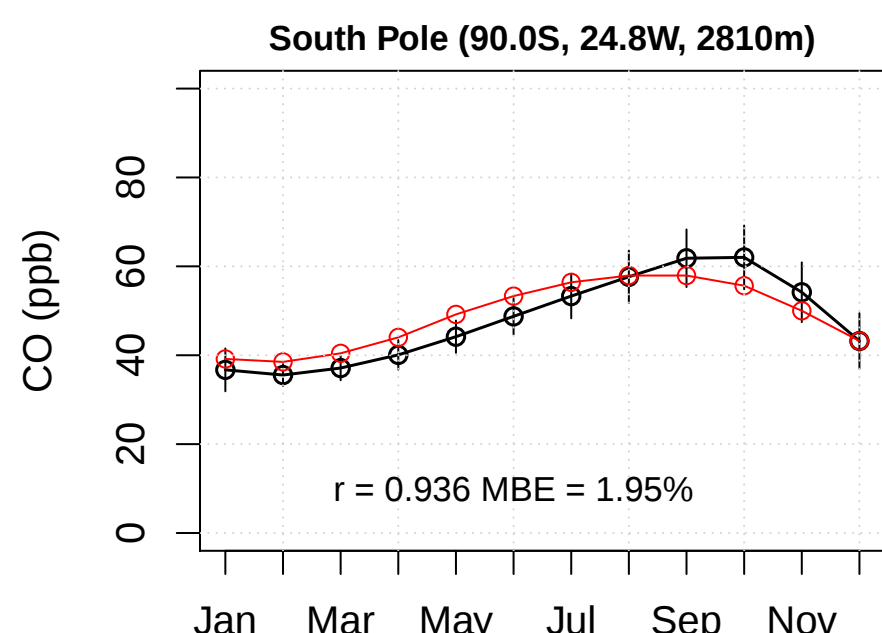
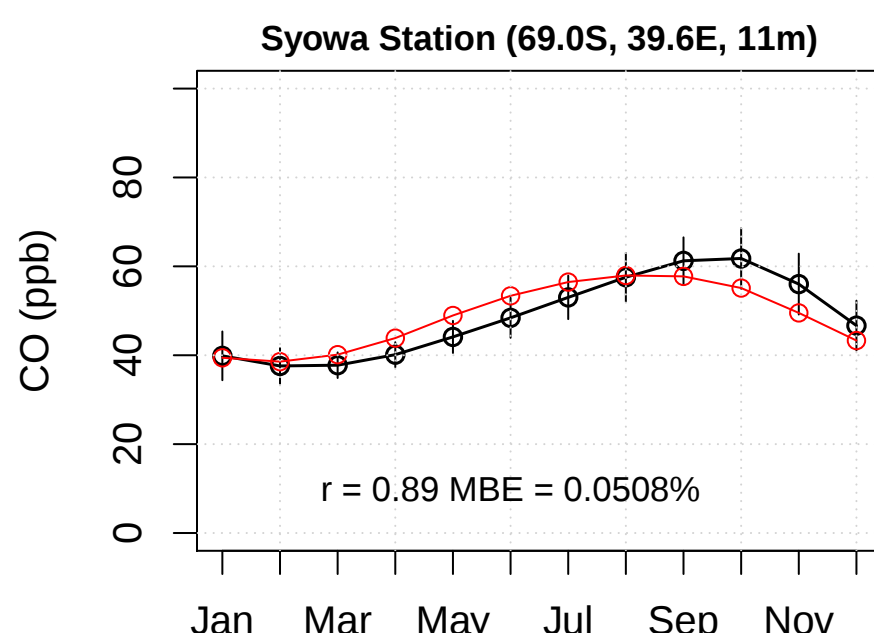
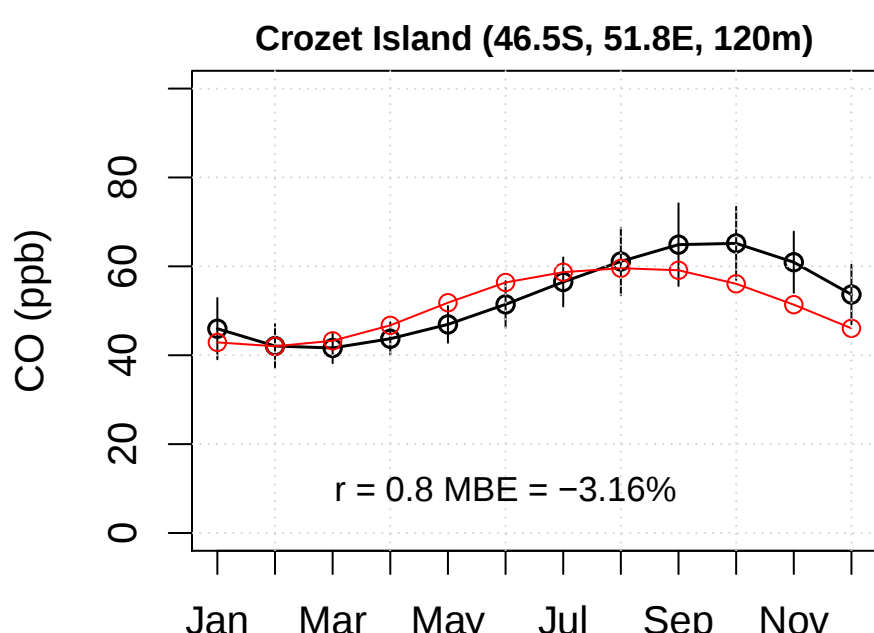
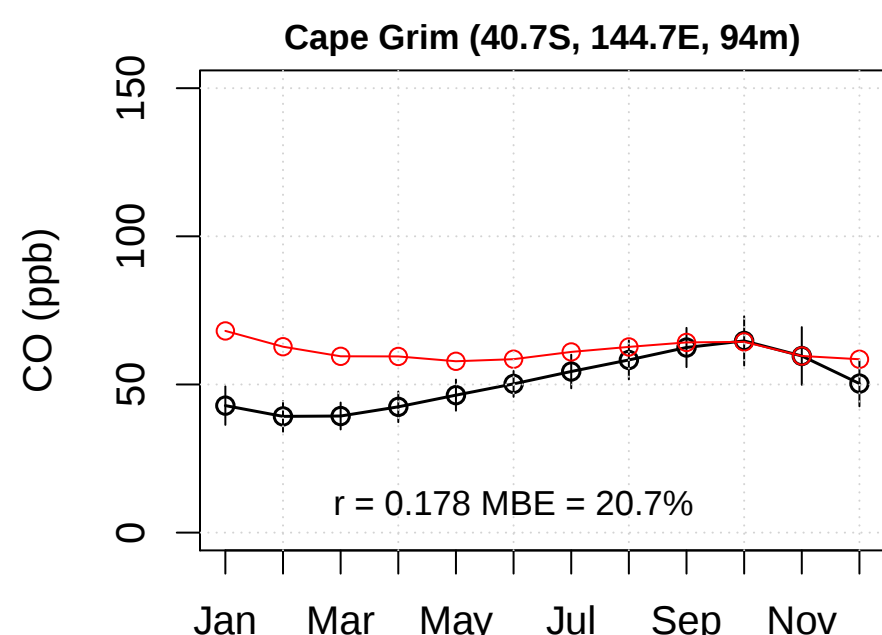
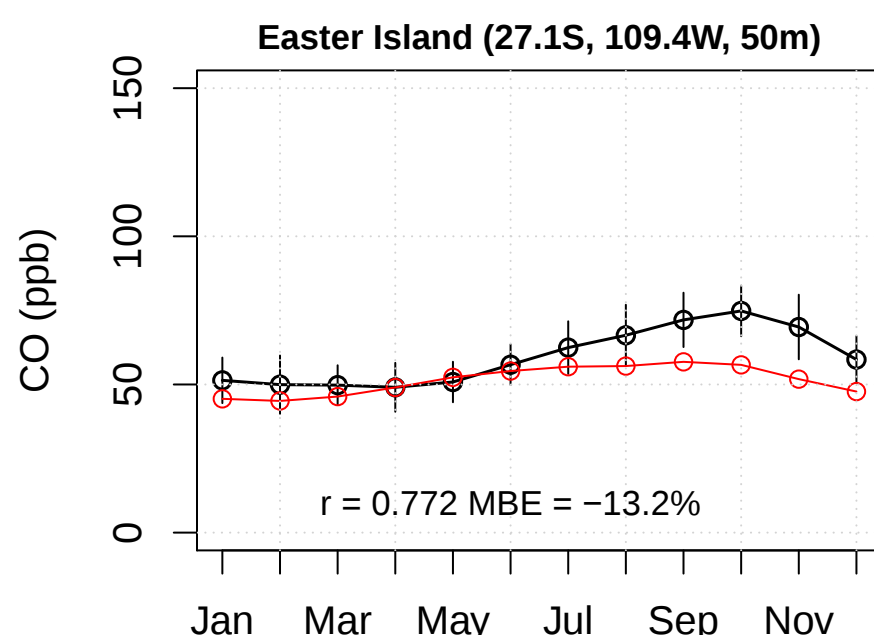
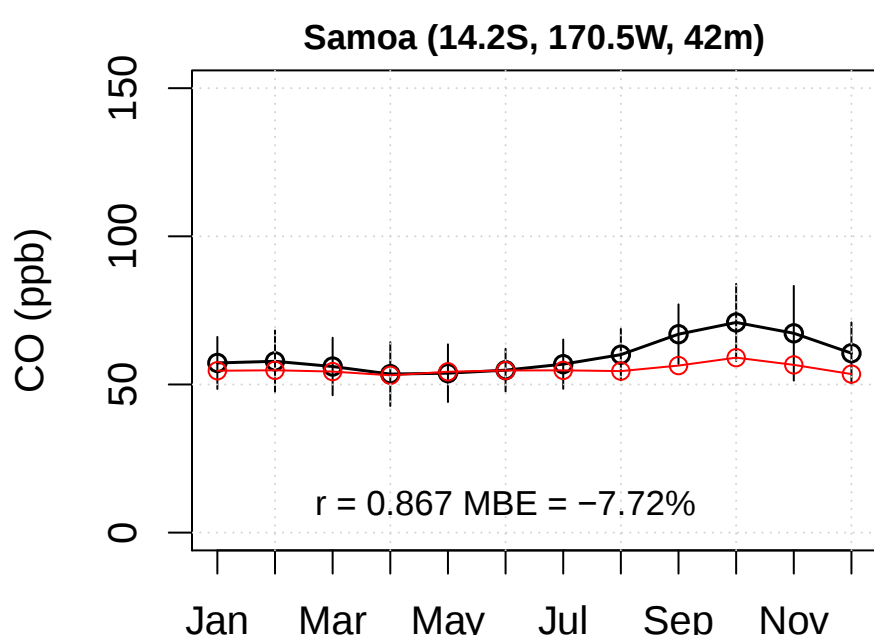
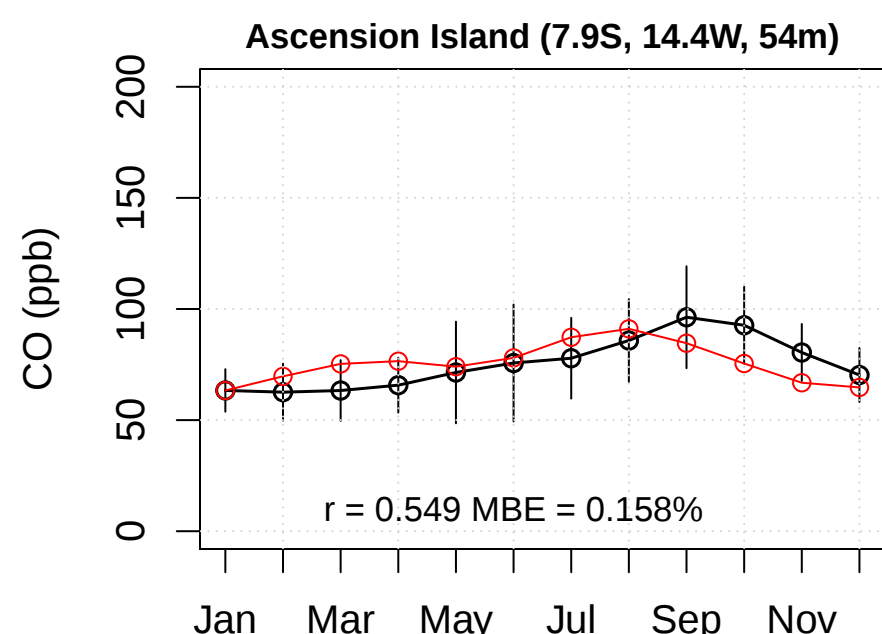
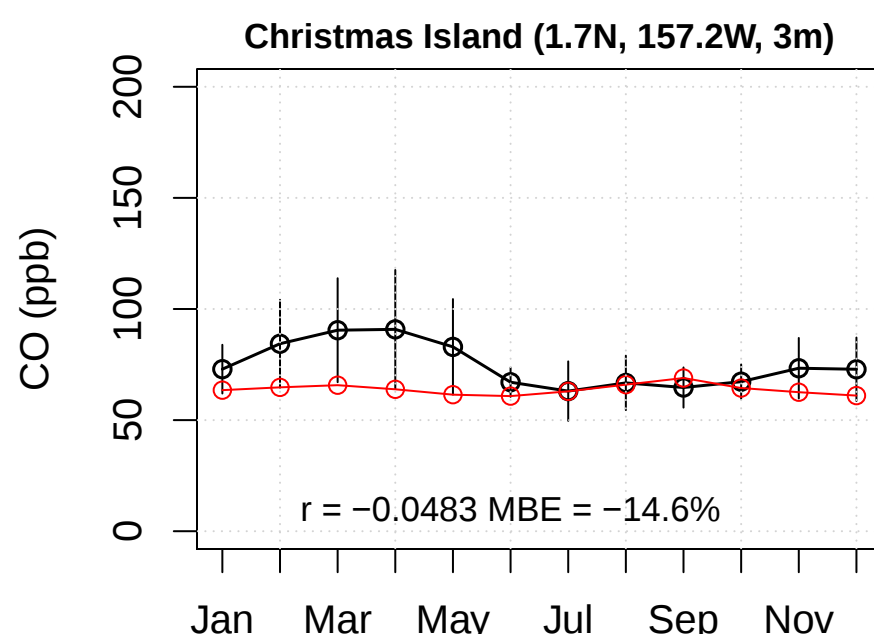
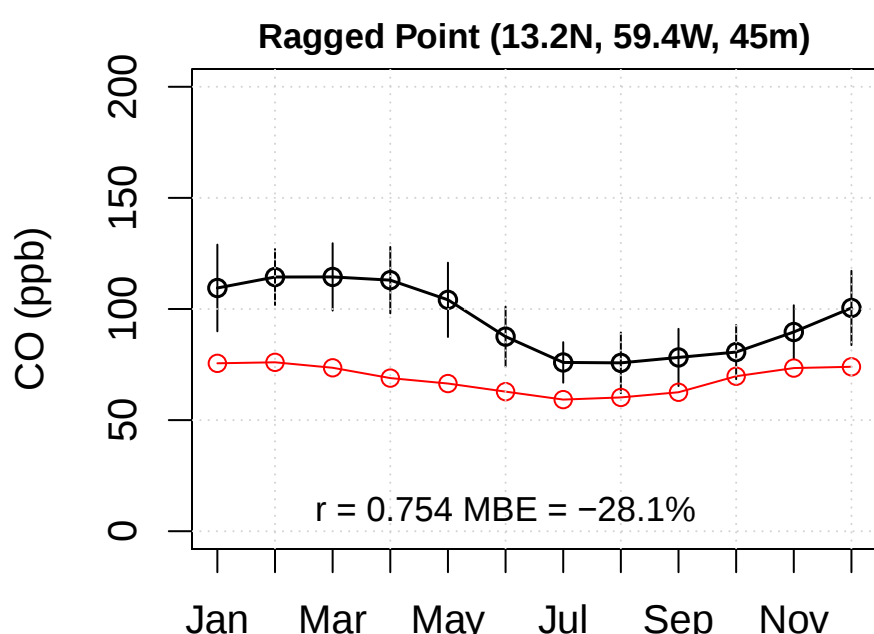
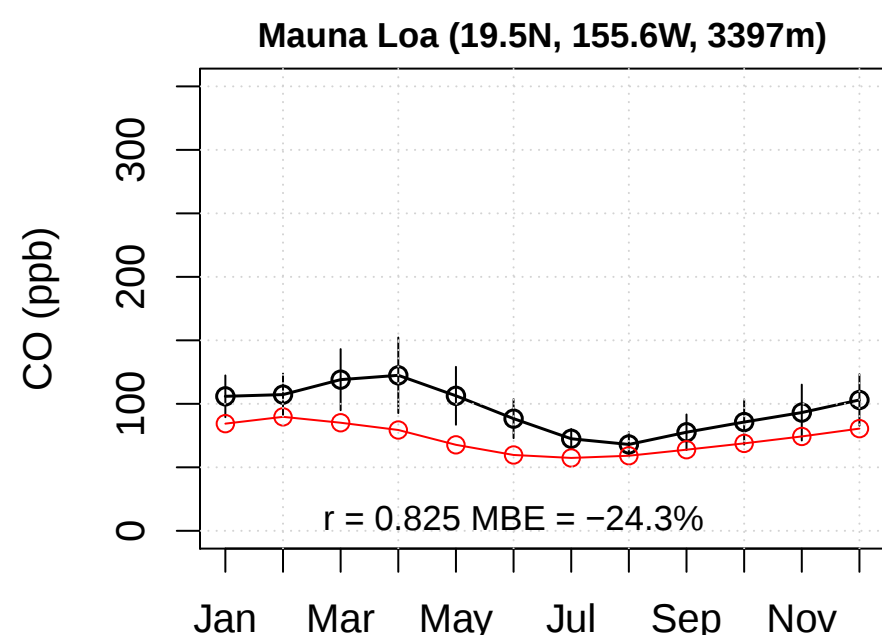
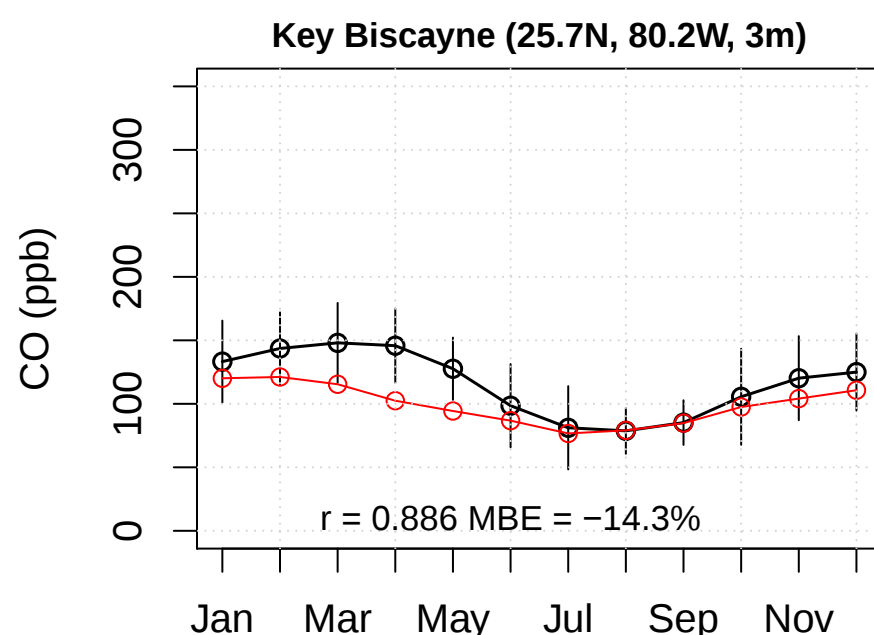
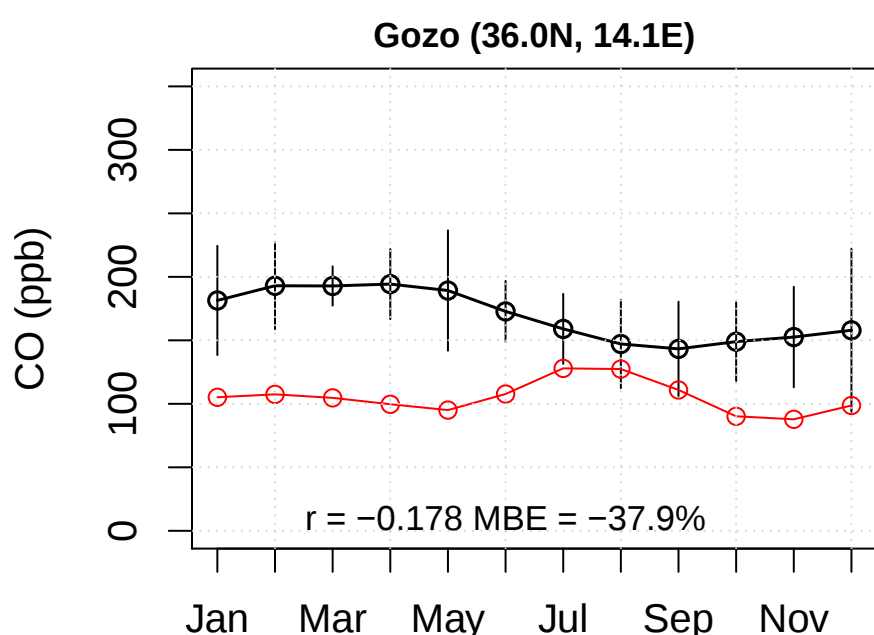
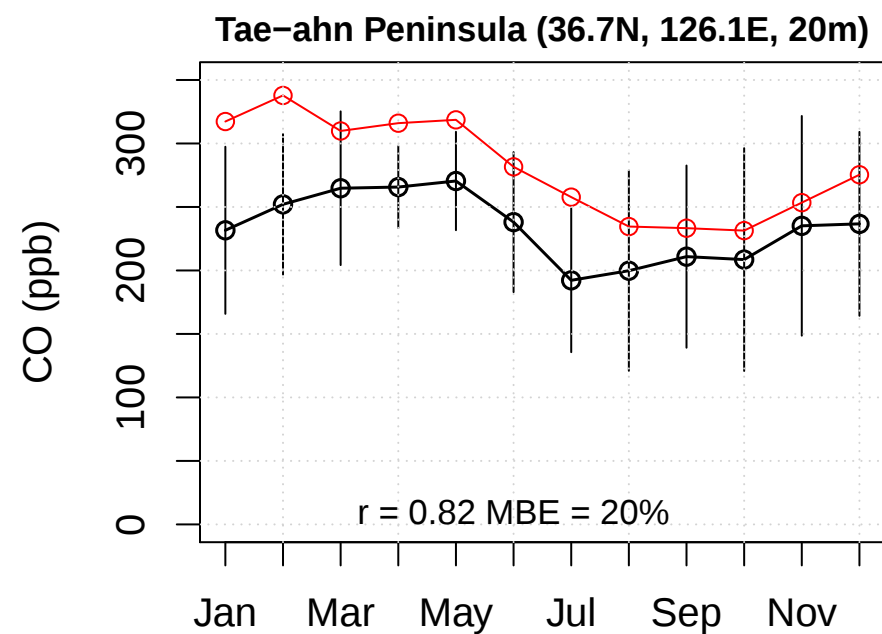
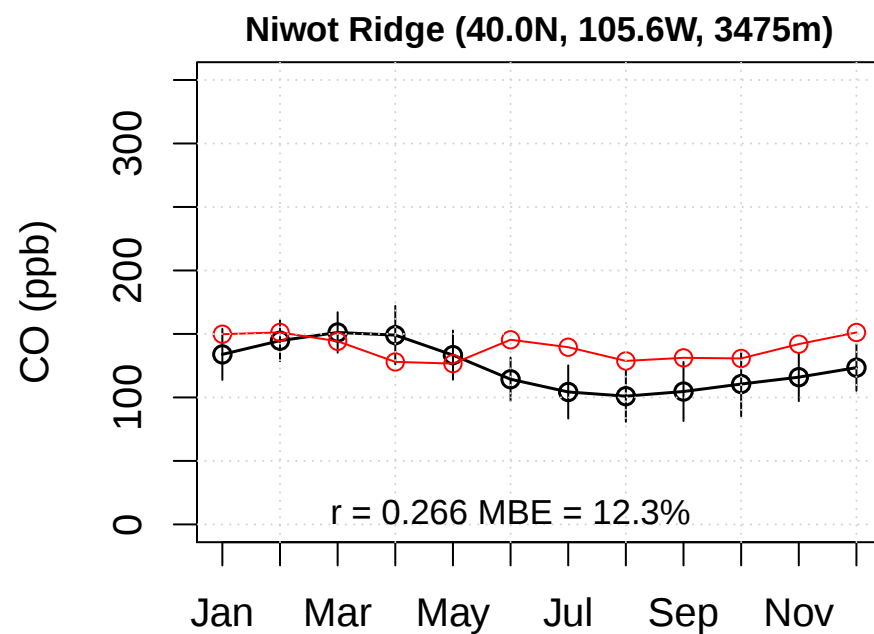
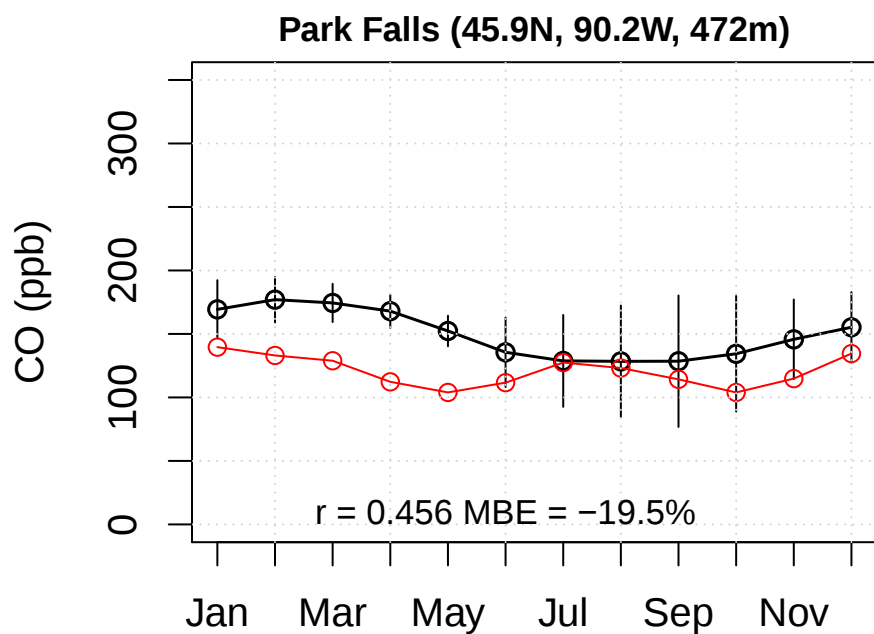
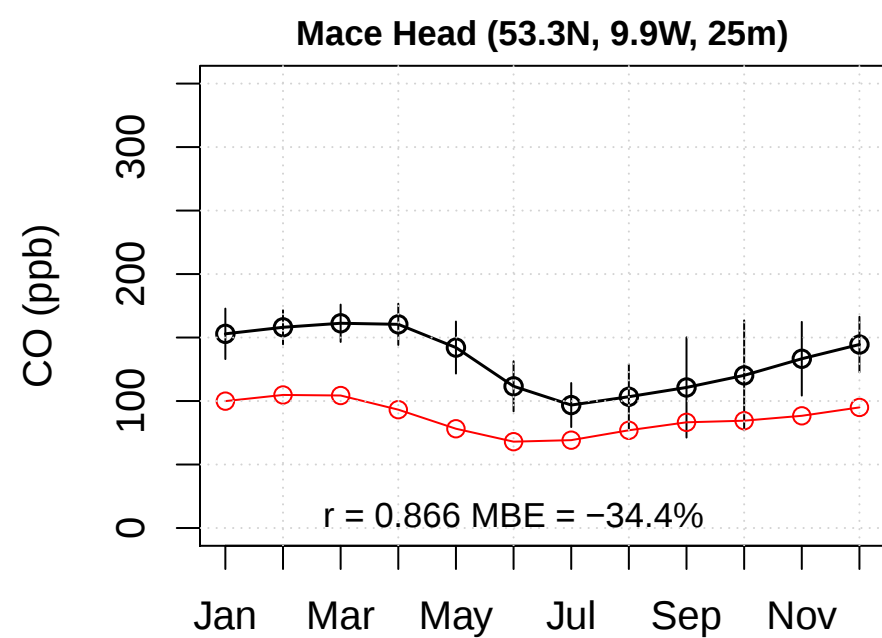
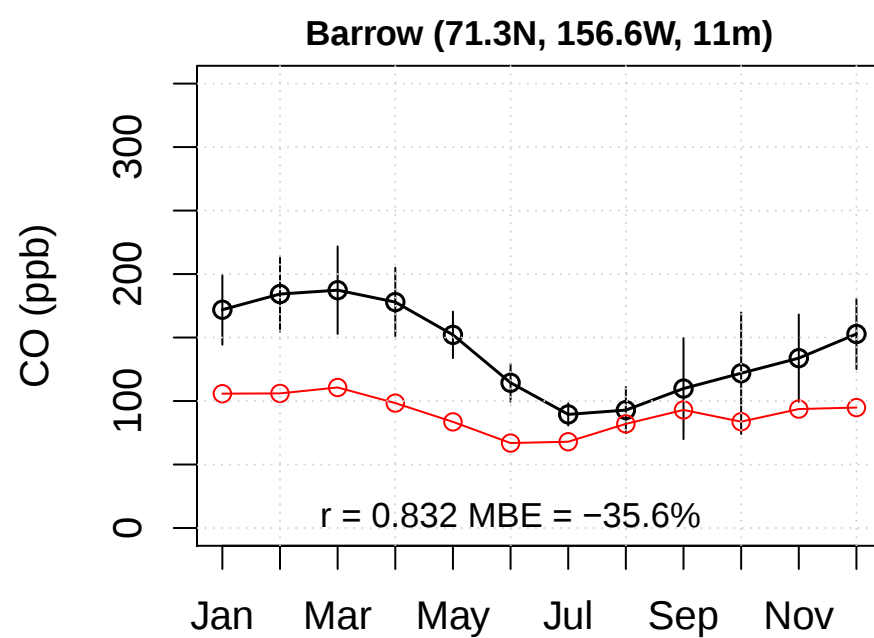
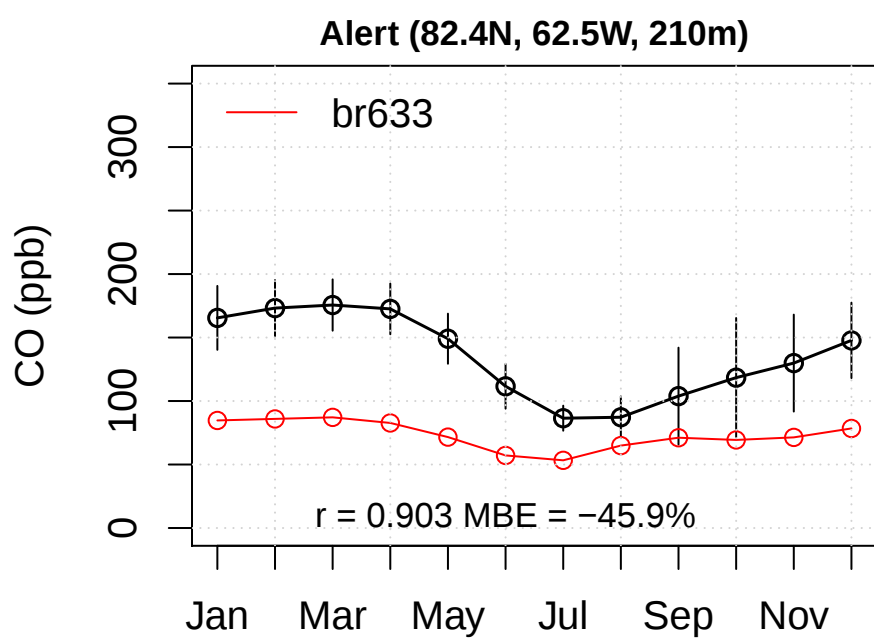
Min = -39.8 Mean = 0.101 Max = 68.7

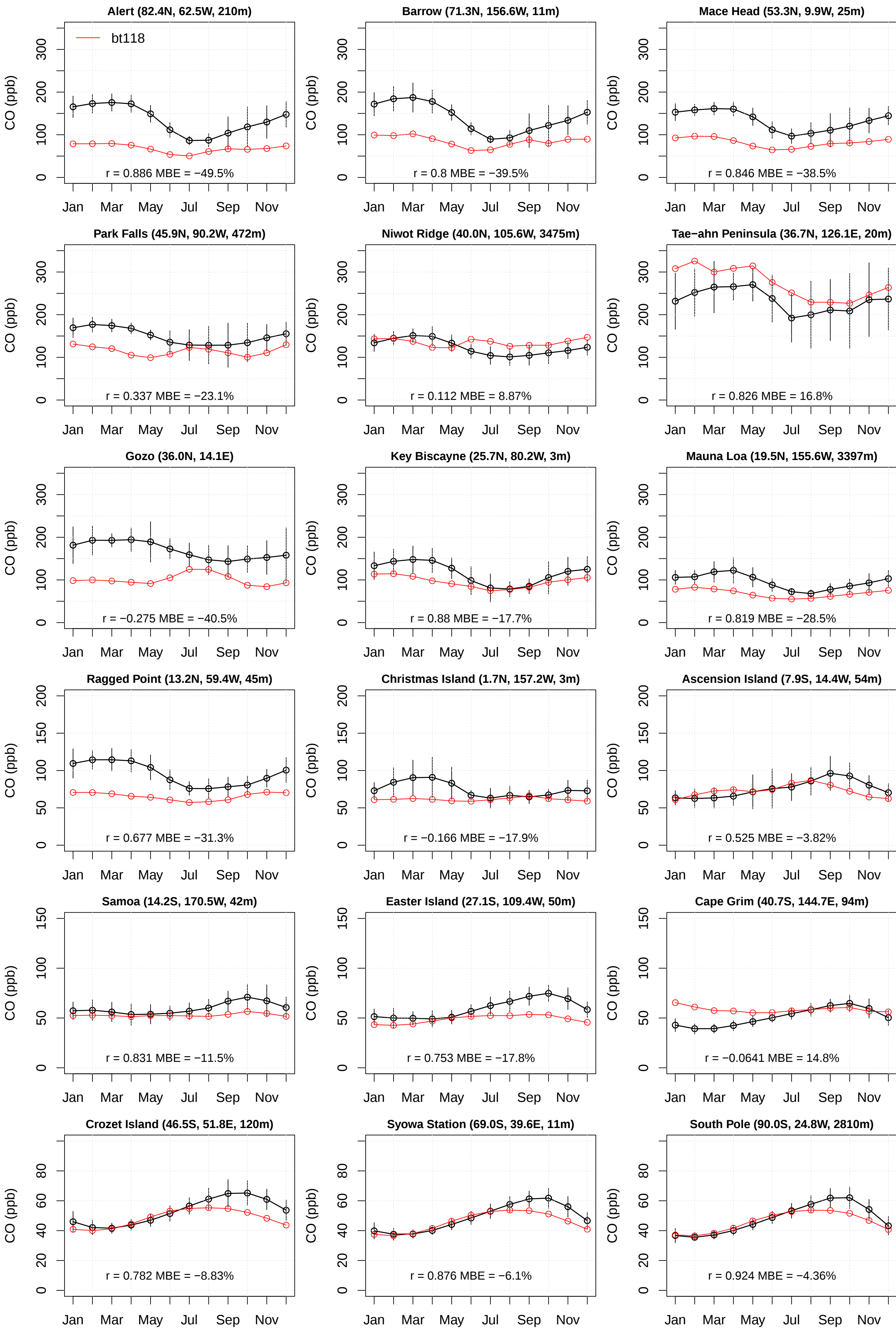


bt118 – ERA Q bias

Min = -38.9 Mean = 0.156 Max = 68.7

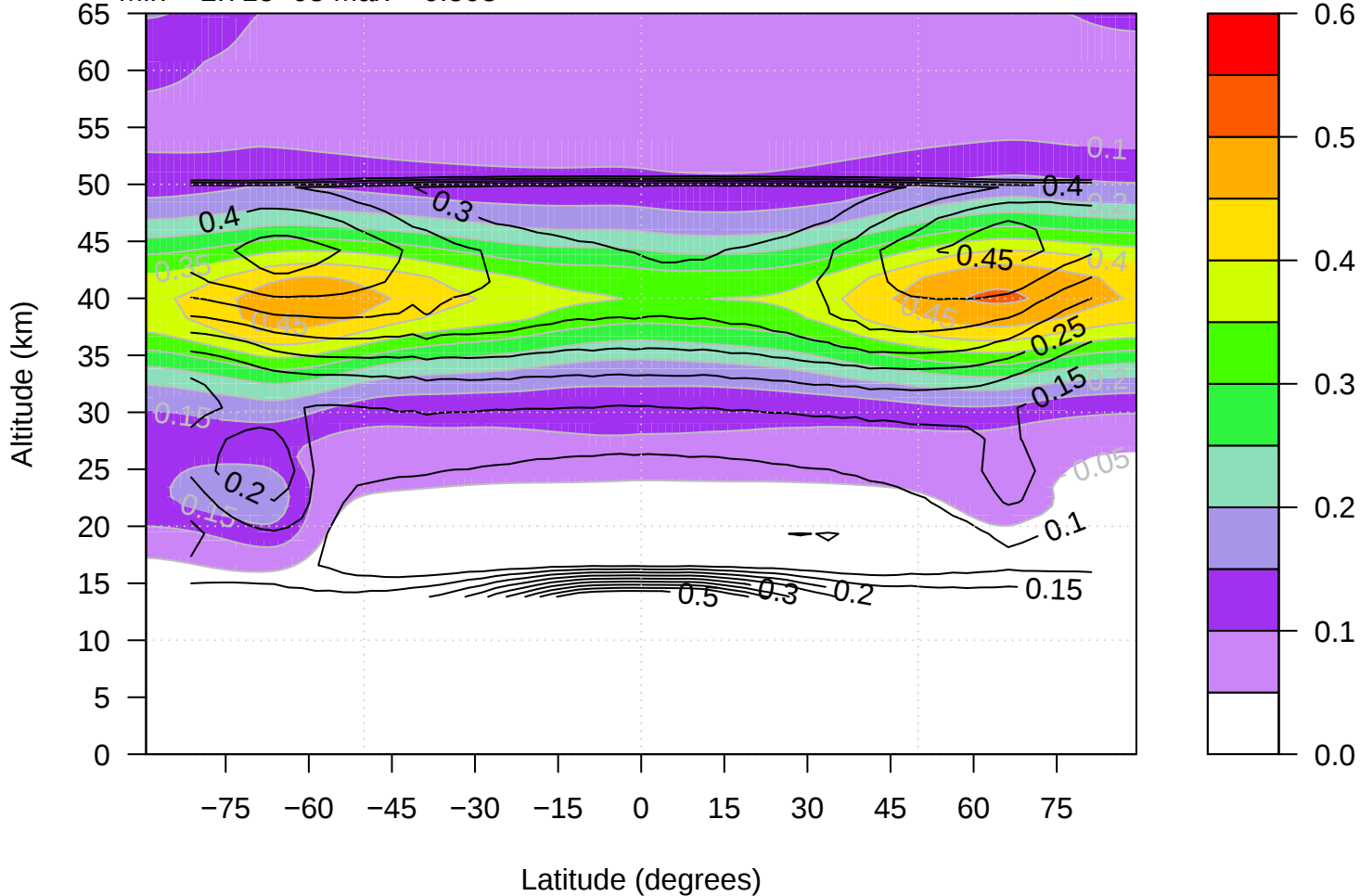






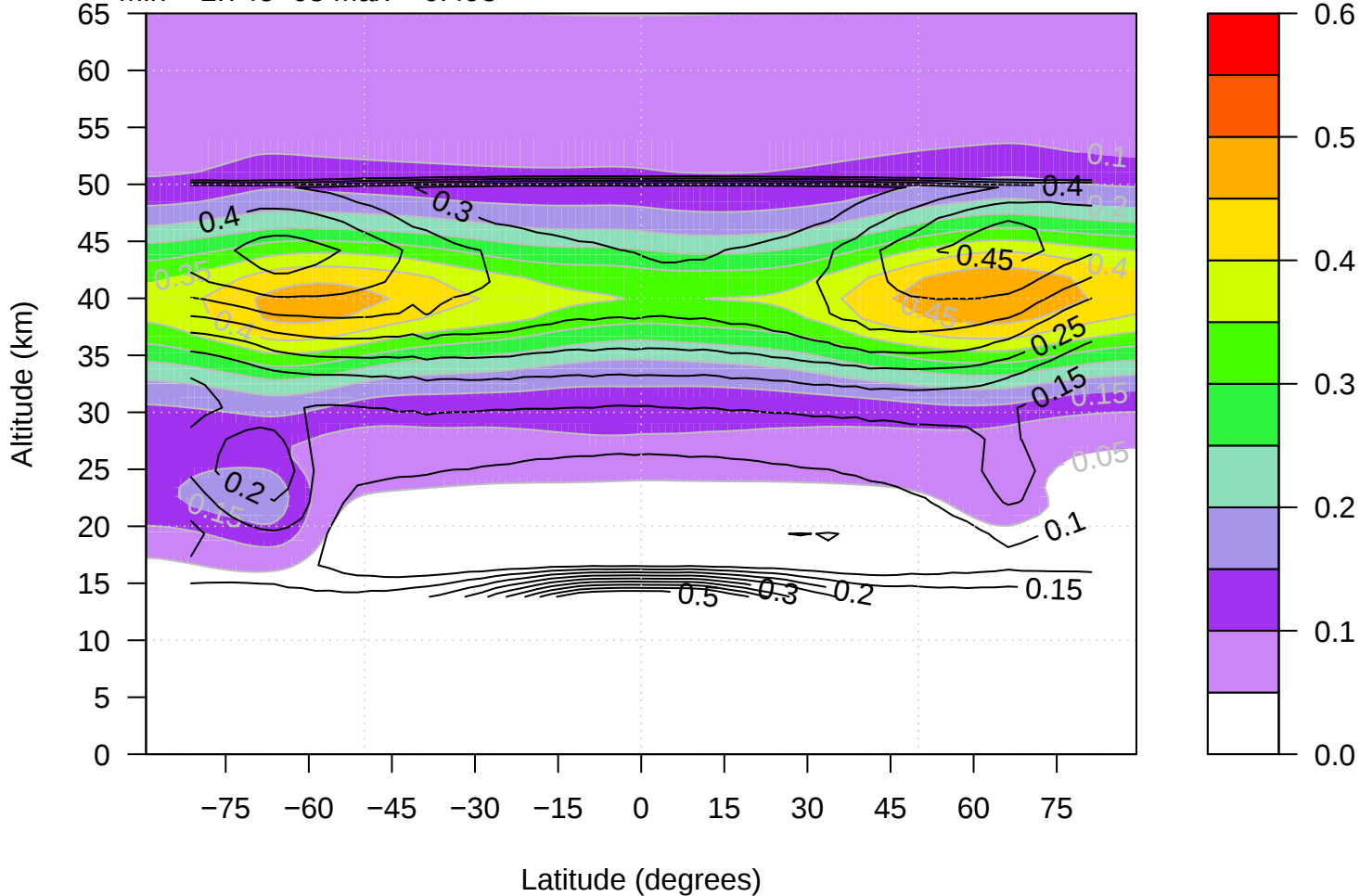
MLS – UKCA br633 ClO comparison

Min = 2.71e-08 Max = 0.508



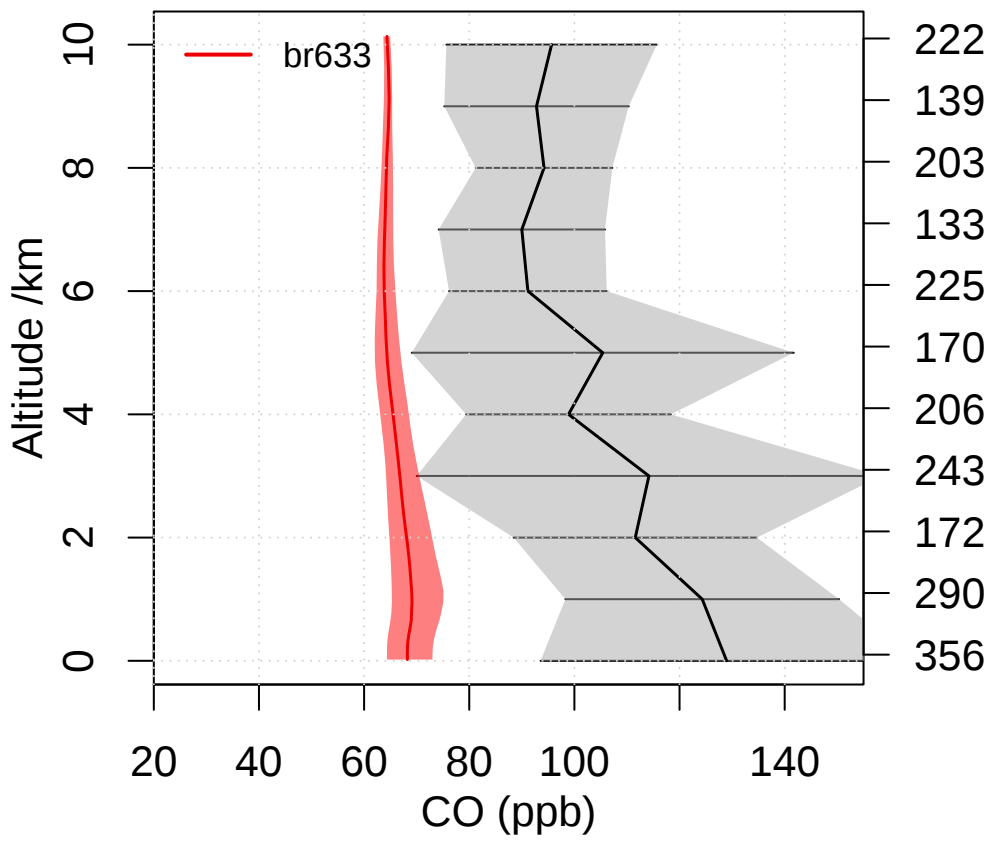
MLS – UKCA bt118 ClO comparison

Min = 2.74e-08 Max = 0.498

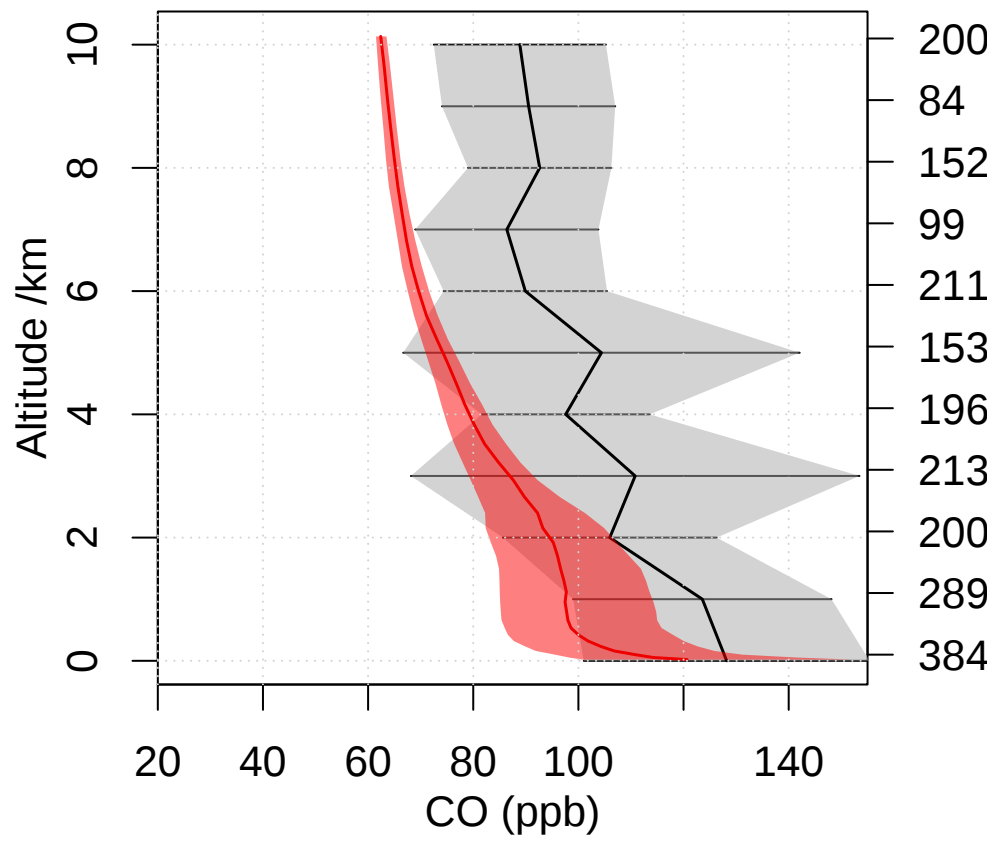


Emmons CO comparison

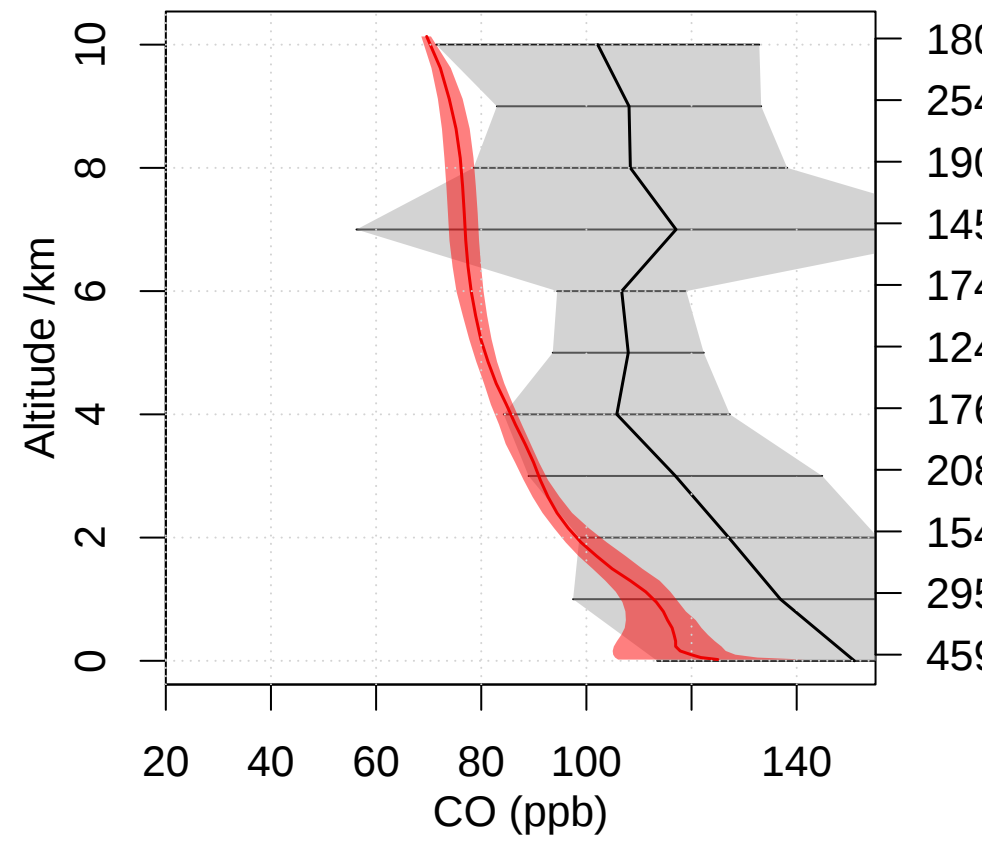
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



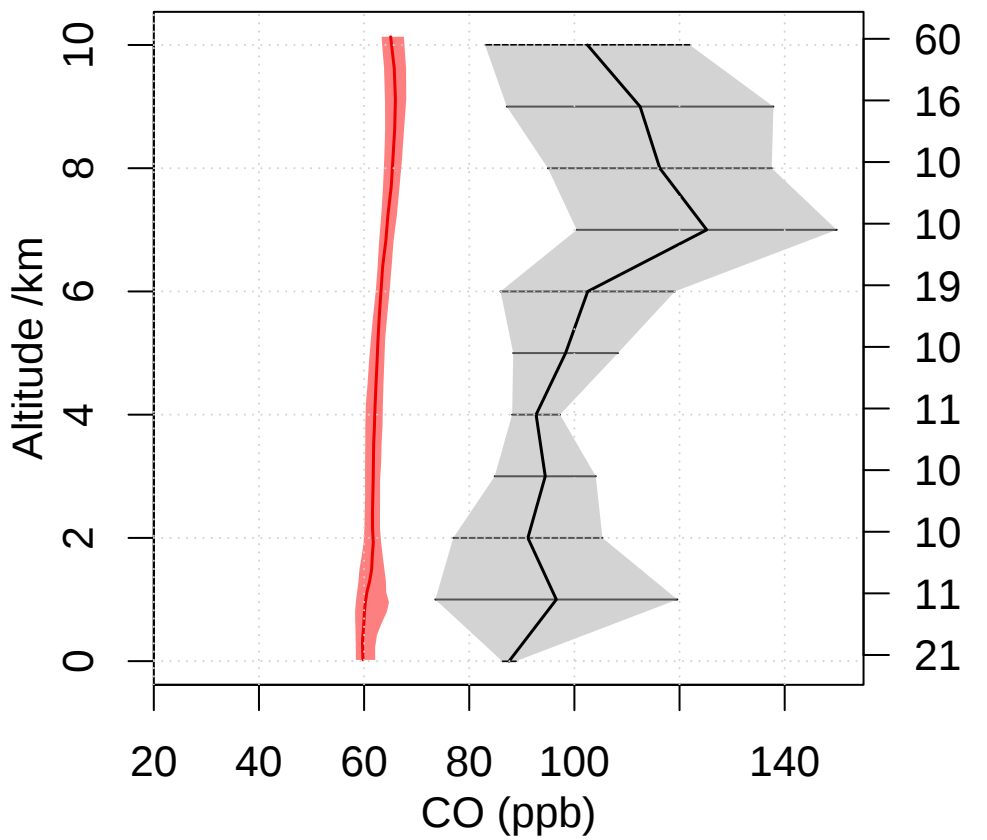
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



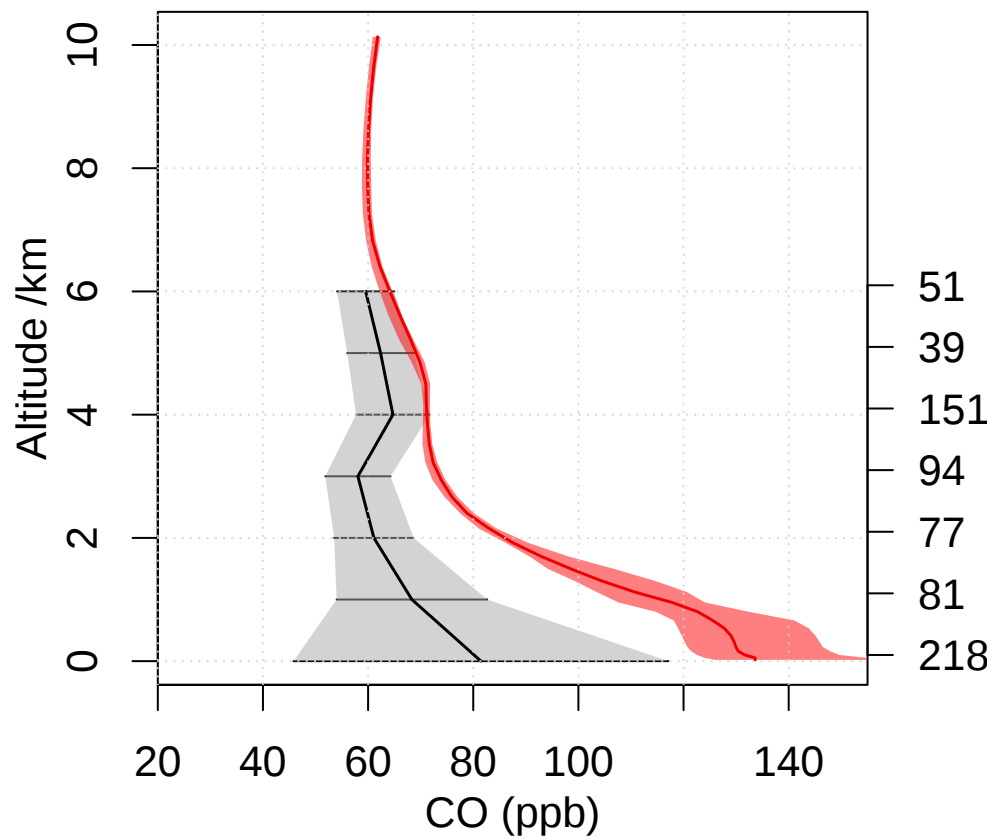
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



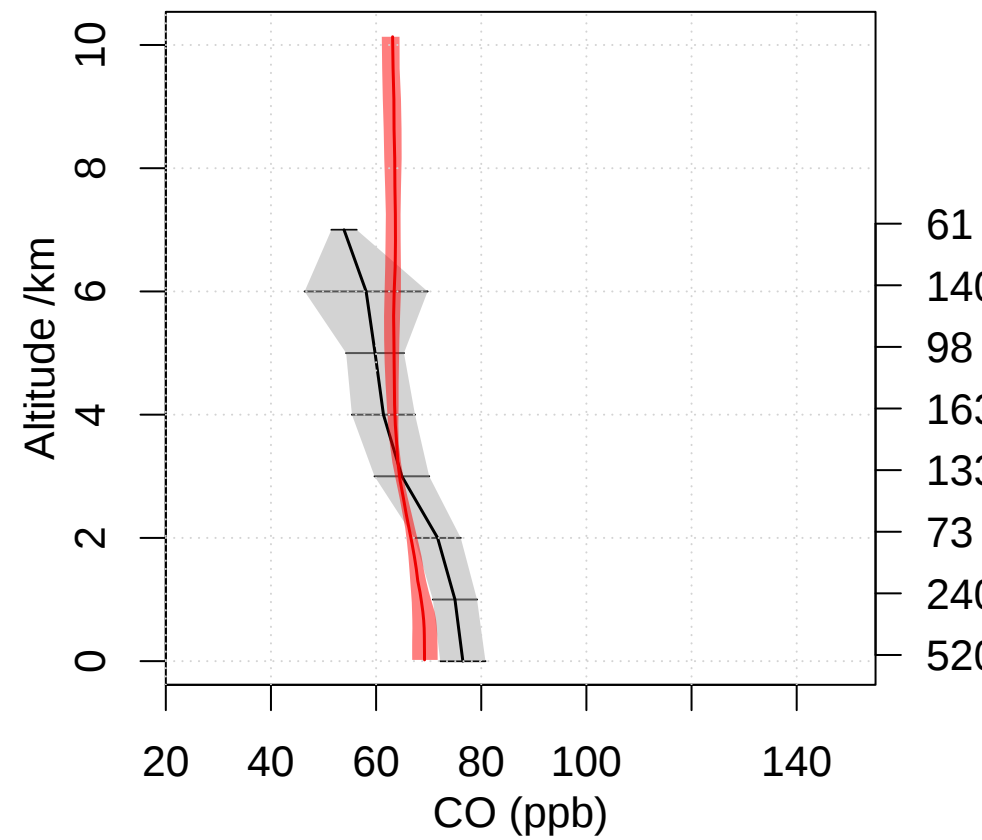
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



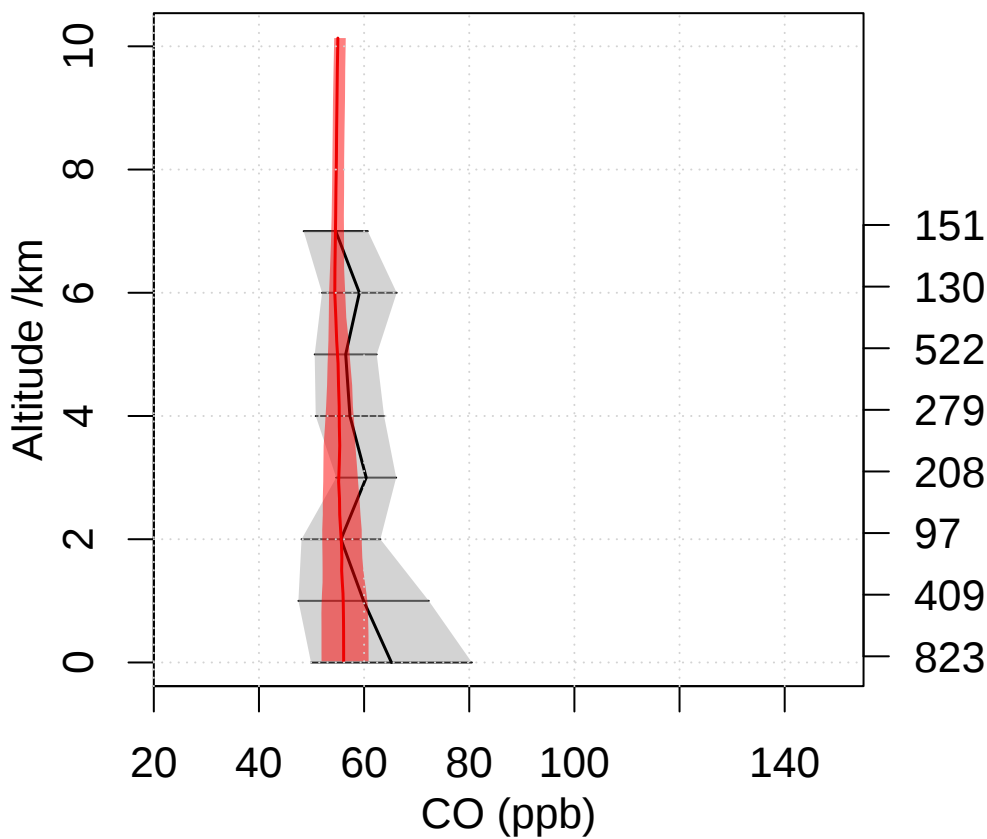
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



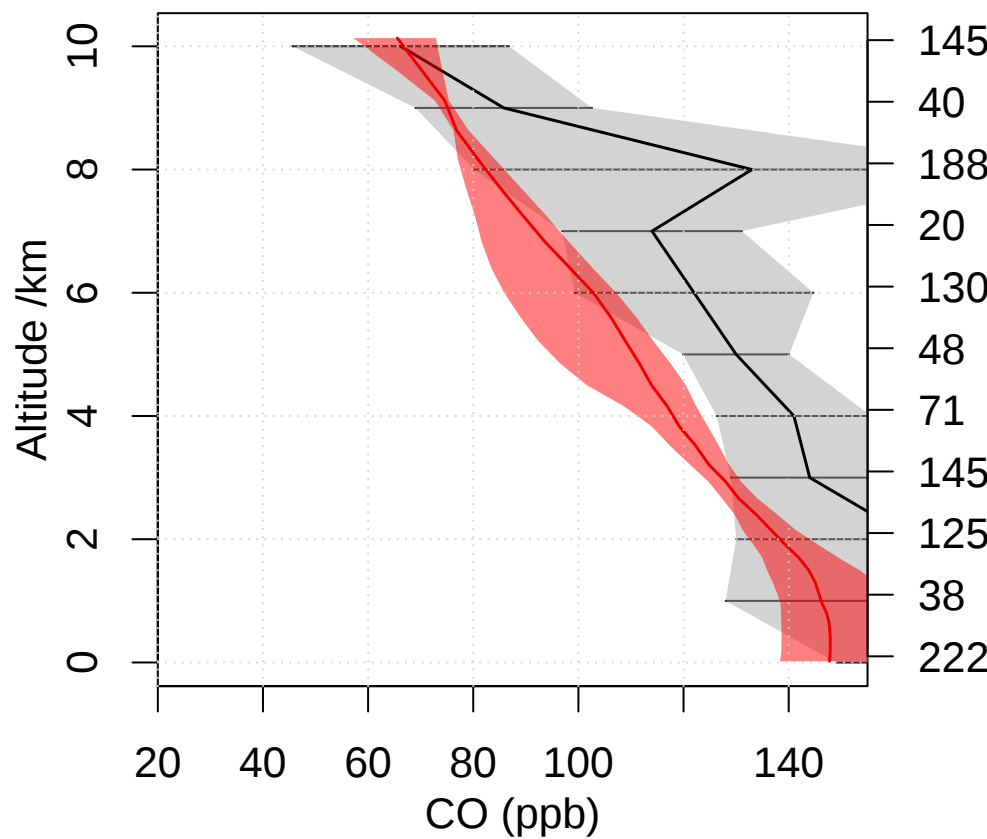
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



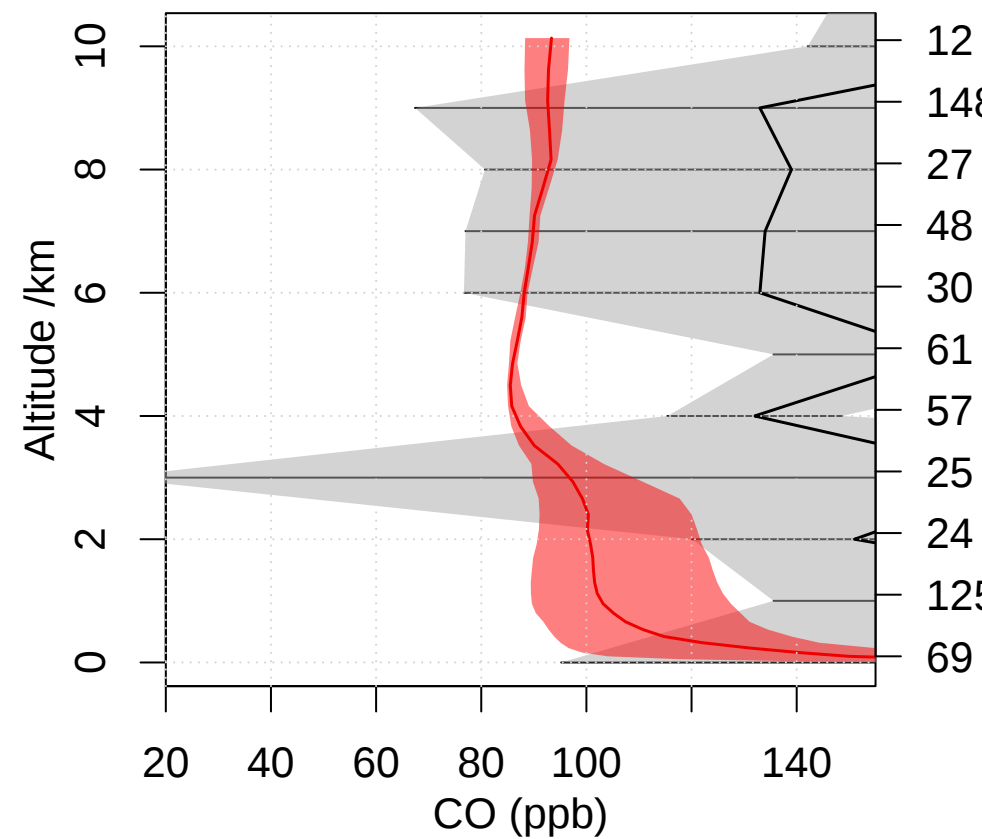
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



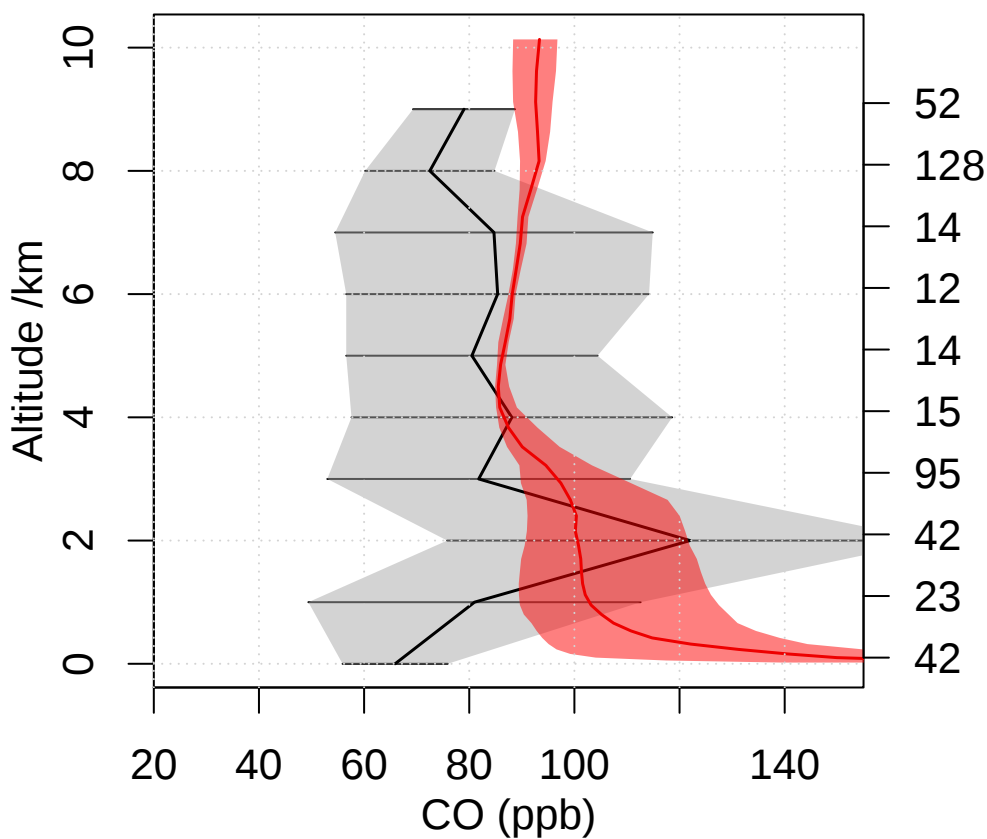
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



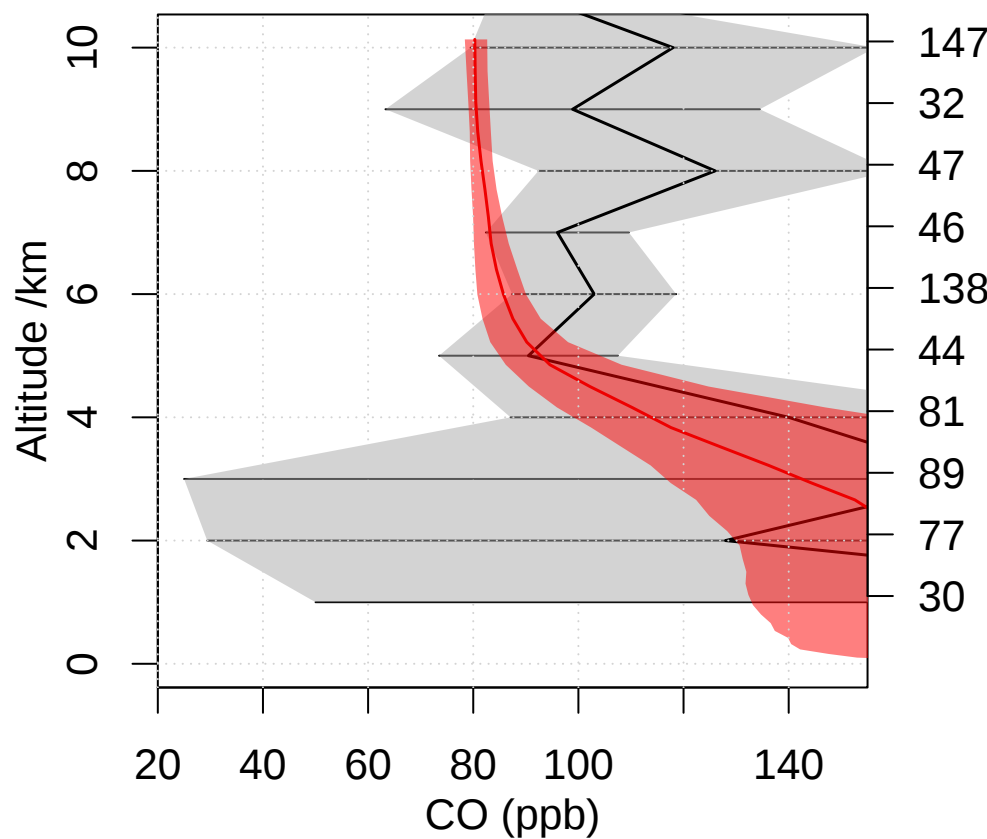
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



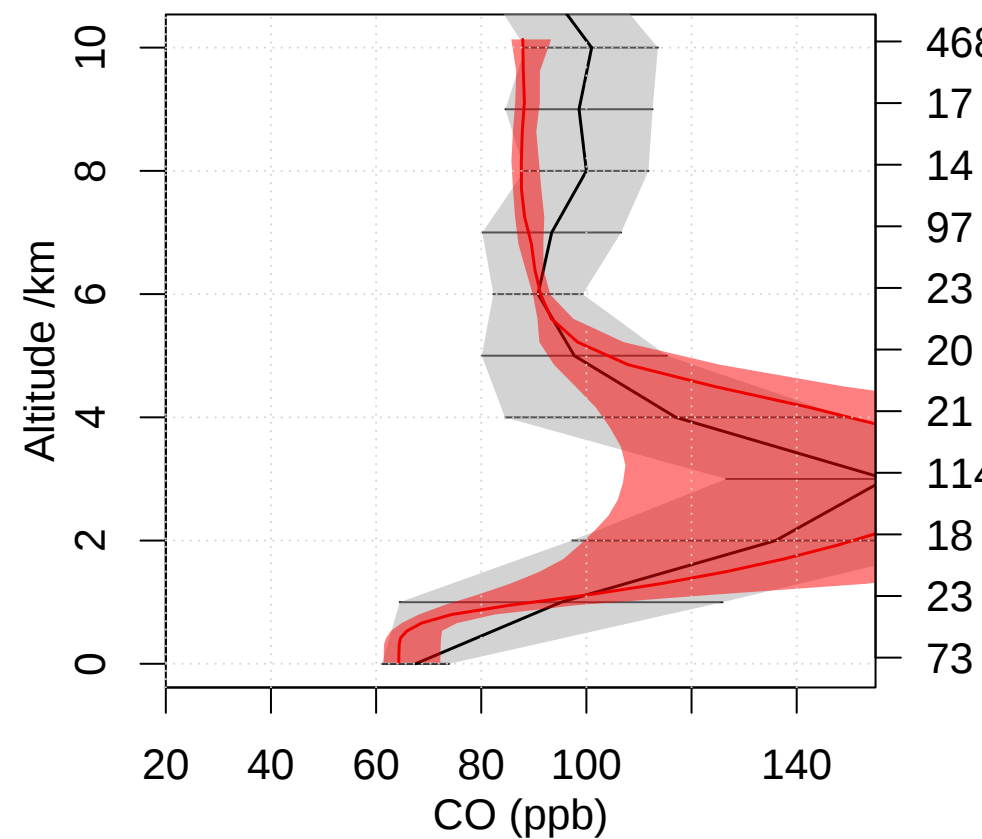
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35

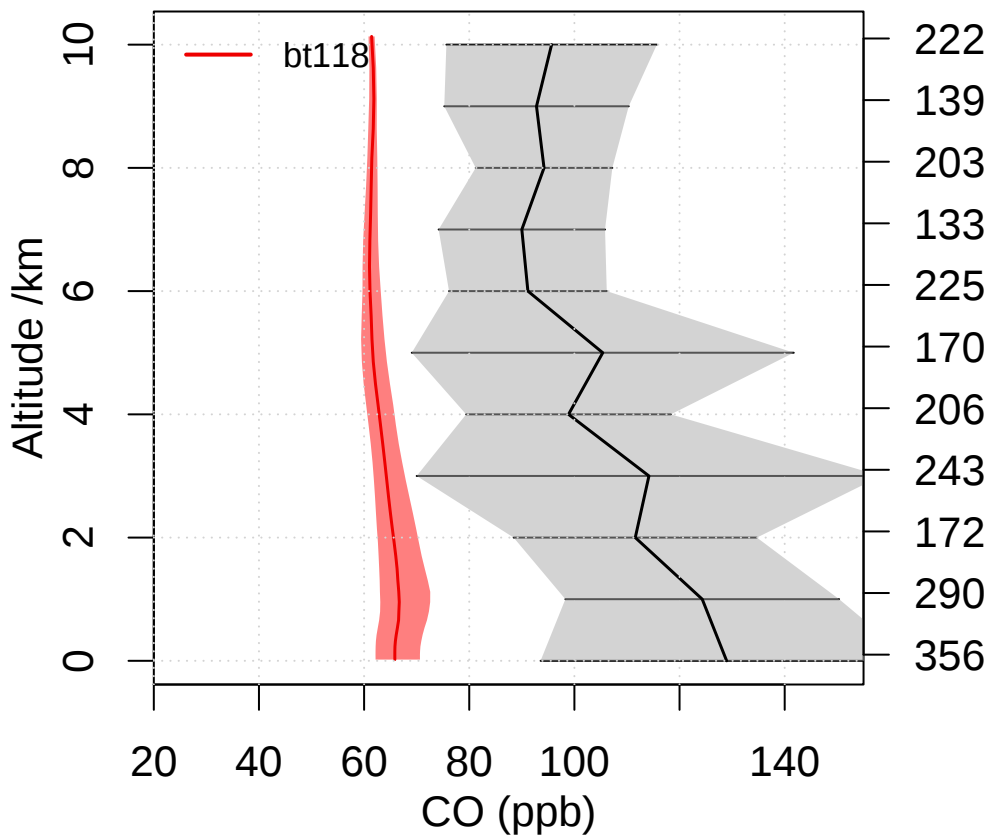


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

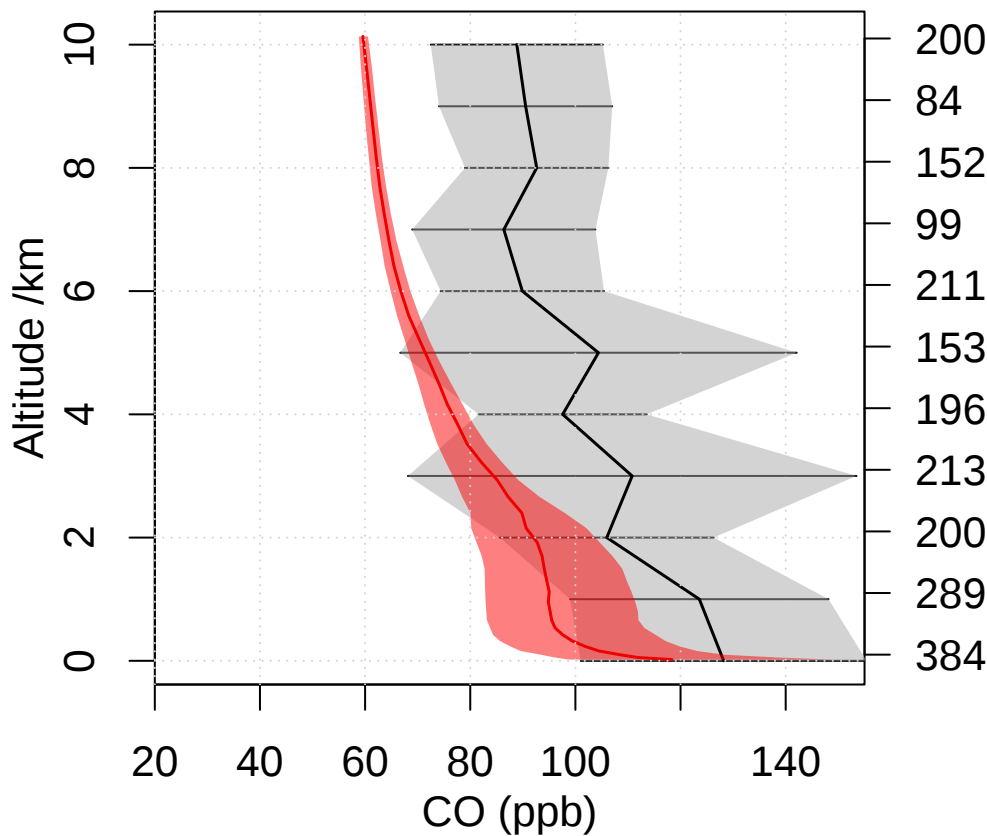


Emmons CO comparison

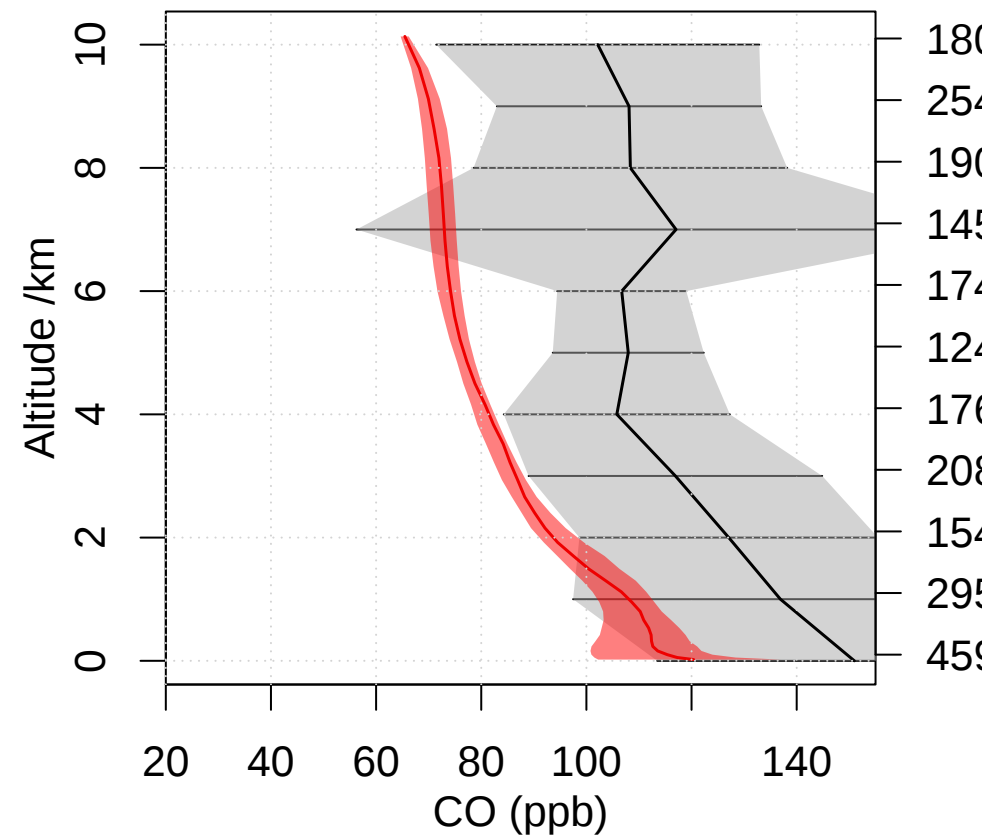
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



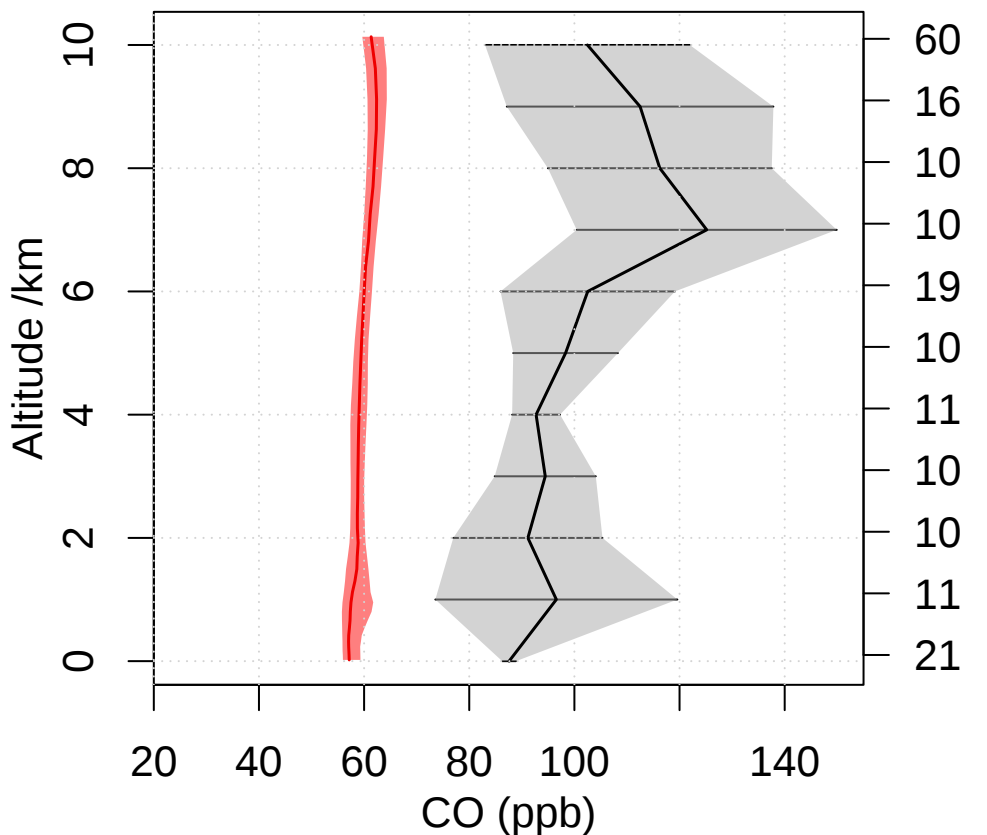
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



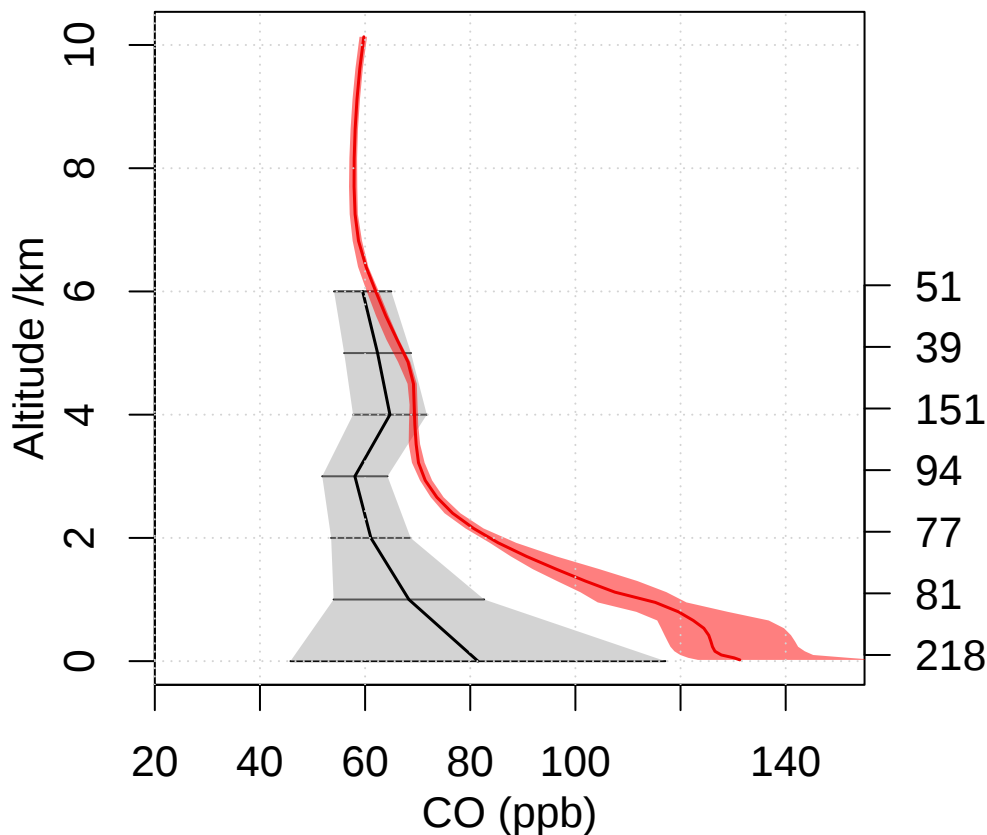
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



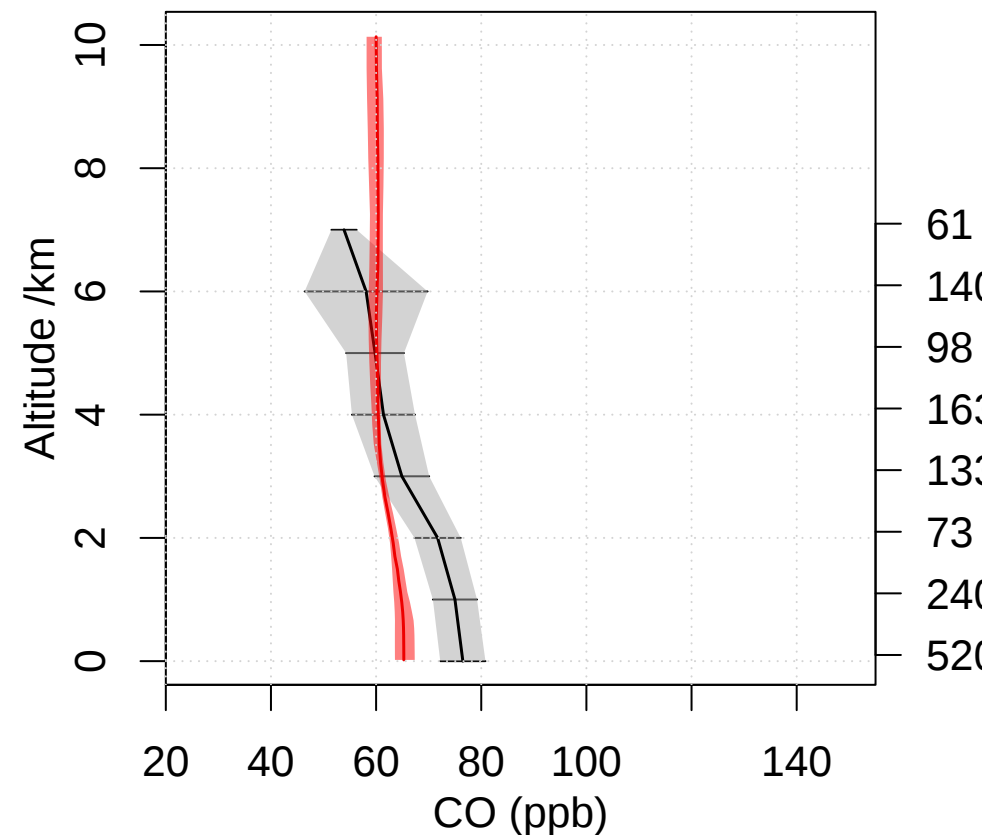
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



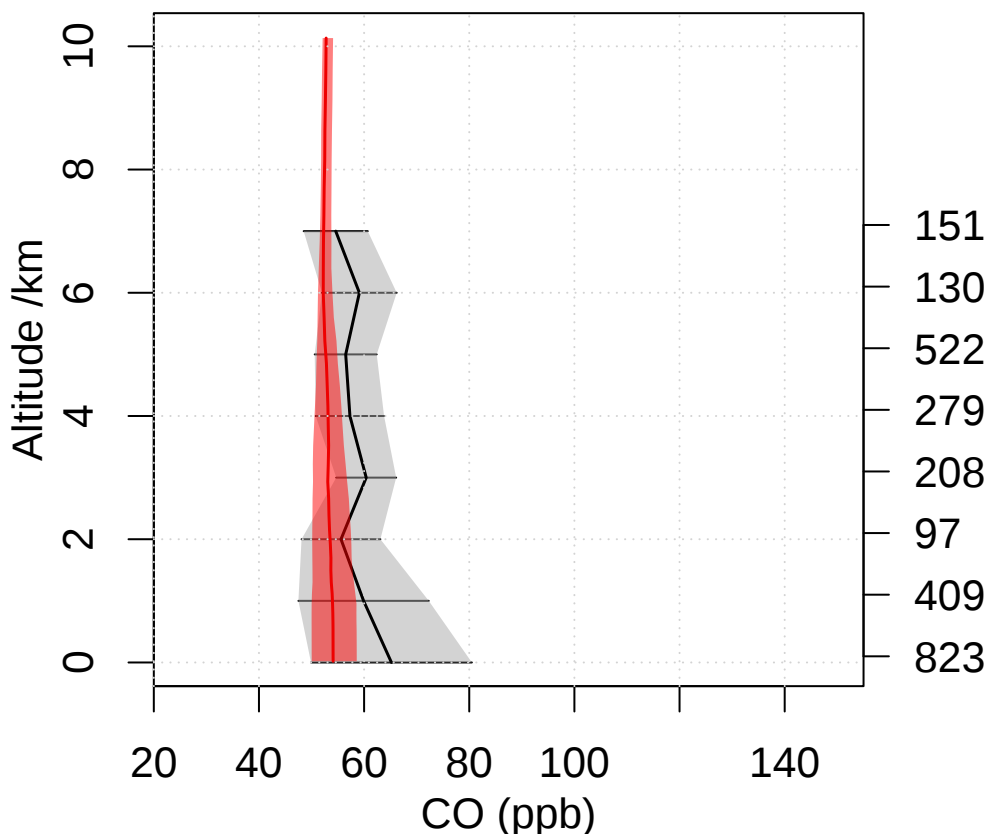
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



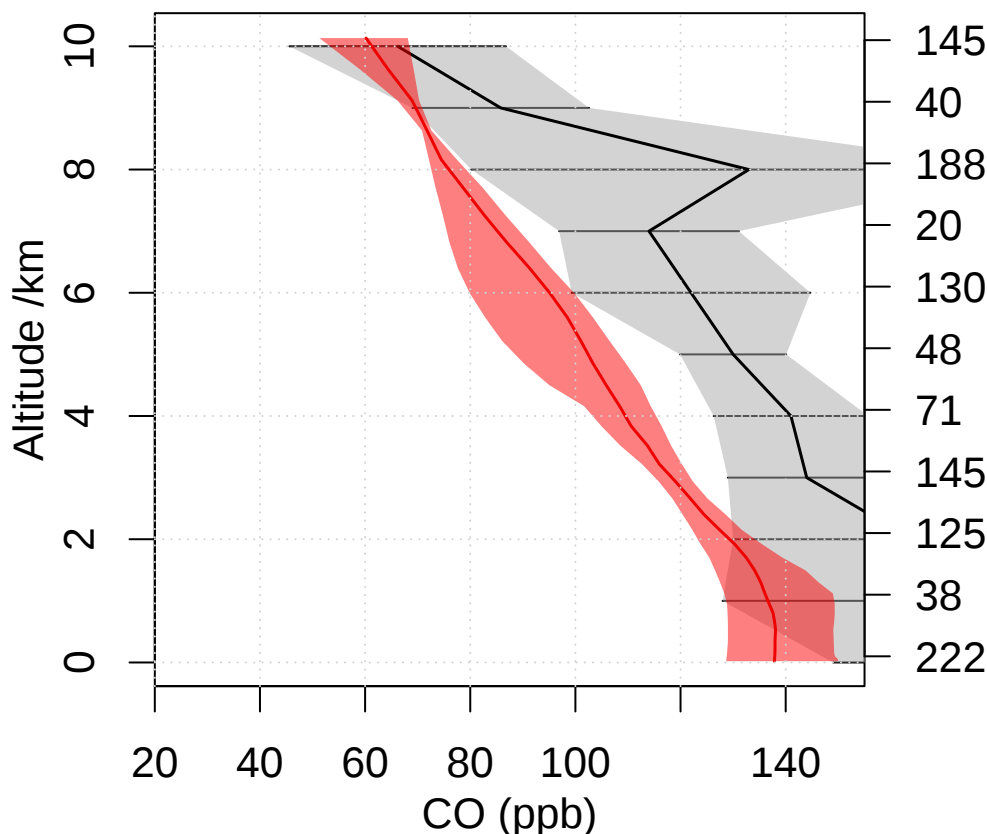
PEM-Tropics-B Christmas-Island 1999 01
Lat 0 – 10 Lon 200 – 220



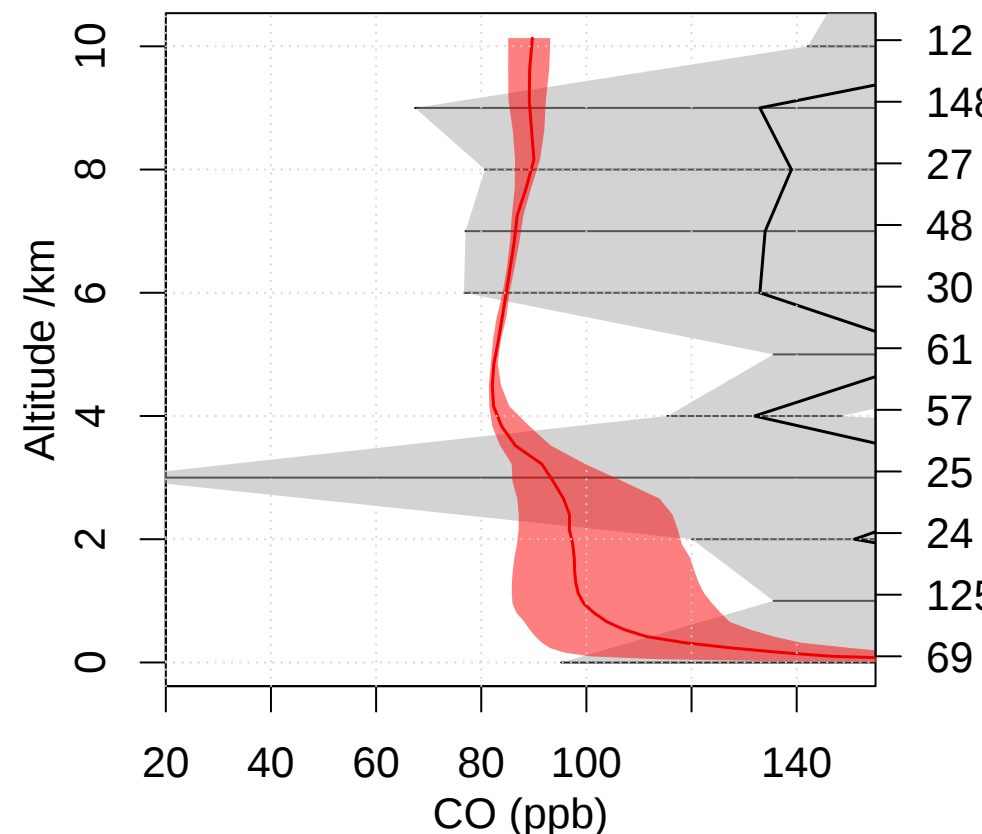
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



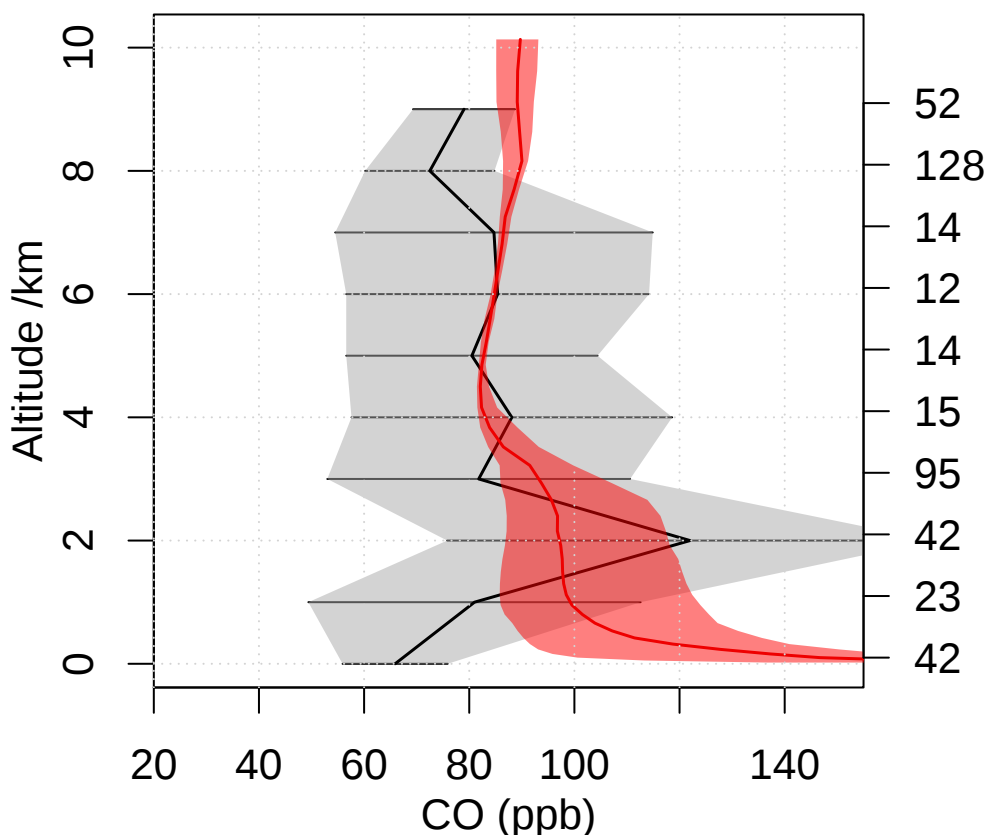
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



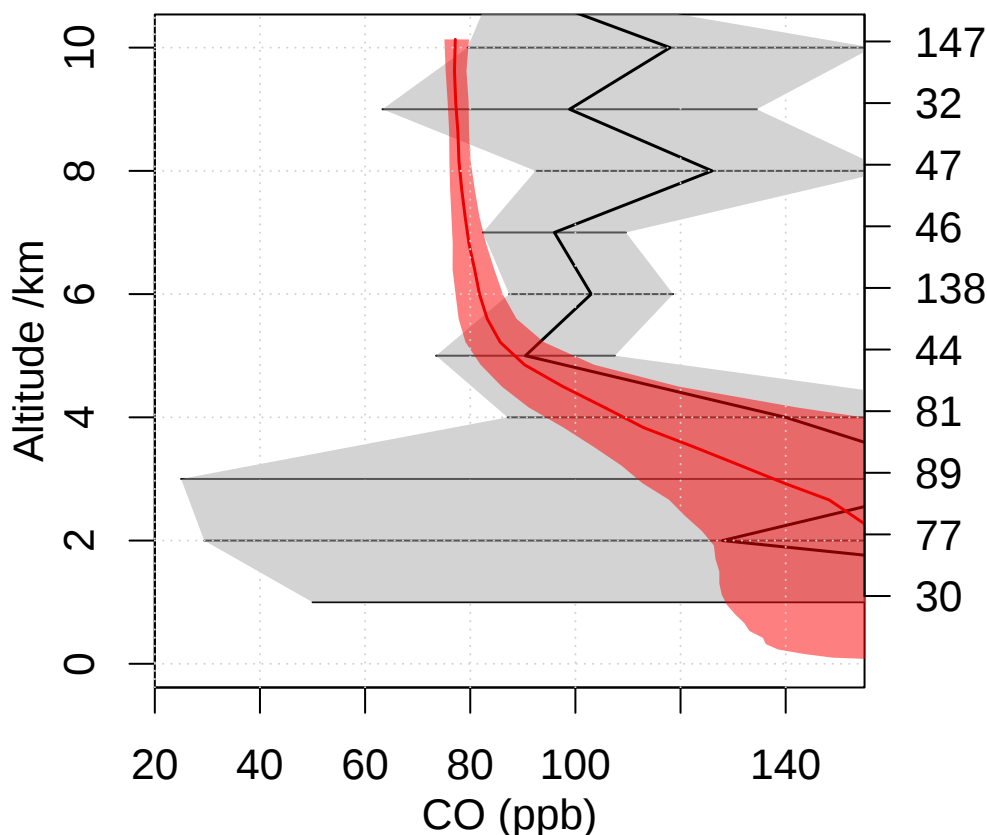
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



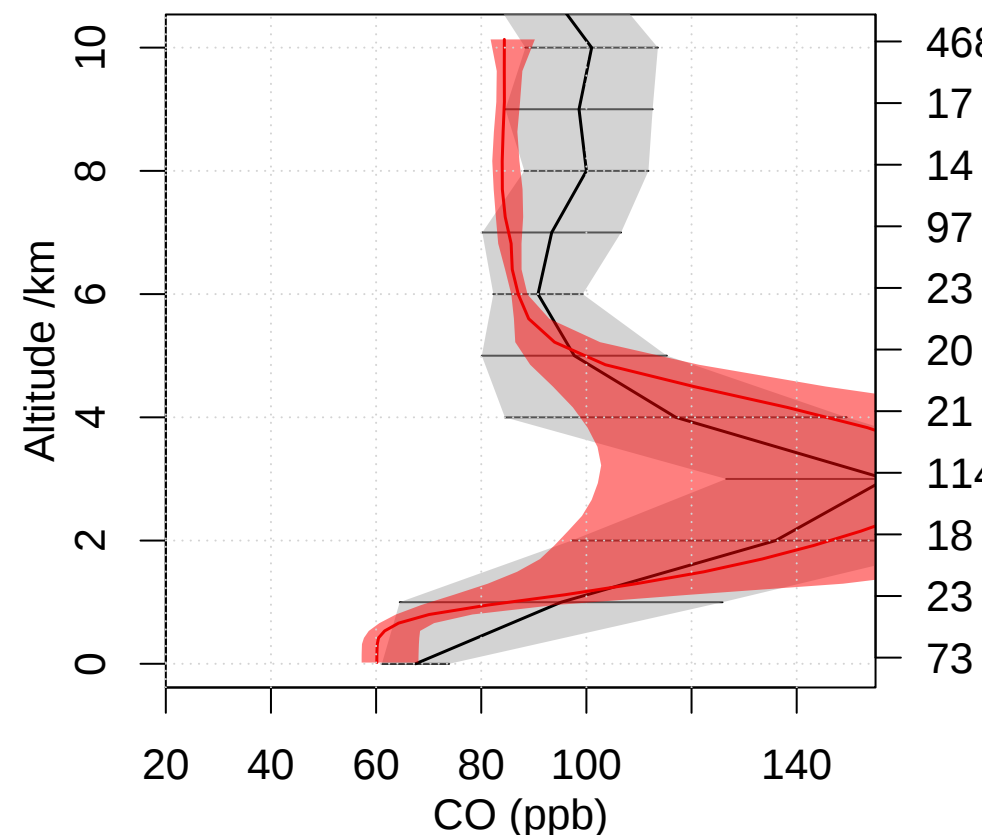
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35

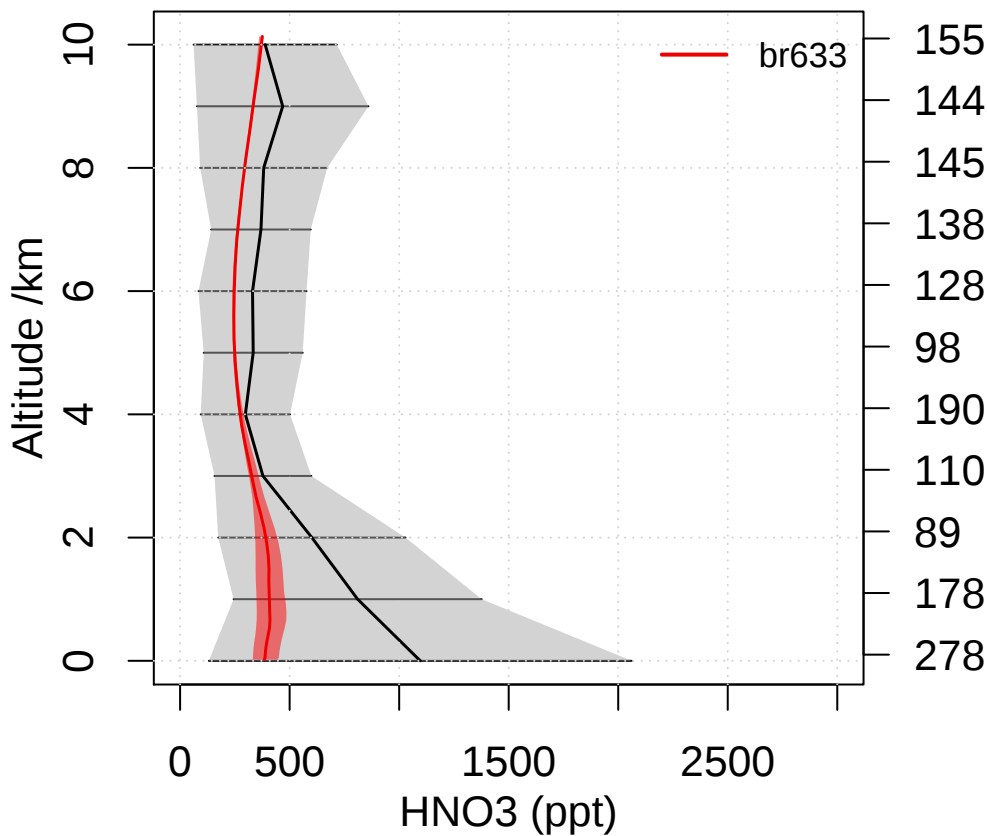


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

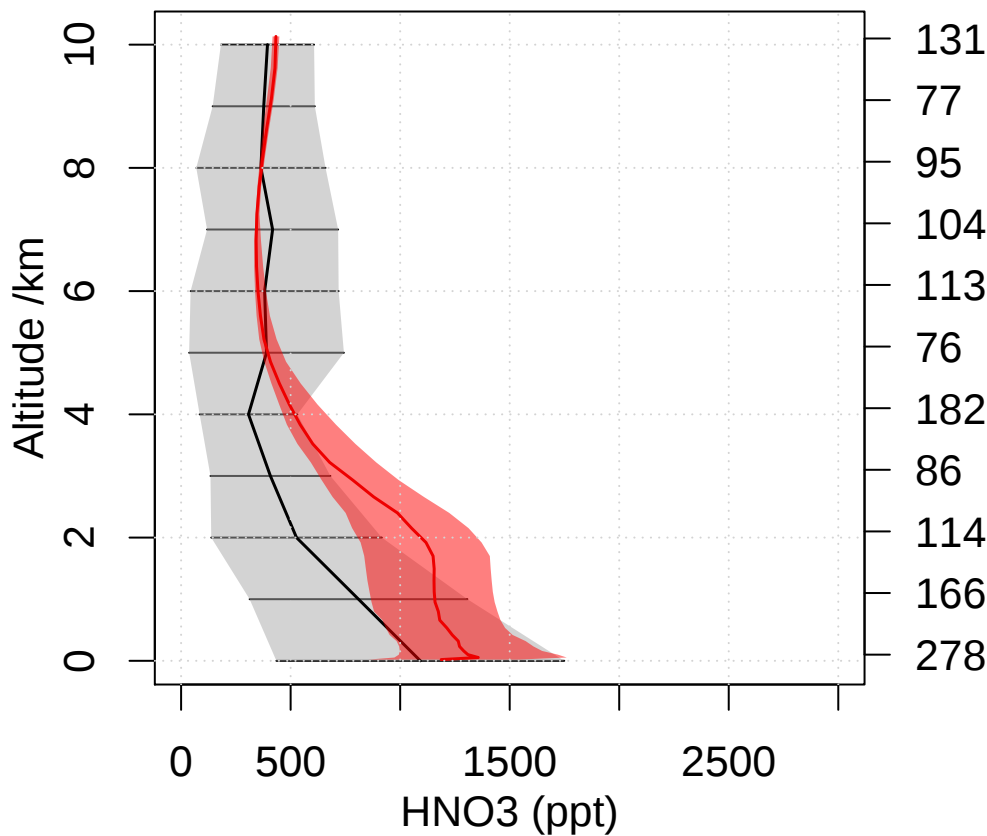


Emmons HNO3 comparison

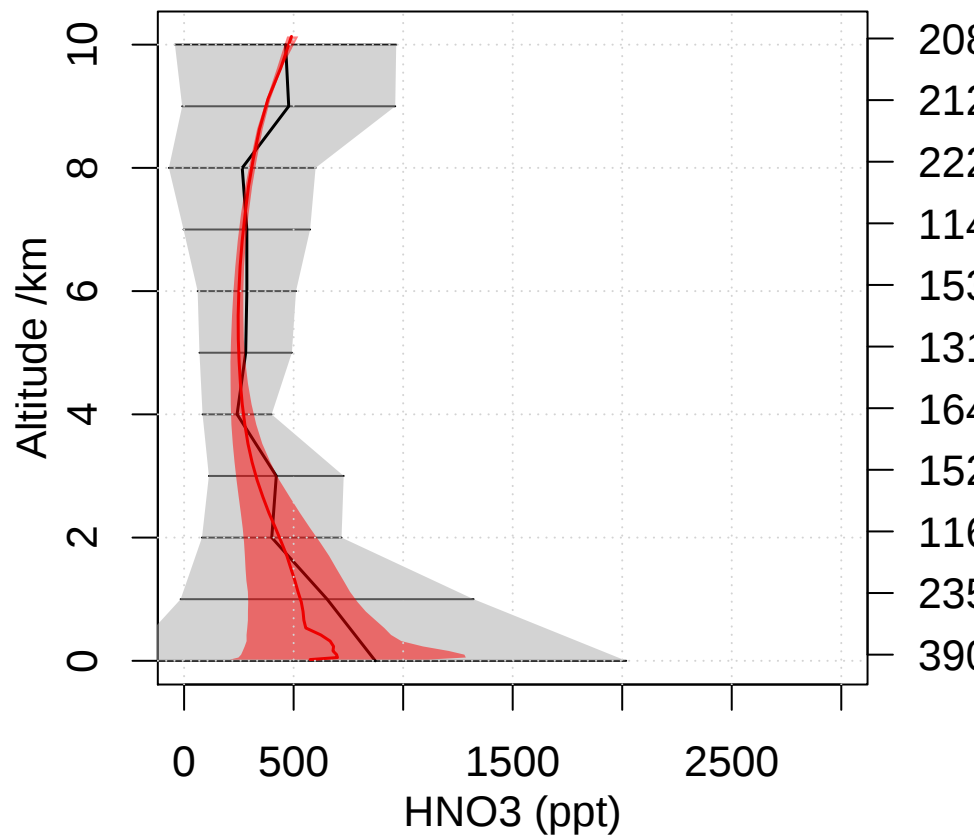
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



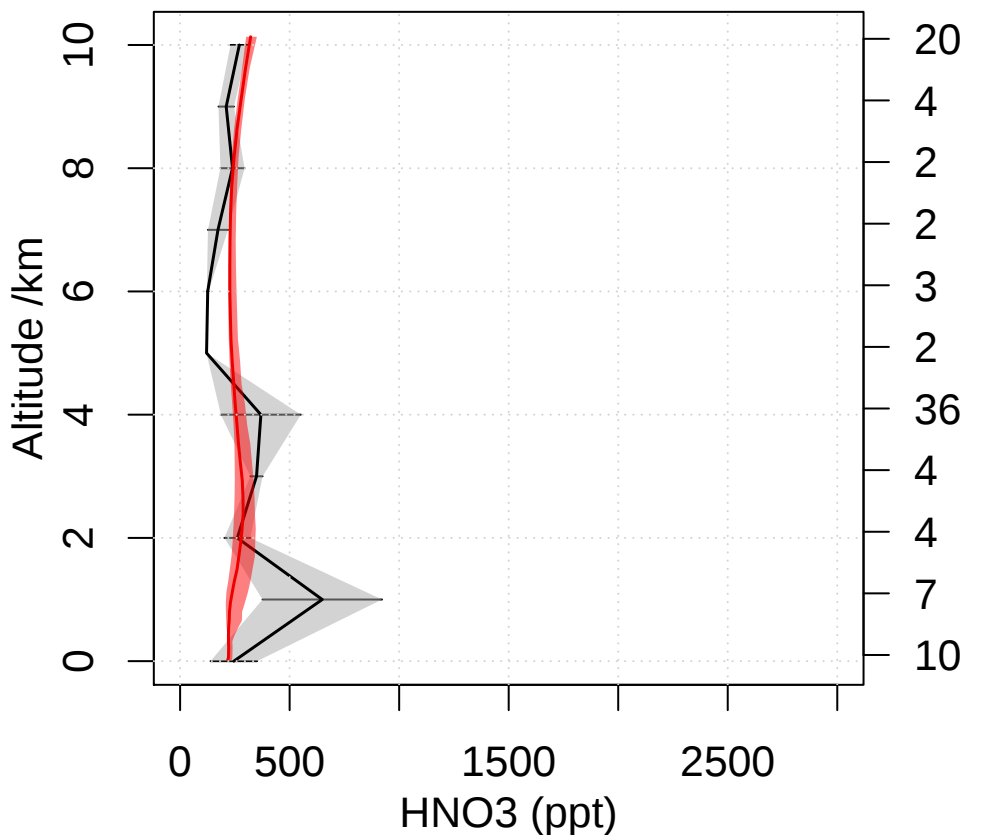
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



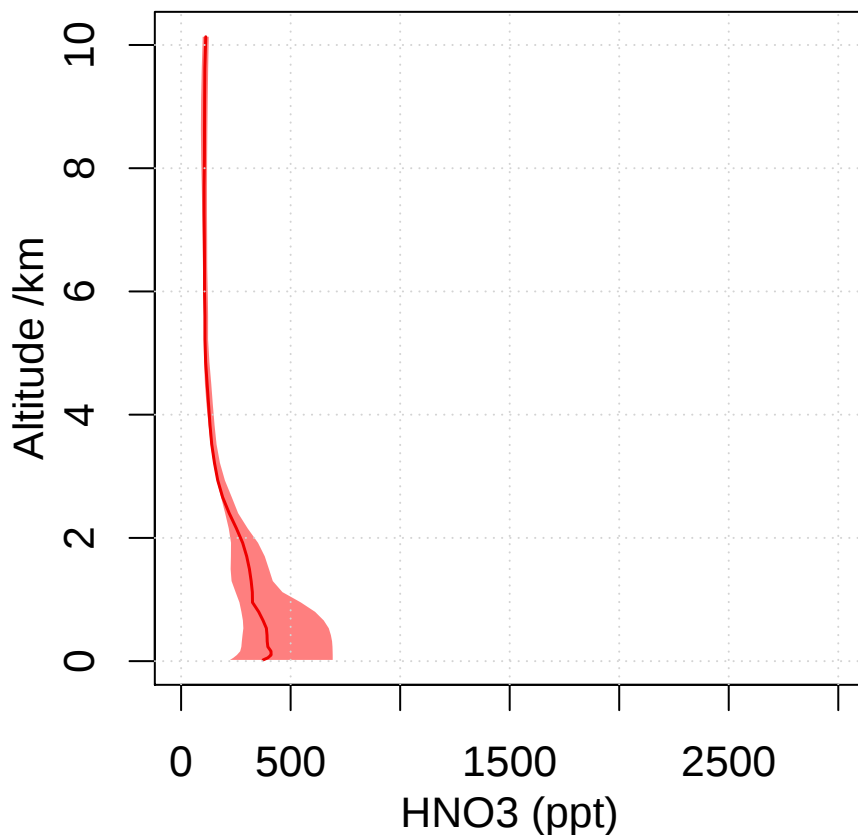
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



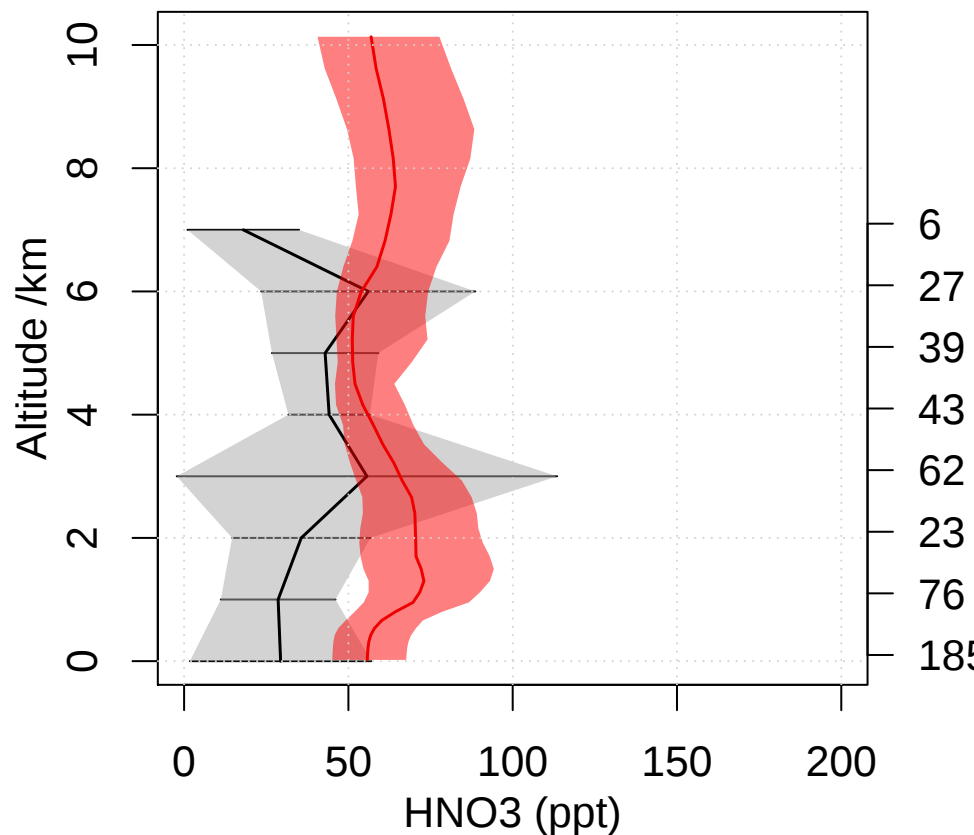
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



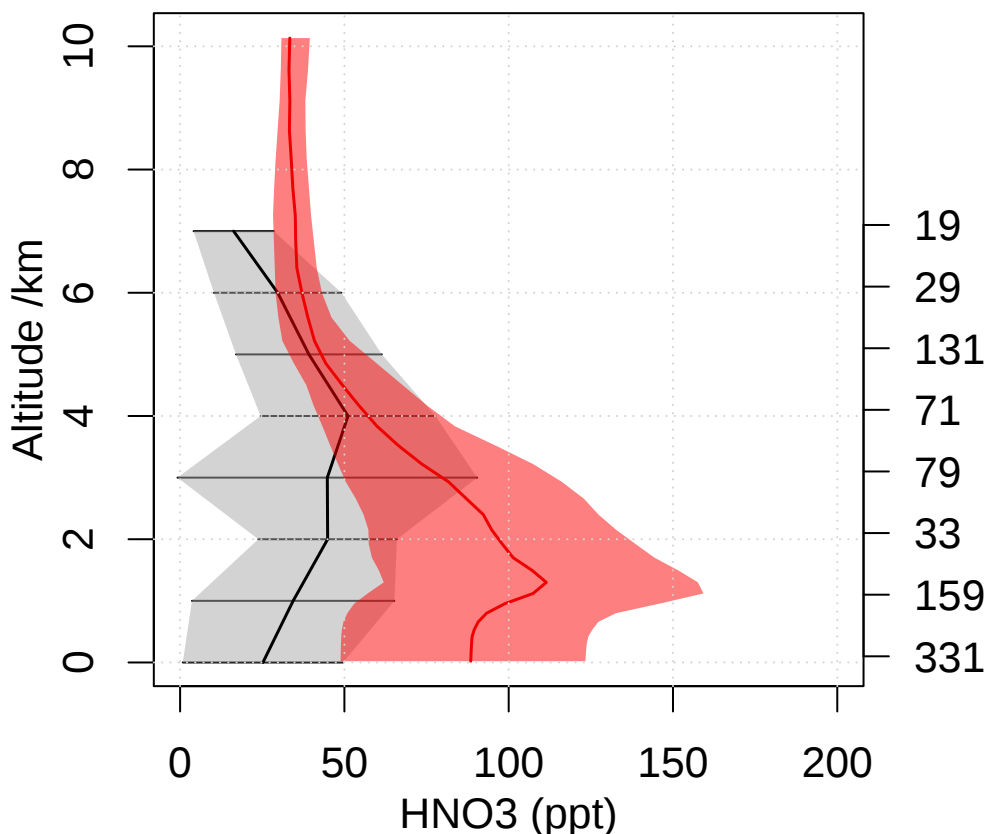
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



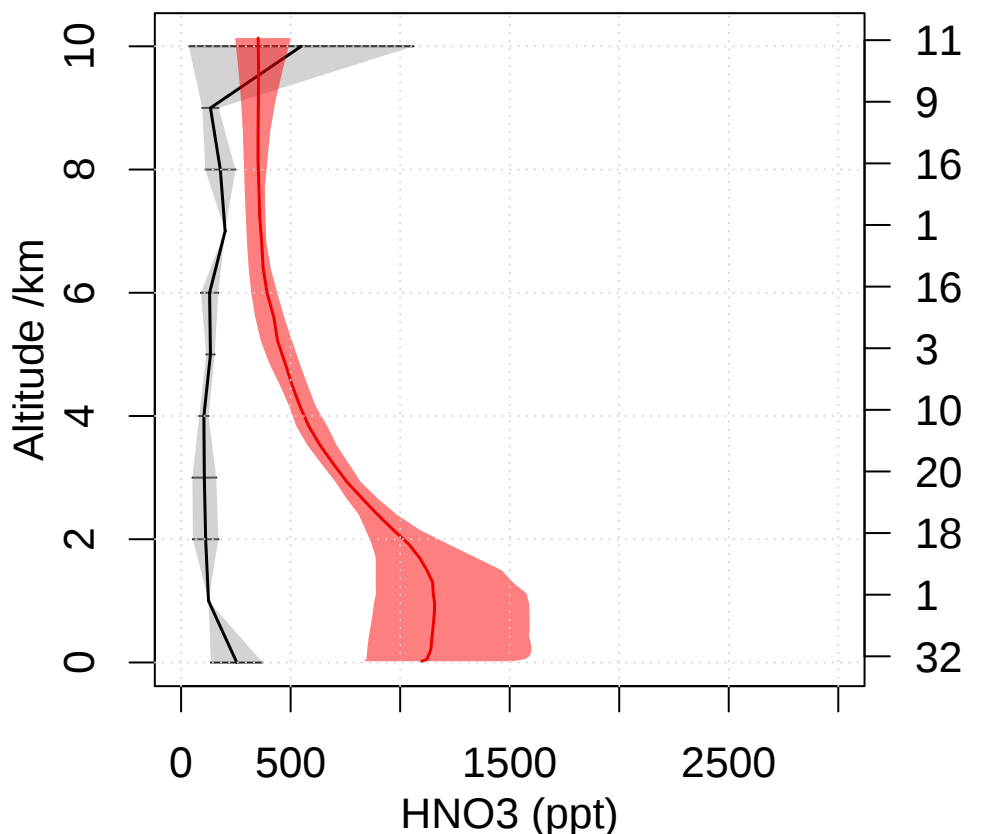
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



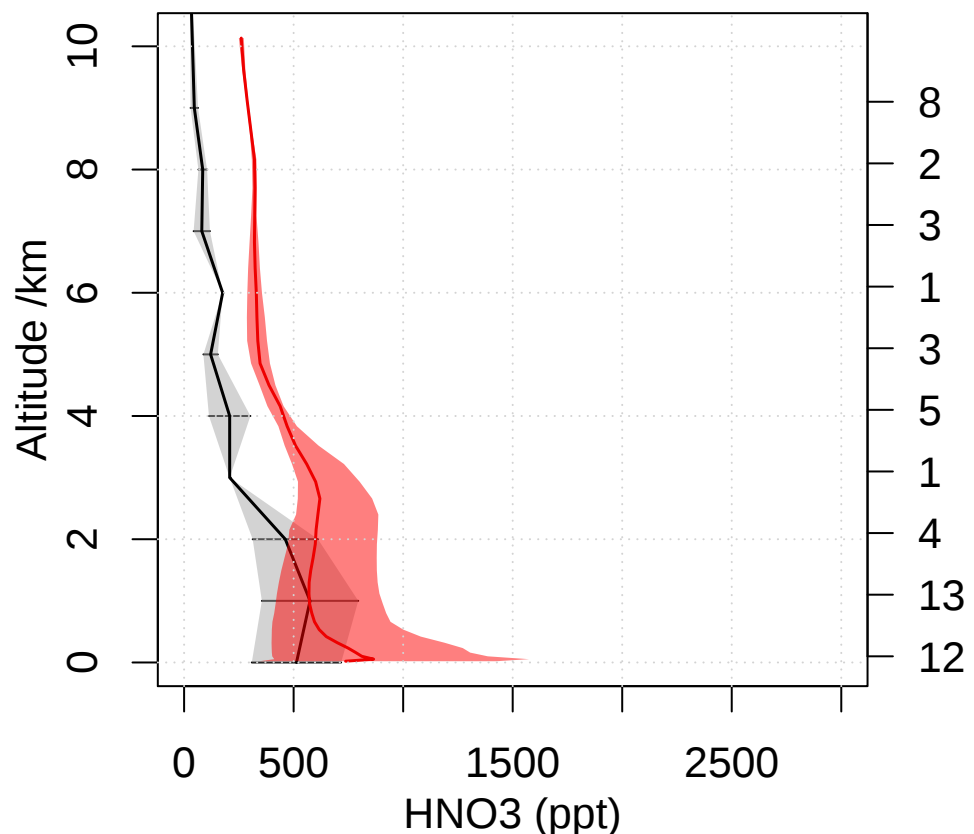
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



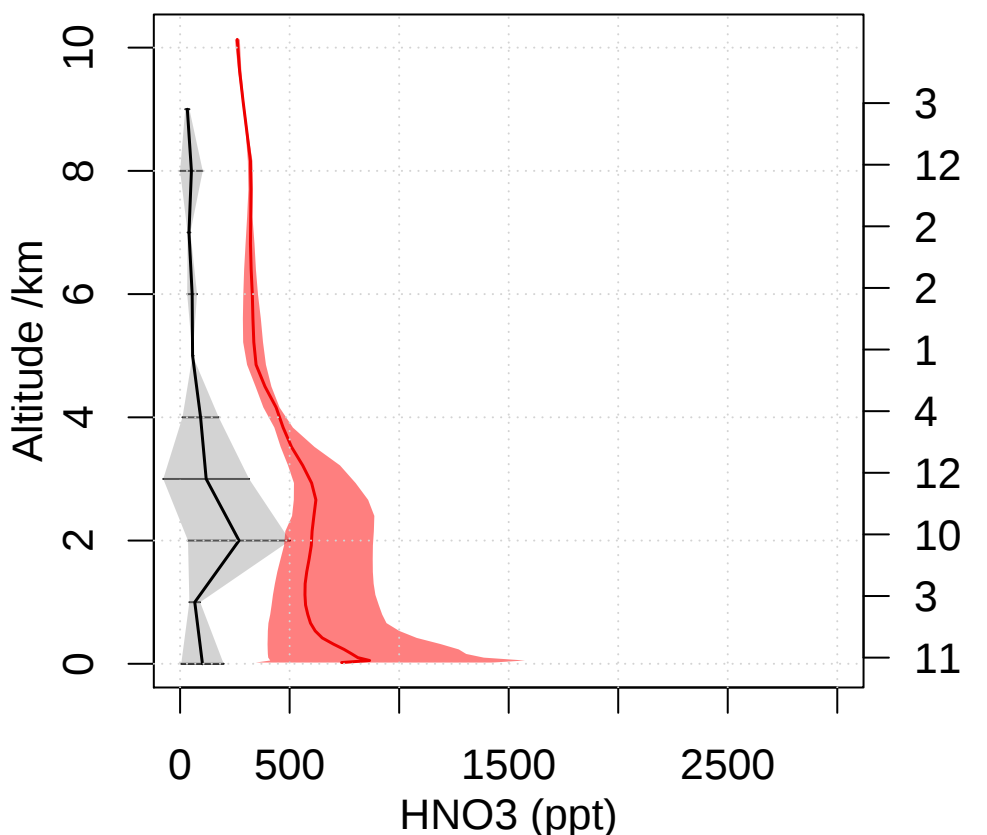
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



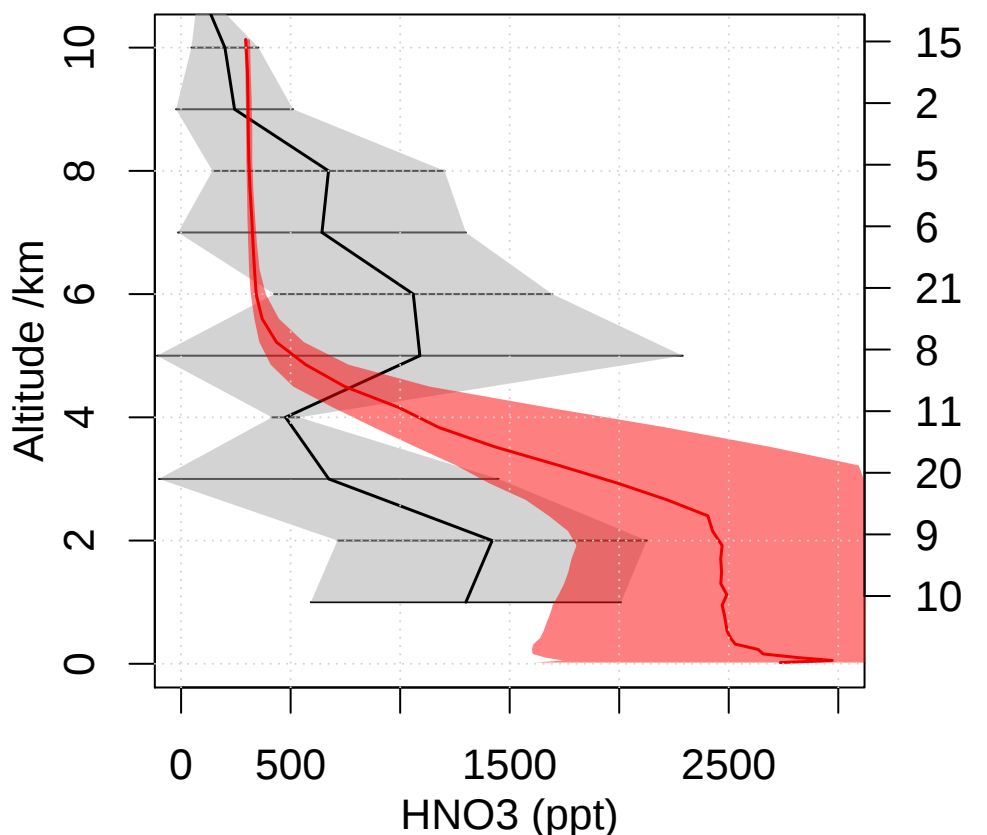
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



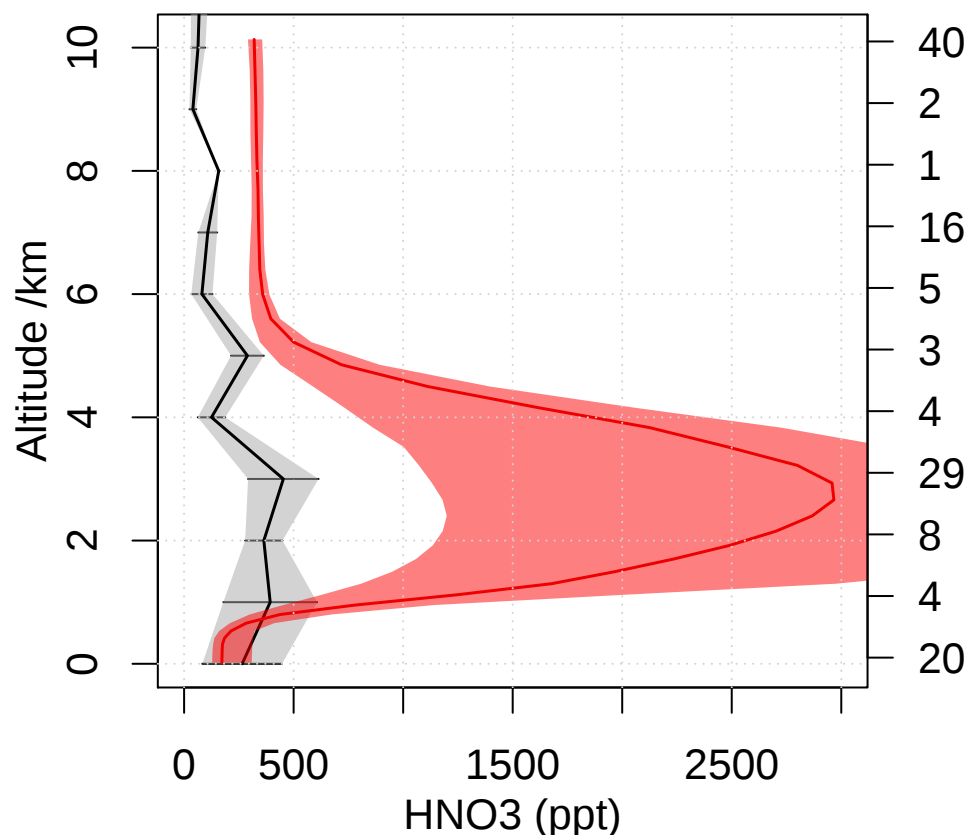
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35

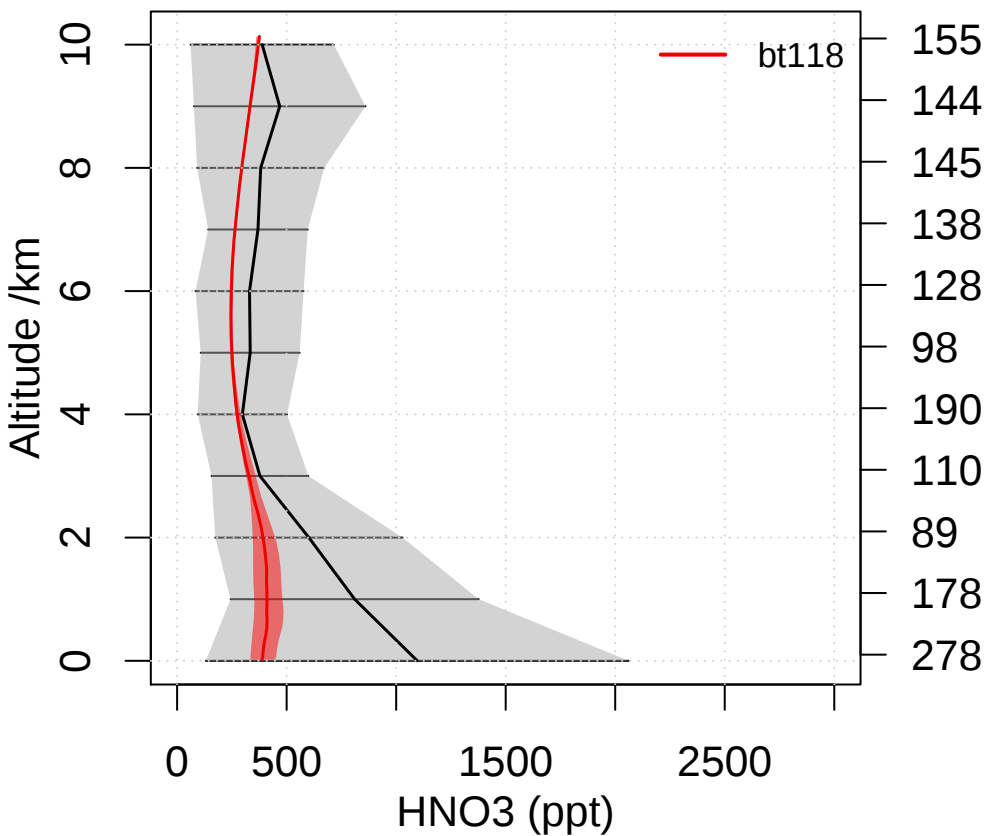


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

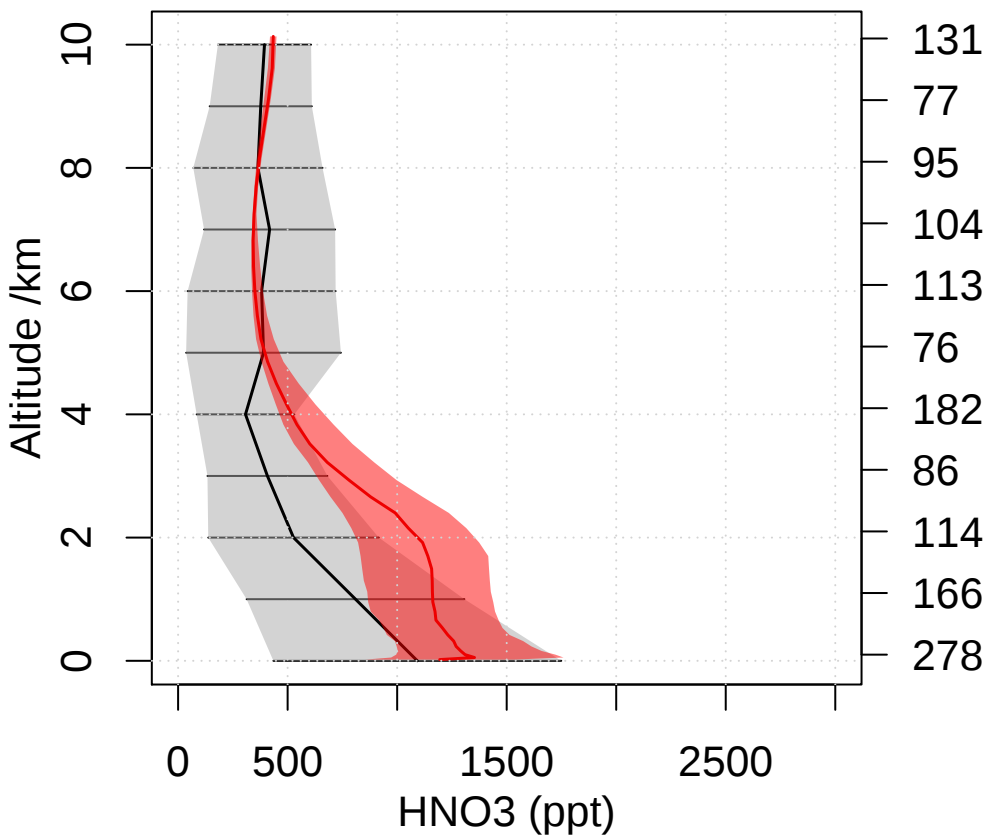


Emmons HNO3 comparison

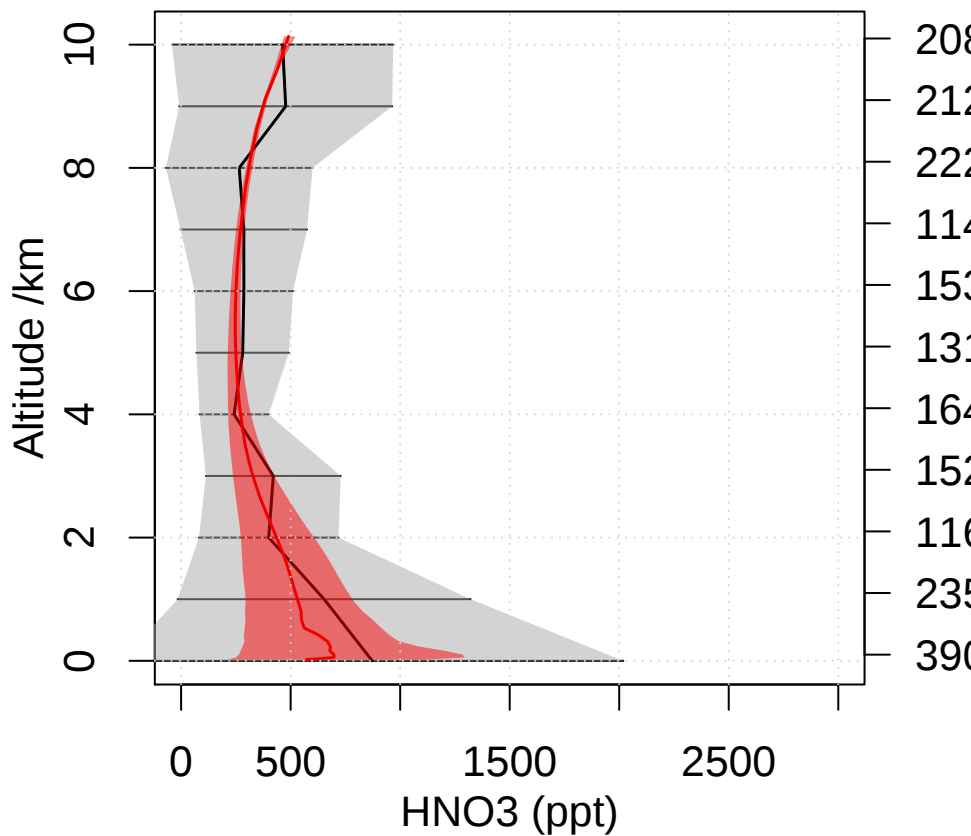
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



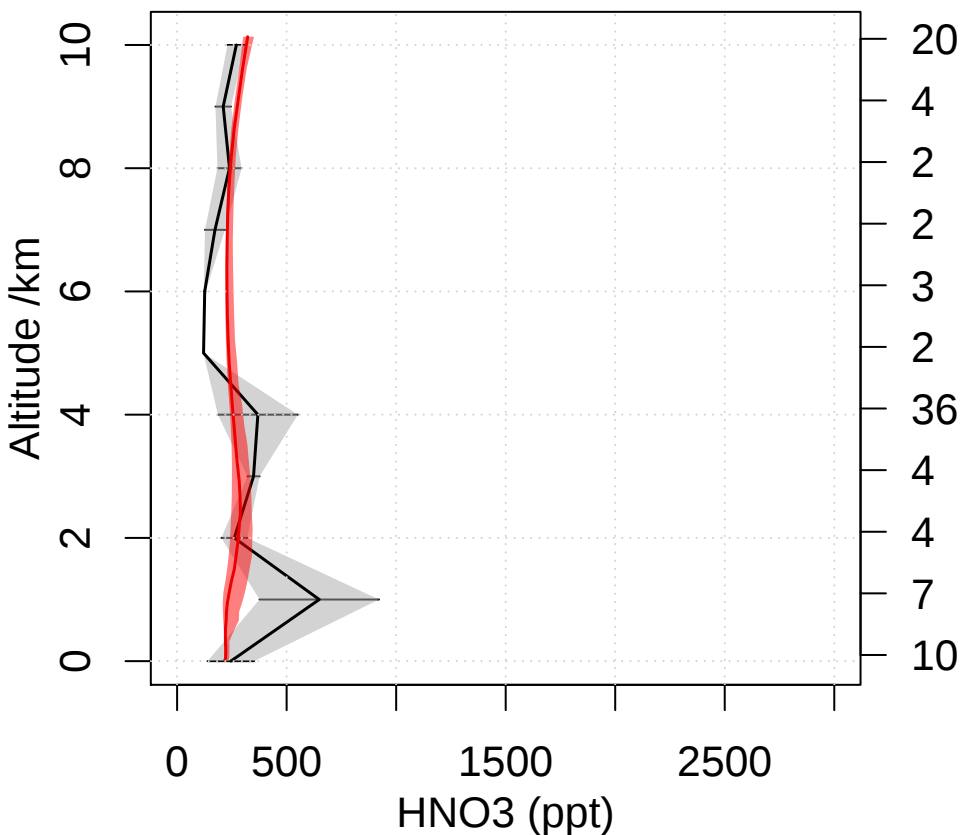
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



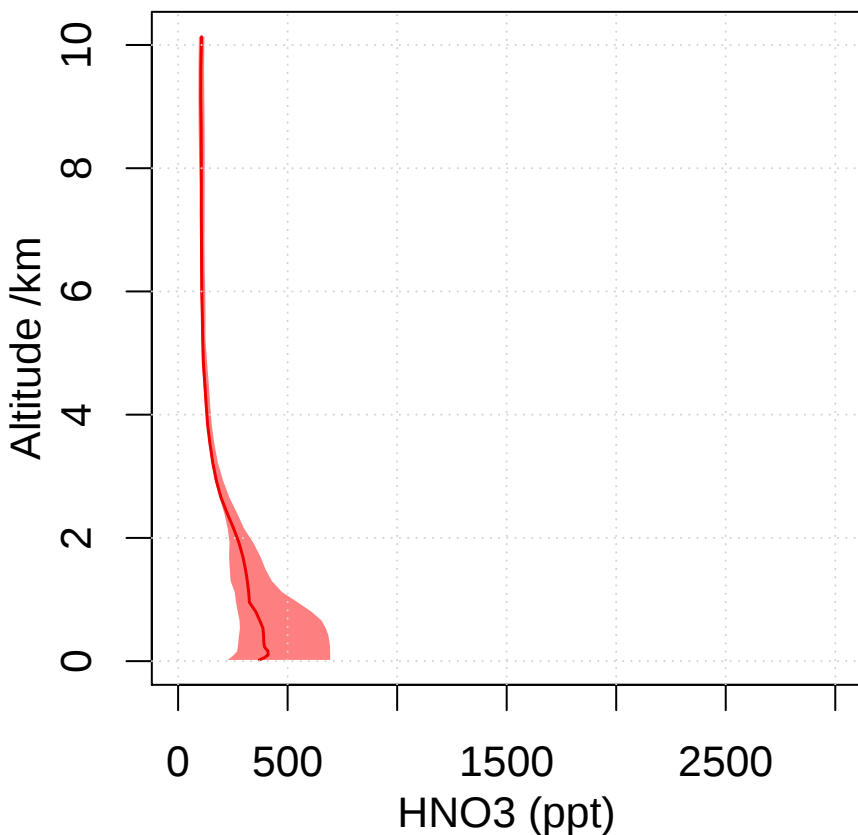
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



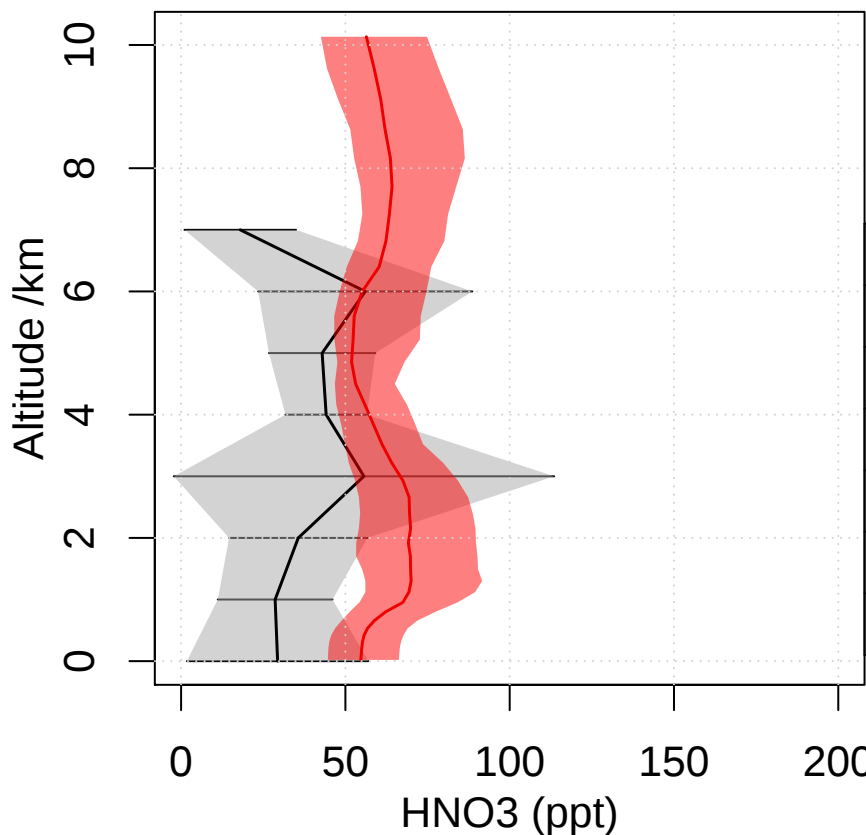
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



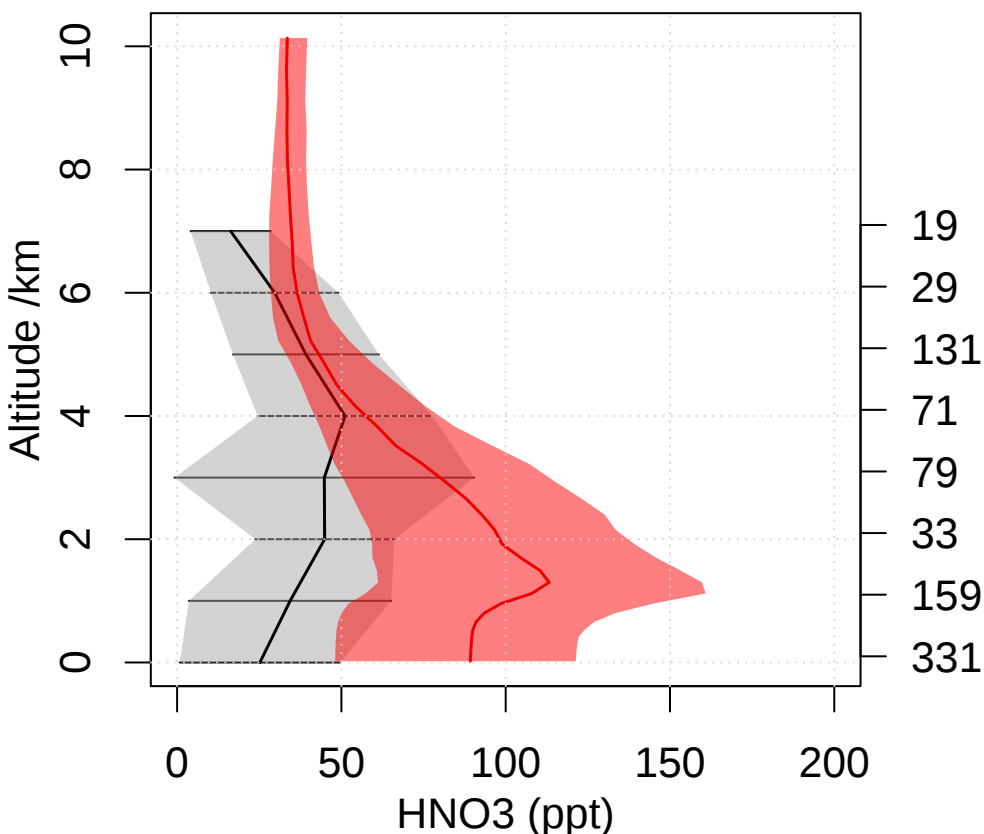
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



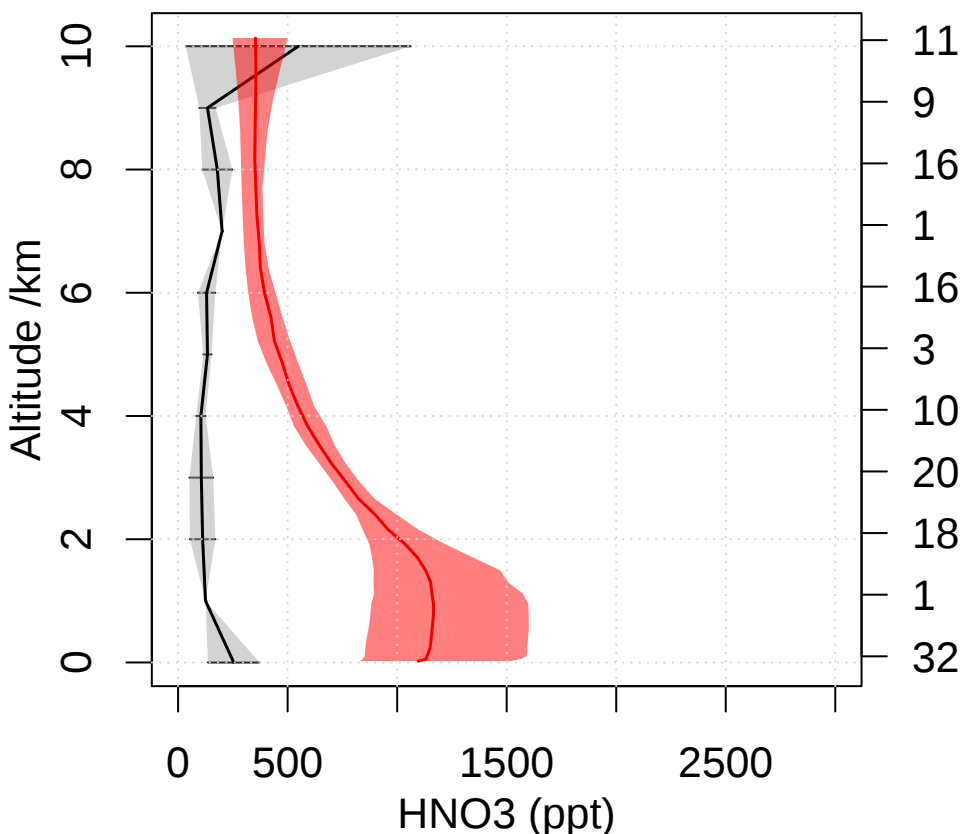
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



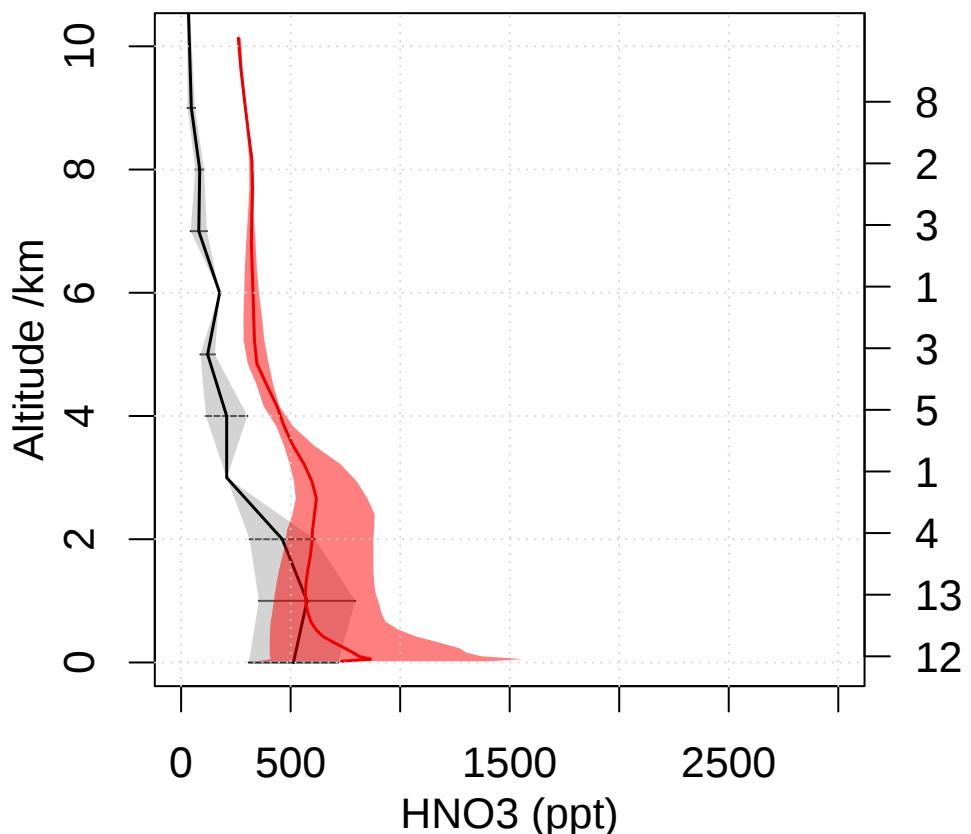
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



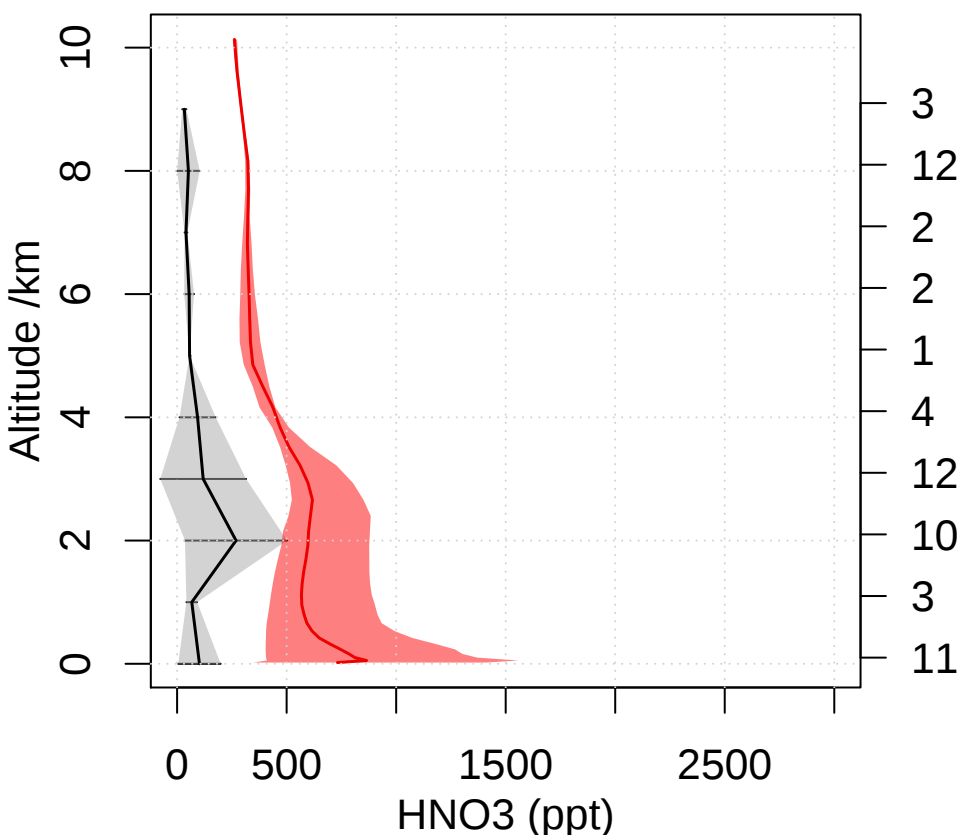
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



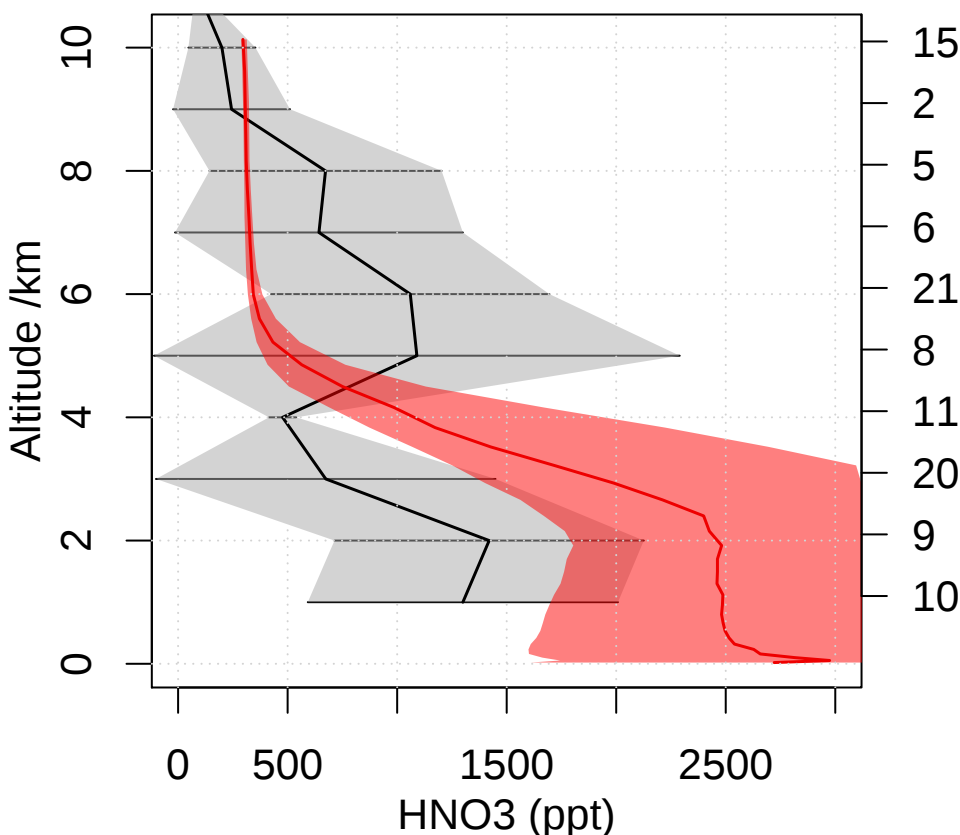
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



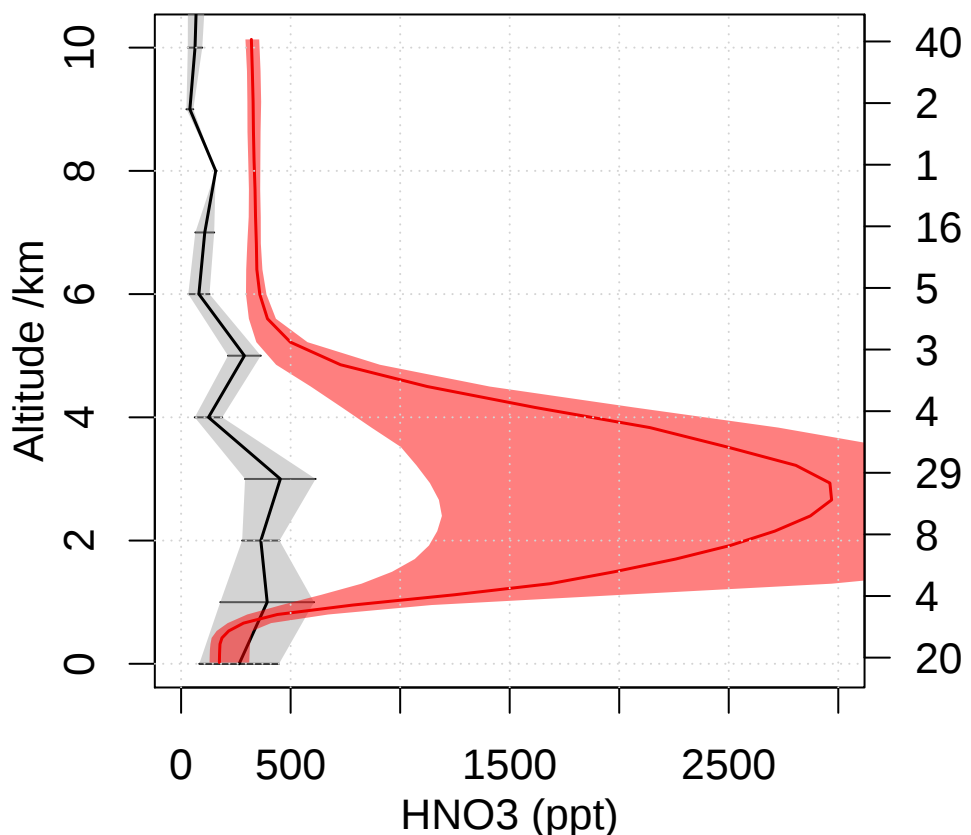
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35

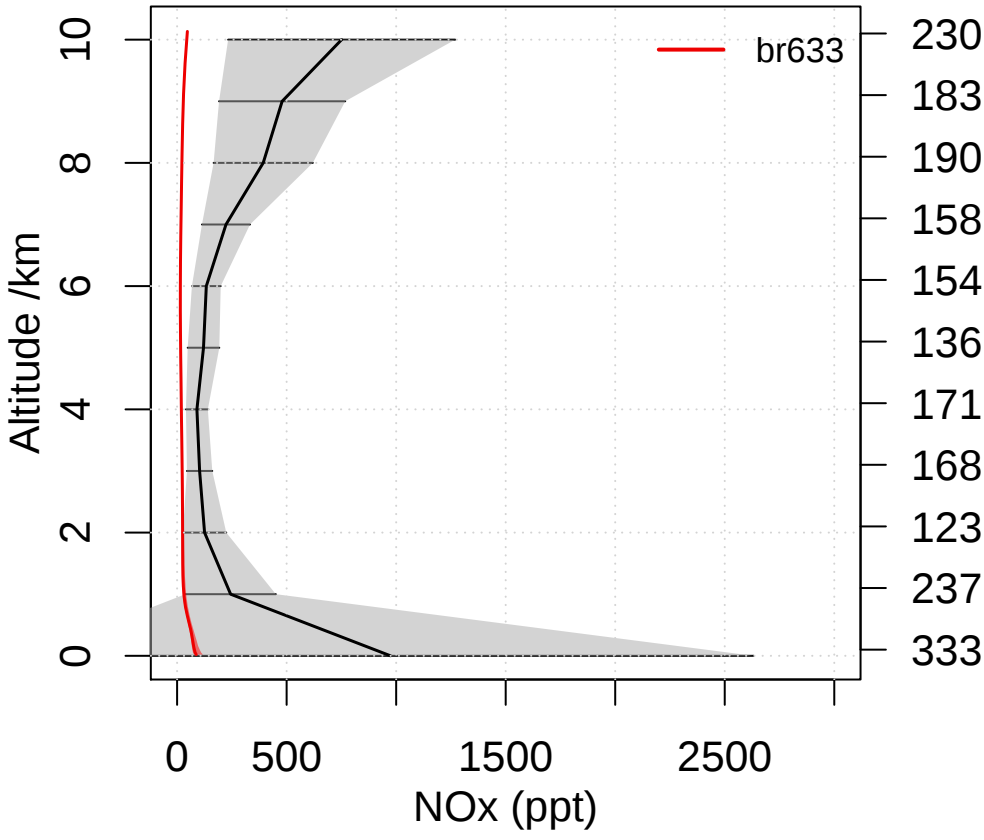


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

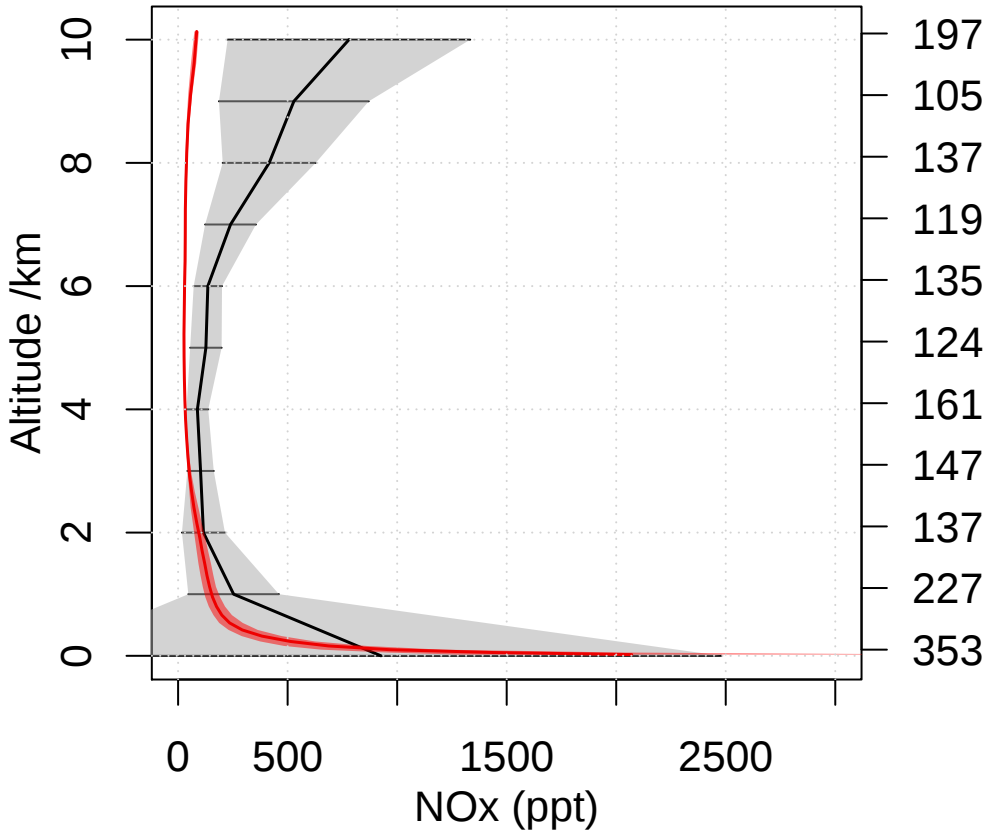


Emmons NOx comparison

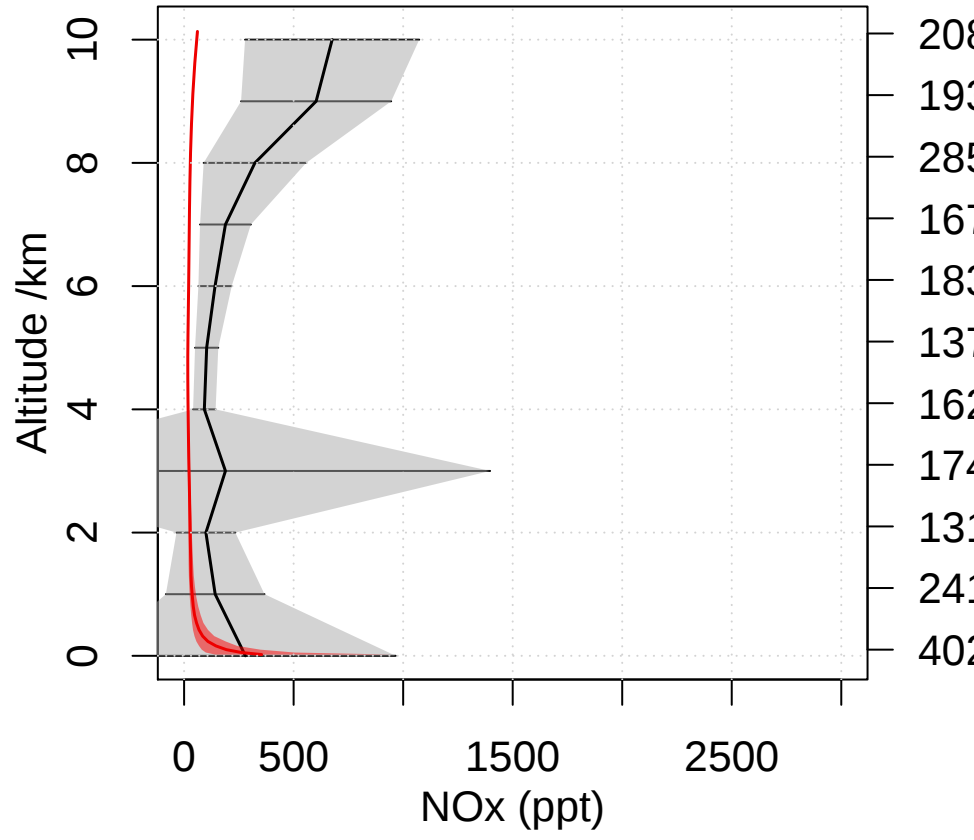
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



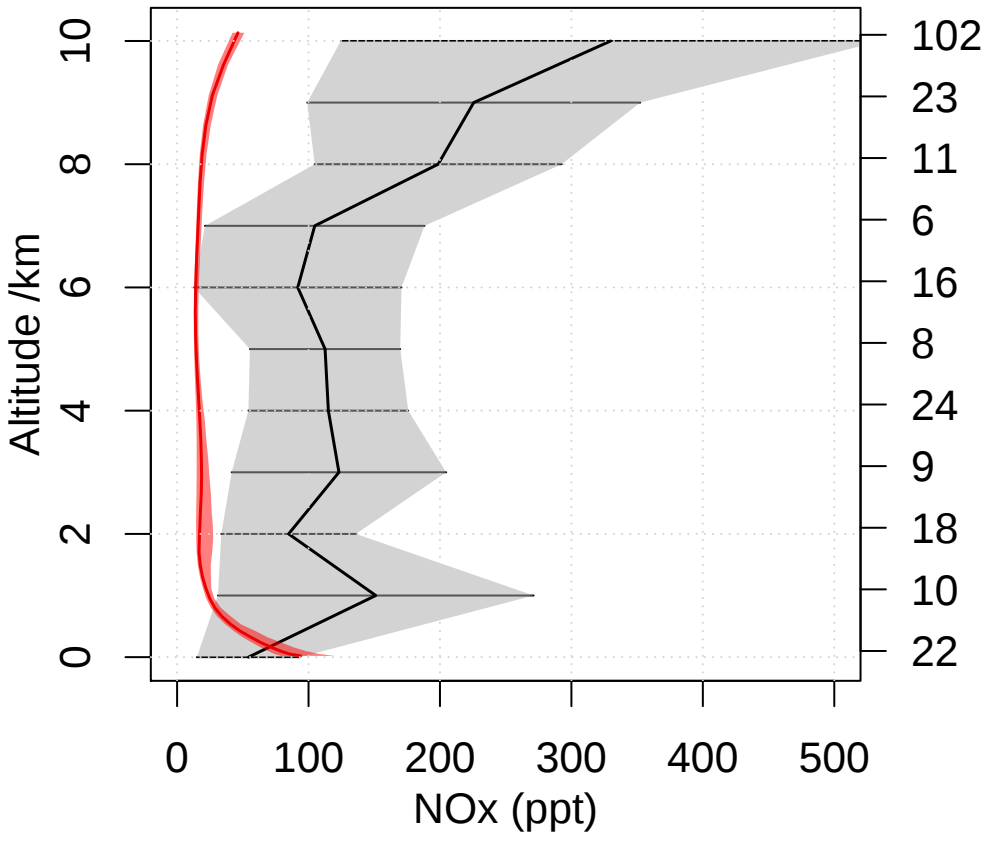
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



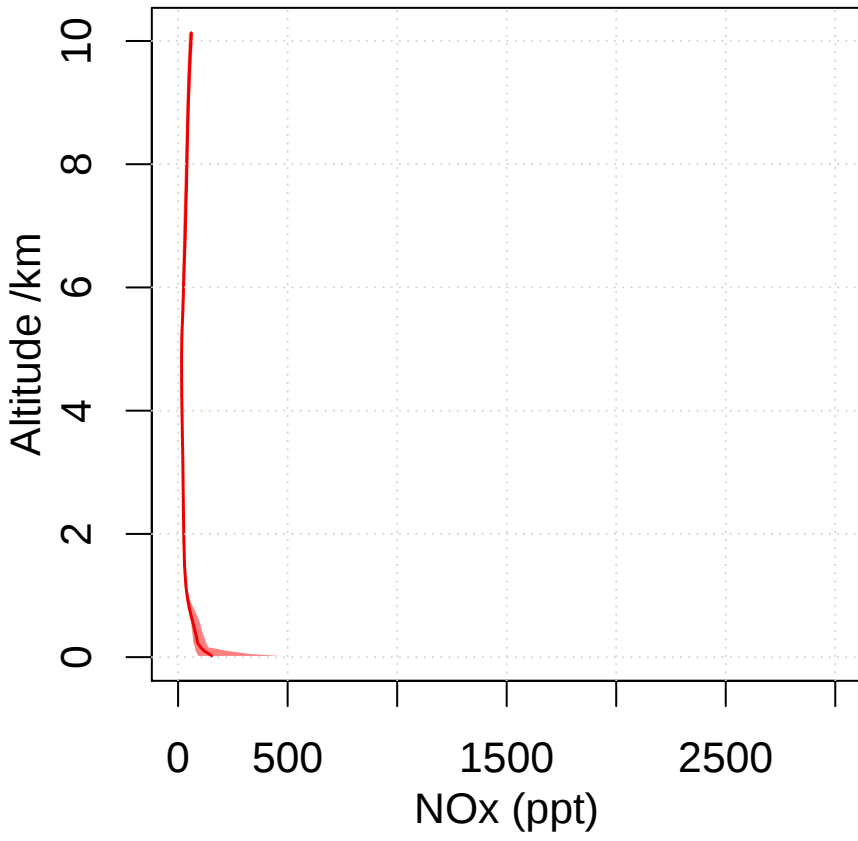
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



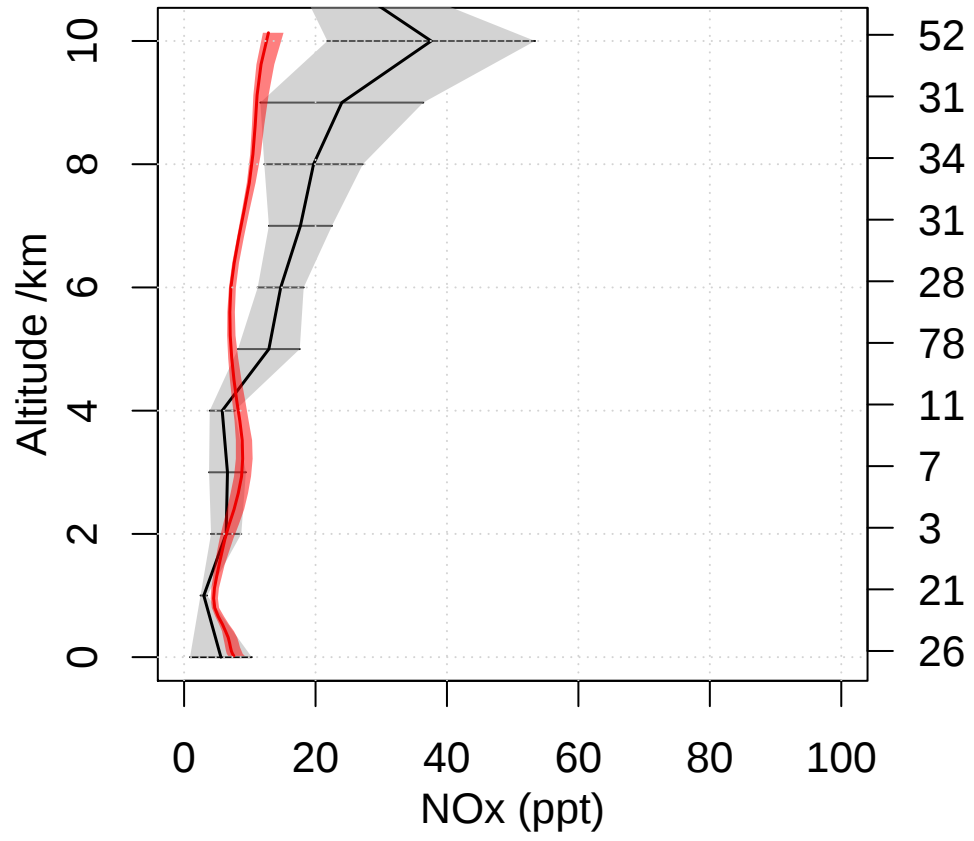
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



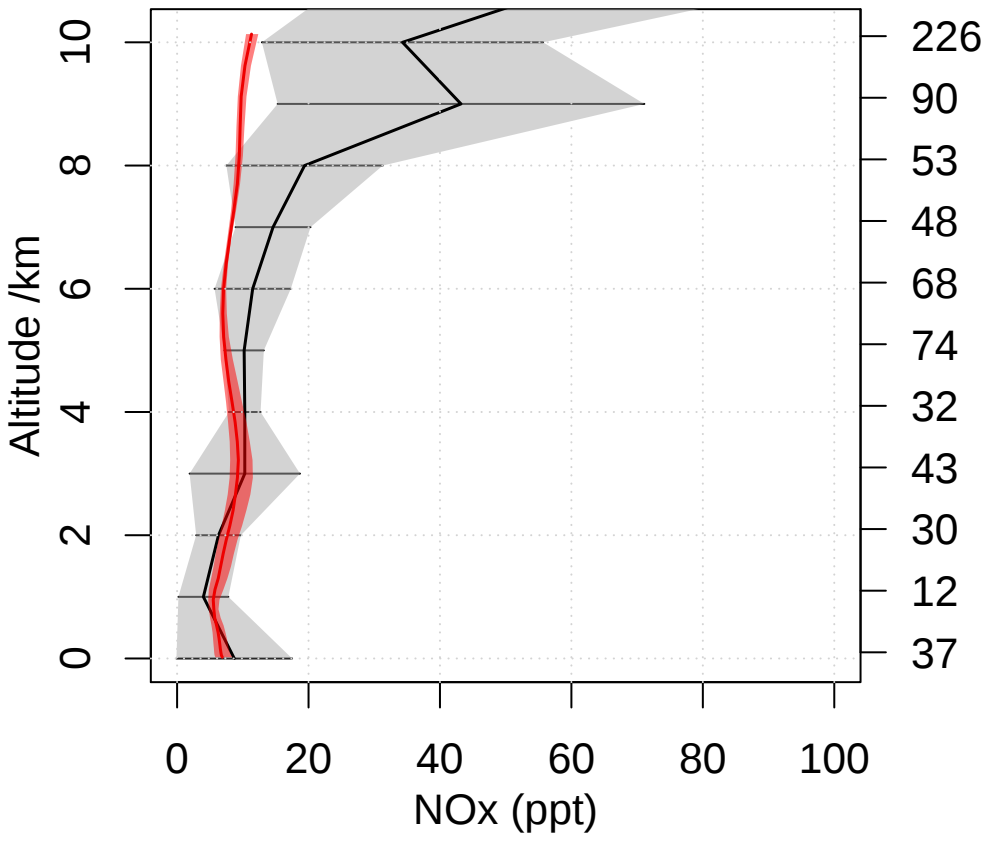
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



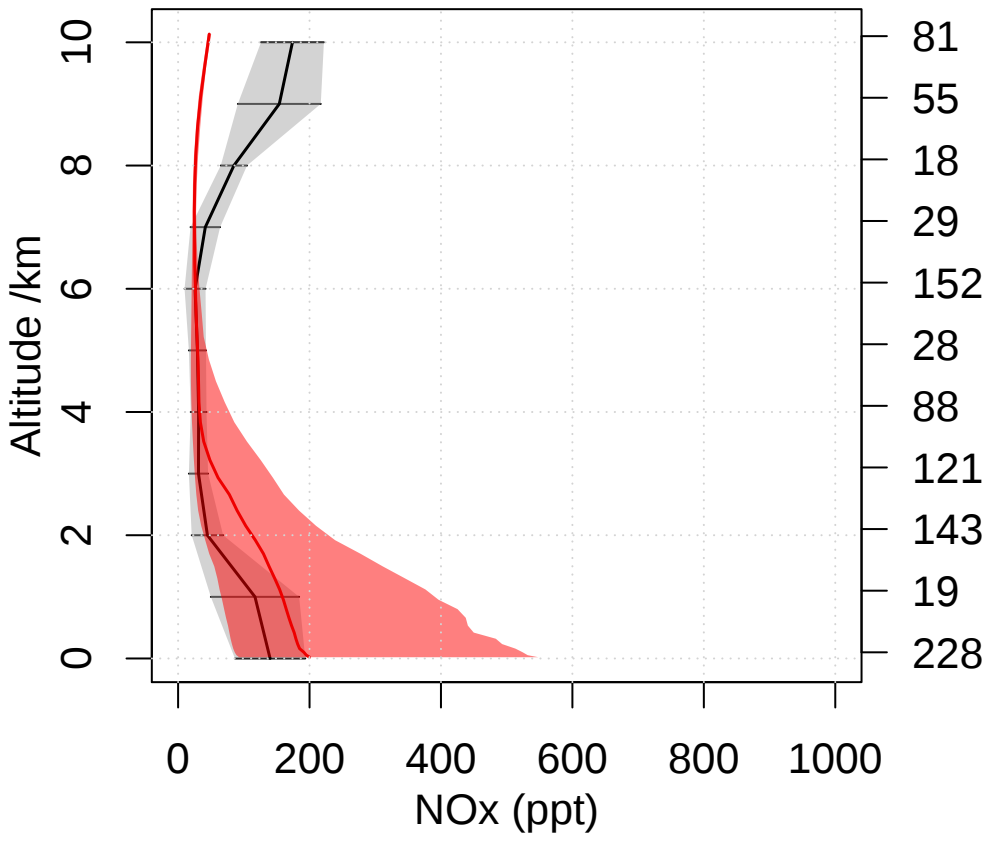
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



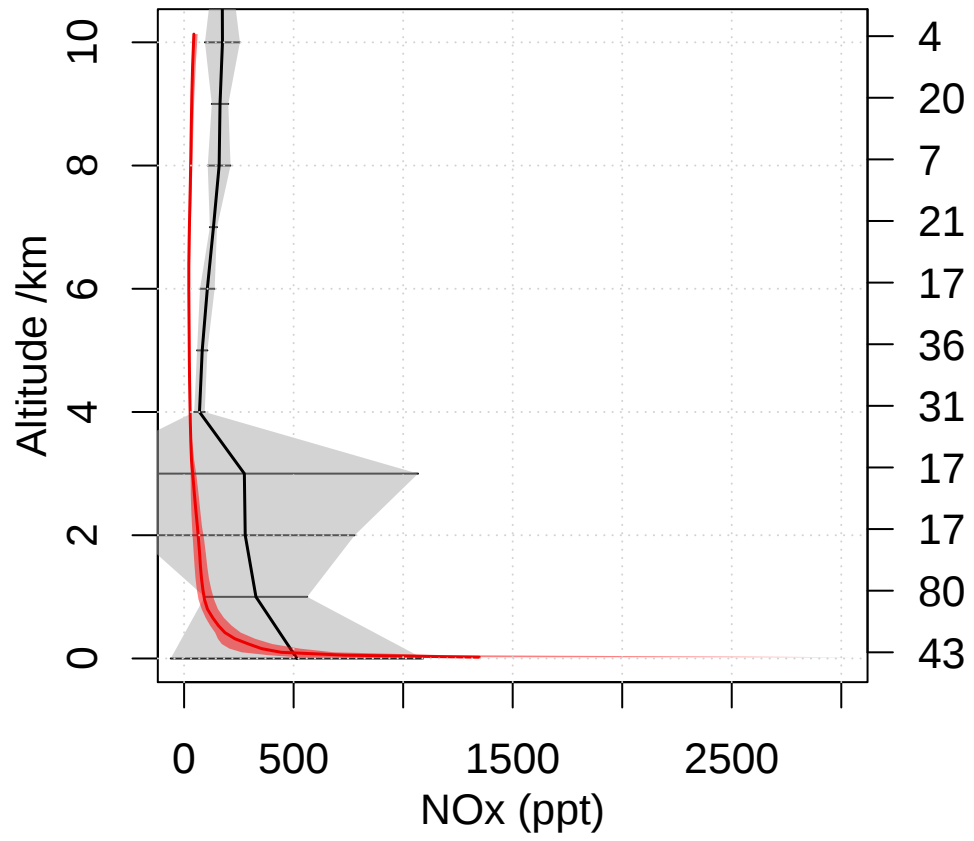
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



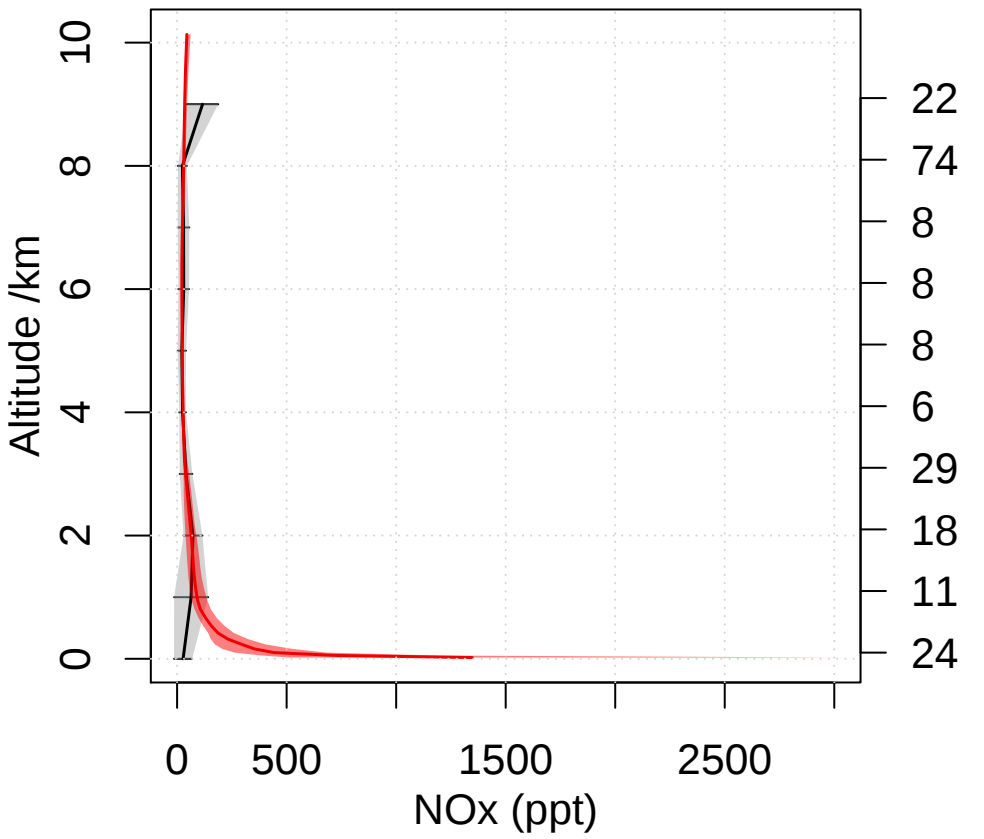
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



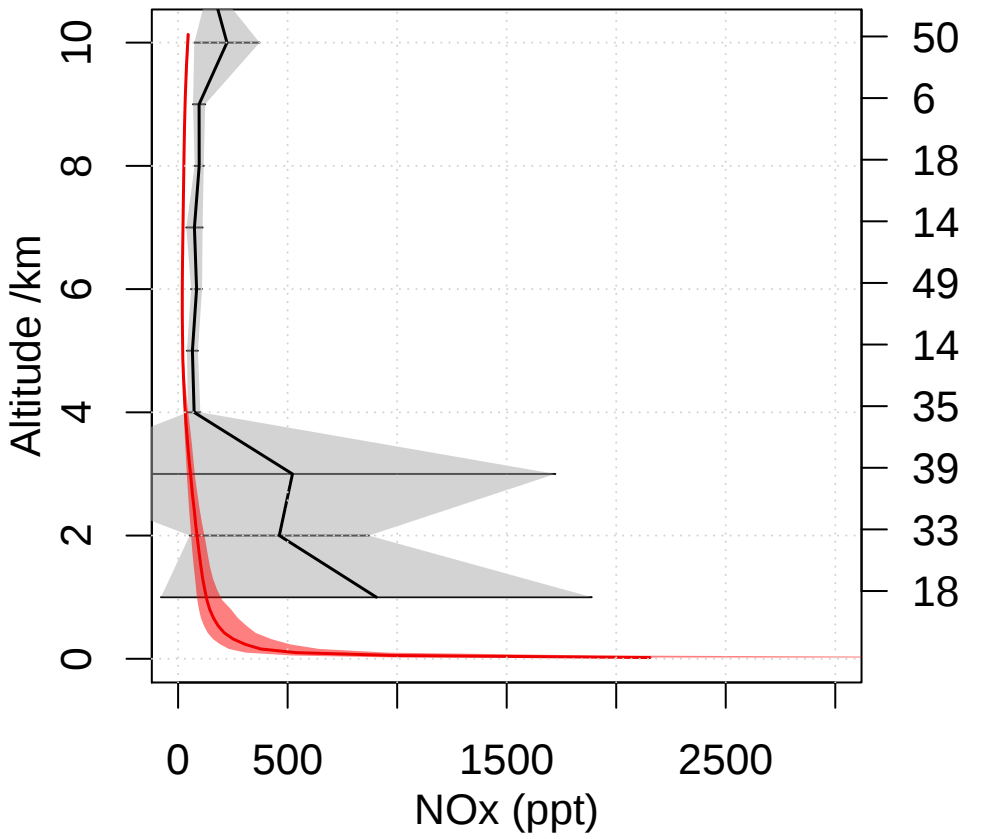
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



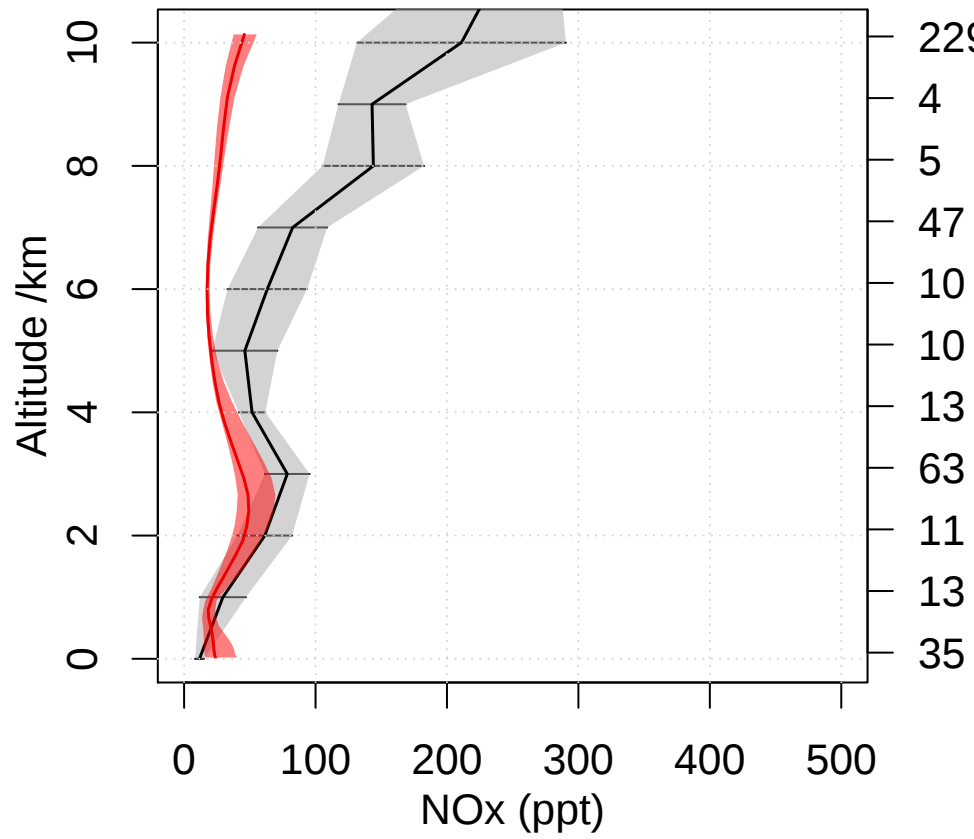
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35

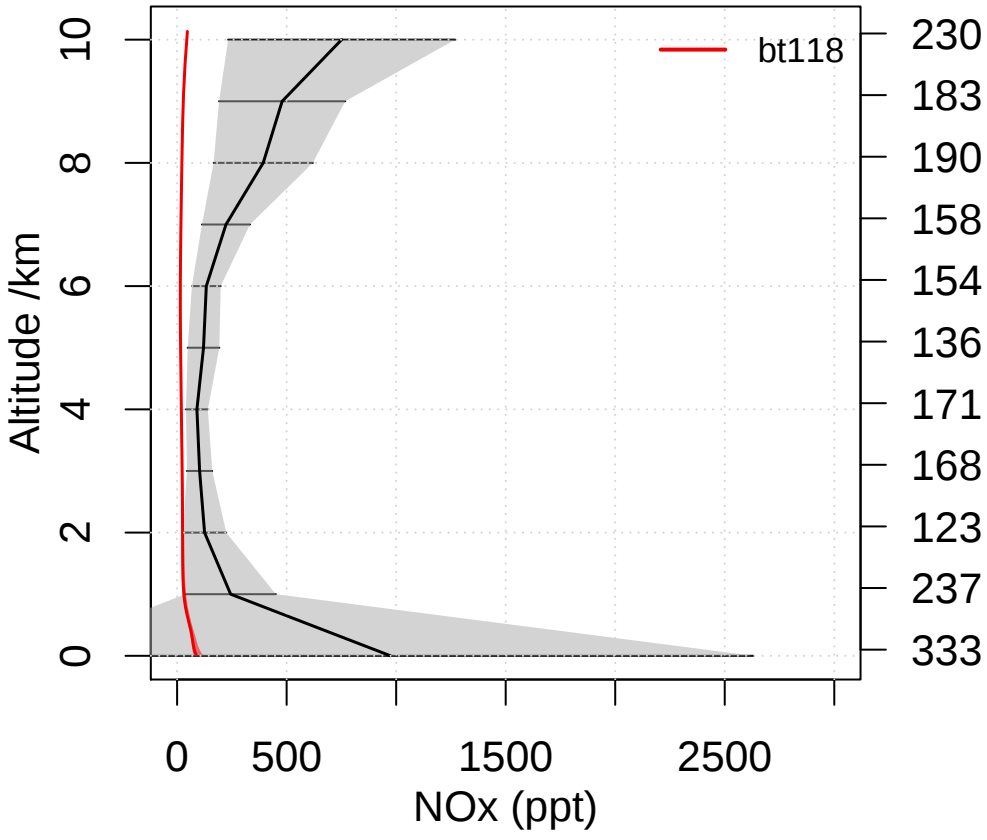


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

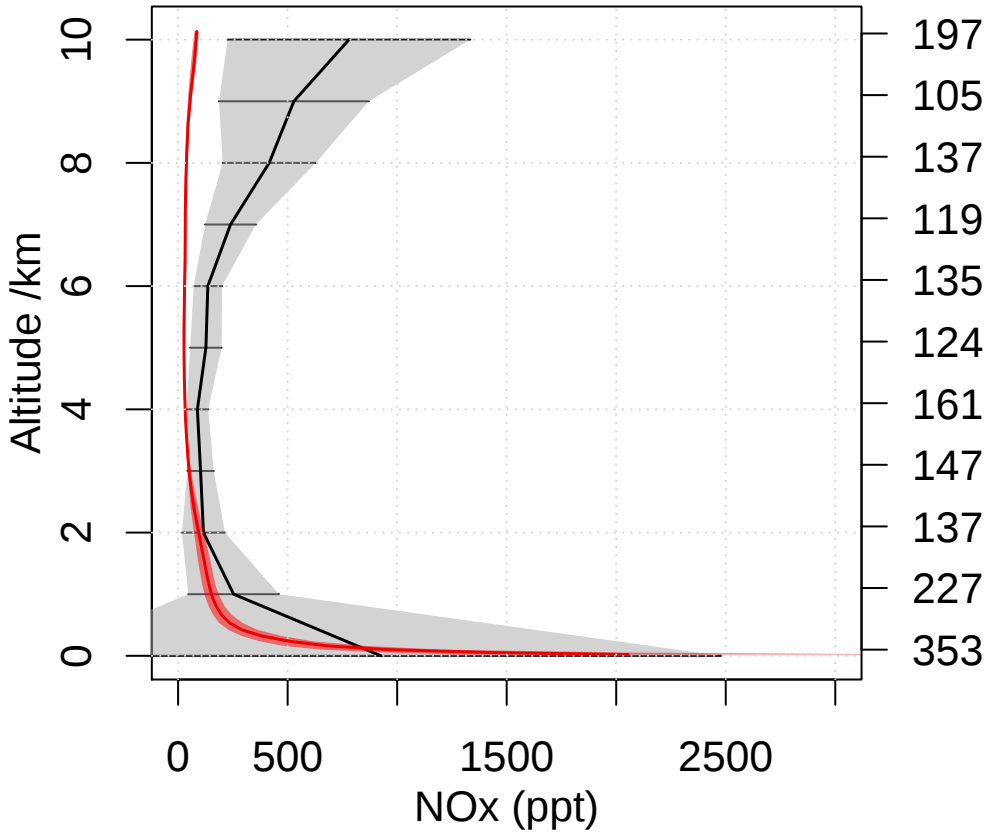


Emmons NOx comparison

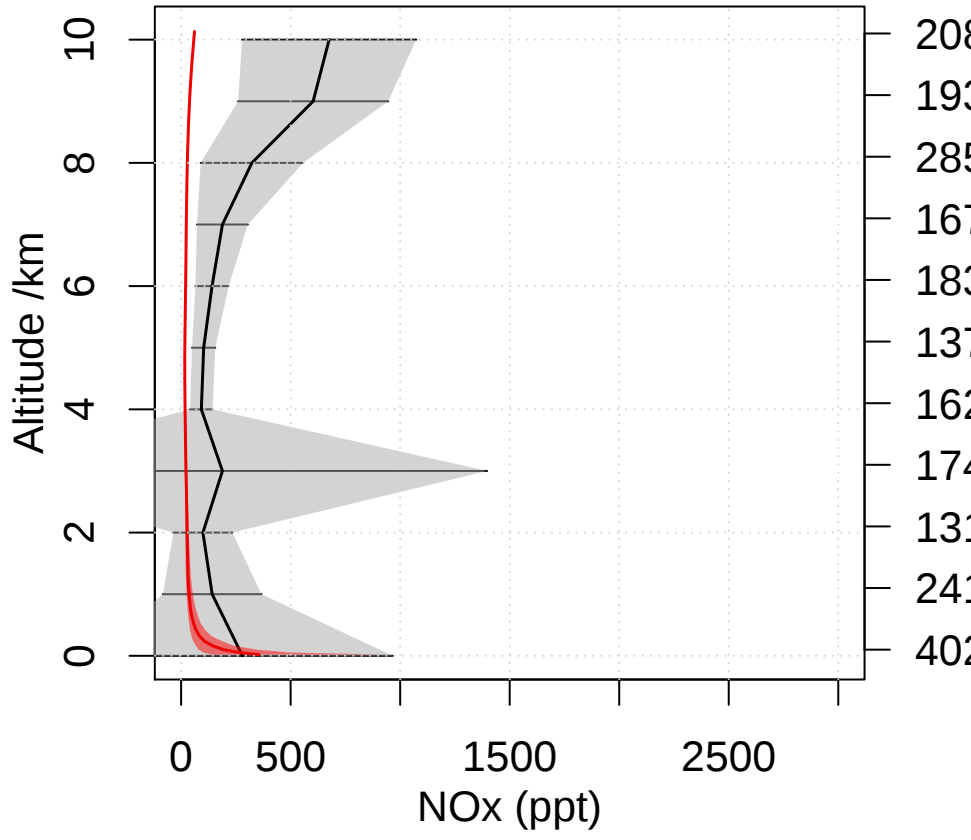
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



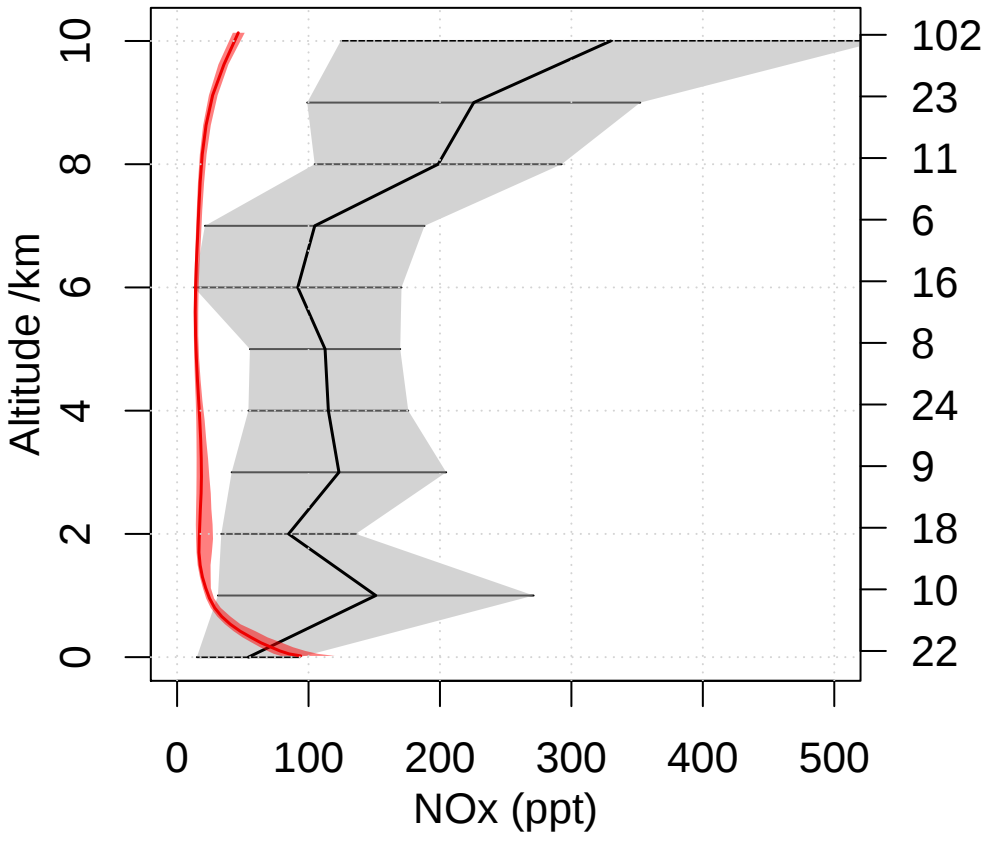
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



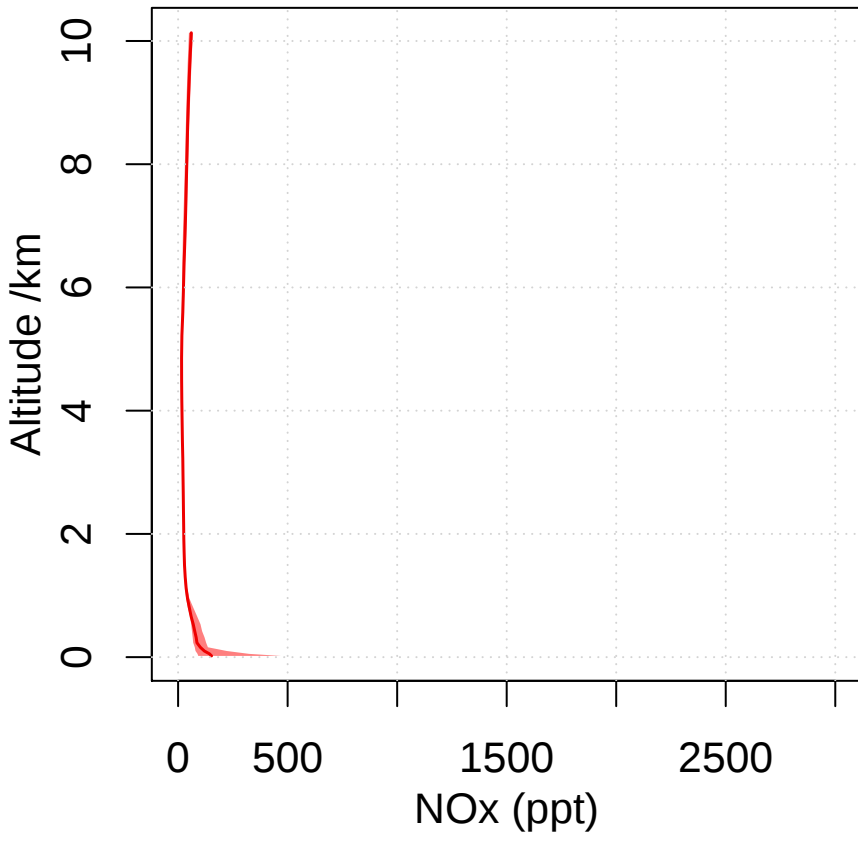
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



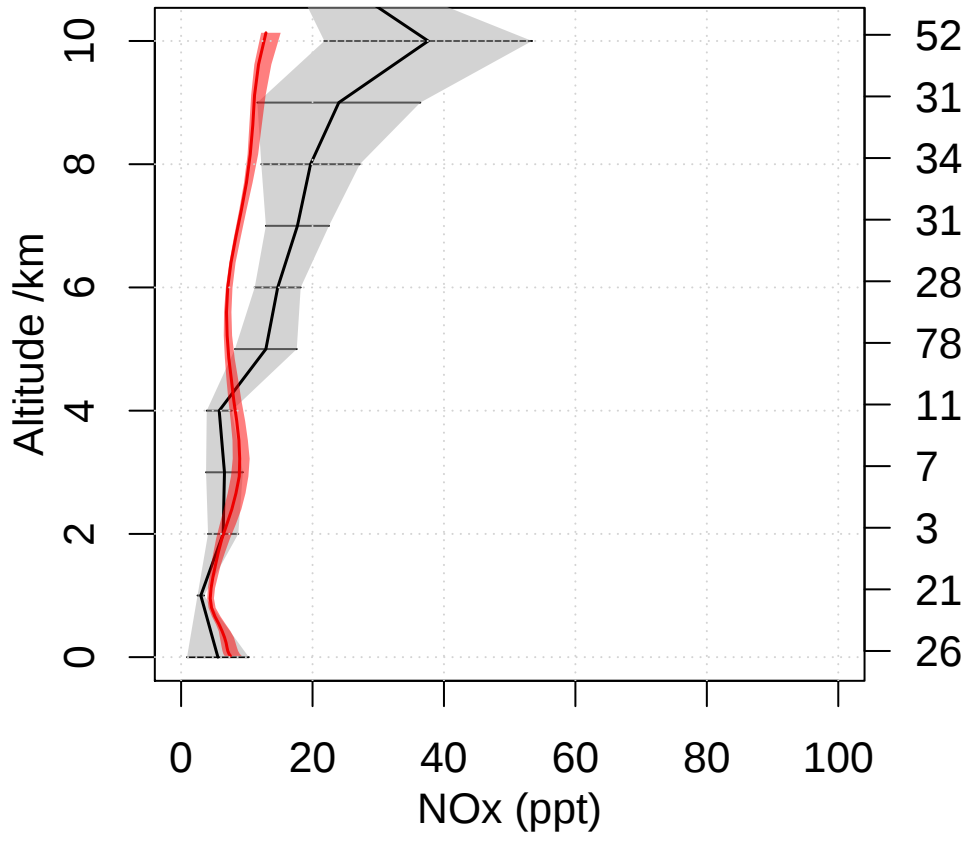
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



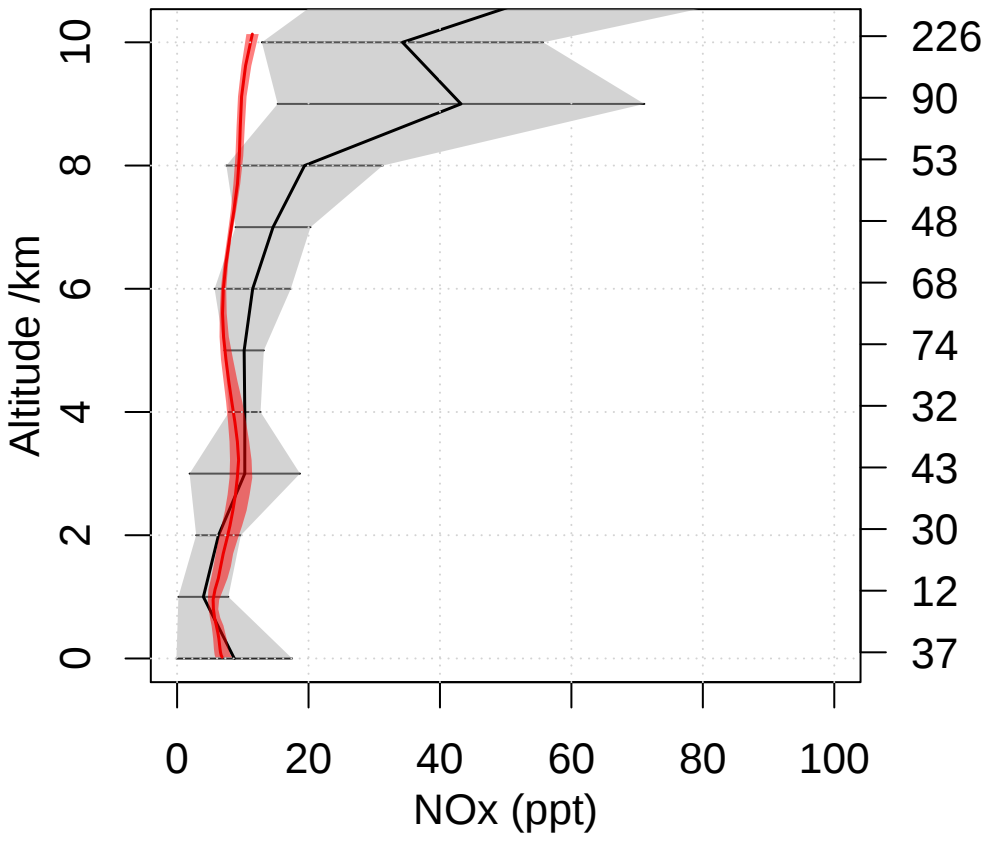
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



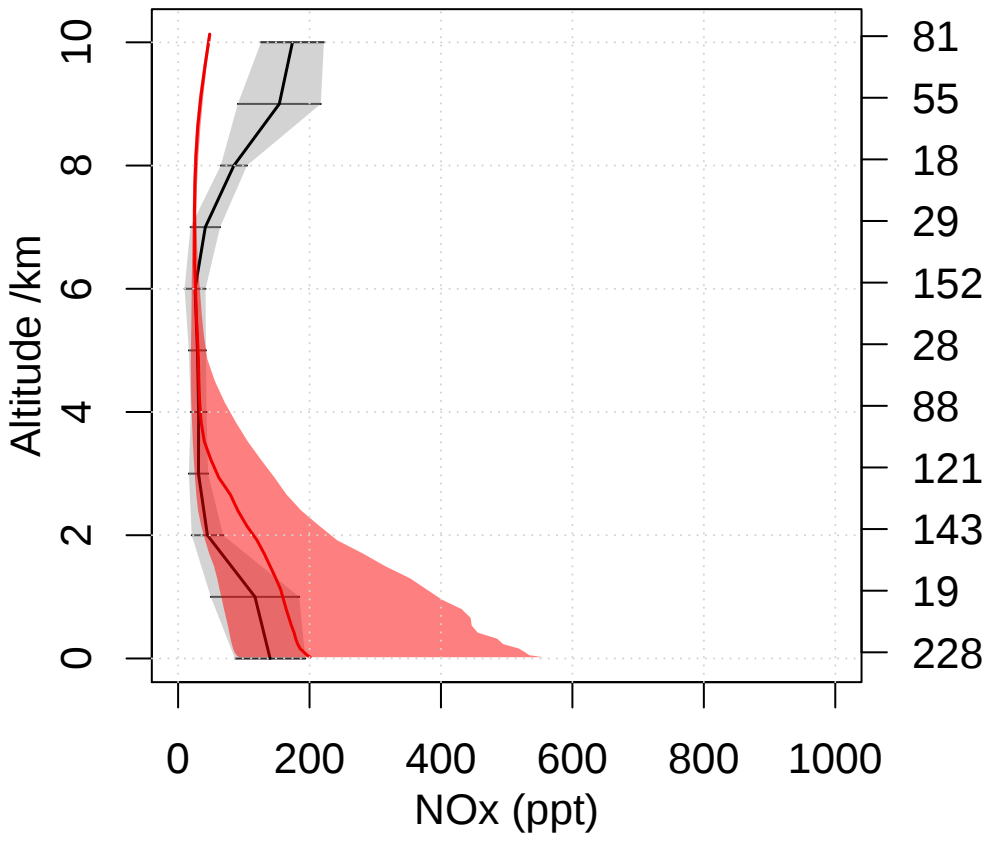
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



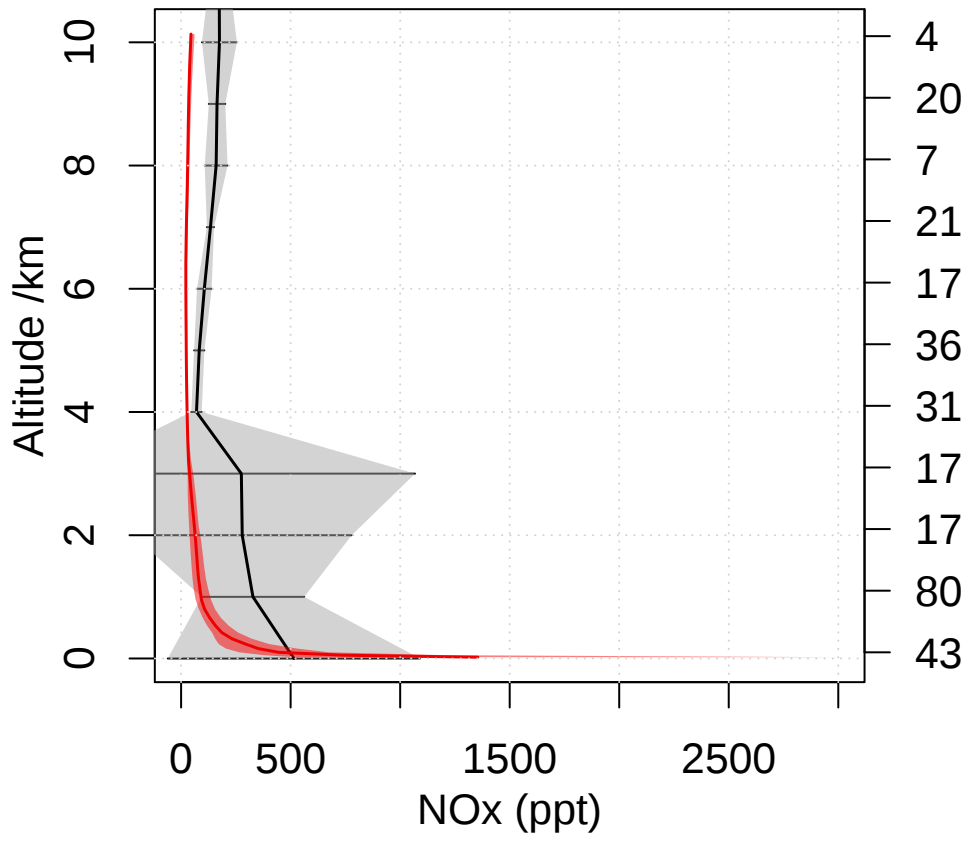
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



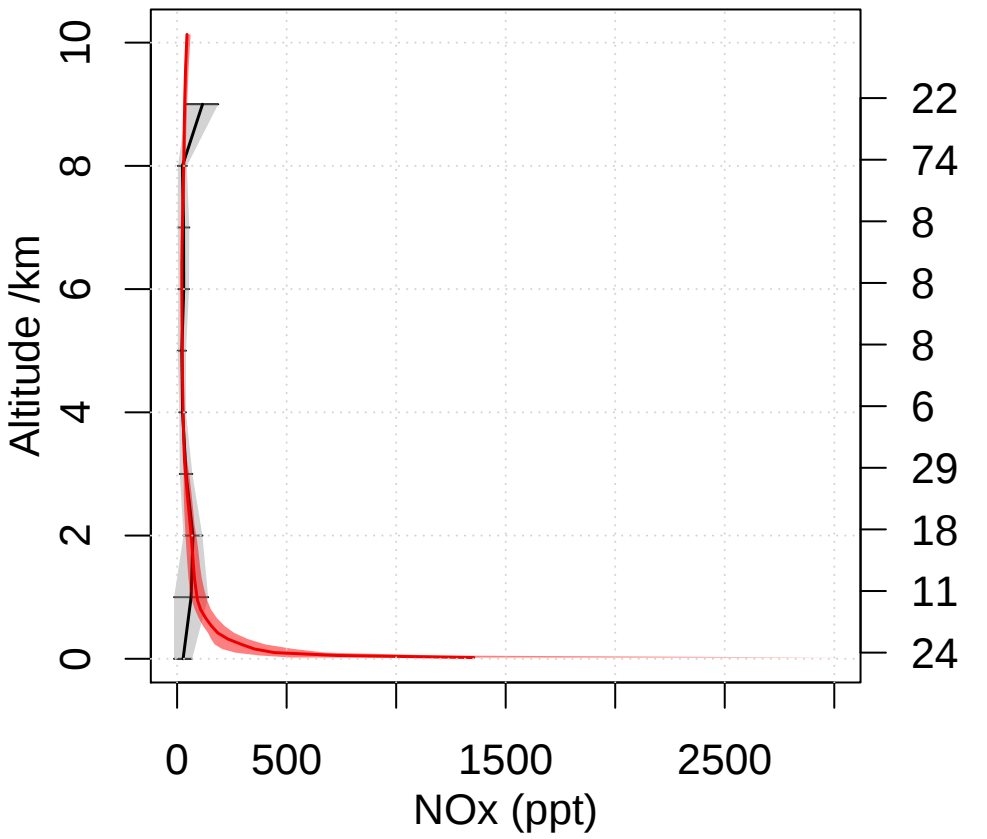
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



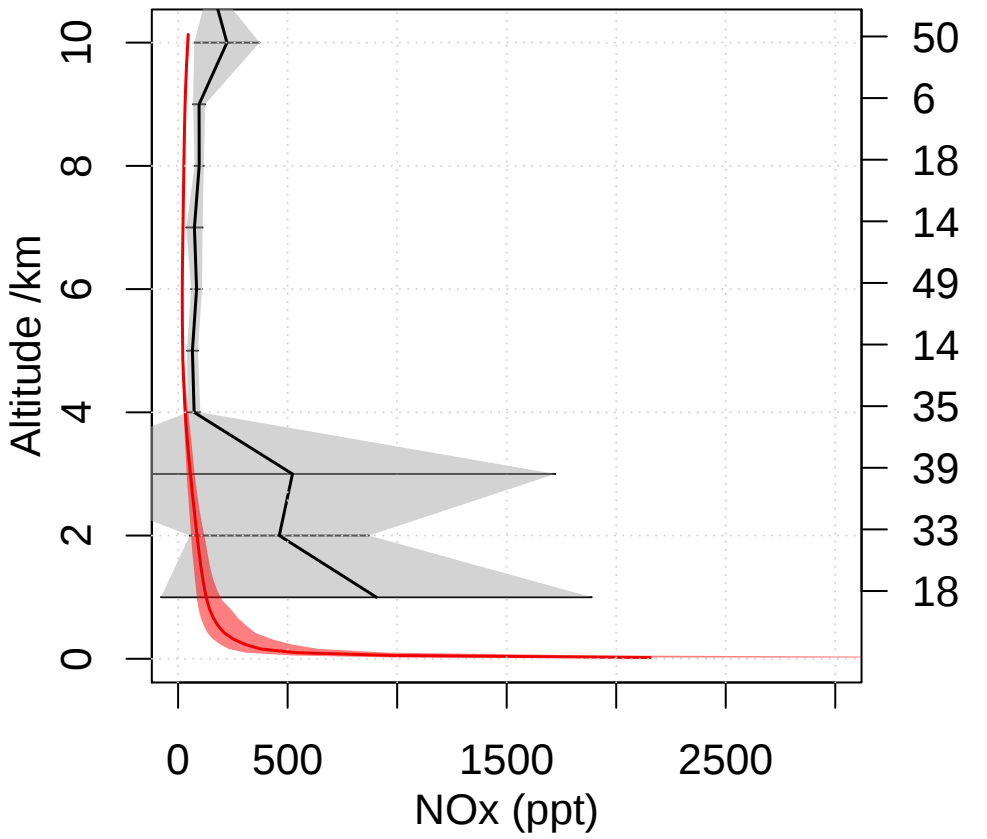
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



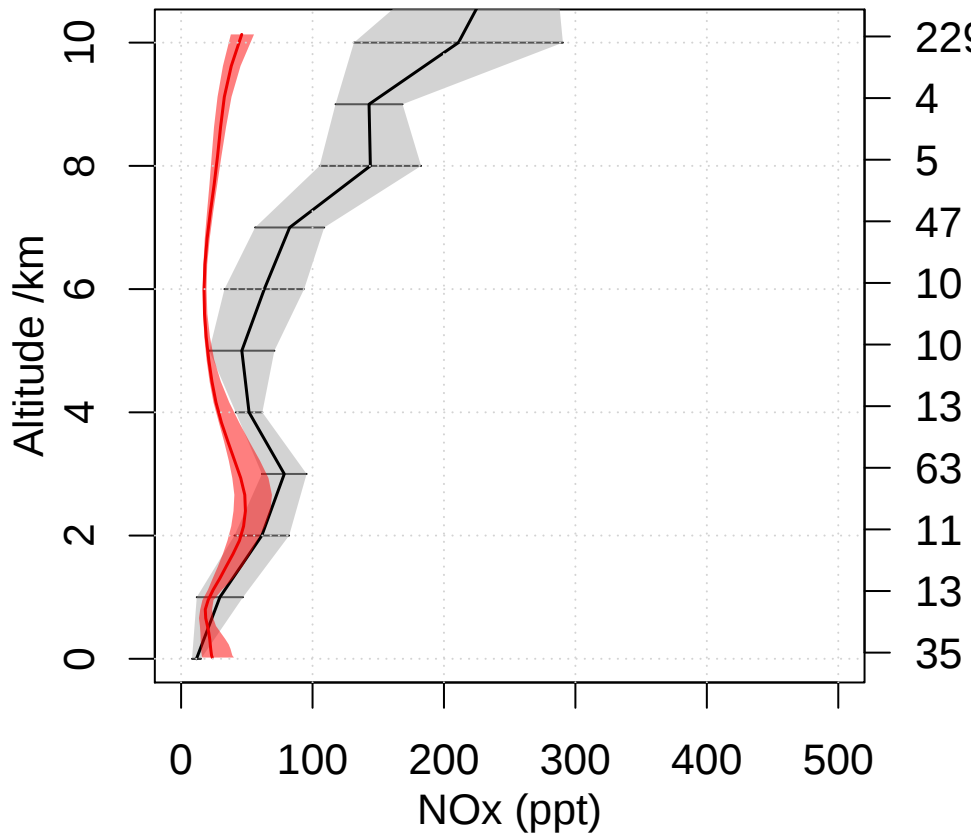
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35



TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10



UKCA br633

[OH] Air mass weighted (10⁶ molecules cm⁻³)

Red: Spivakovsky values

Mean OH= 1.29e+06 molec/cm³

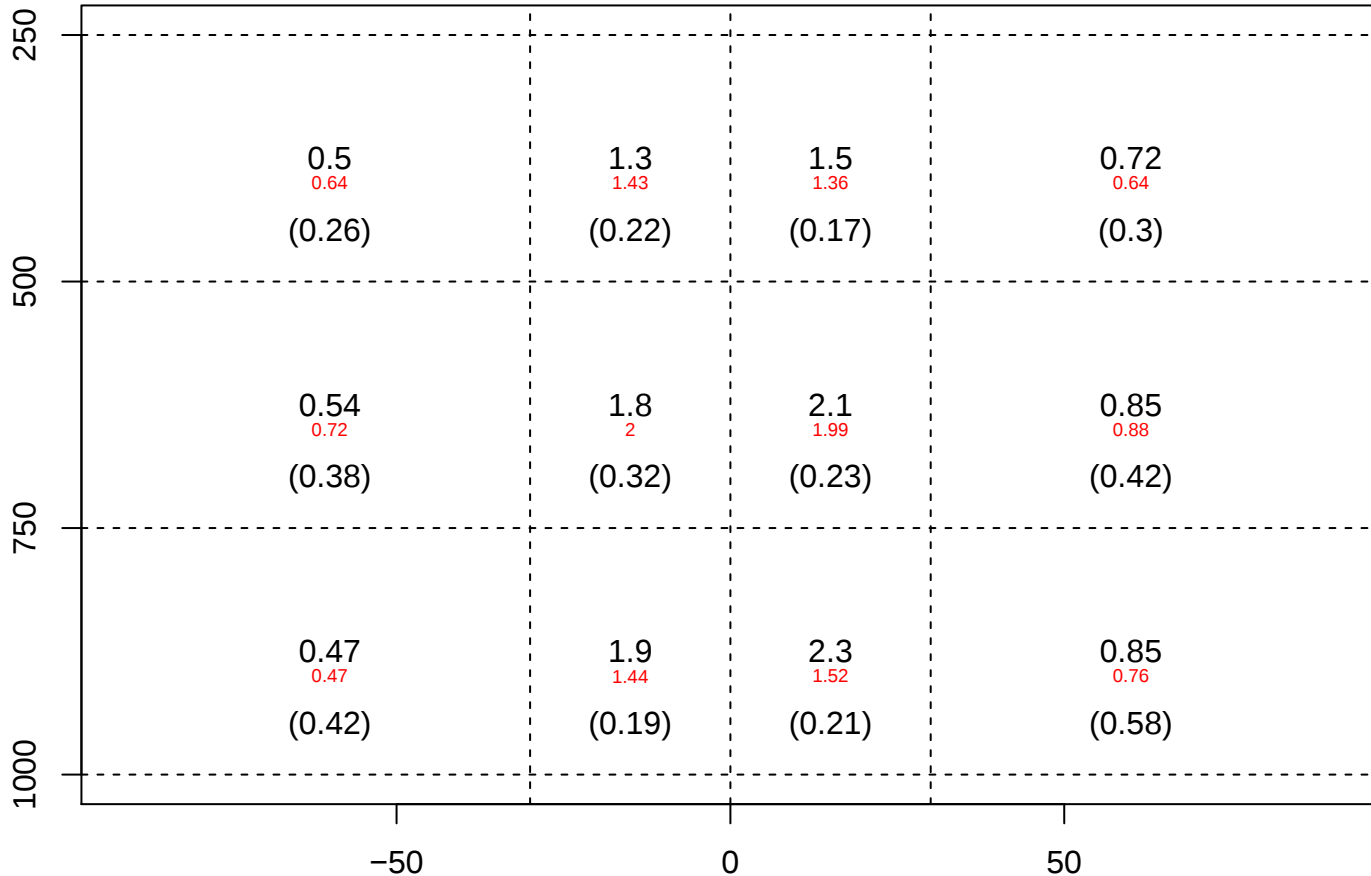
Values in (): Std dev

ACCMIP Multi-model Mean= 1.17 (+/- 0.1) e+06 molec/cm³

NH:SH ratio= 1.33 Patra et al 2014: 0.97 +/- 0.12

Pressure (hPa)

Latitude



UKCA bt118

[OH] Air mass weighted (10⁶ molecules cm⁻³)

Mean OH= 1.3e+06 molec/cm3

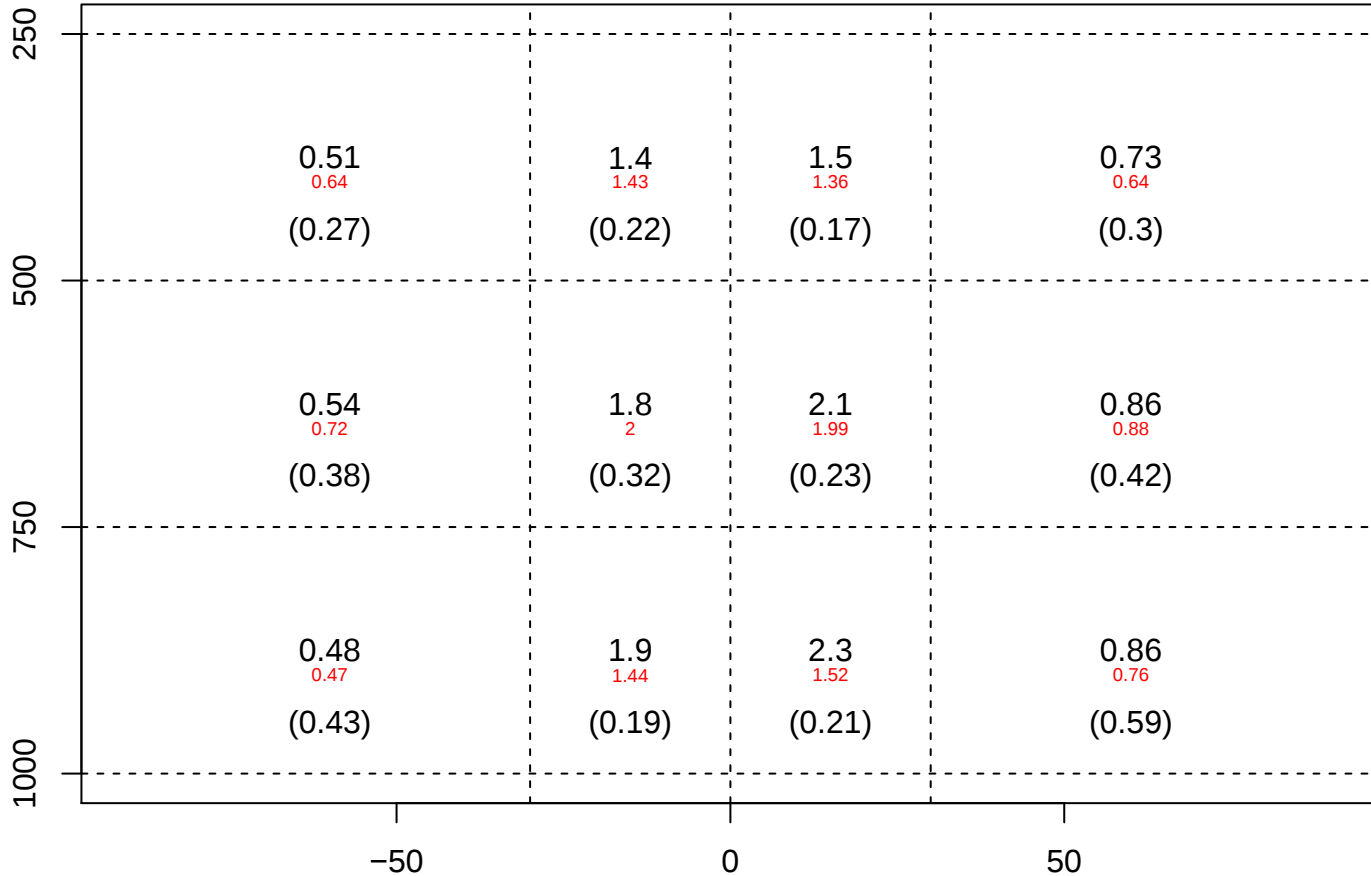
ACCMIP Multi-model Mean= 1.17 (+/- 0.1) e+06 molec/cm3

NH:SH ratio= 1.33 Patra et al 2014: 0.97 +/- 0.12

Red: Spivakovsky values

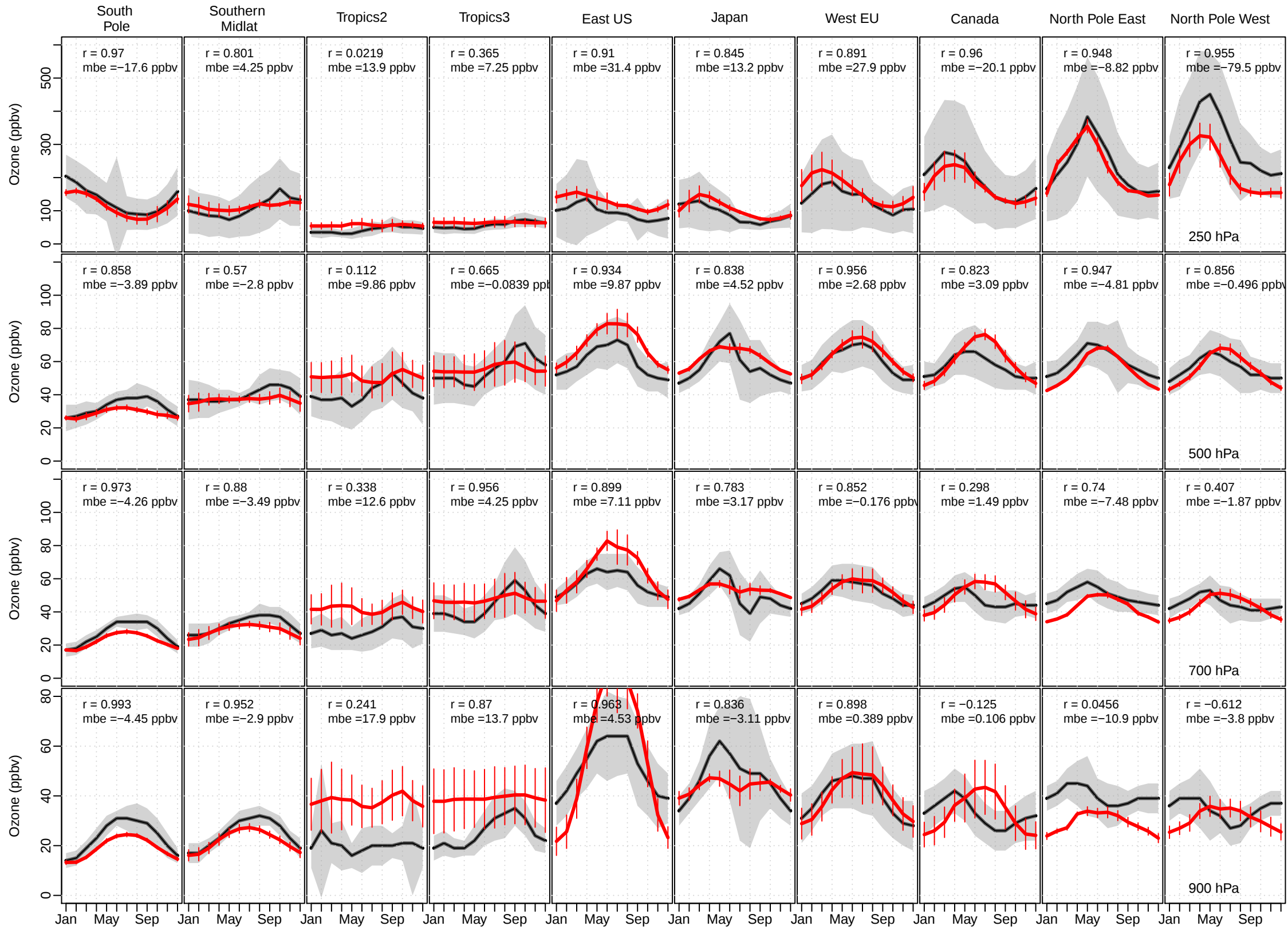
Values in (): Std dev

Pressure (hPa)

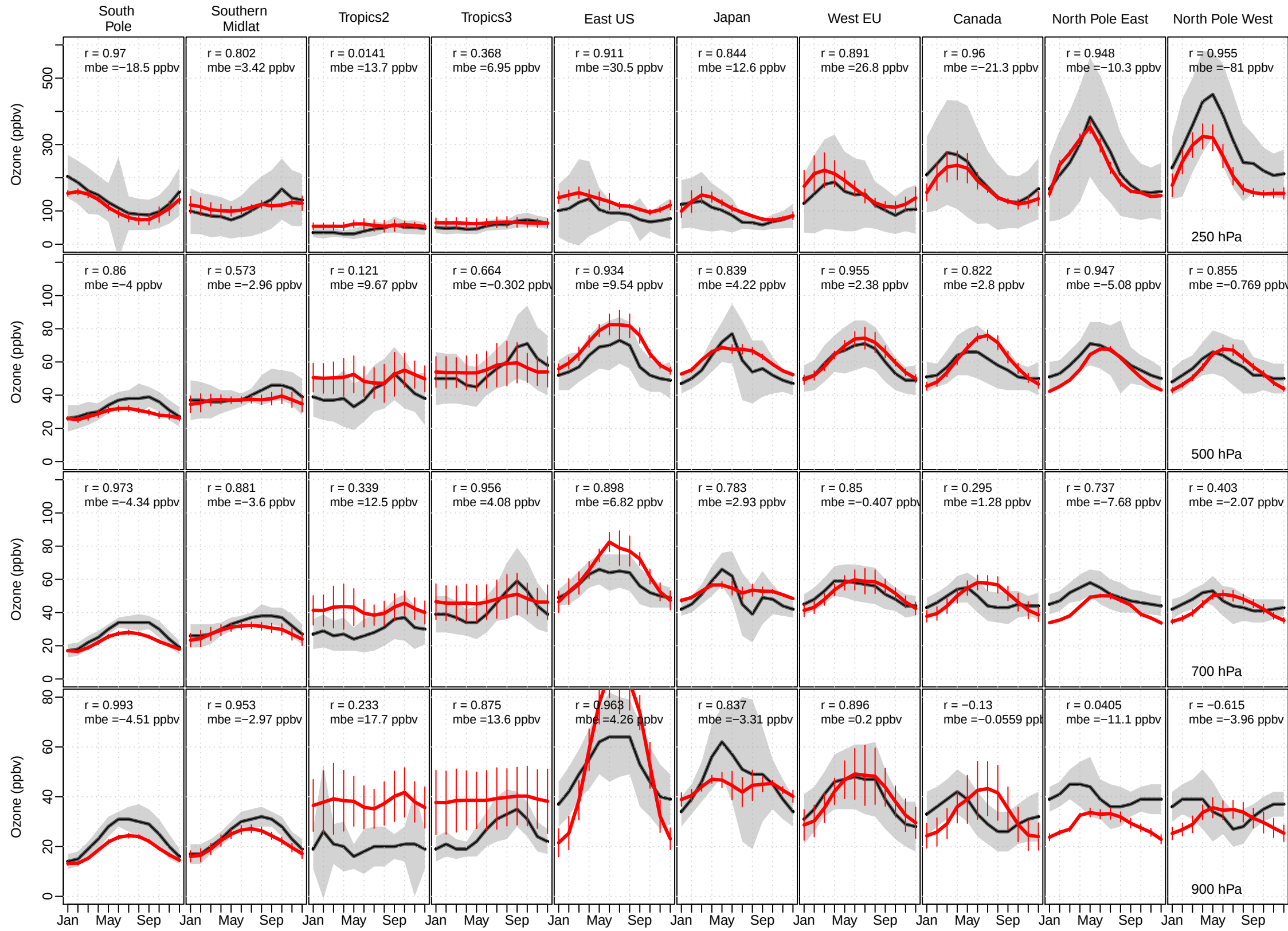


Latitude

br633 Tilmes ozone sonde comparison



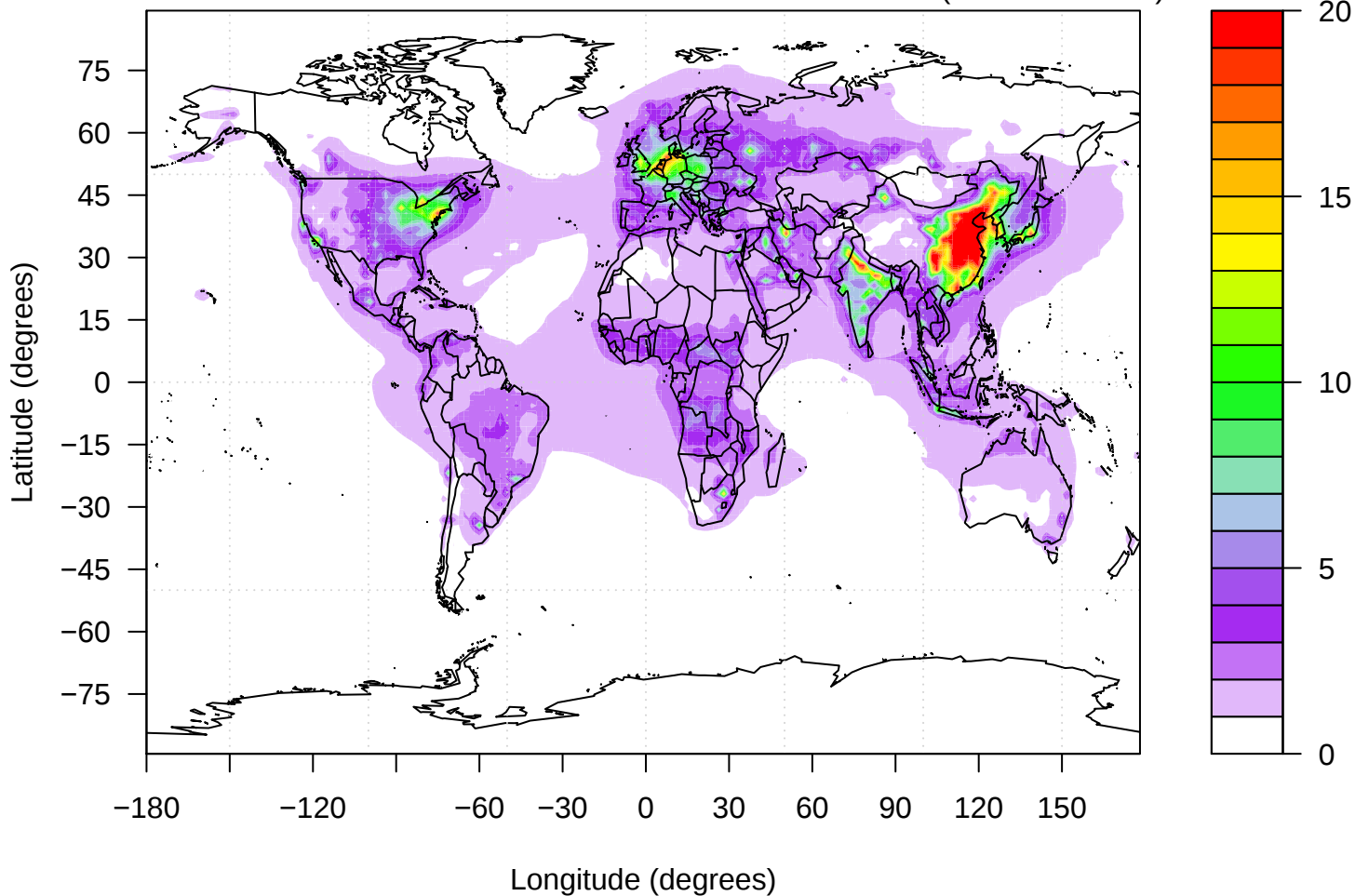
bt118 Tilmes ozone sonde comparison



br633 tropospheric NO₂ column

Min = 0.015 Mean = 1.17 Max = 80.8

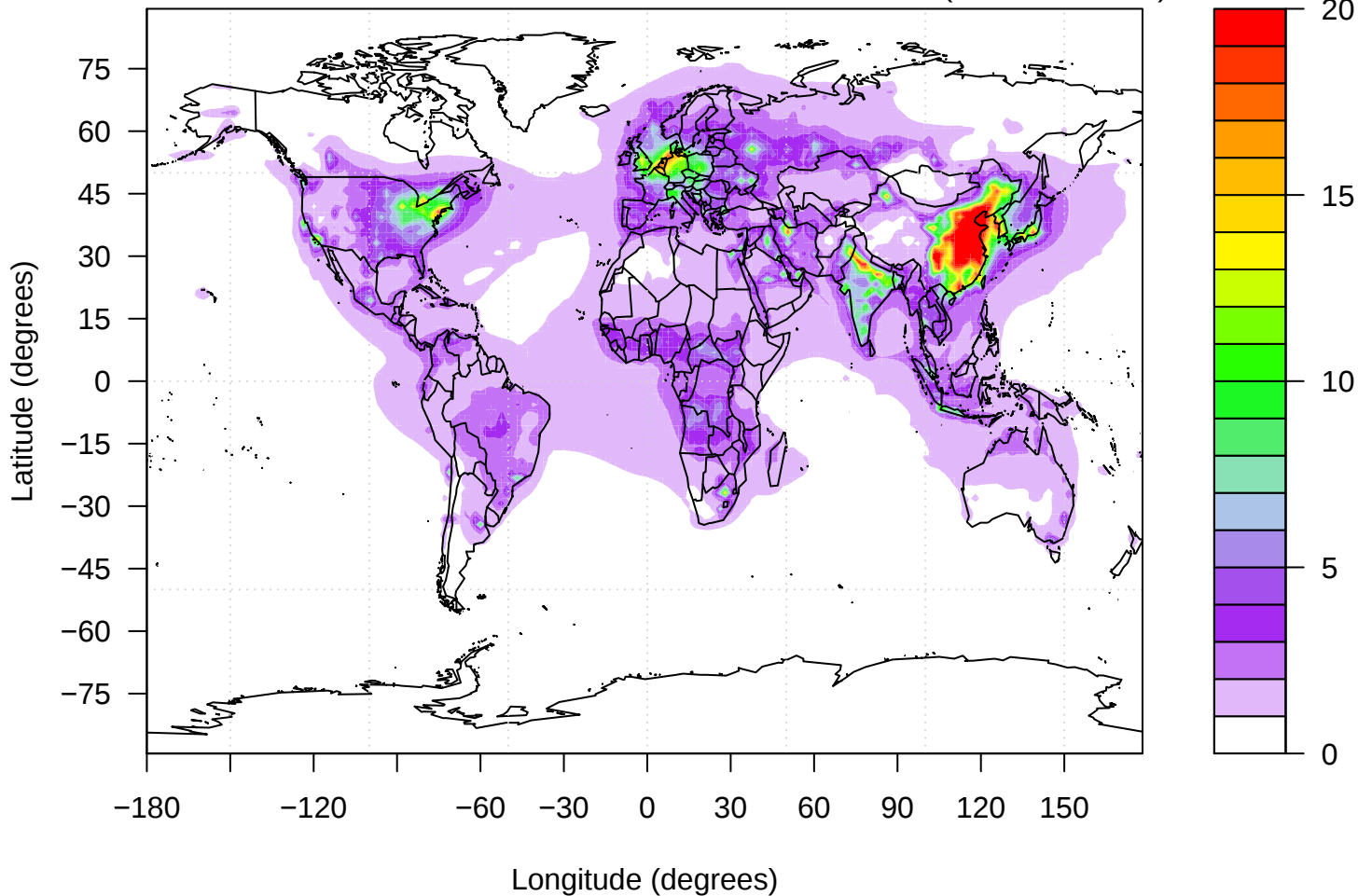
10¹⁵ (molecules cm⁻²)



bt118 tropospheric NO₂ column

Min = 0.015 Mean = 1.17 Max = 80.7

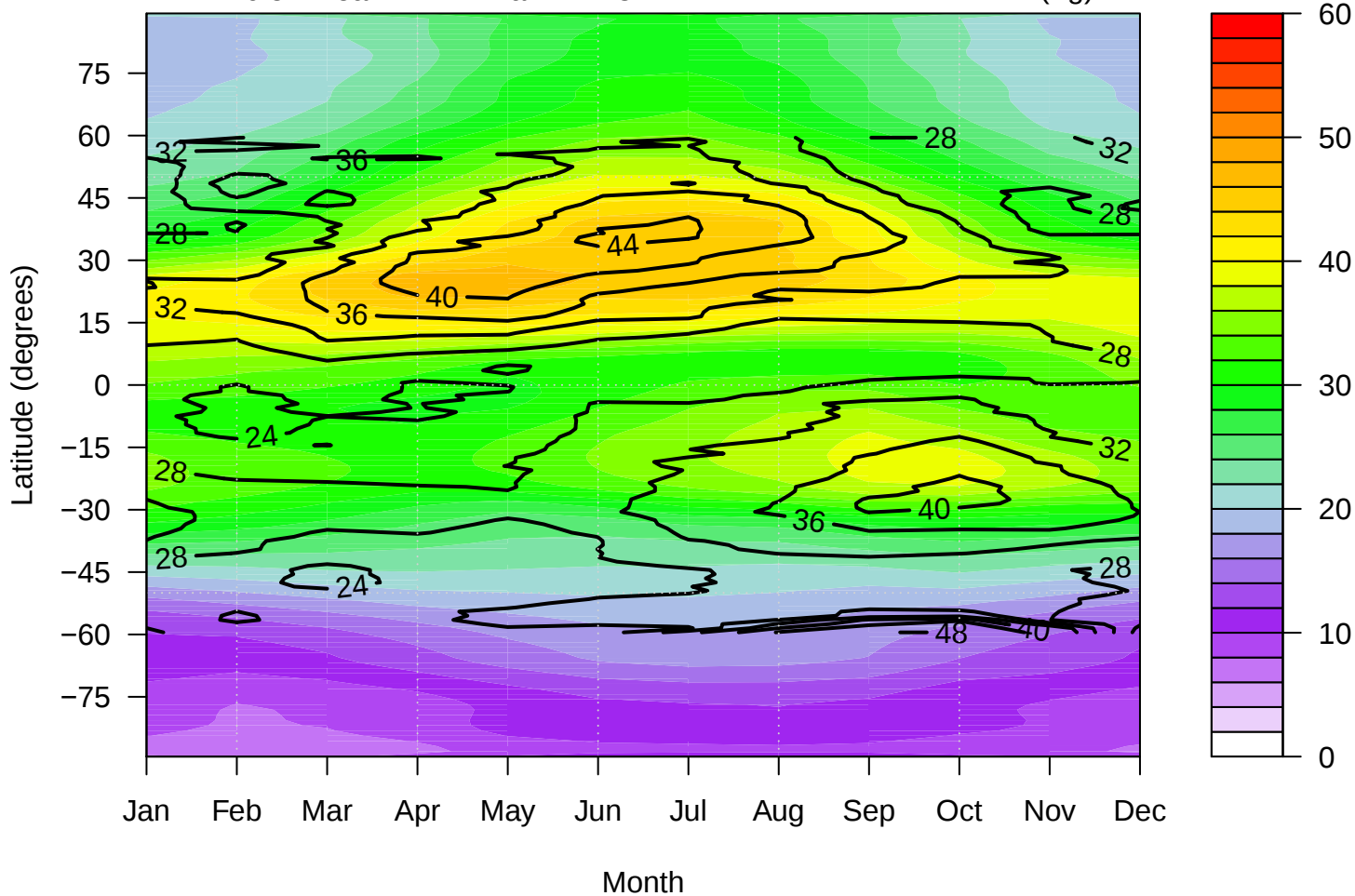
10¹⁵ (molecules cm⁻²)



br633 tropospheric O₃ column

Min = 6.51 Mean = 27.1 Max = 47.8

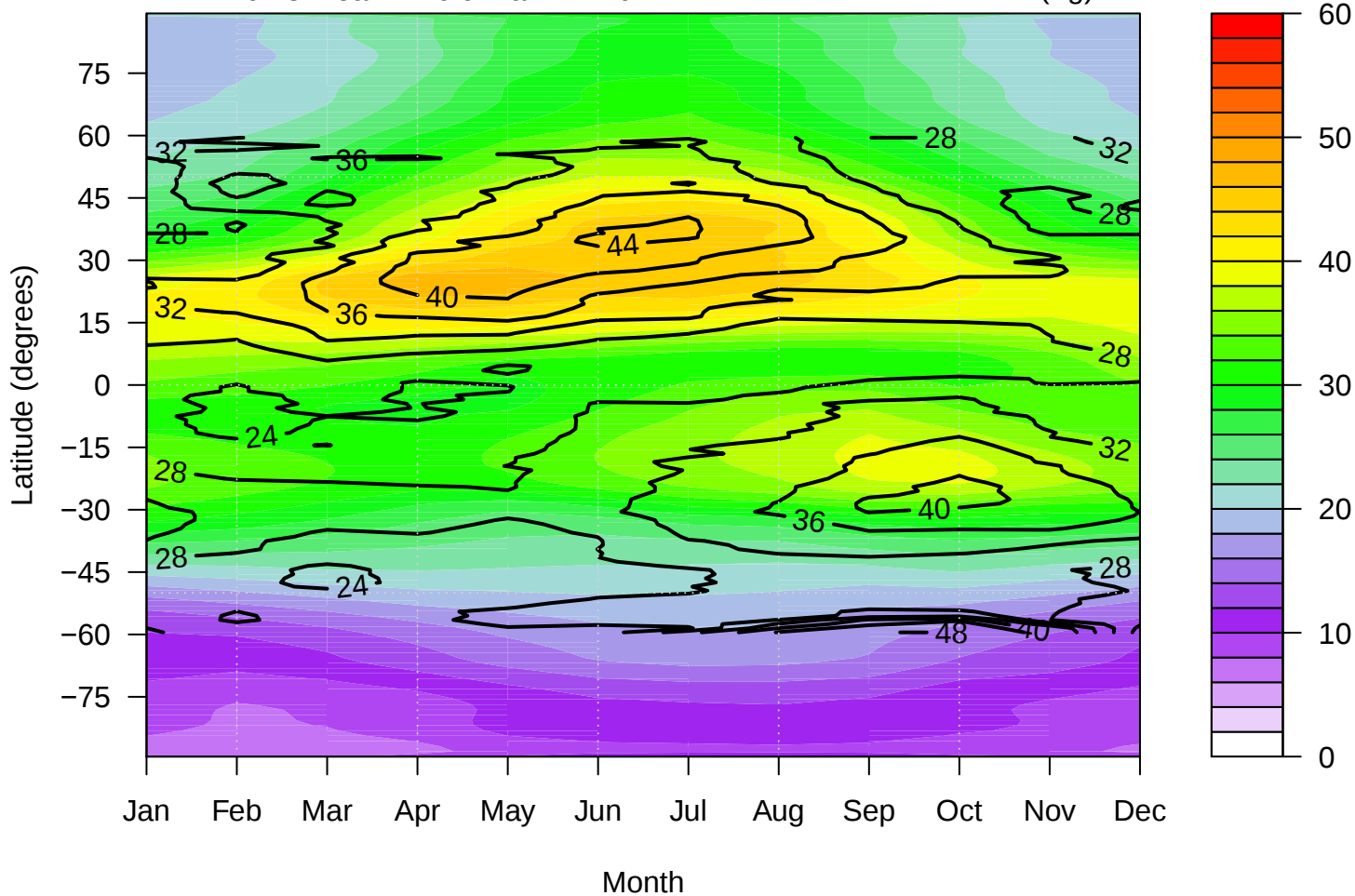
Burden (Tg) = 336



bt118 tropospheric O₃ column

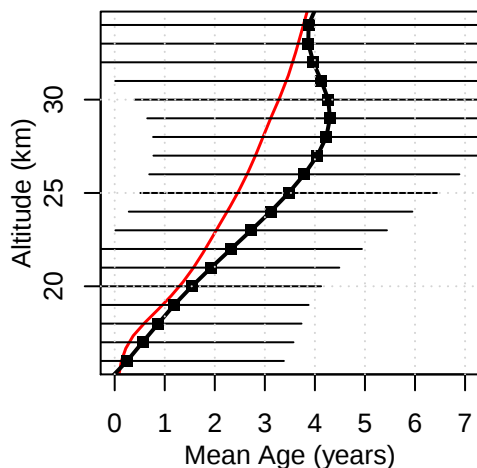
Min = 6.48 Mean = 26.9 Max = 47.6

Burden (Tg) = 334

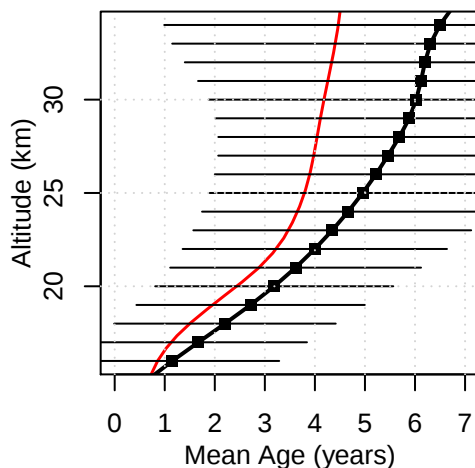


UKCA br633 Mean Age of Air

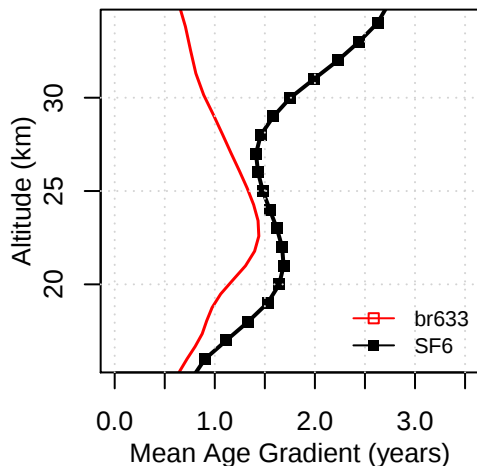
Tropical Mean Age Profile



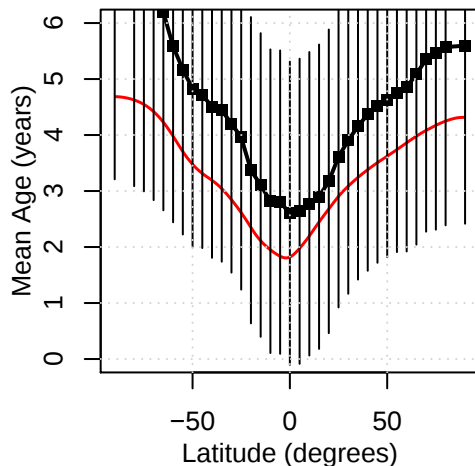
Midlatitude Mean Age Profile



Trop-Midlat Mean Age Gradient Prof

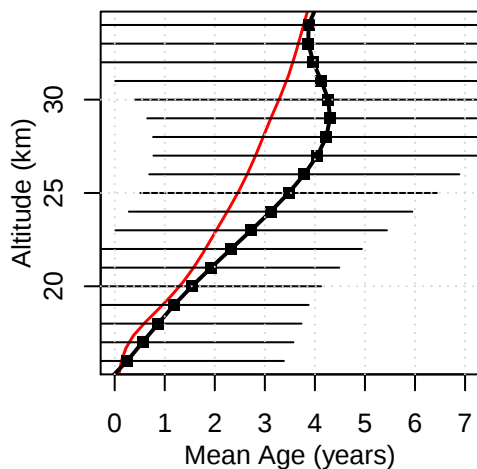


Mean Age, 23km (~50hPa)

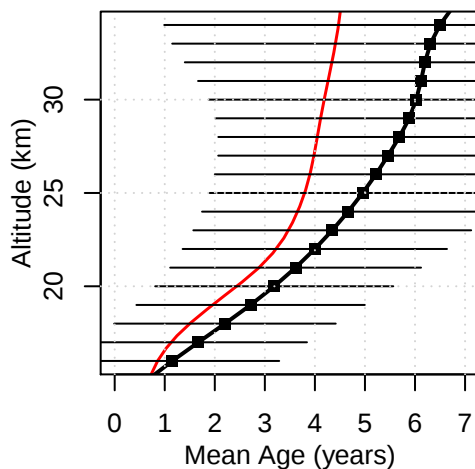


UKCA bt118 Mean Age of Air

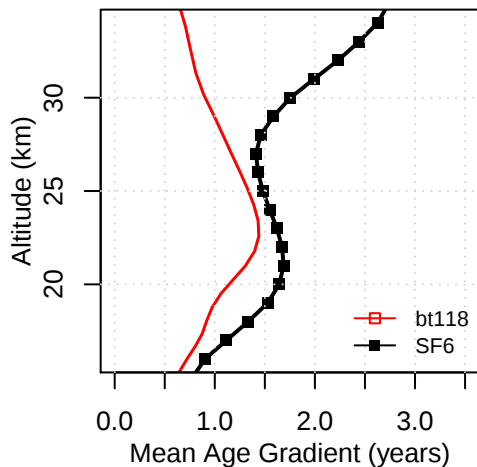
Tropical Mean Age Profile



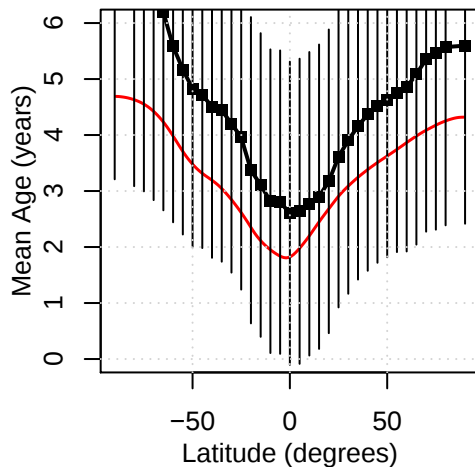
Midlatitude Mean Age Profile



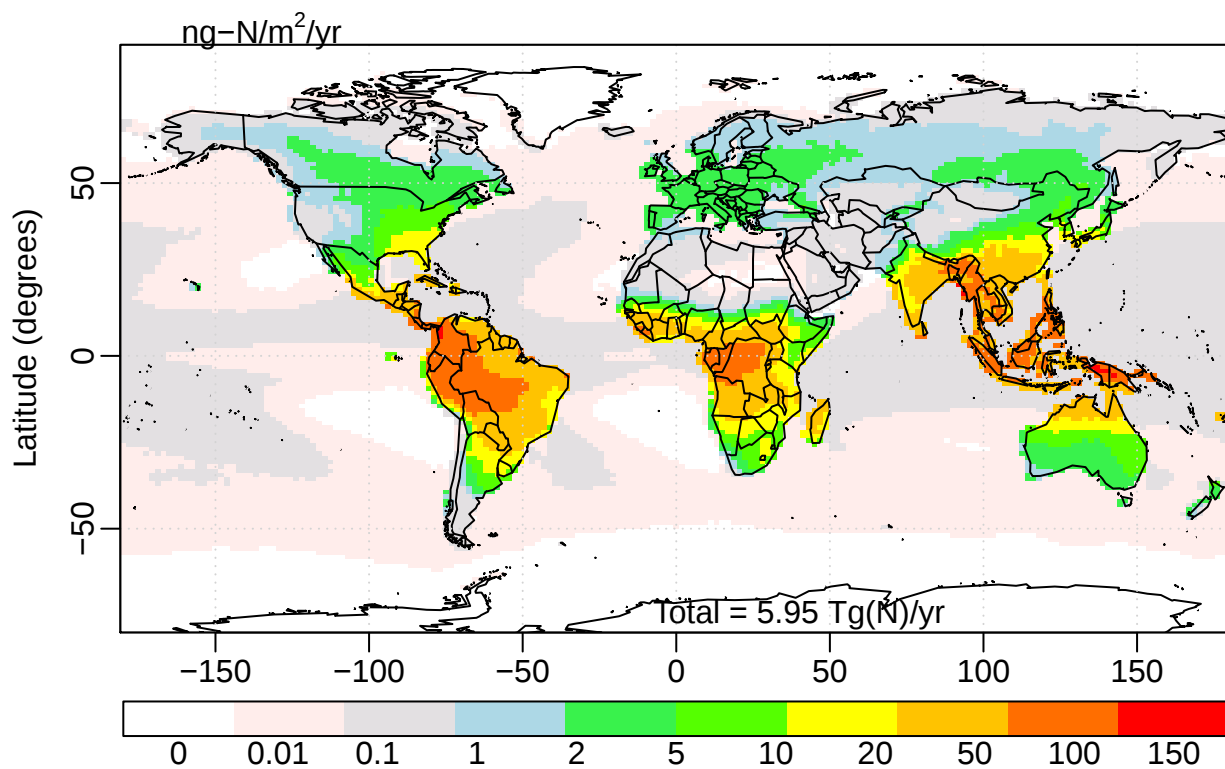
Trop-Midlat Mean Age Gradient Prof



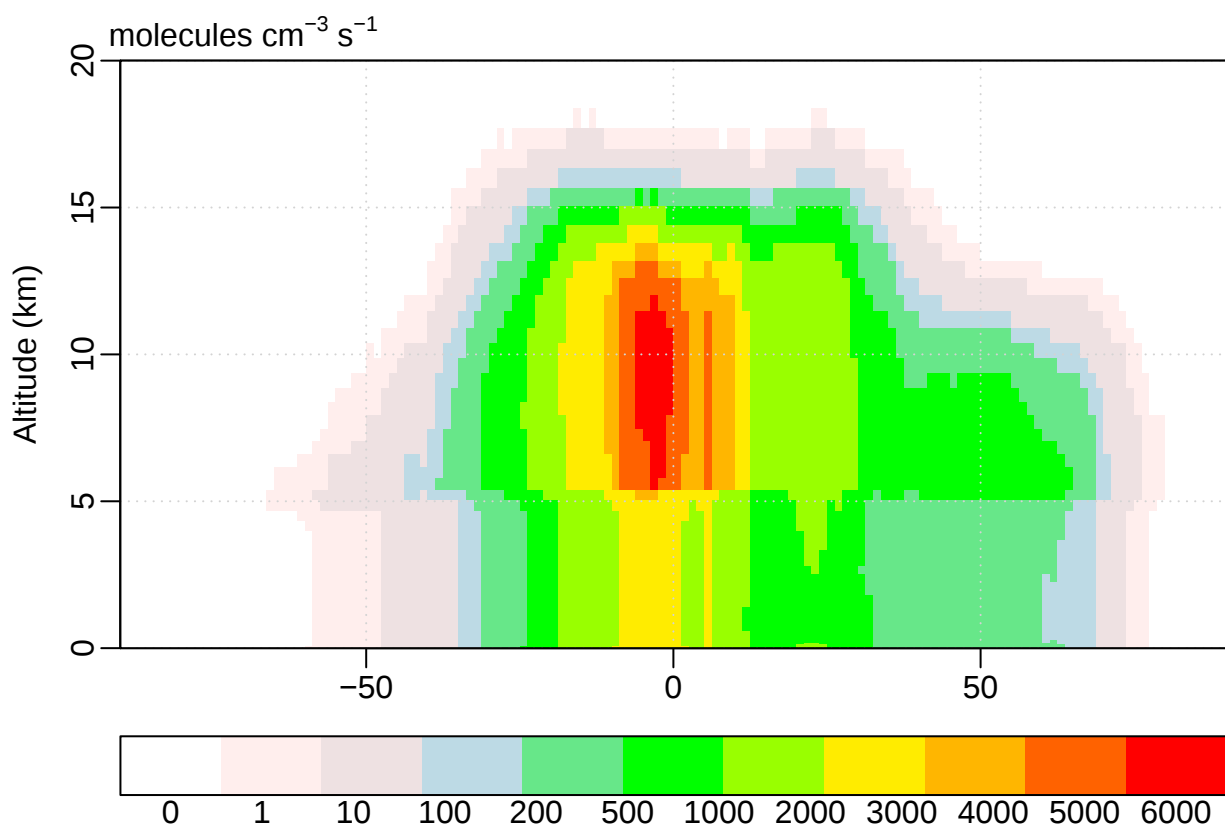
Mean Age, 23km (~50hPa)



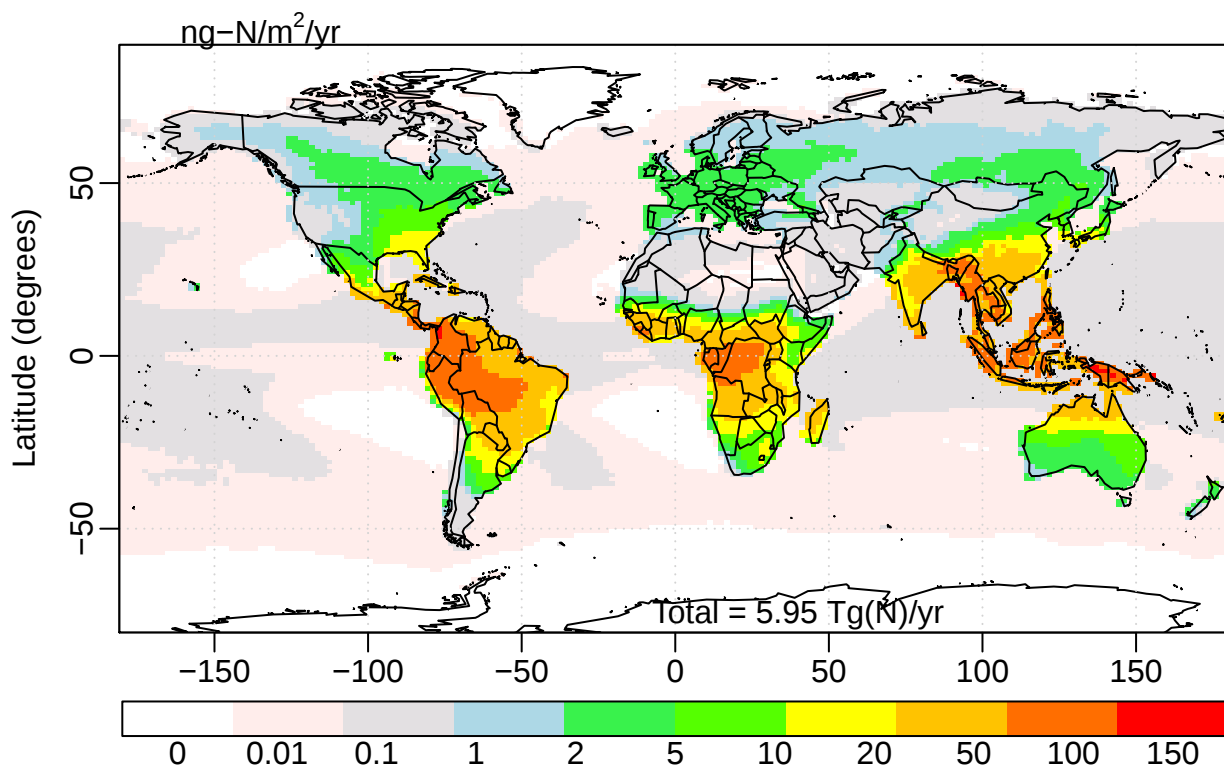
br633 total column



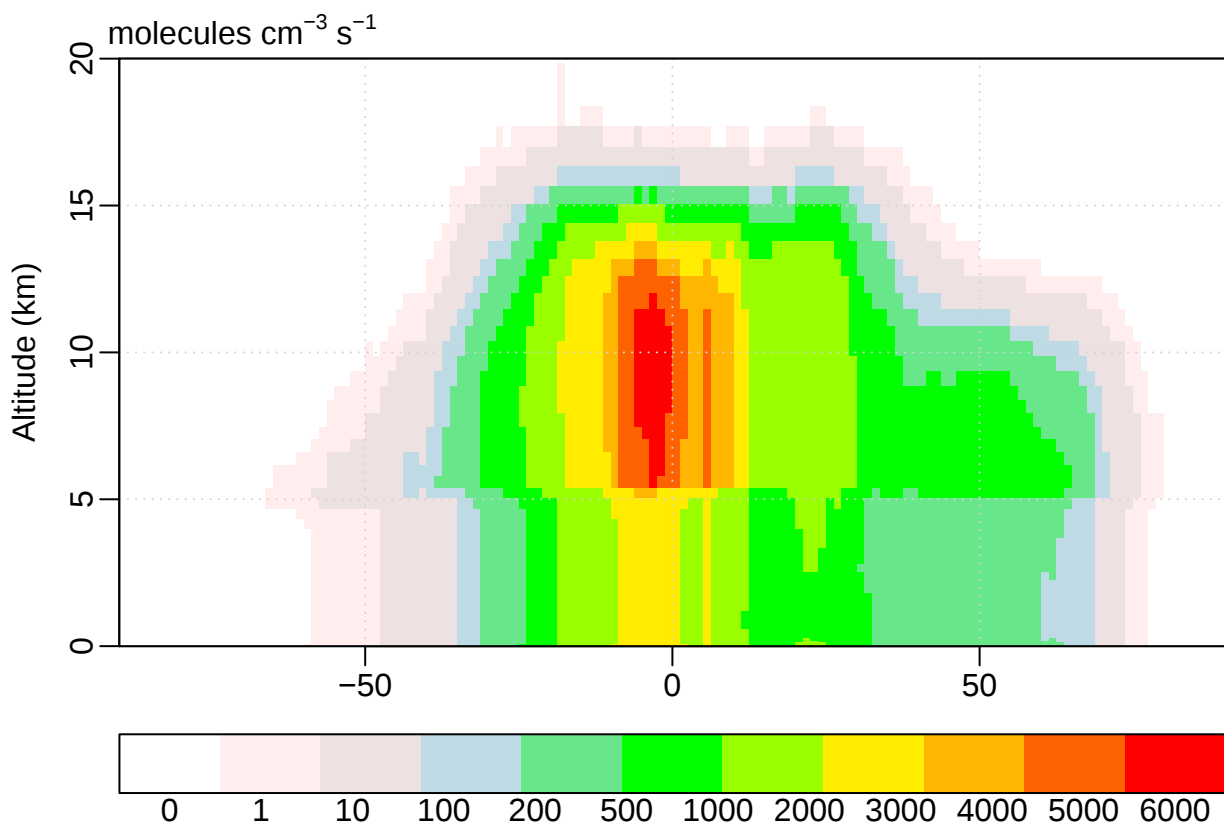
br633 zonal mean



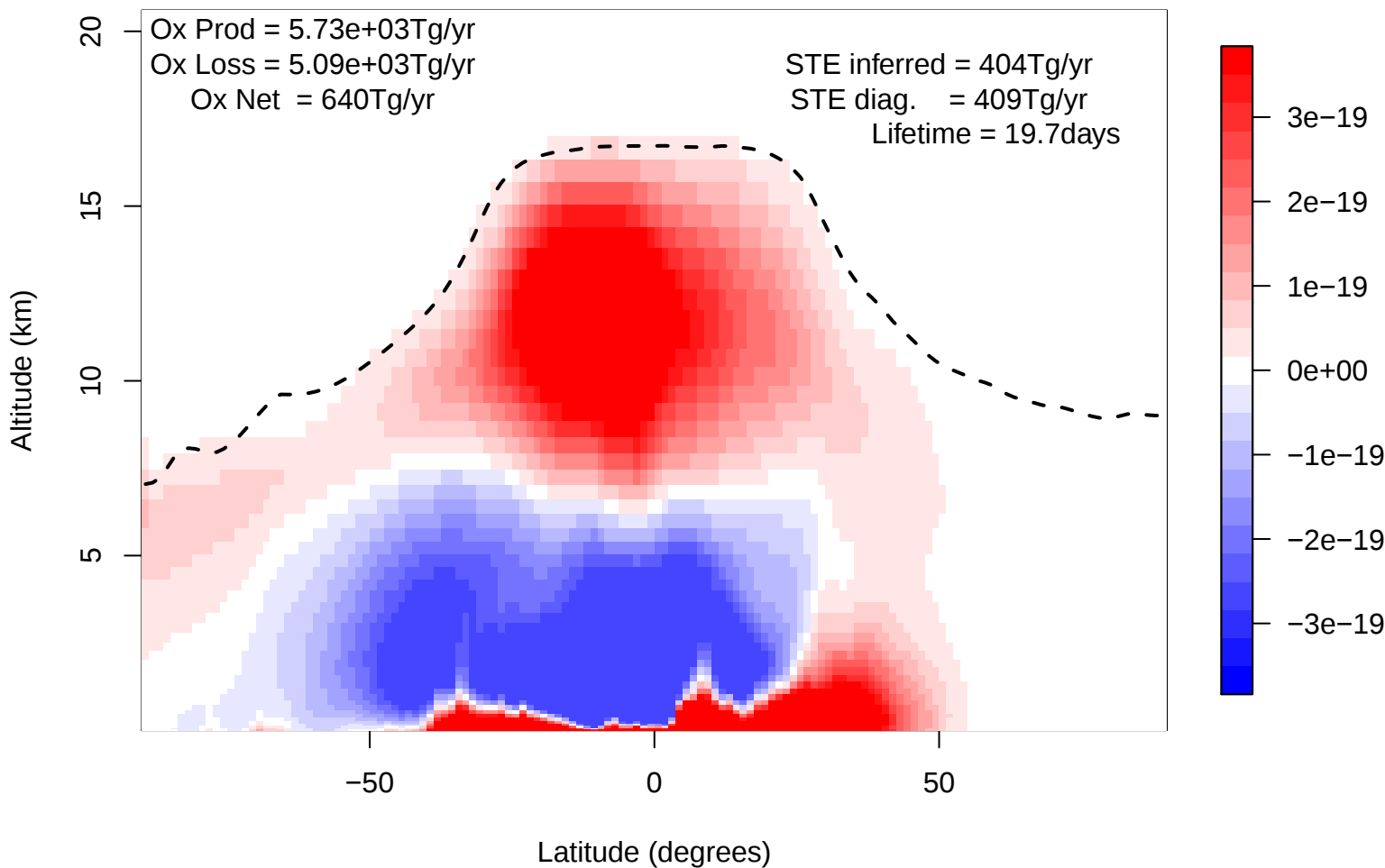
bt118 total column



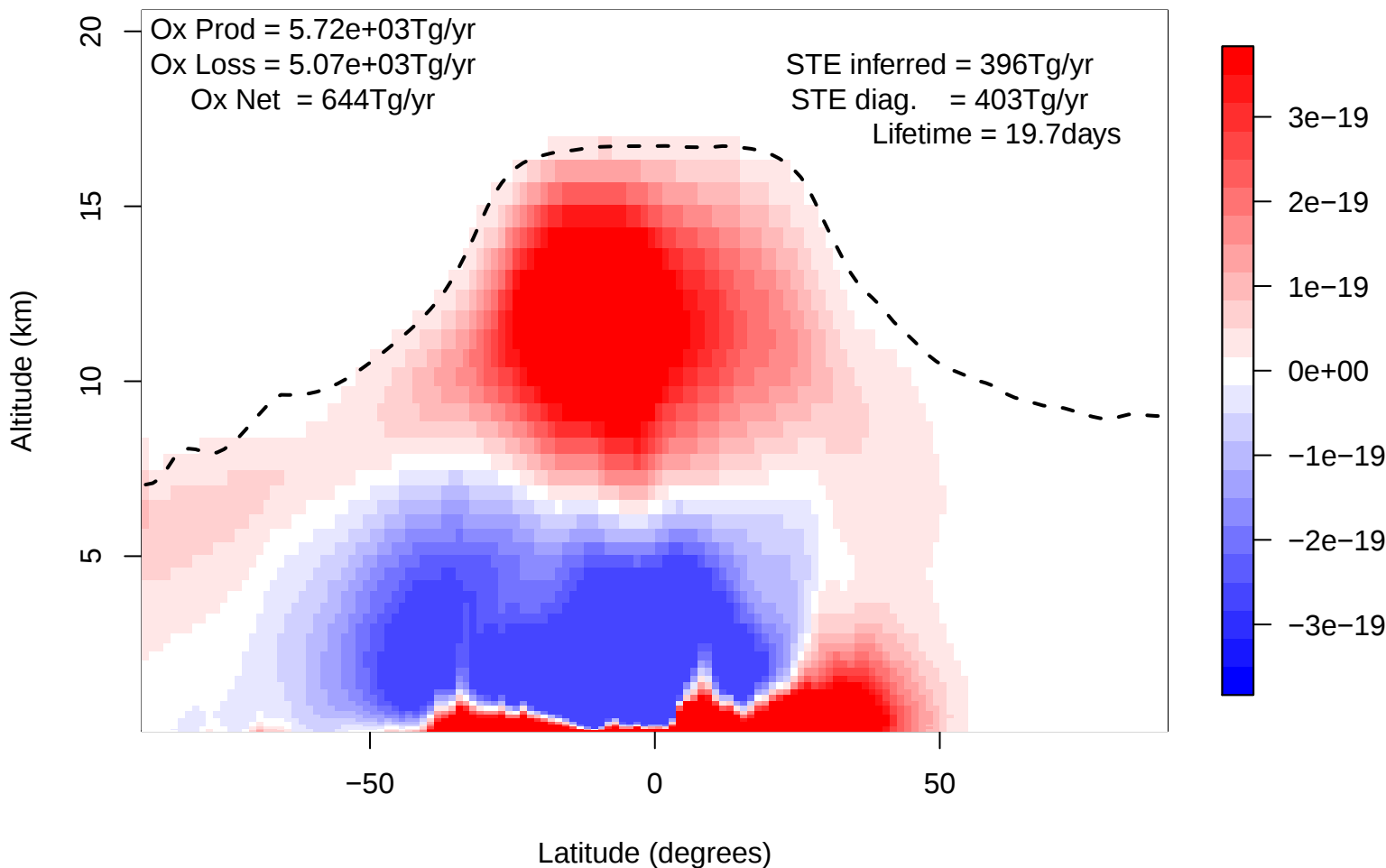
bt118 zonal mean



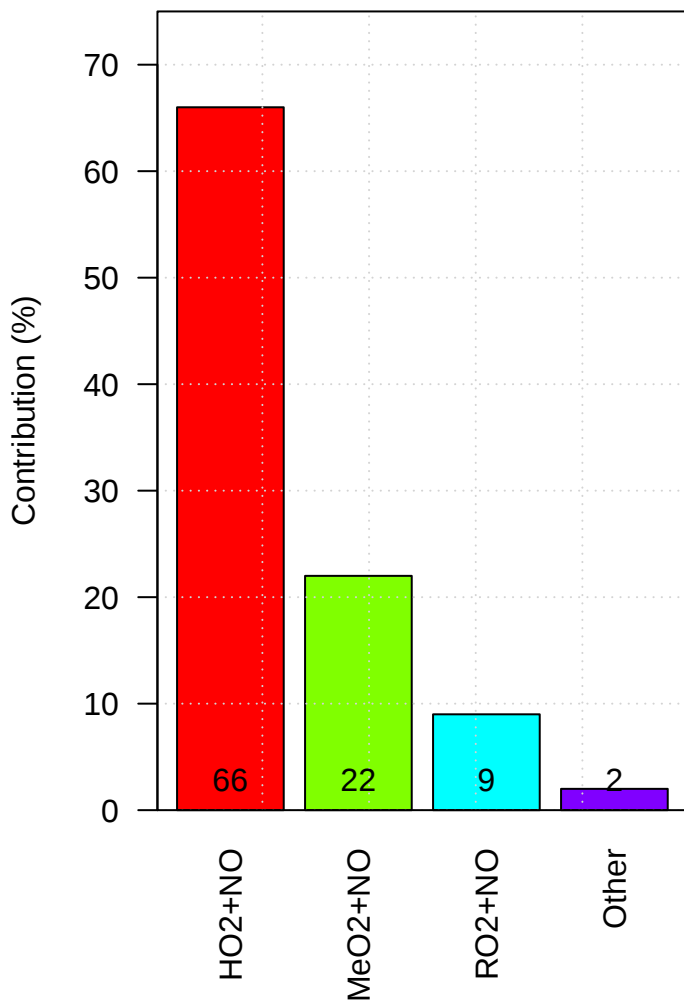
UKCA br633 Ox Net Chemical Production



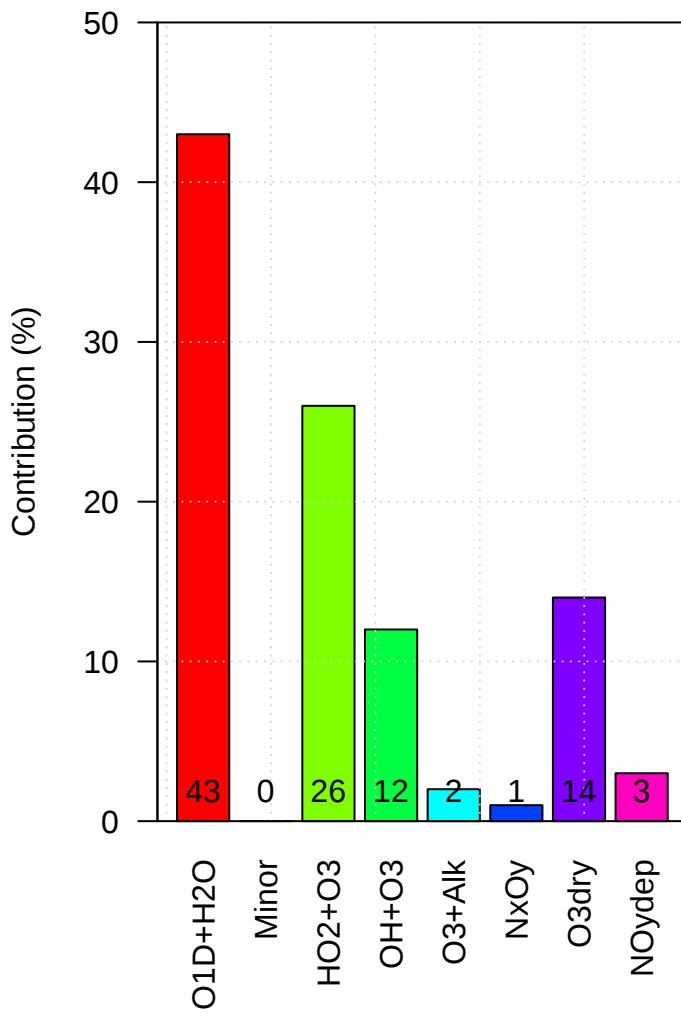
UKCA bt118 Ox Net Chemical Production



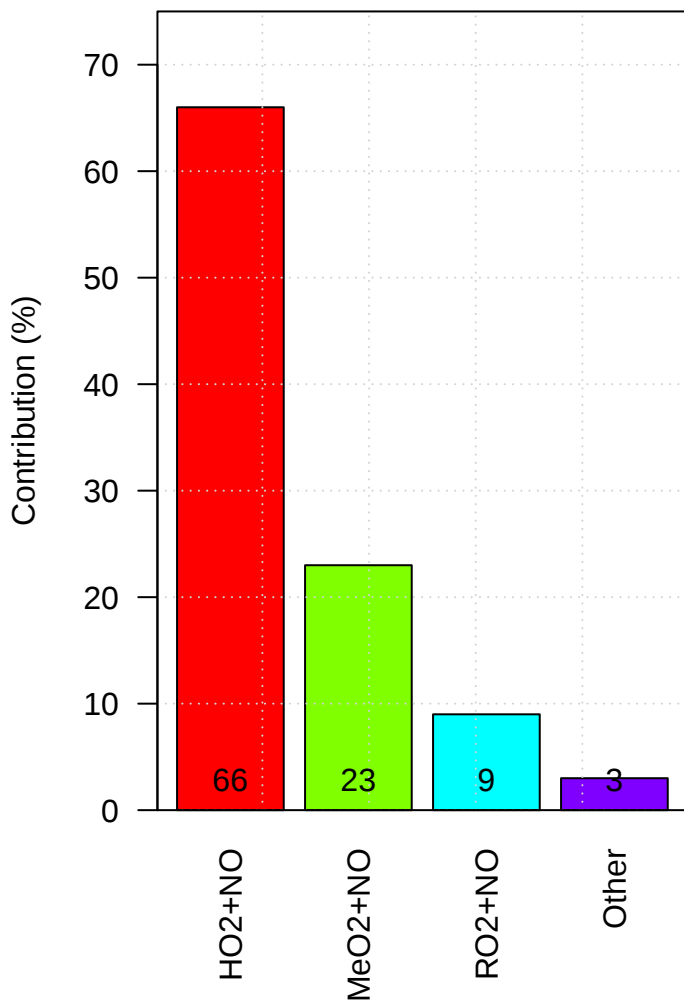
br633 Production of Tropospheric Ox



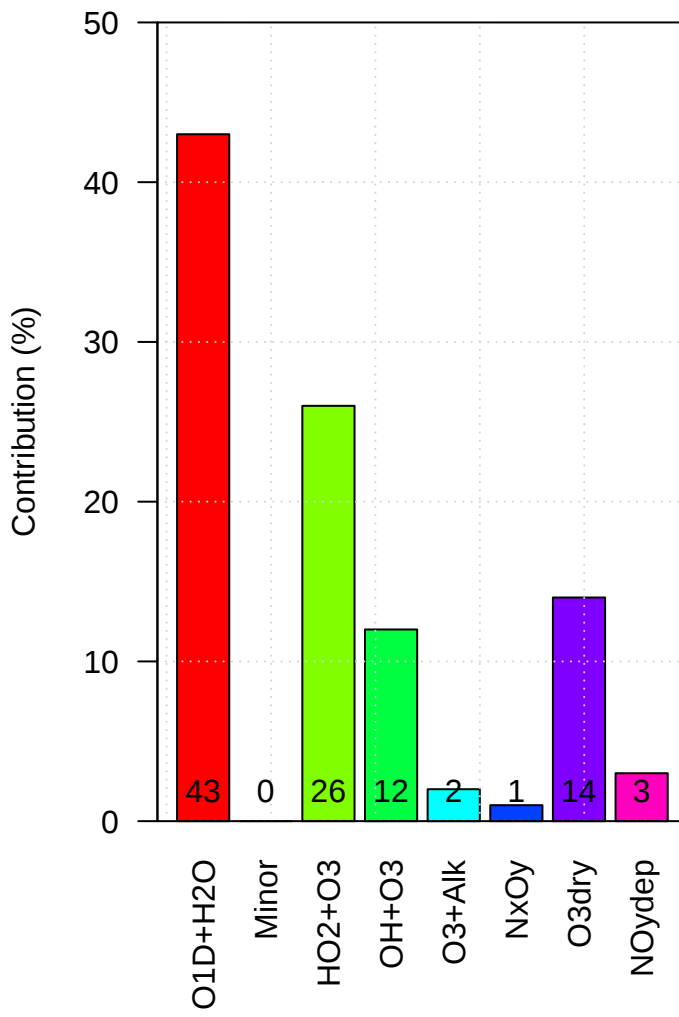
br633 Loss of Tropospheric Ox



bt118 Production of Tropospheric Ox

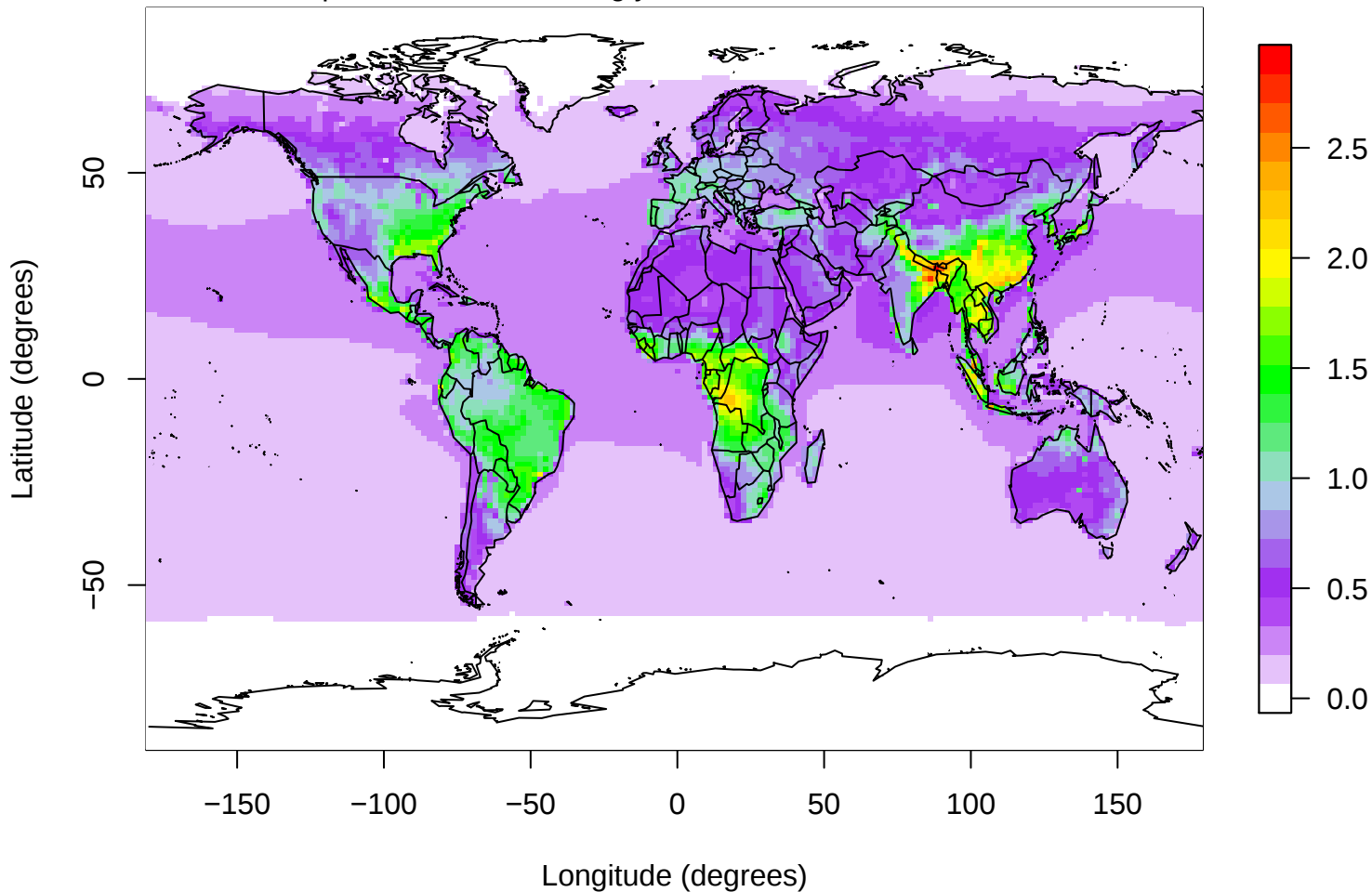


bt118 Loss of Tropospheric Ox



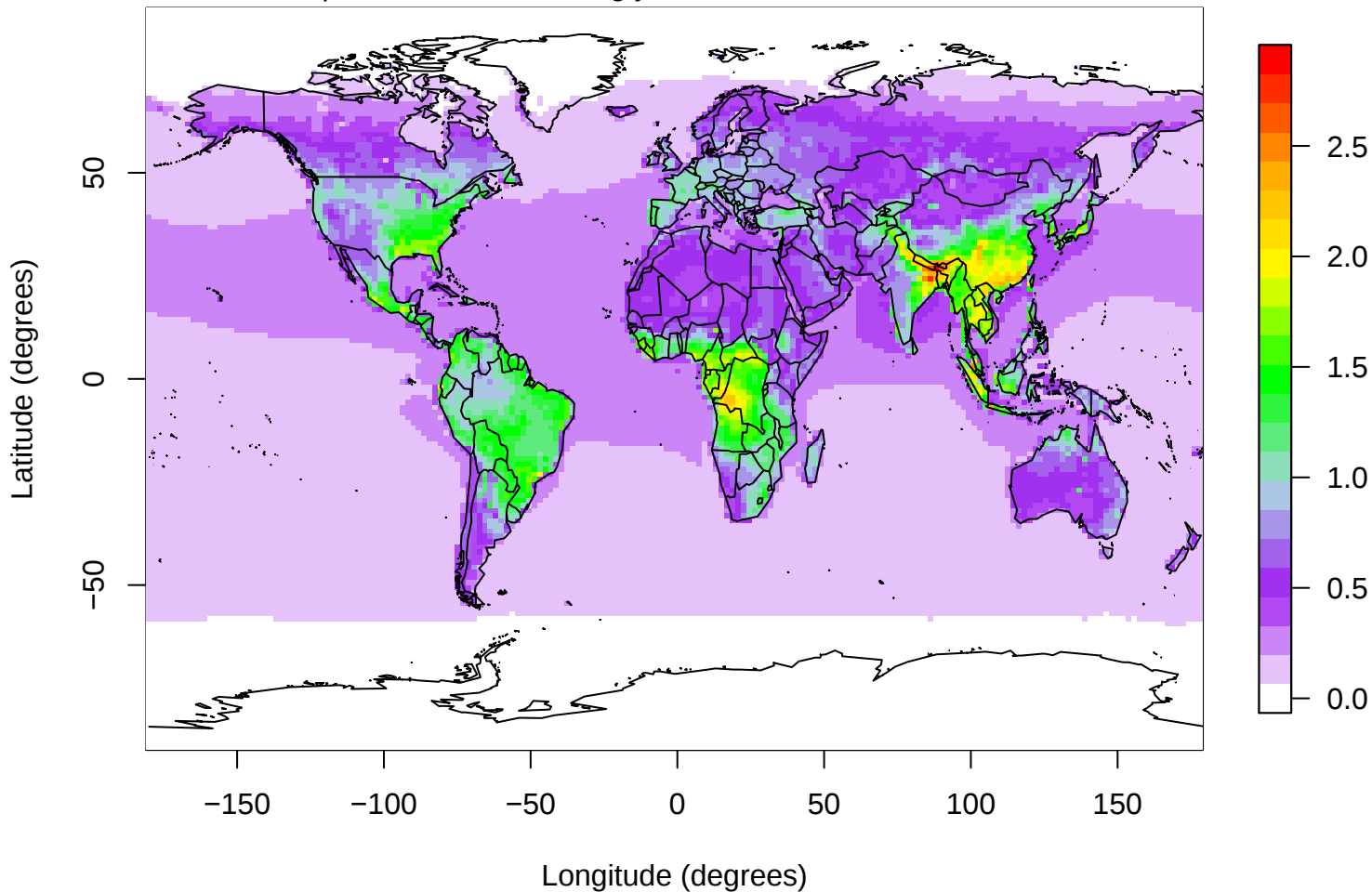
UKCA Ox deposition br633

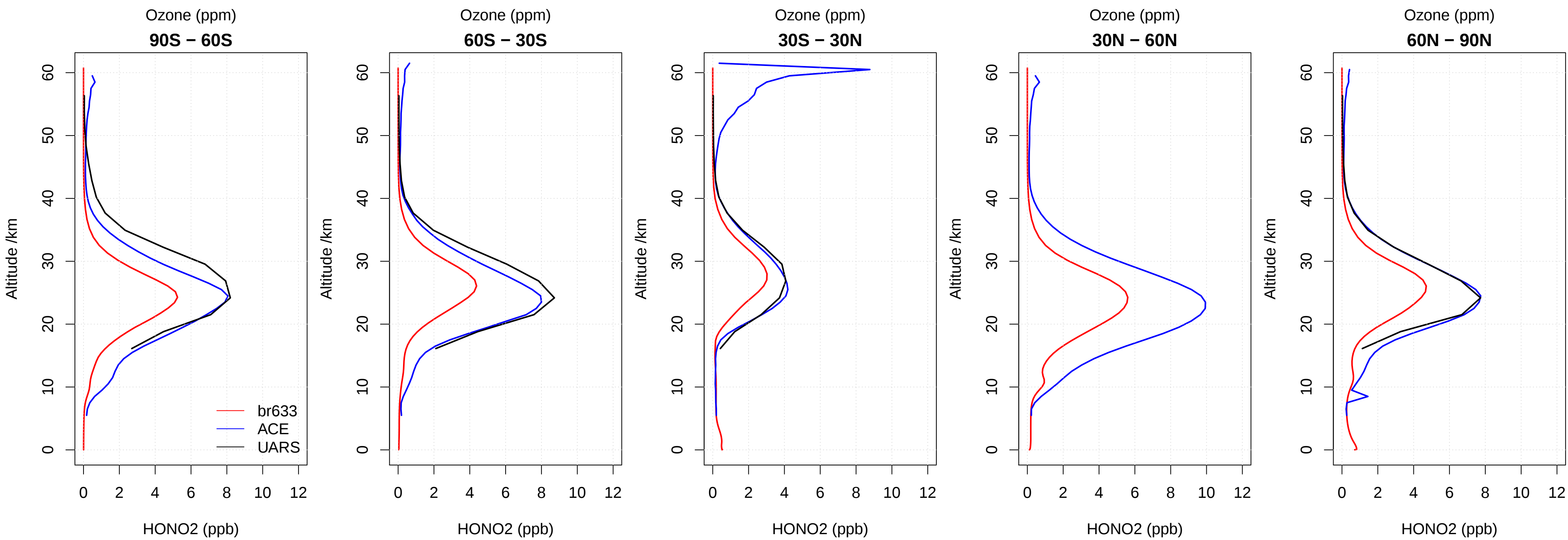
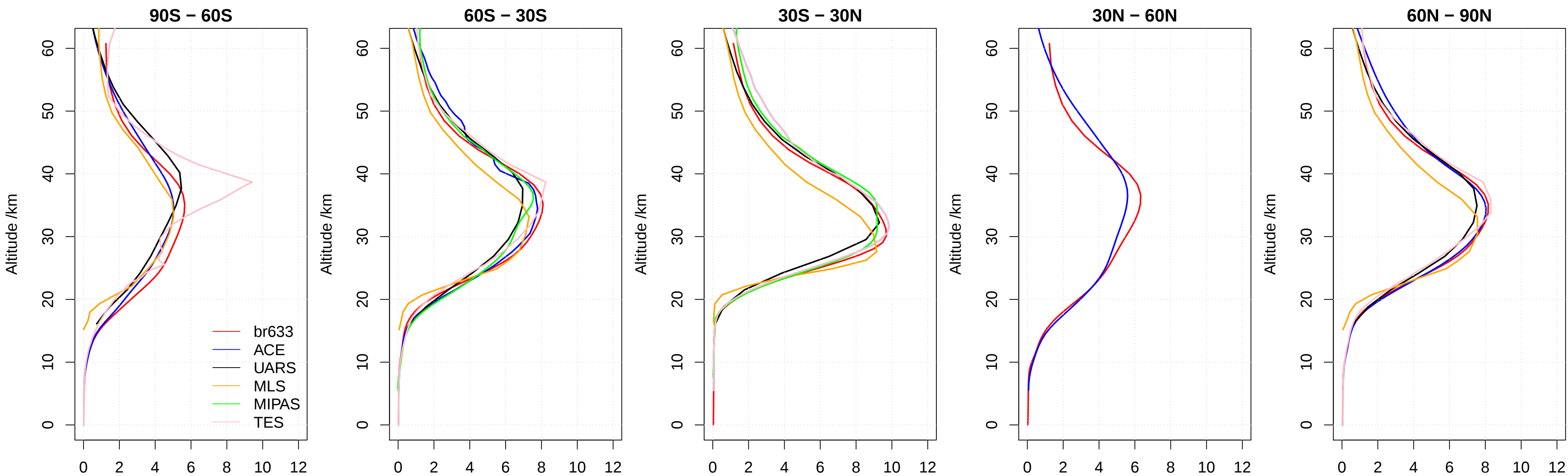
Total Ox Deposition = 1.04×10^3 Tg/yr

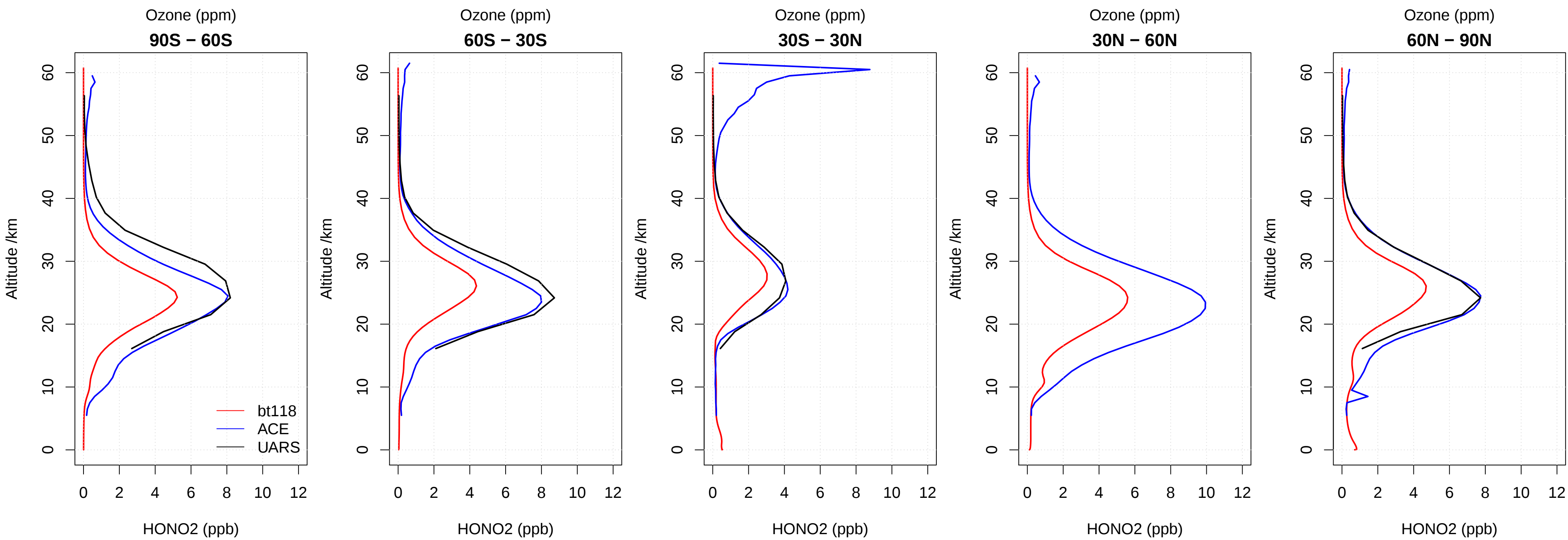
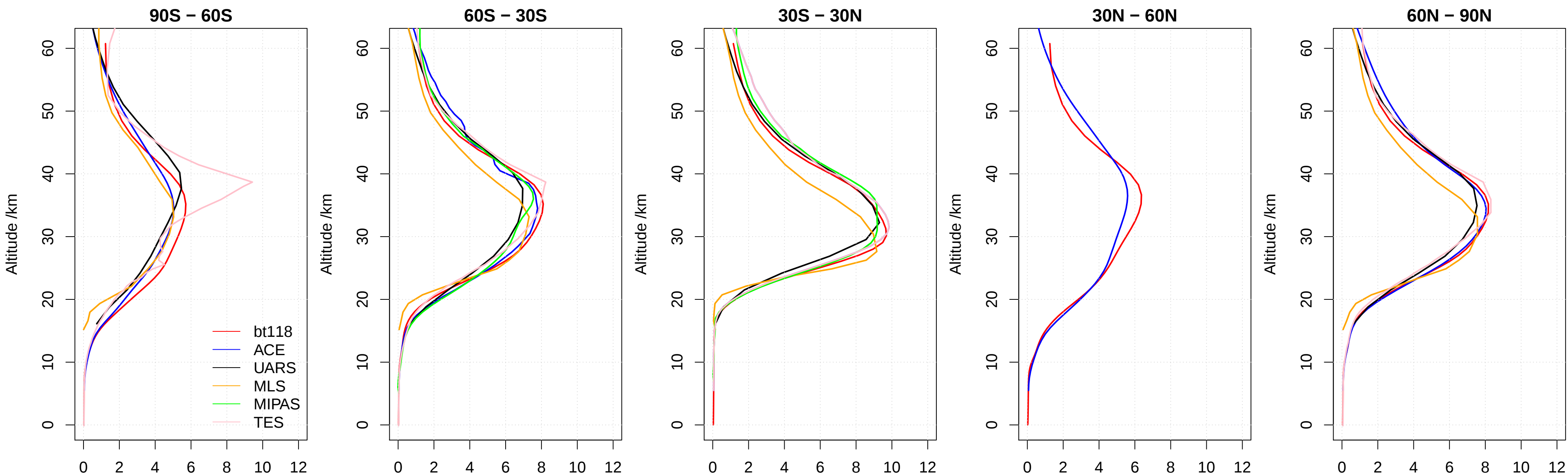


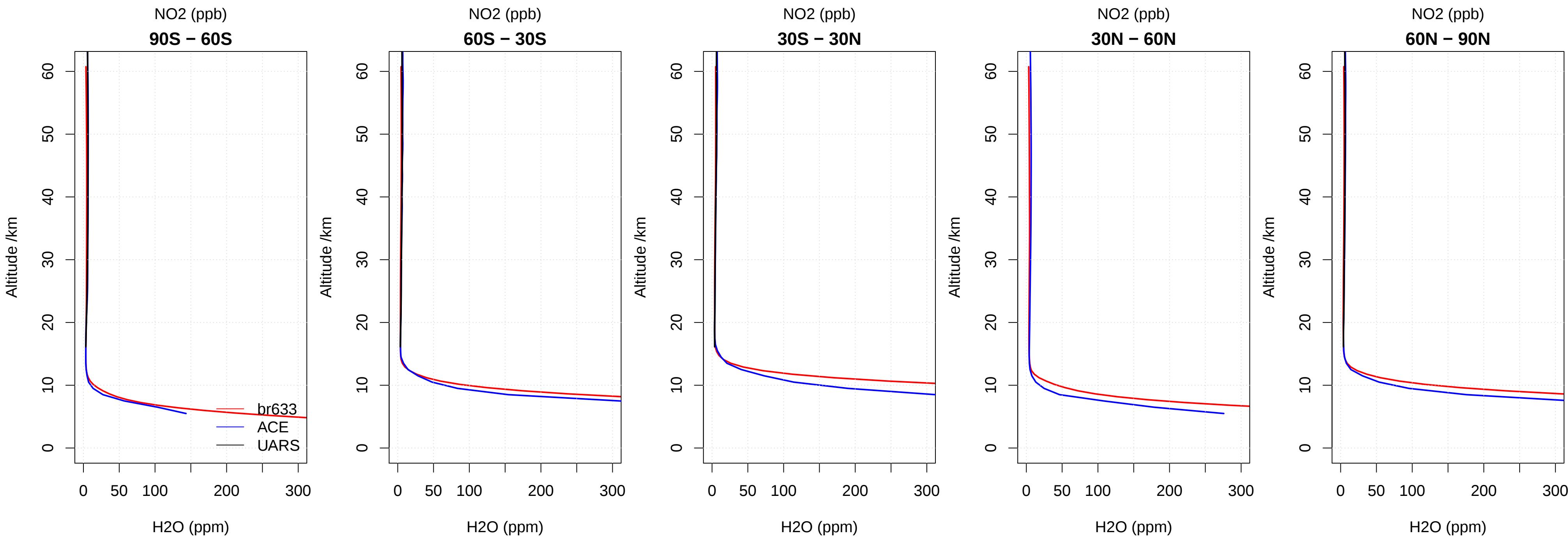
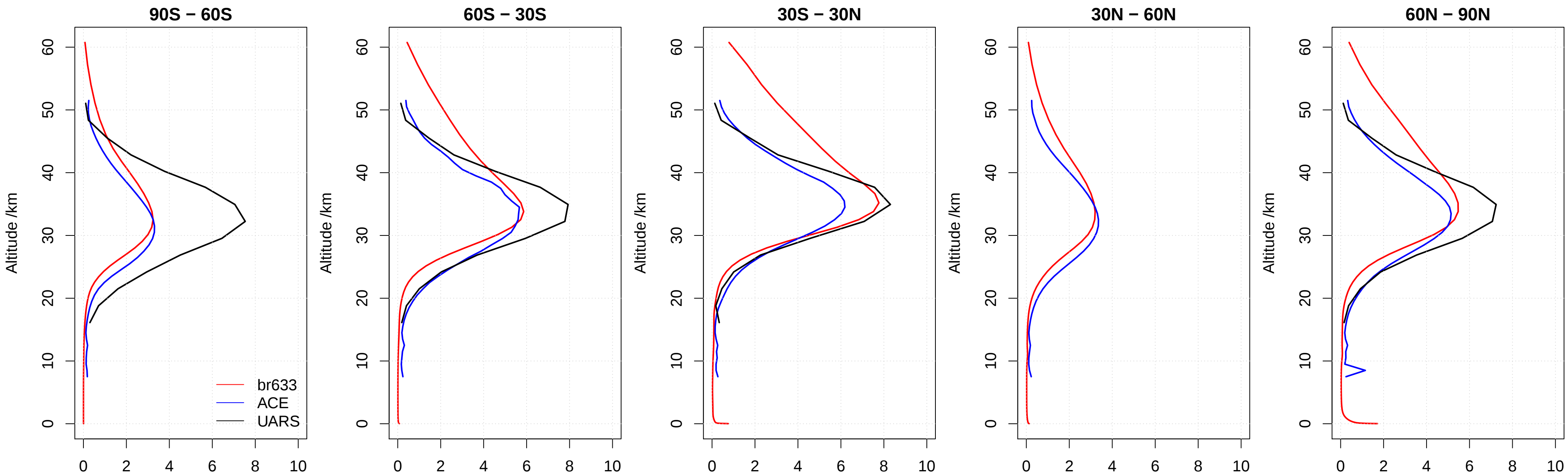
UKCA Ox deposition bt118

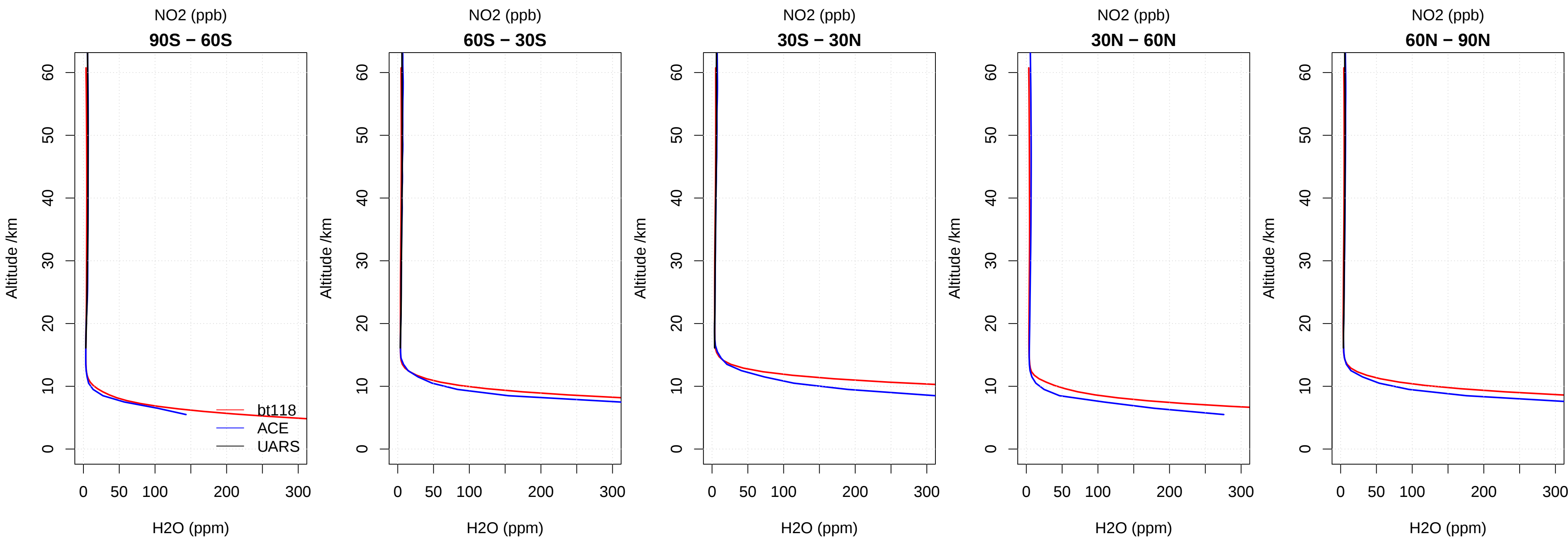
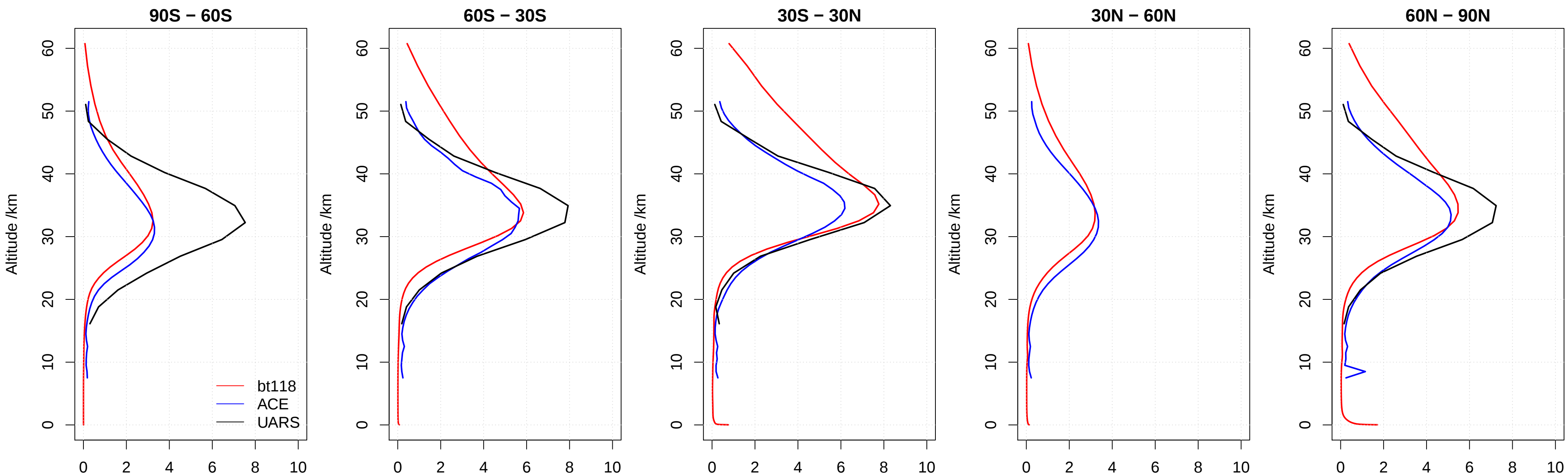
Total Ox Deposition = 1.04×10^3 Tg/yr

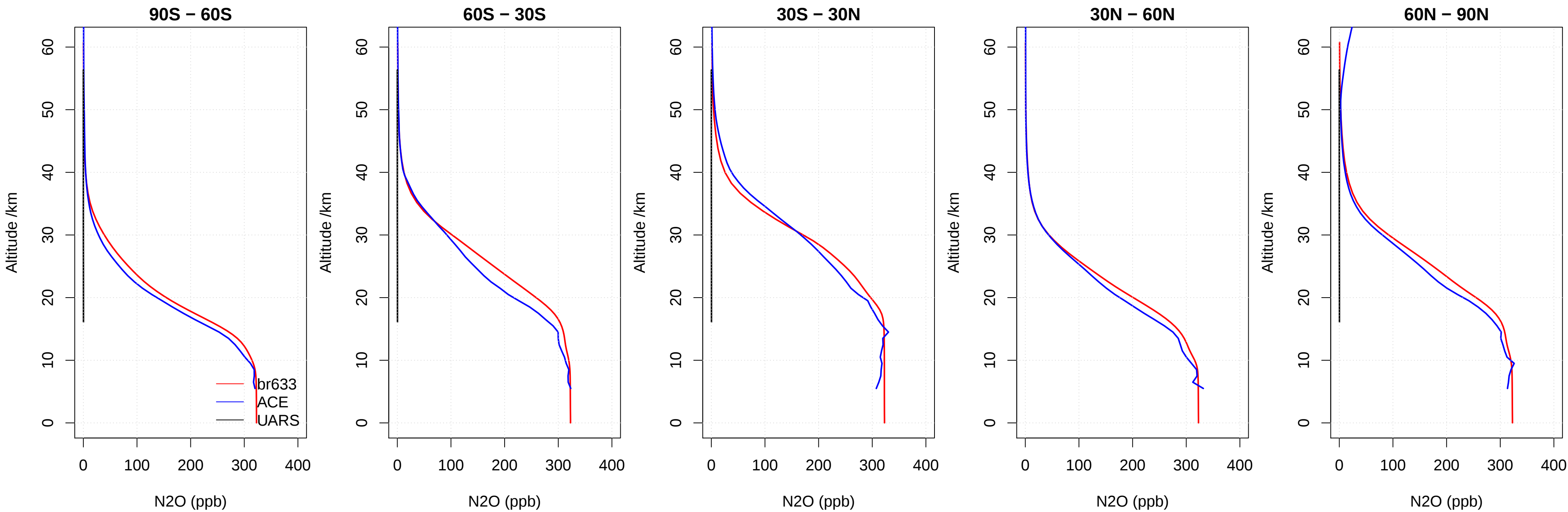


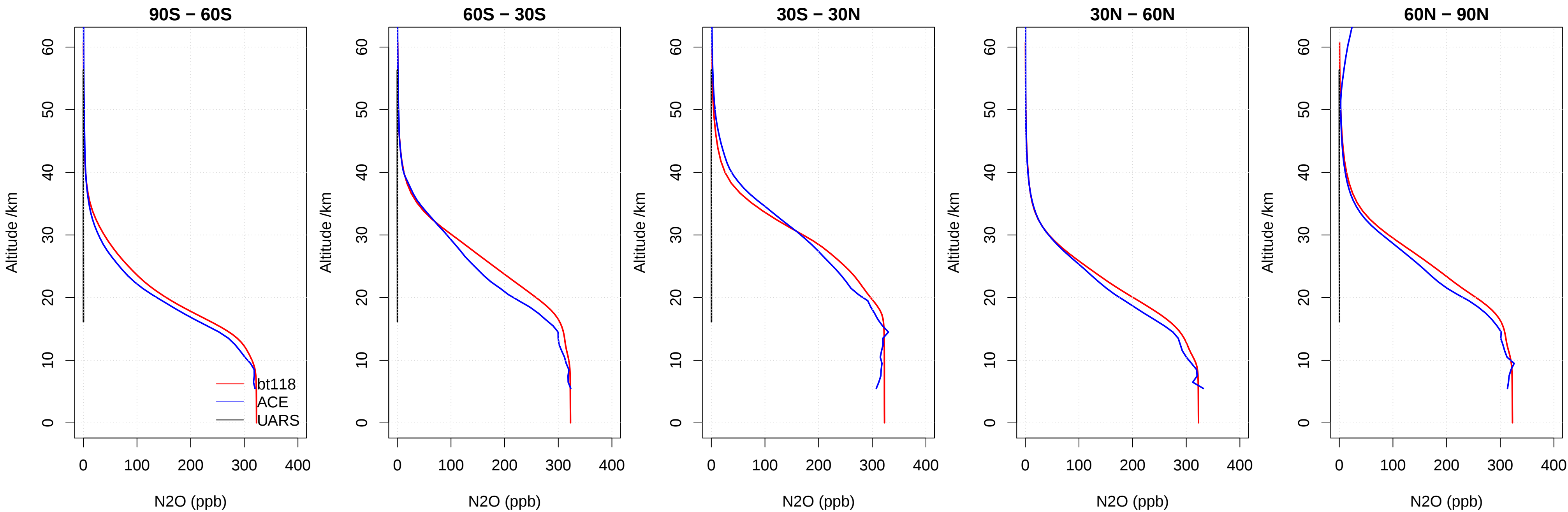






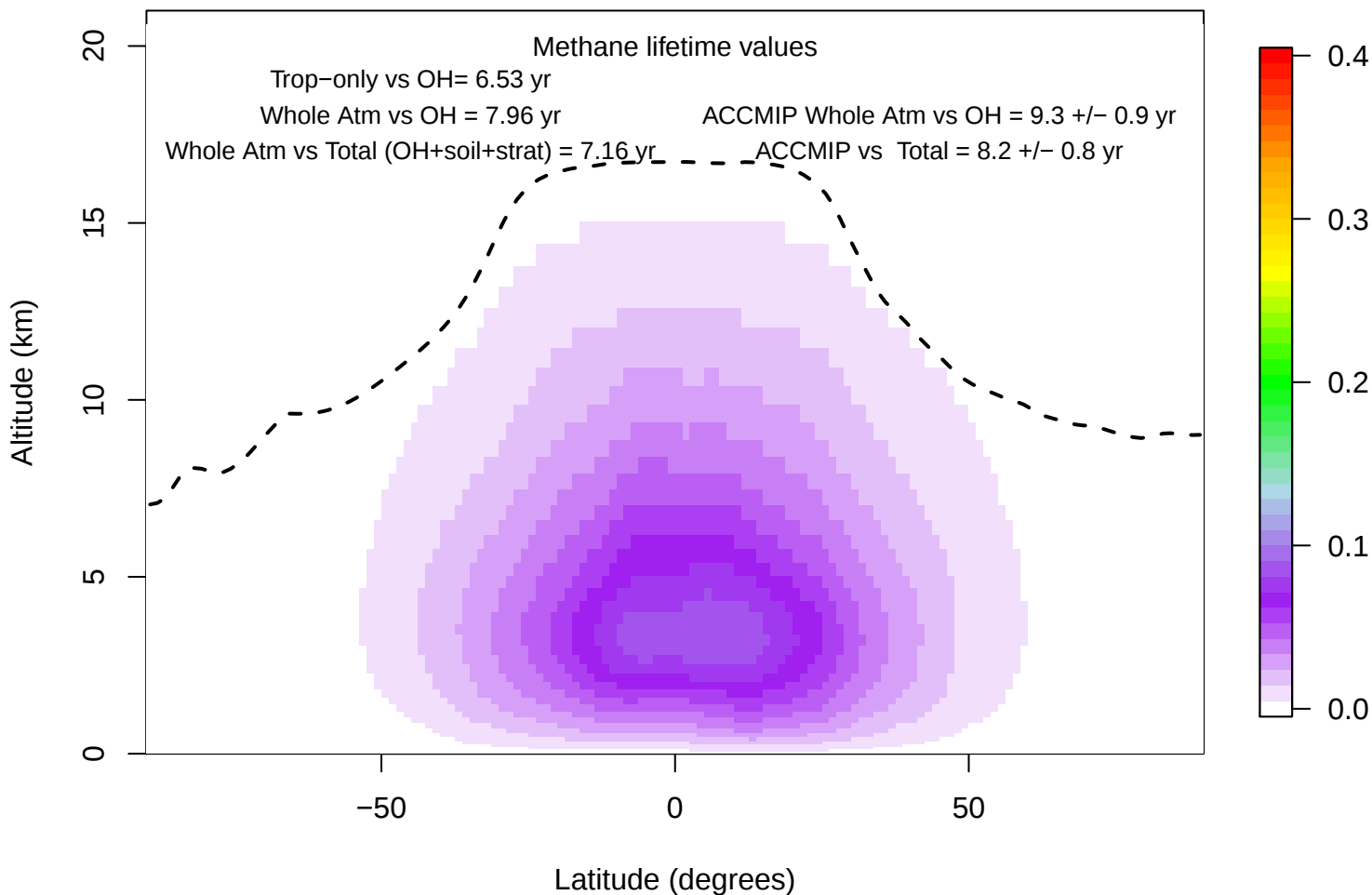






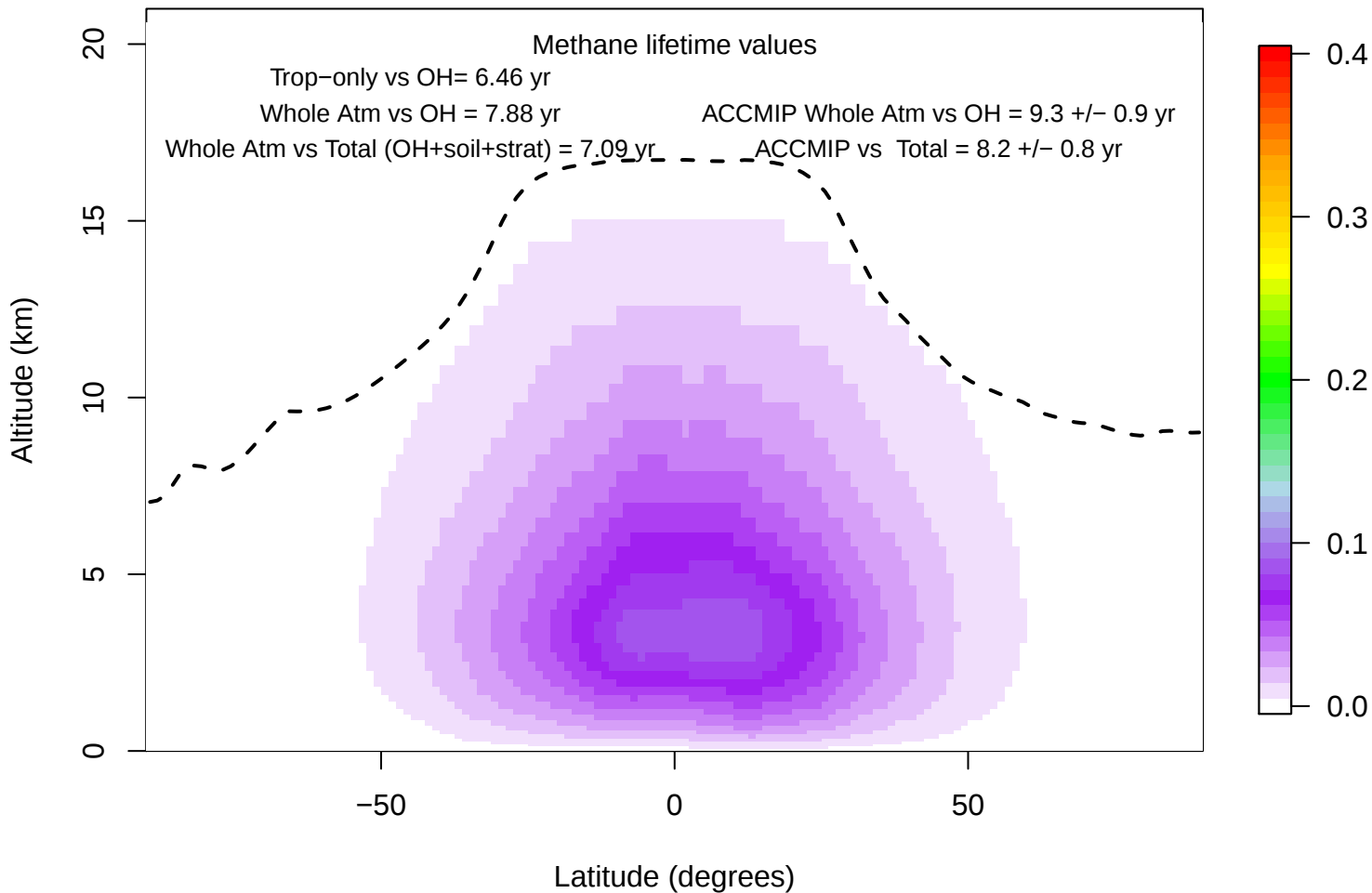
UKCA br633

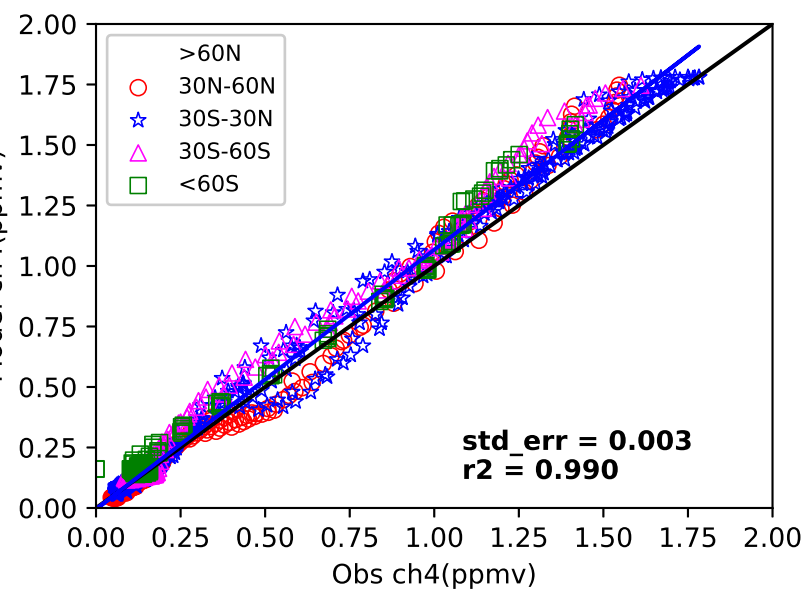
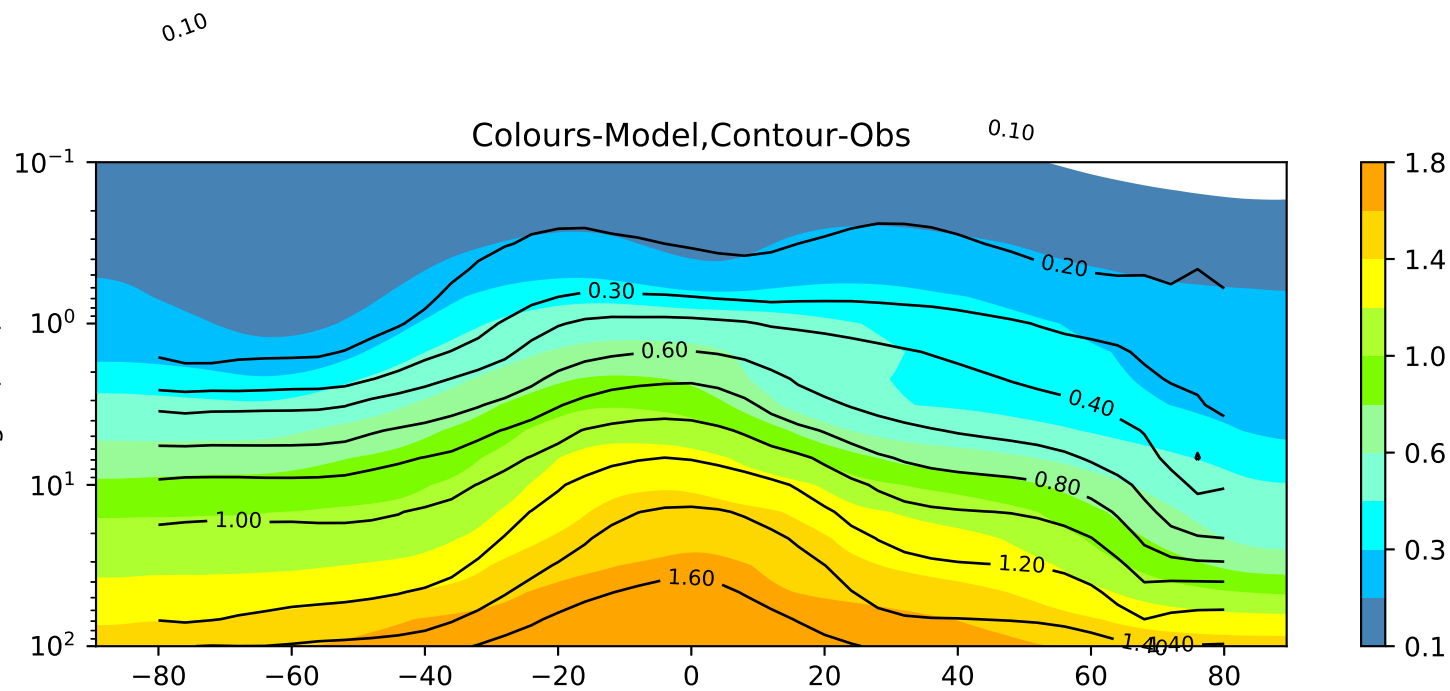
% CH₄ + OH flux (moles cm⁻³ s⁻¹)



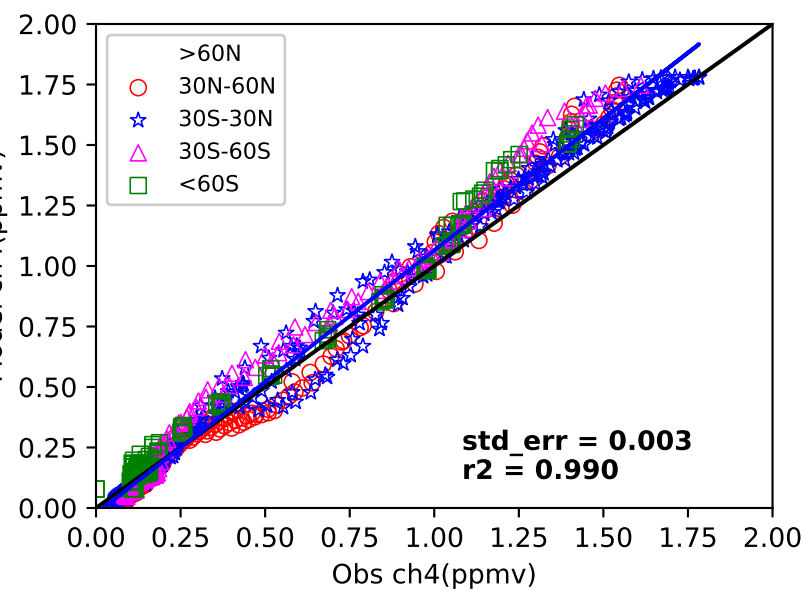
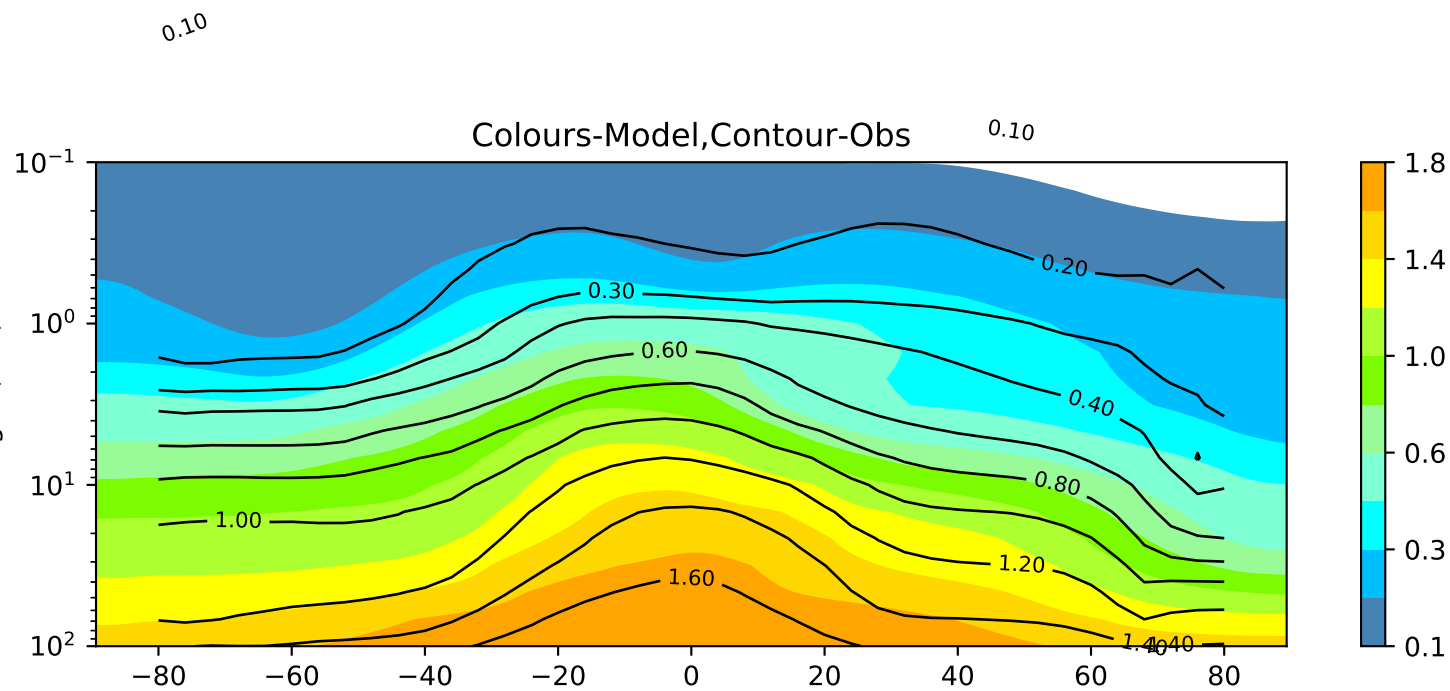
UKCA bt118

% CH₄ + OH flux (moles cm⁻³ s⁻¹)

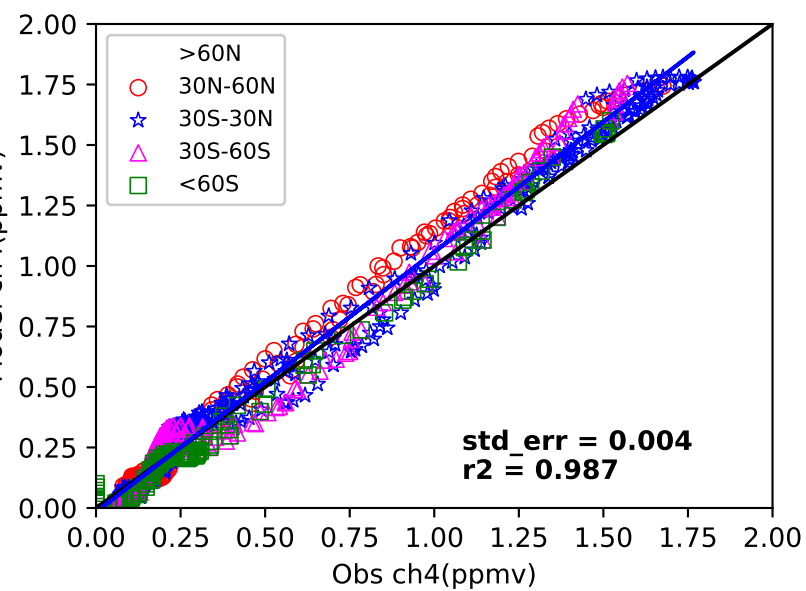
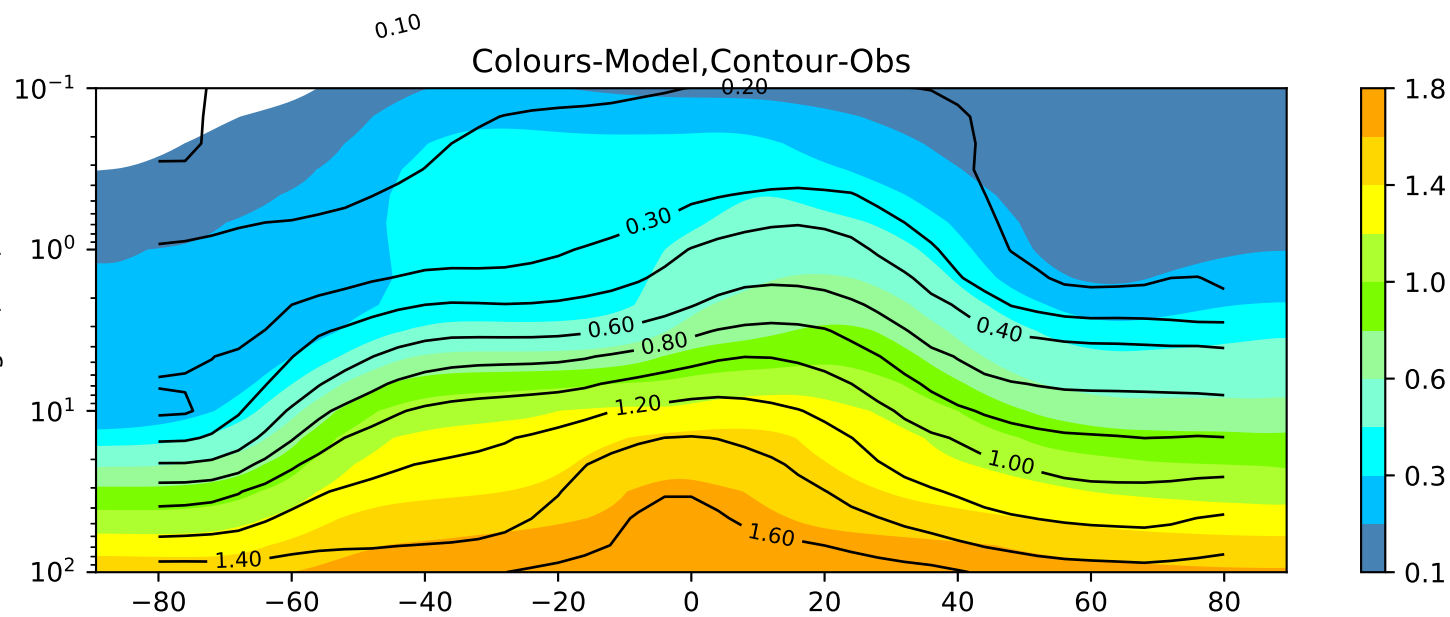




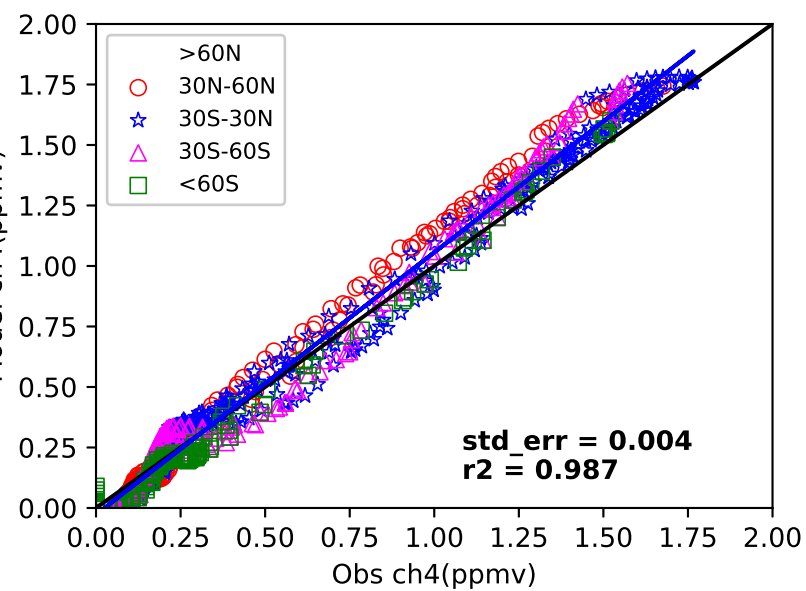
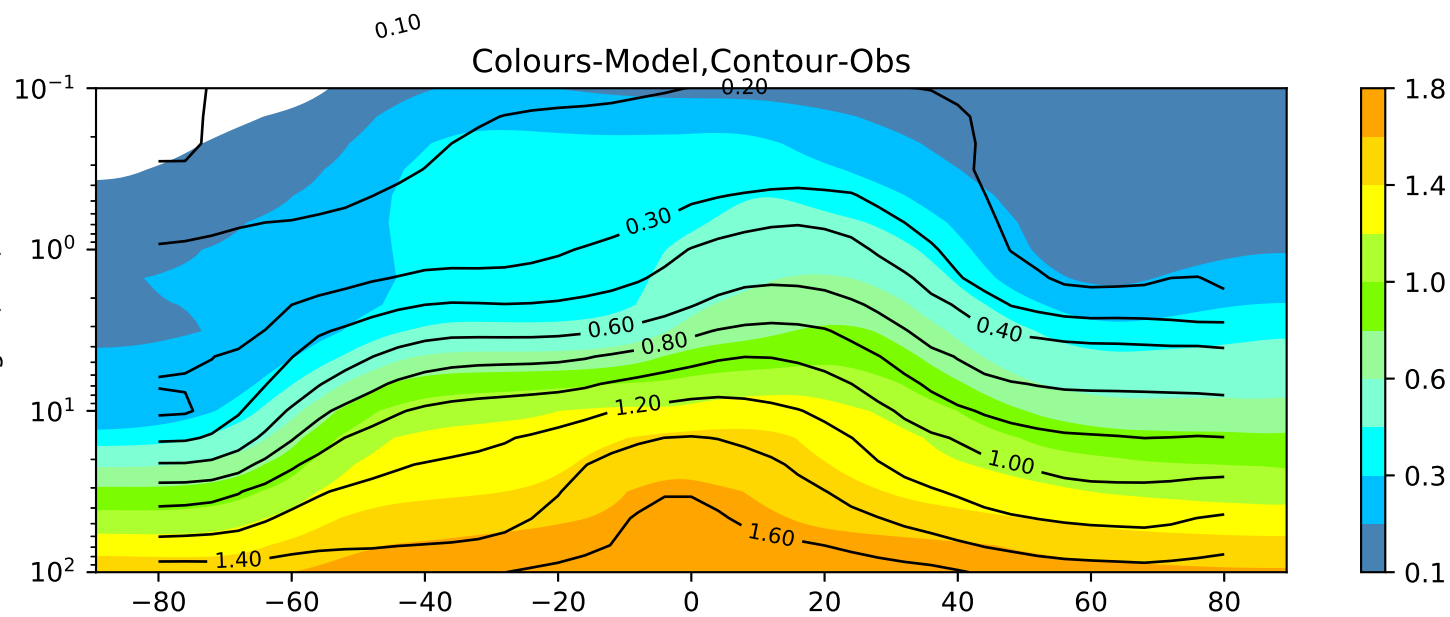
UKCA br633 vs HALOE:
CH4 (ppmv) Jan



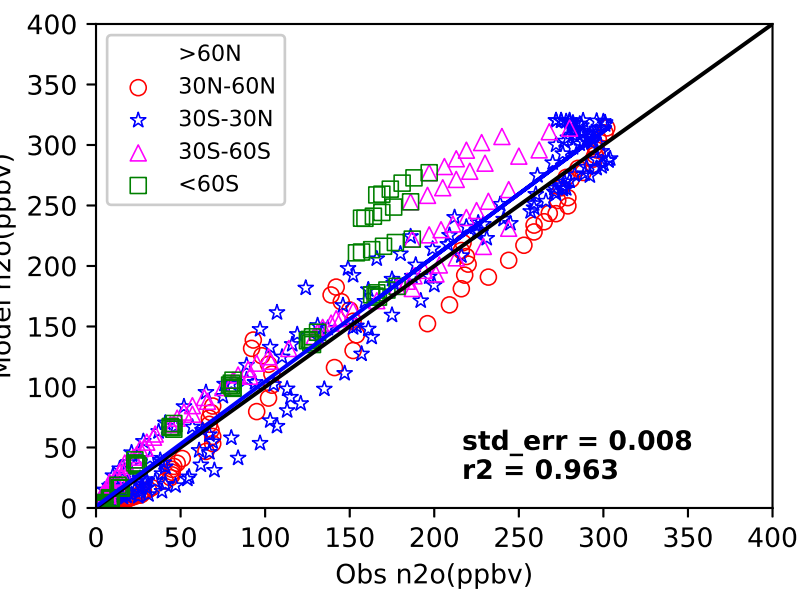
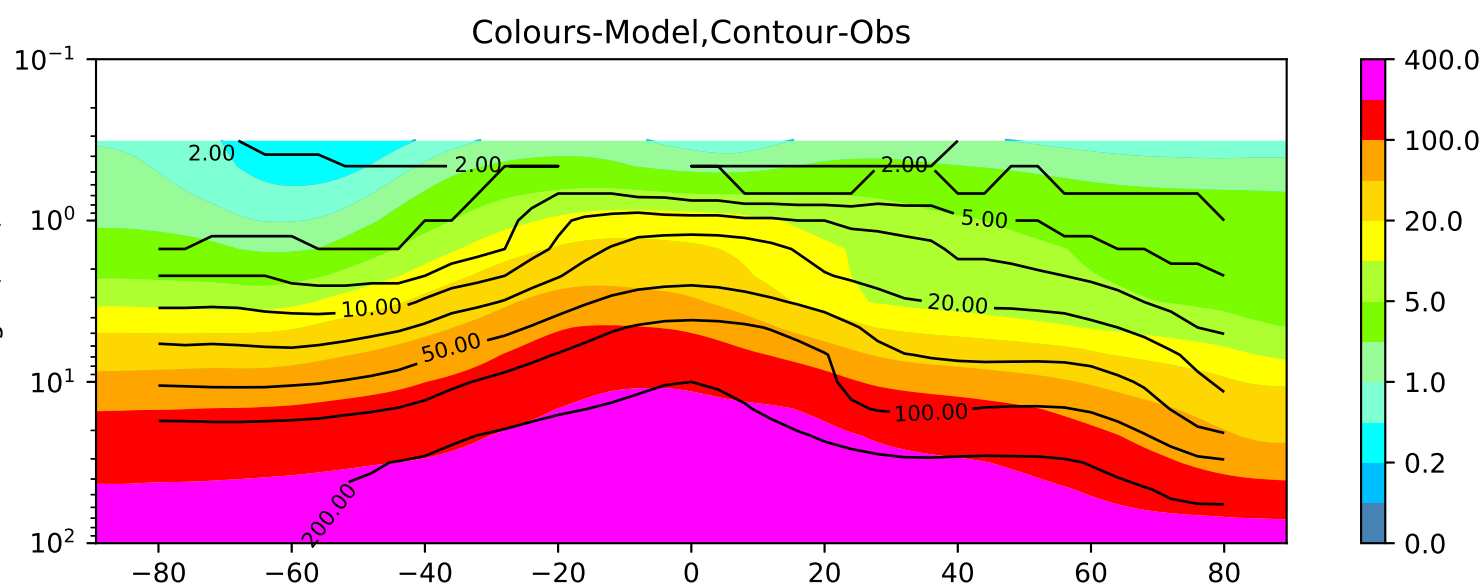
UKCA bt118 vs HALOE:
CH4 (ppmv) Jan



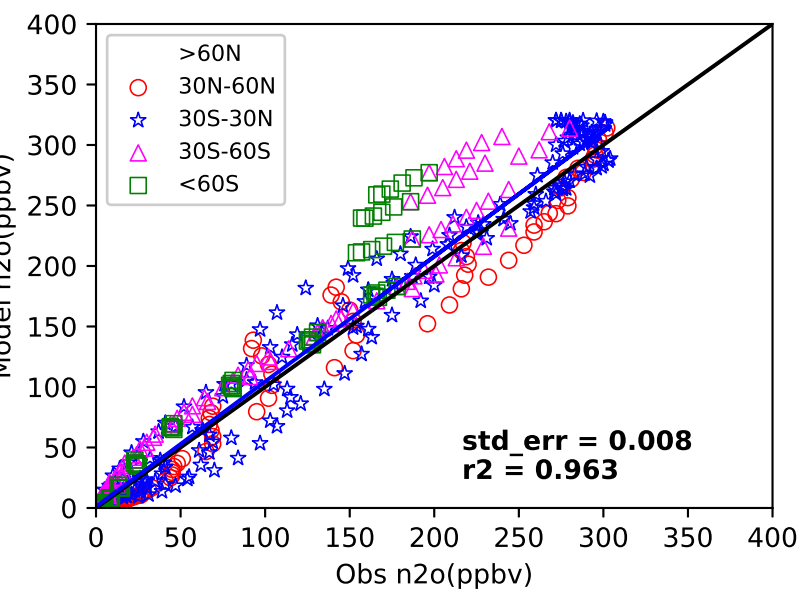
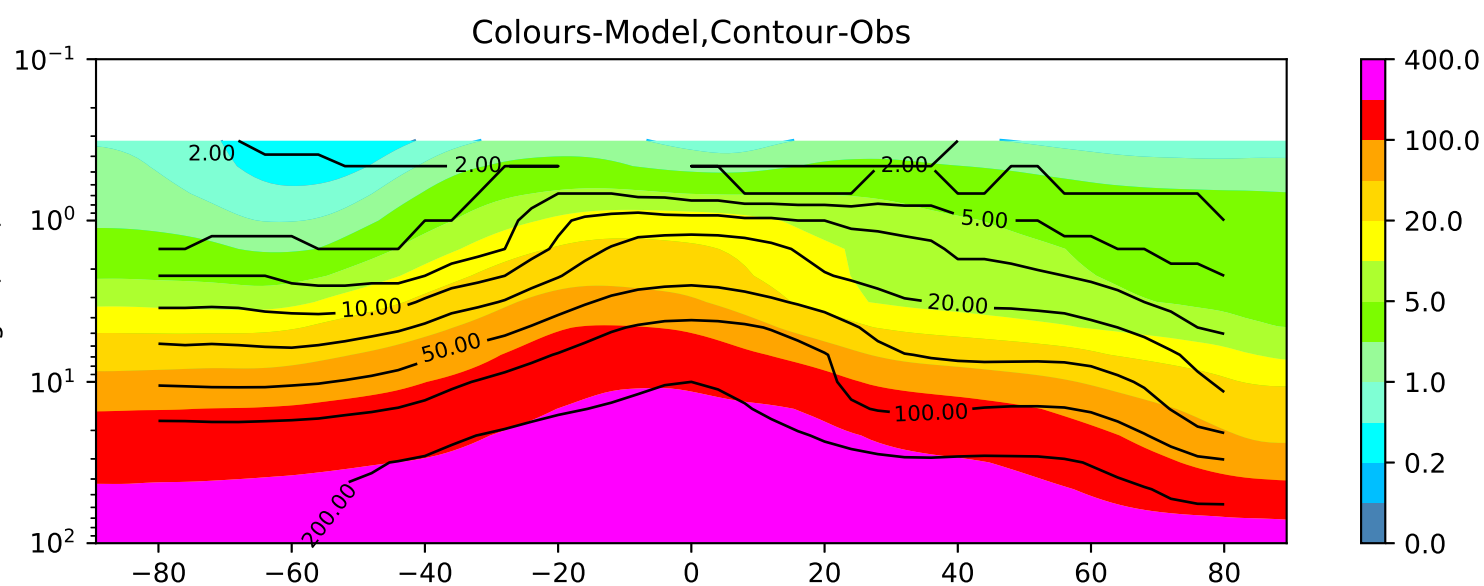
UKCA br633 vs HALOE:
CH4 (ppmv) Jul



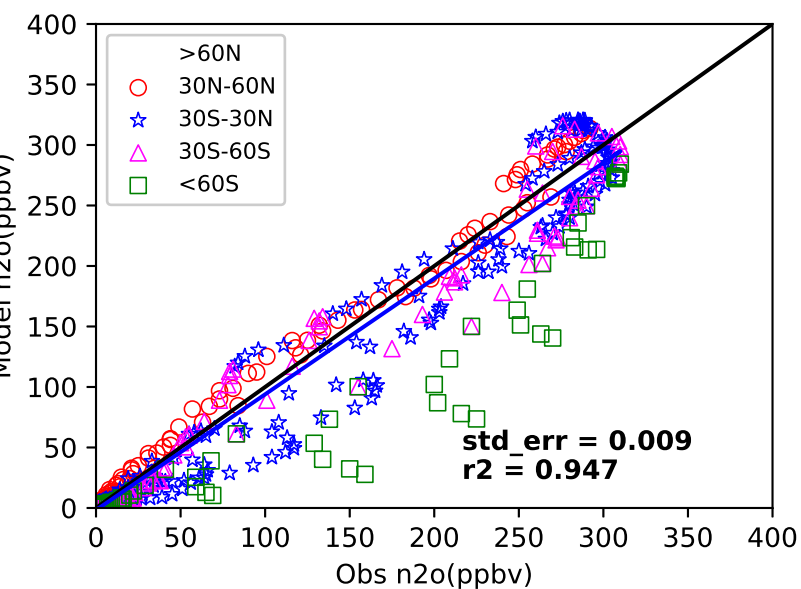
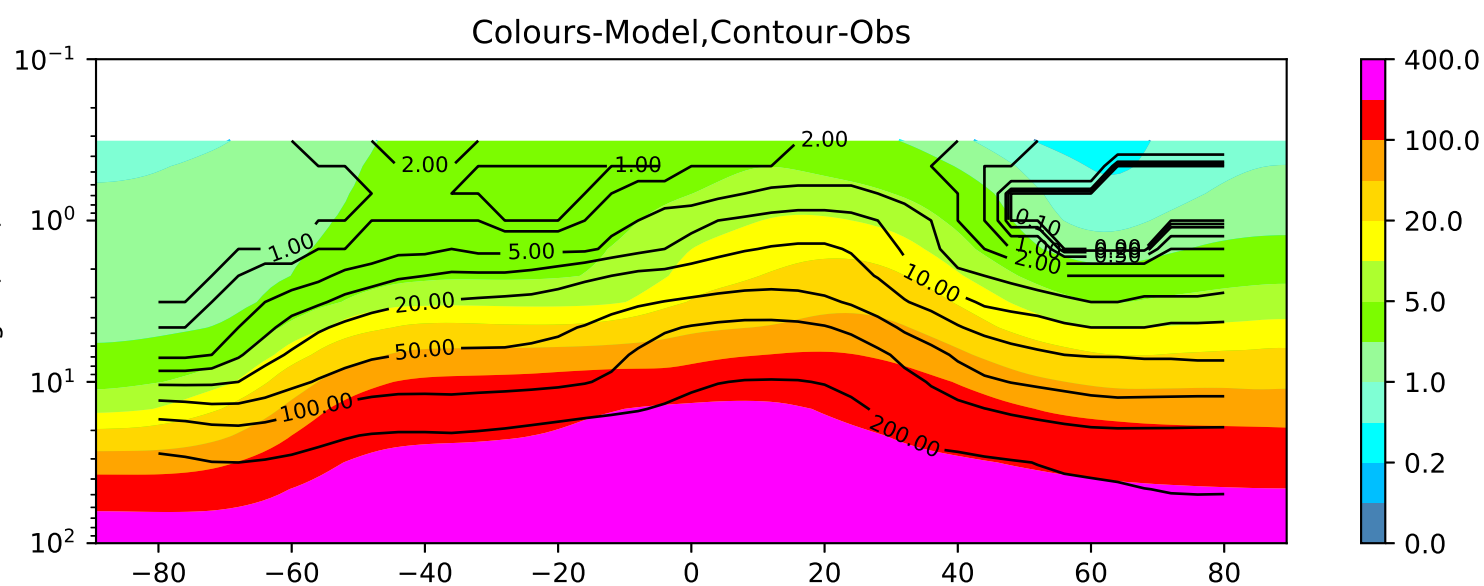
UKCA bt118 vs HALOE:
CH4 (ppmv) Jul



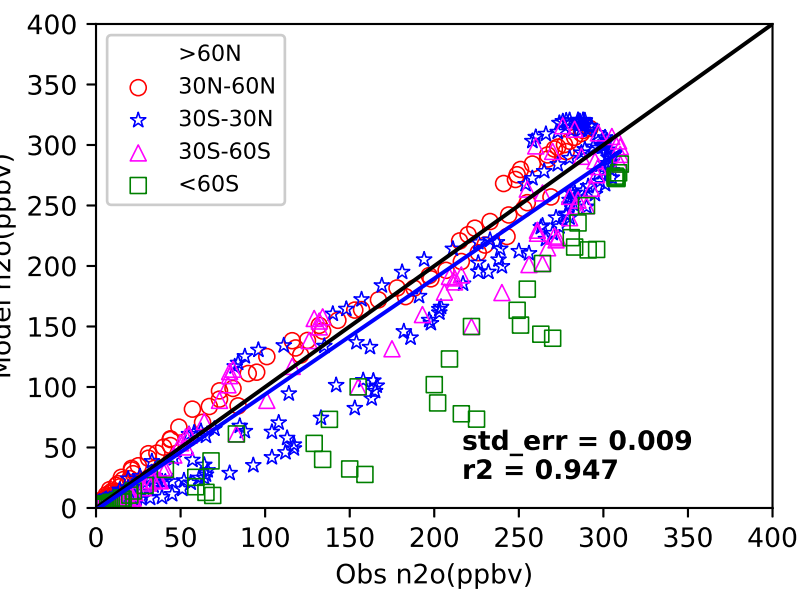
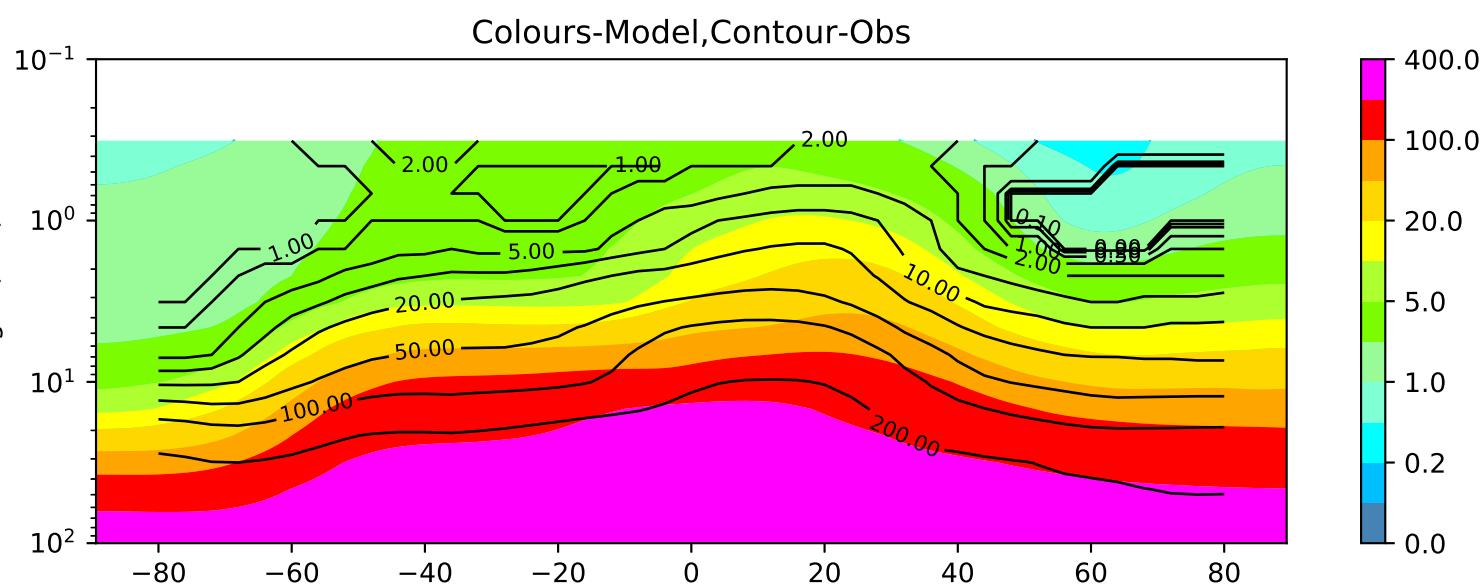
UKCA br633 vs HALOE:
N2O (ppmv) Jan



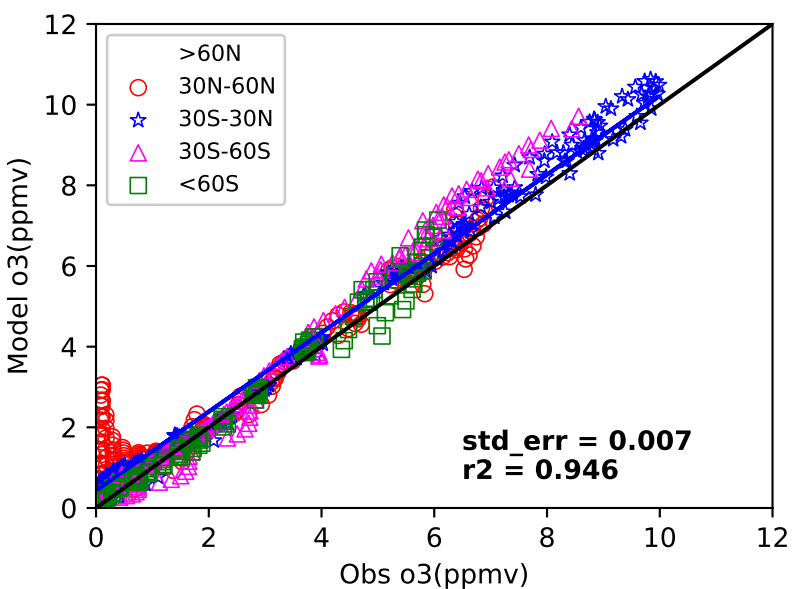
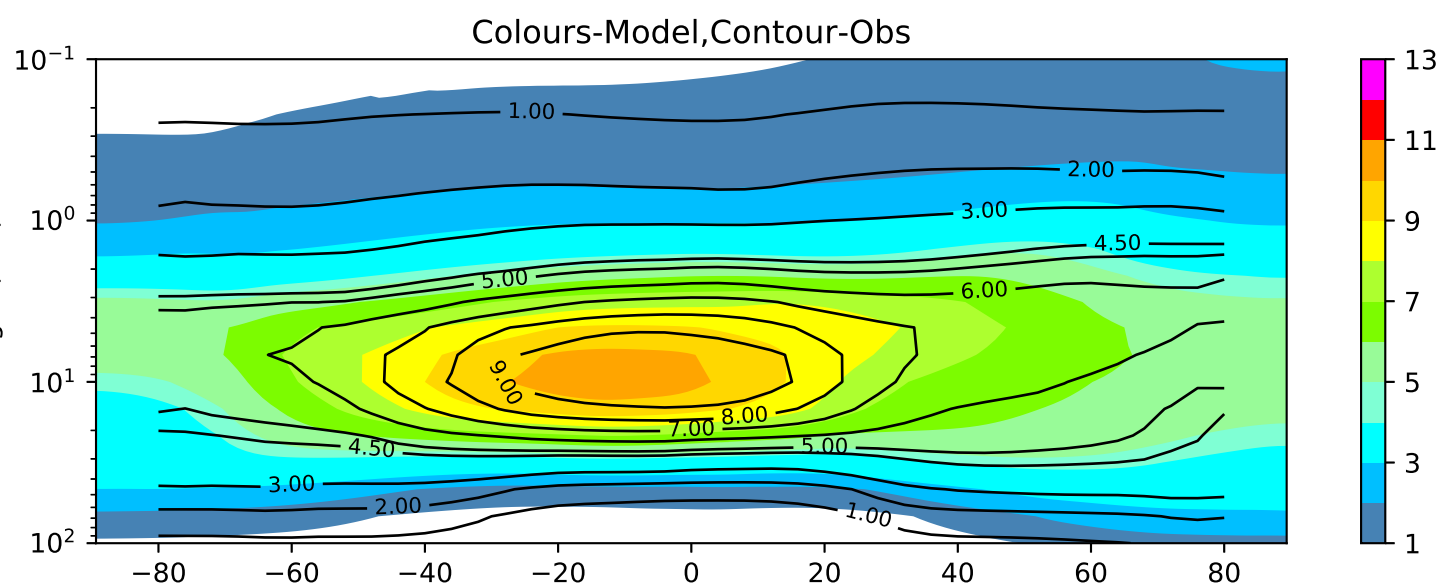
UKCA bt118 vs HALOE:
N2O (ppmv) Jan



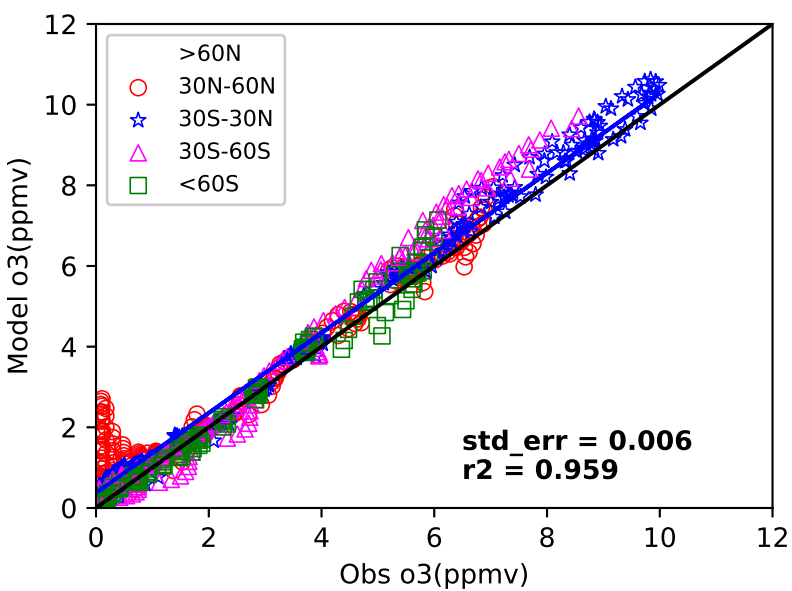
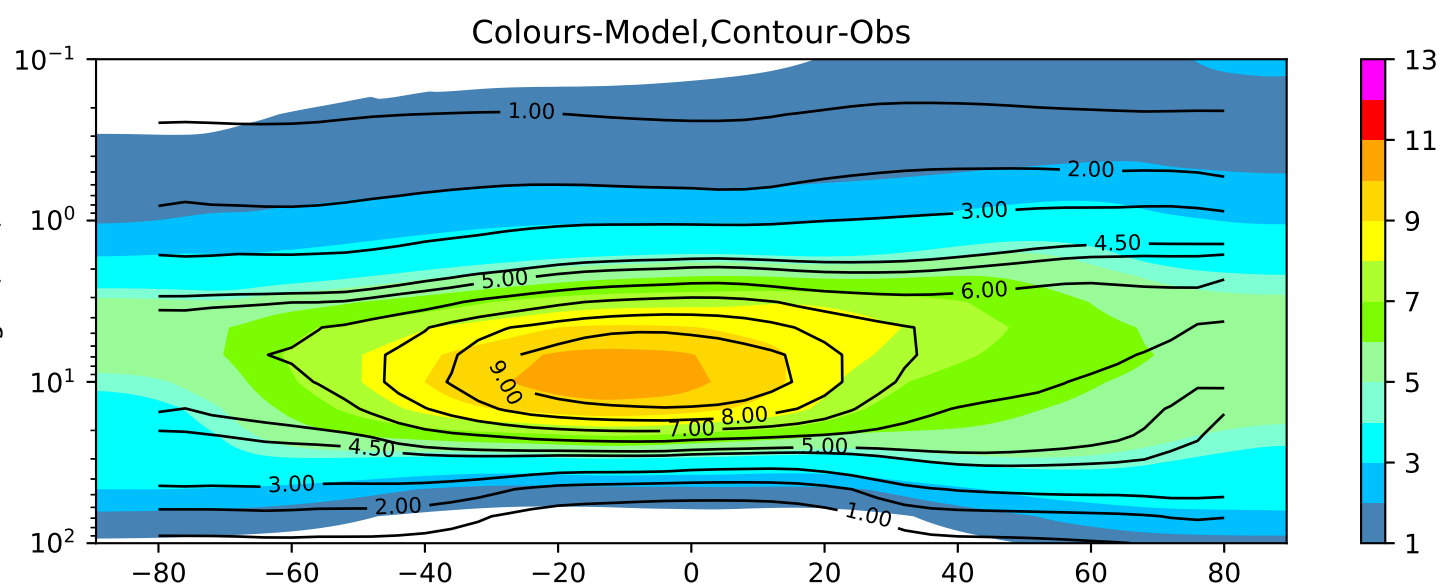
UKCA br633 vs HALOE:
N2O (ppmv) Jul



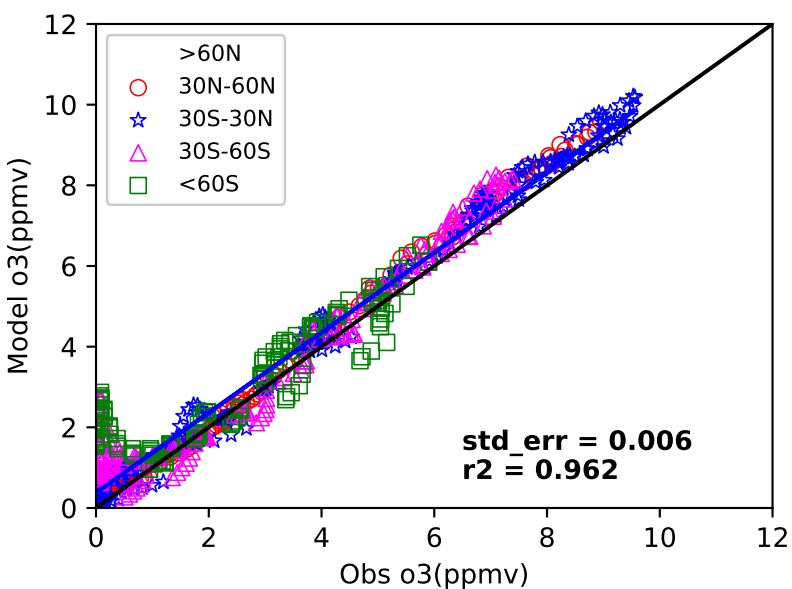
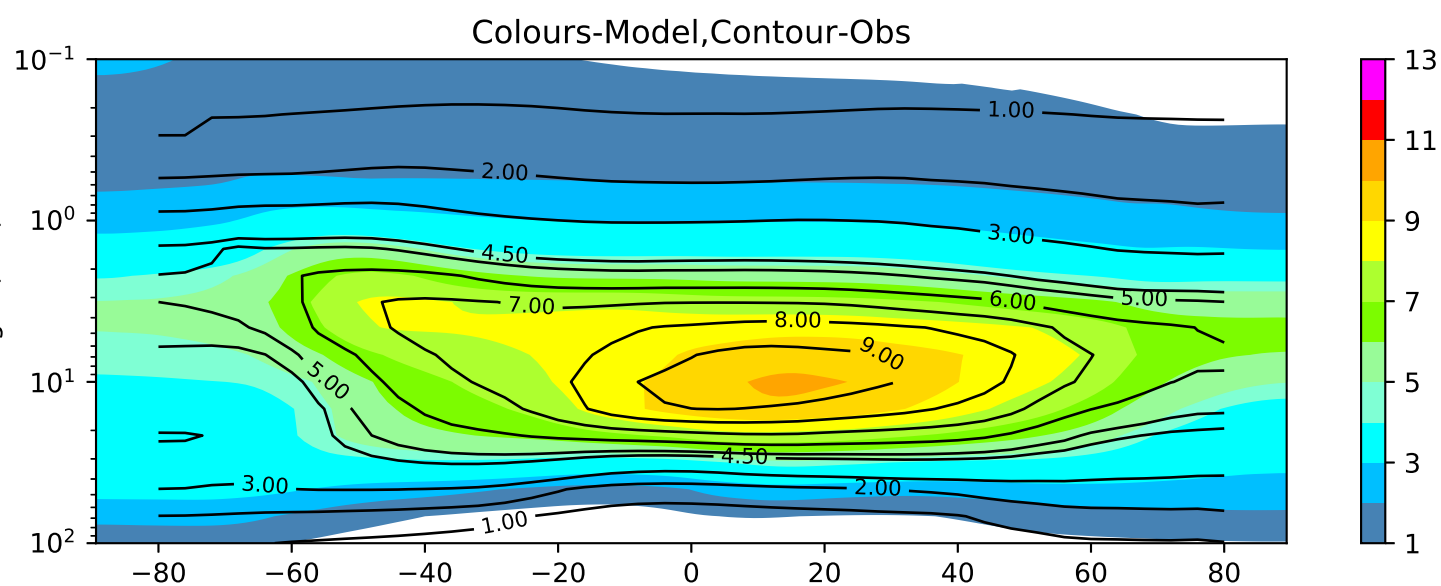
UKCA bt118 vs HALOE:
N2O (ppmv) Jul



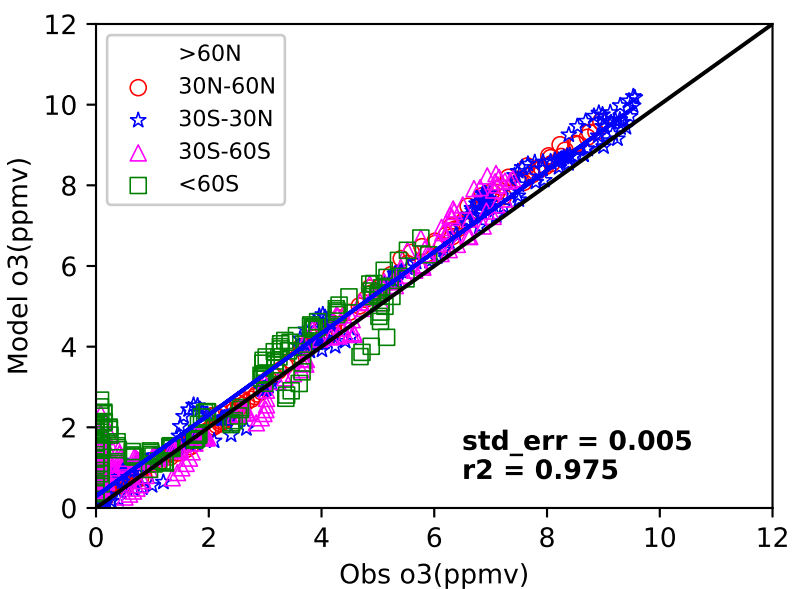
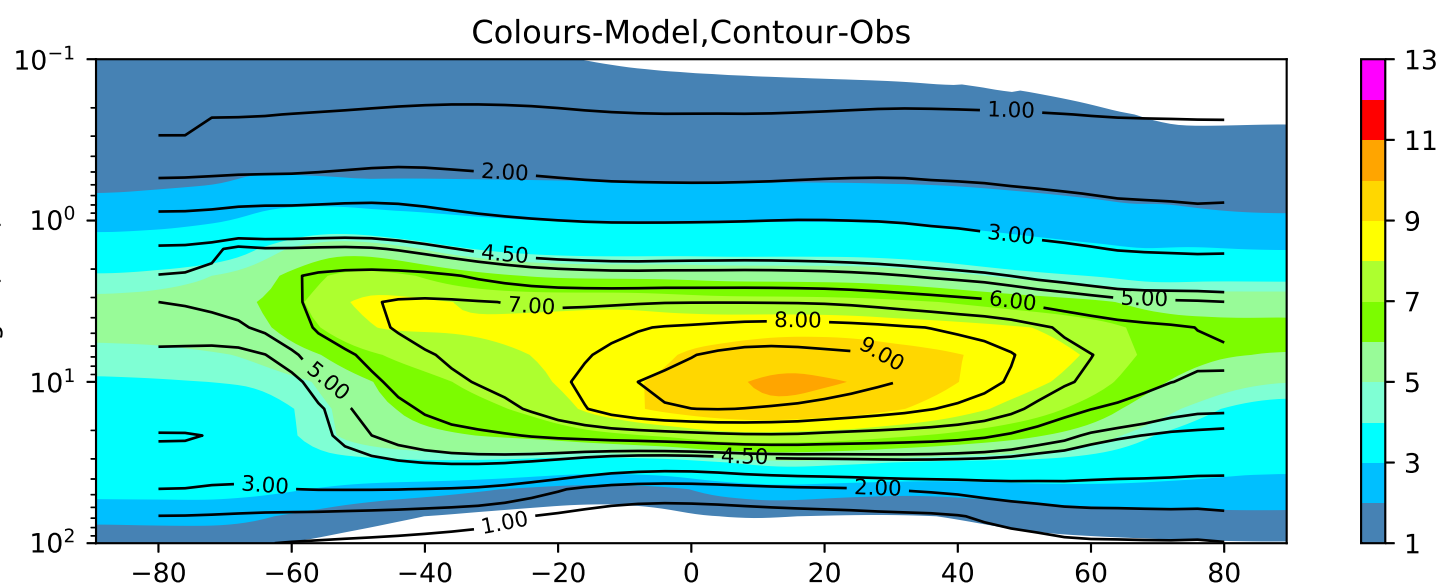
UKCA br633 vs HALOE:
O₃ (ppmv) Jan



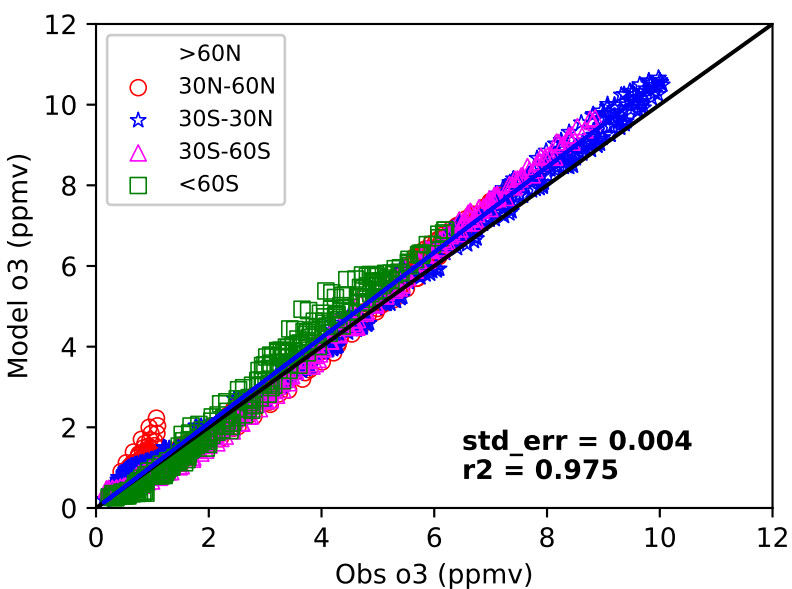
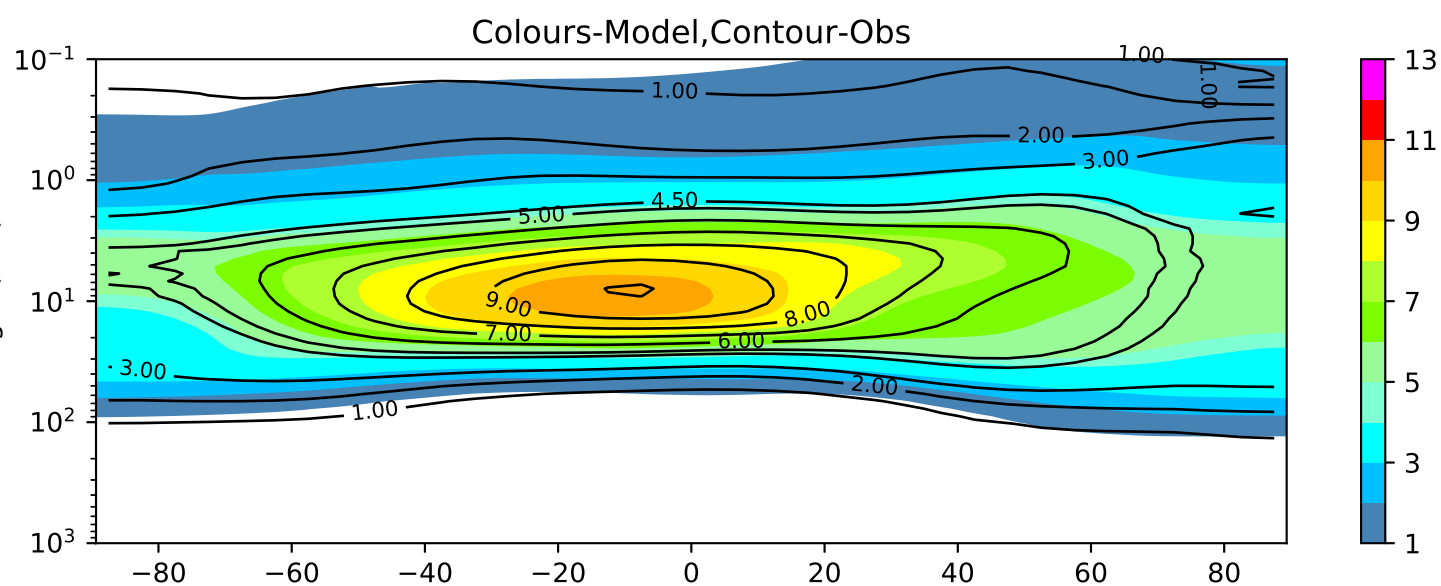
UKCA bt118 vs HALOE:
O₃ (ppmv) Jan



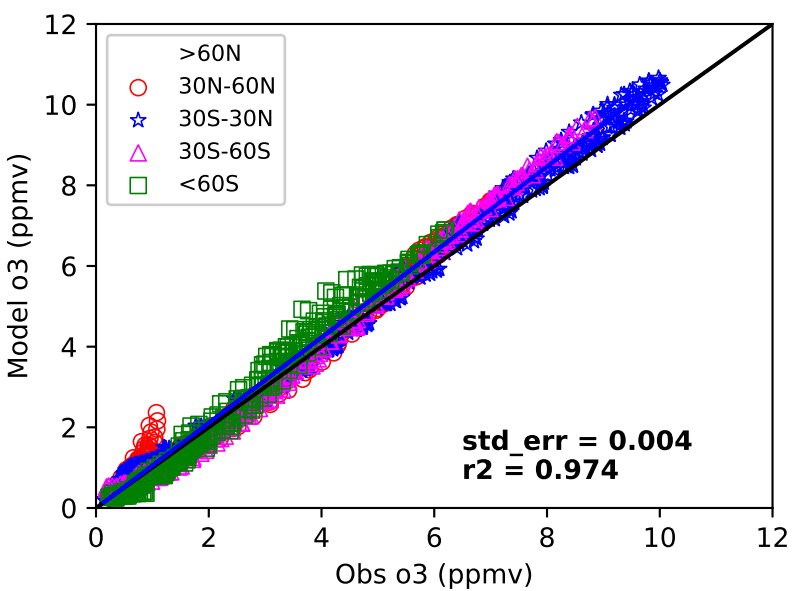
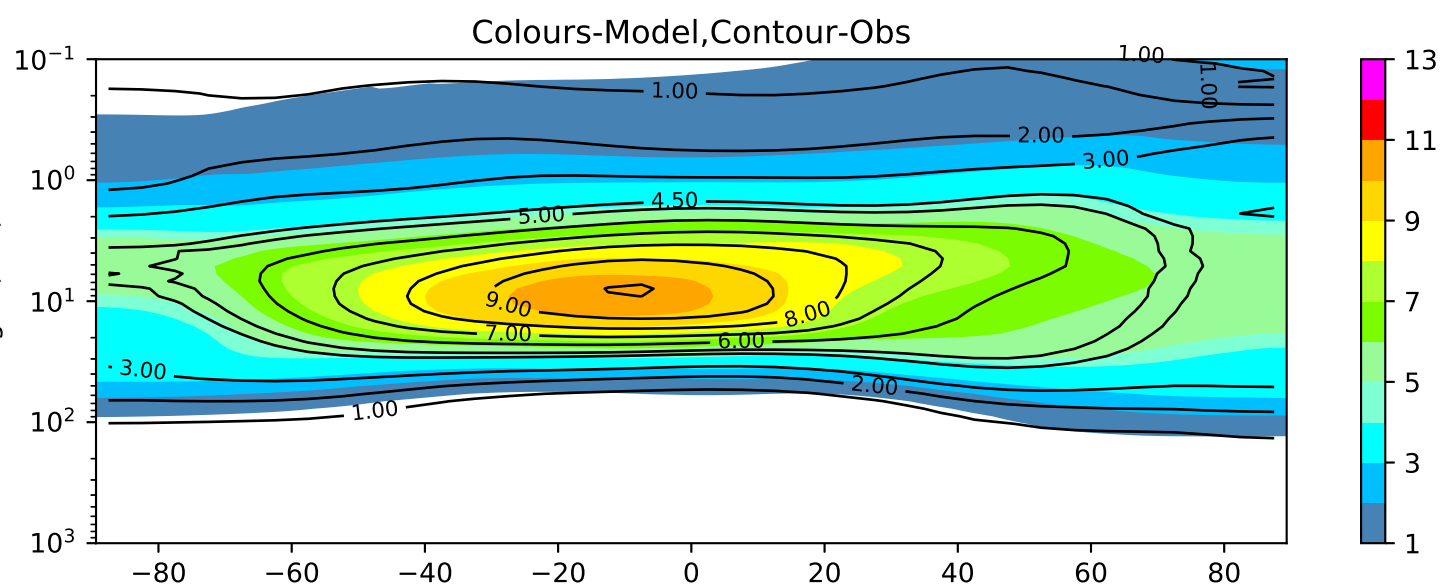
UKCA br633 vs HALOE:
O₃ (ppmv) Jul



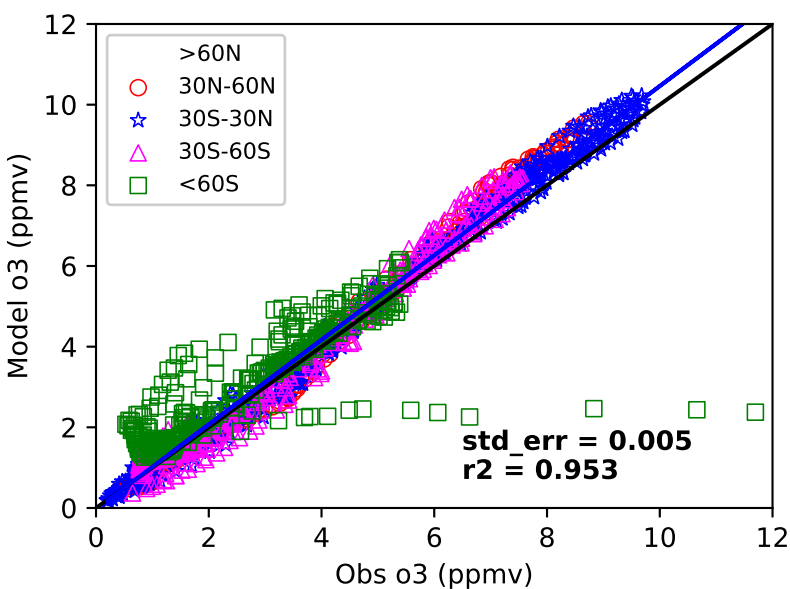
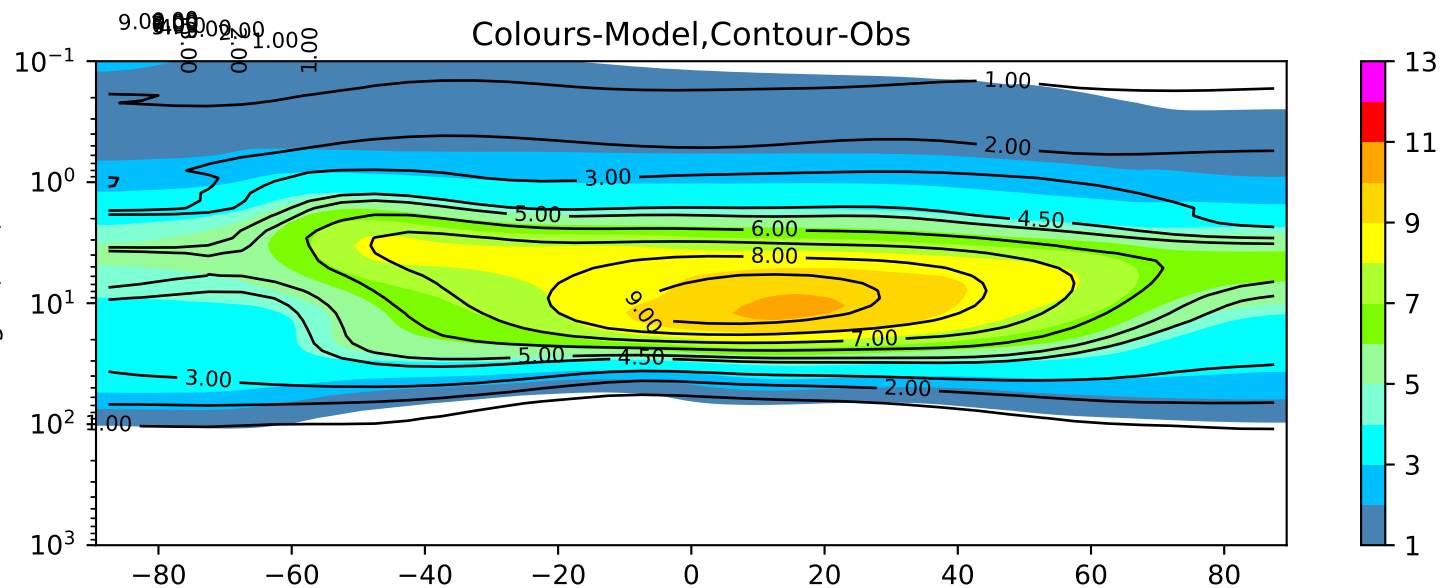
UKCA bt118 vs HALOE:
O₃ (ppmv) Jul



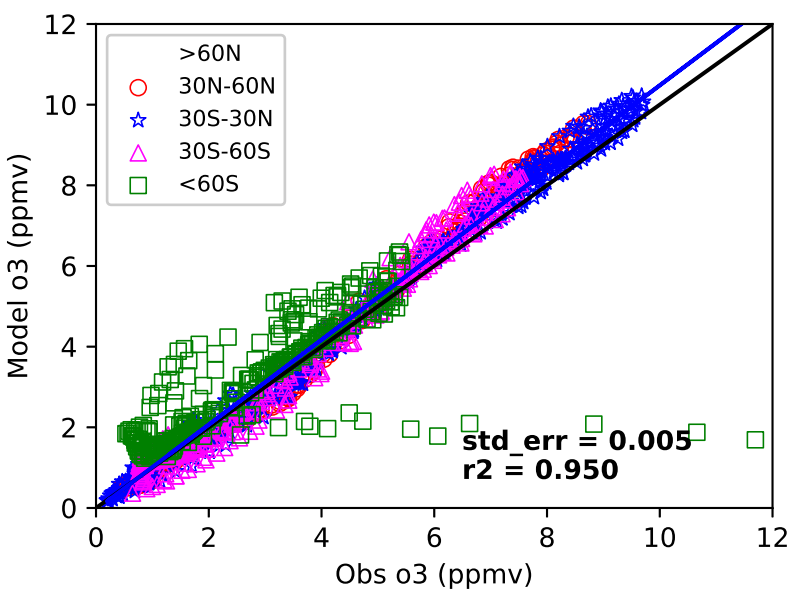
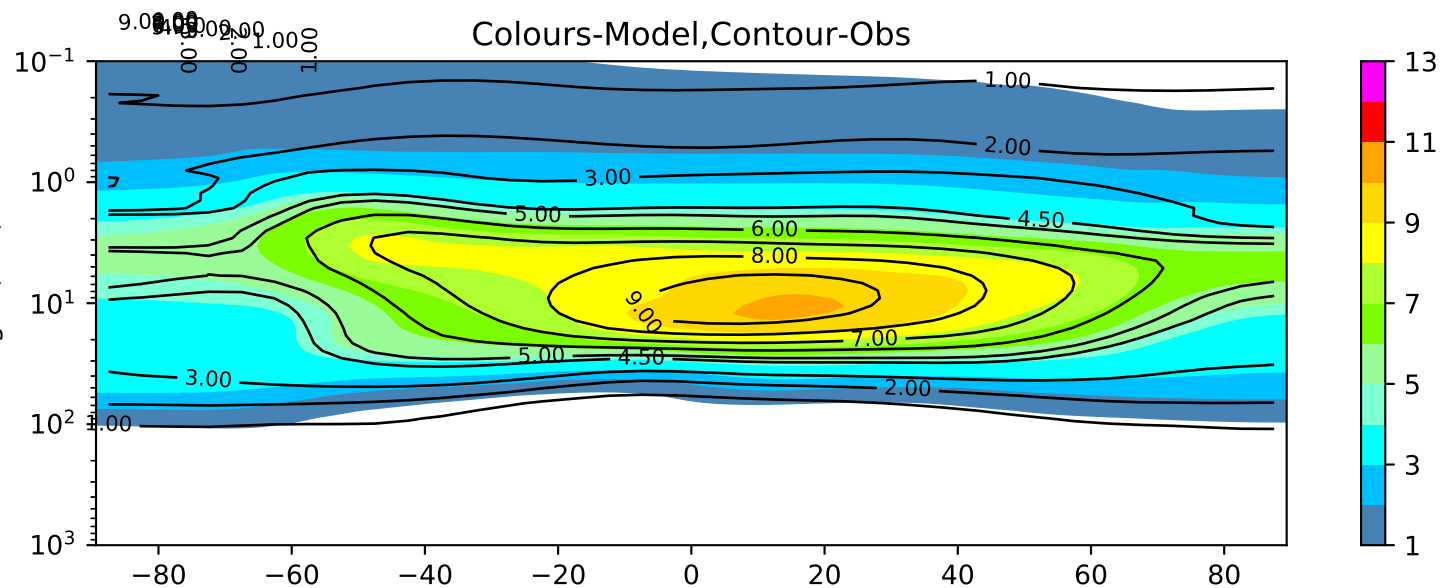
UKCA br633 vs NIWA-CCMVal:
O3 (ppmv) Jan



UKCA bt118 vs NIWA-CCMVal:
O3 (ppmv) Jan



UKCA br633 vs NIWA-CCMVal:
O3 (ppmv) Jul



UKCA bt118 vs NIWA-CCMVal:
O3 (ppmv) Jul

