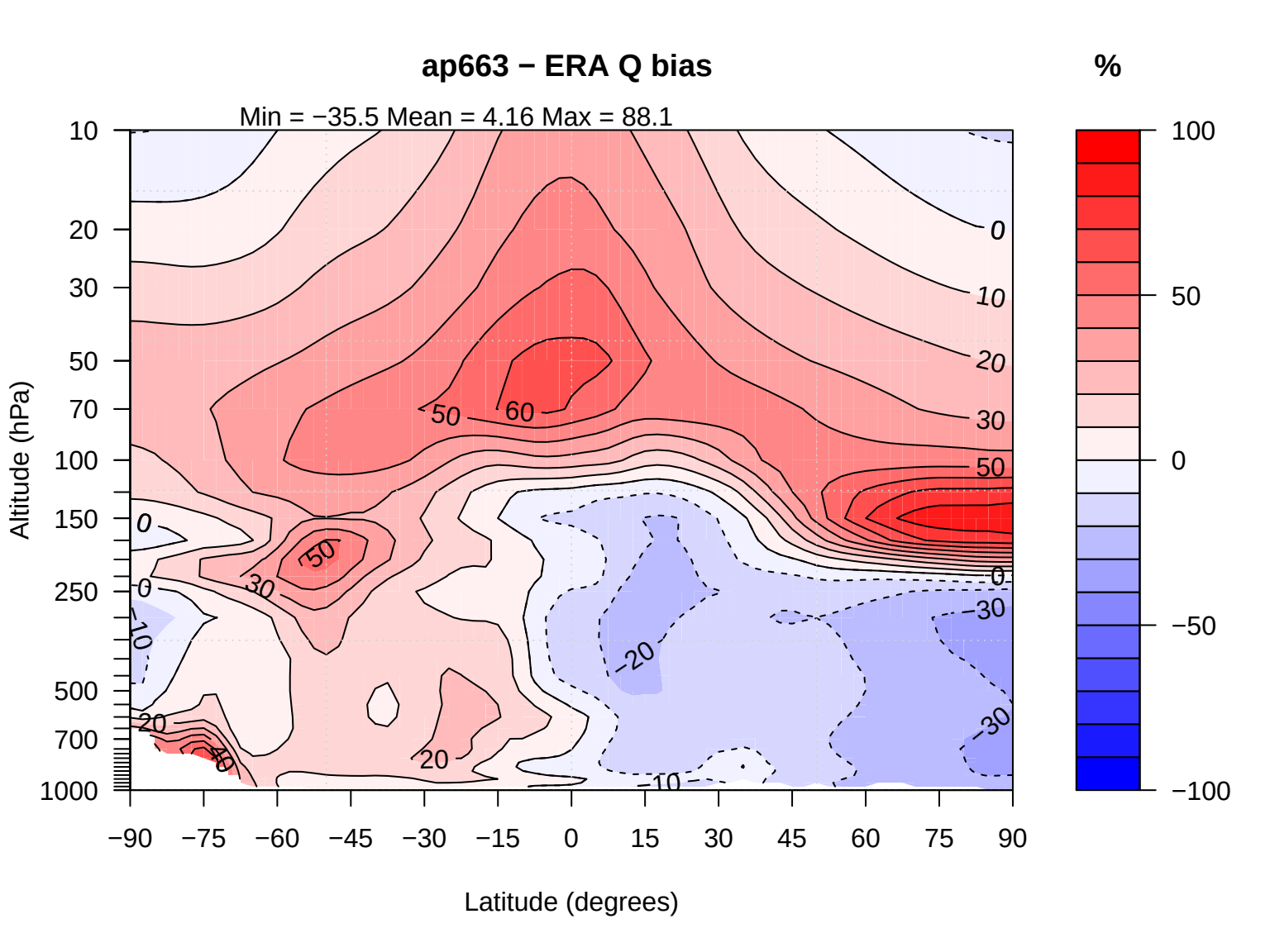
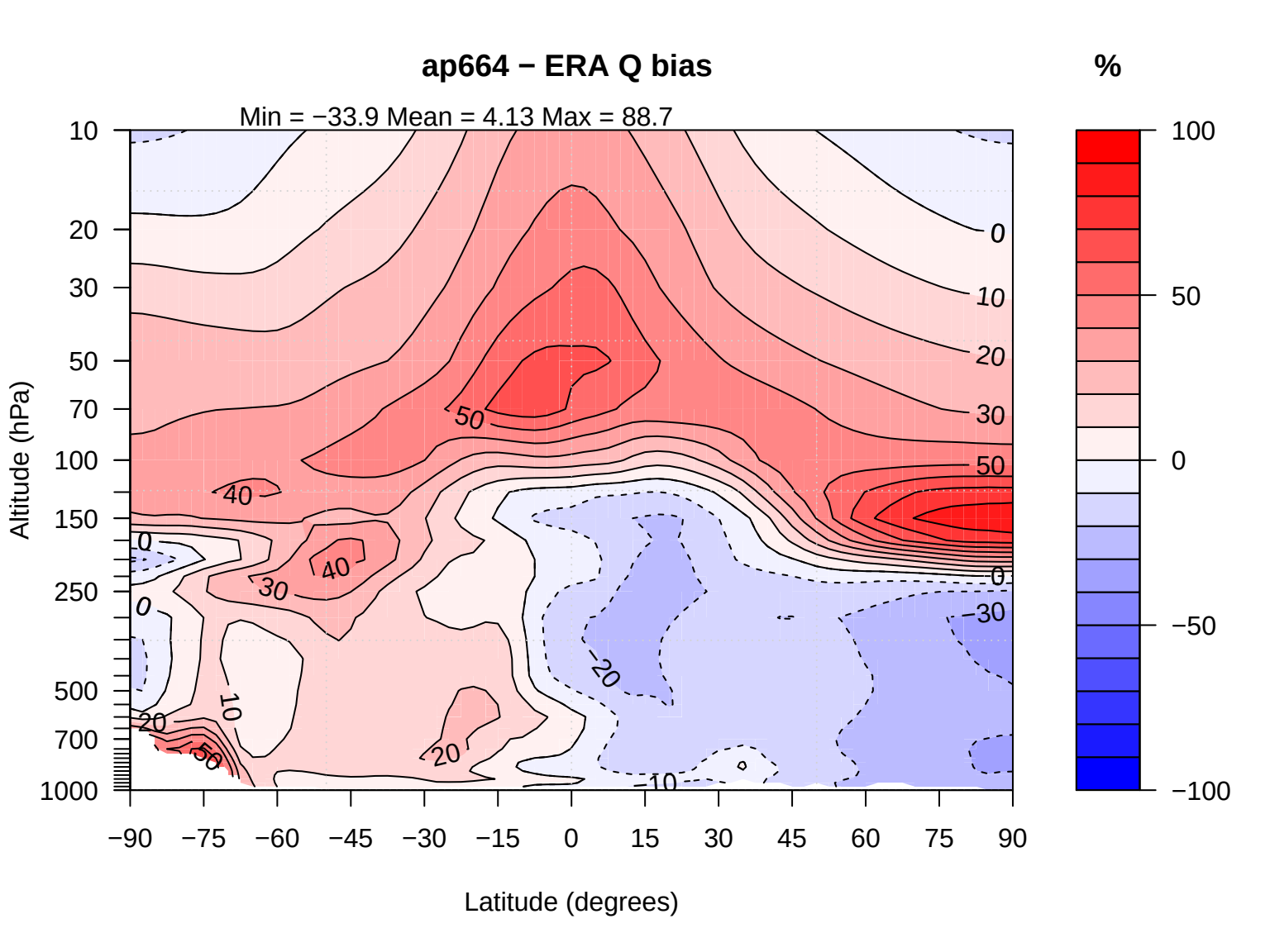
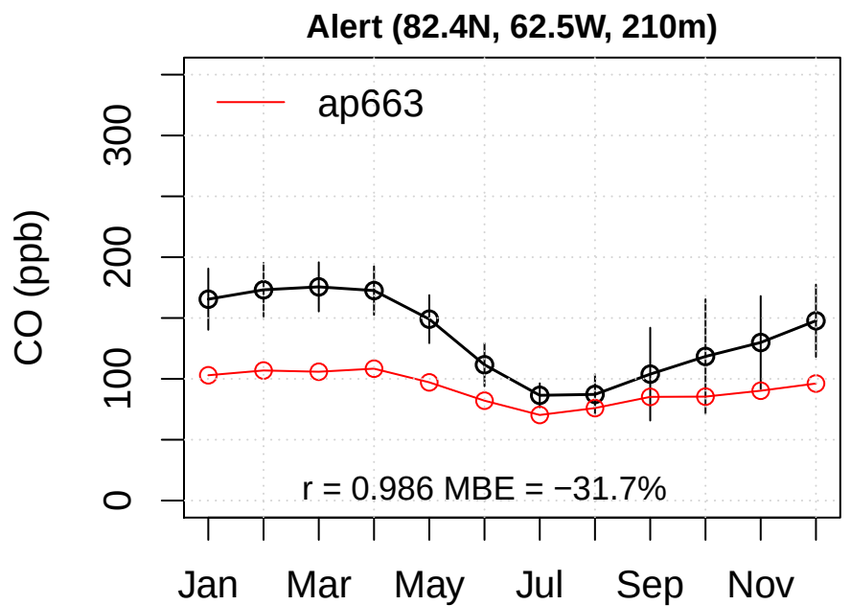
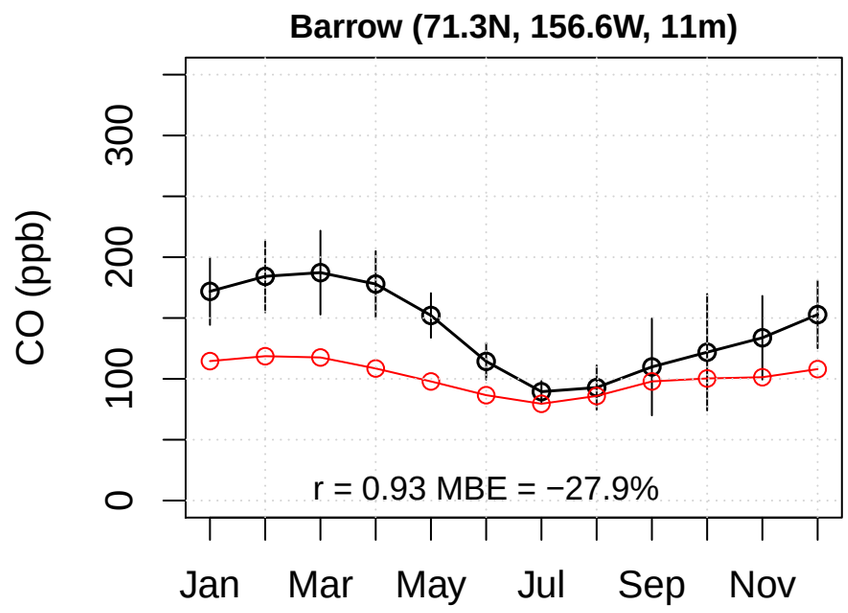
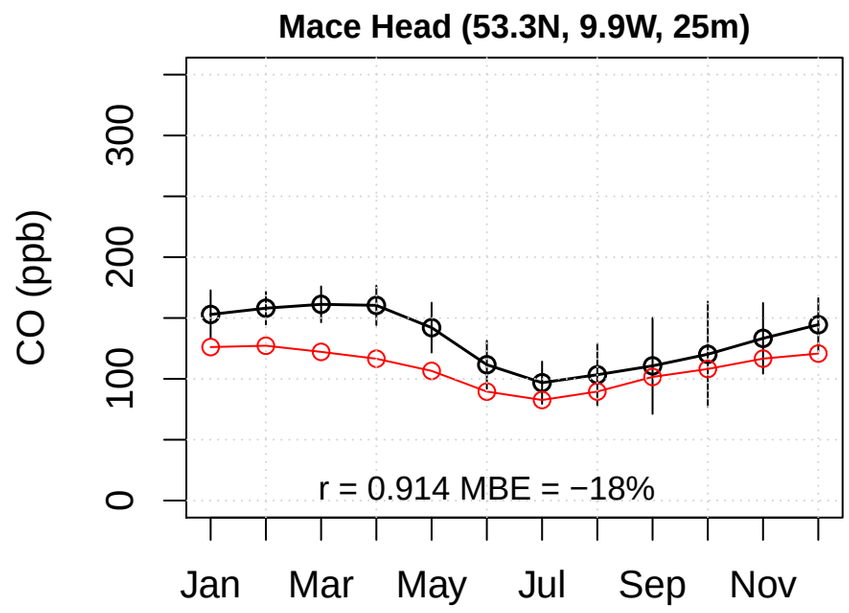
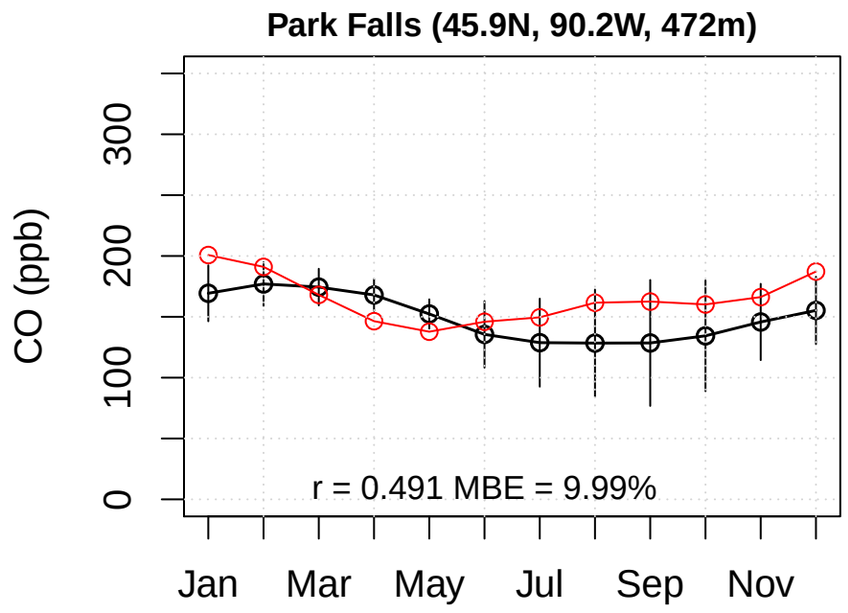

ap663 − ERA Q bias
%
Min = −35.5 Mean = 4.16 Max = 88.1
Altitude (hPa)
10
20
30
50
70
100
150
250
500
700
1000
−90
−75
−60
−45
−30
−15
0
15
30
45
60
75
90
Latitude (degrees)
100
50
0
−50
−100

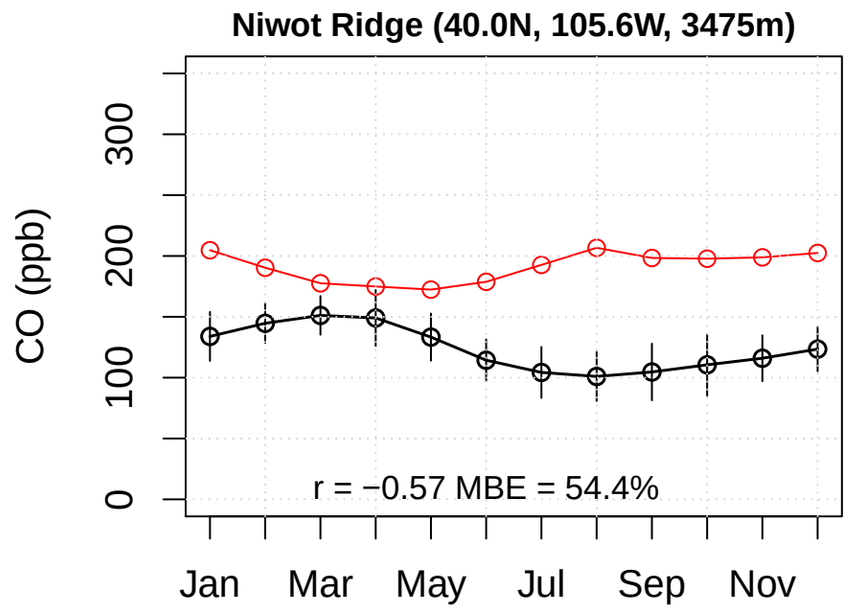

ap664 − ERA Q bias
%
Min = −33.9 Mean = 4.13 Max = 88.7
Altitude (hPa)
10
20
30
50
70
100
150
250
500
700
1000
−90
−75
−60
−45
−30
−15
0
15
30
45
60
75
90
Latitude (degrees)
100
50
0
−50
−100

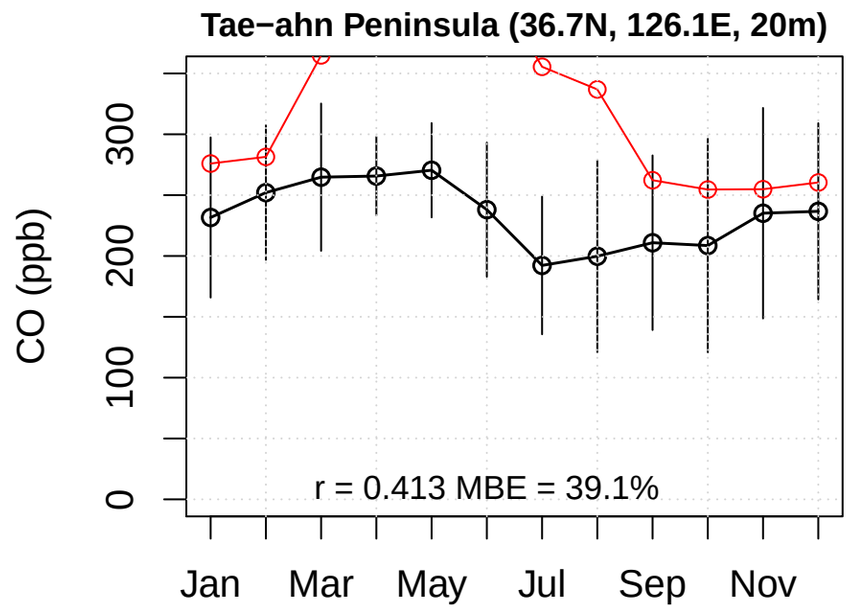

Alert (82.4N, 62.5W, 210m)
ap663
CO (ppb)
0
100
200
300
r = 0.986 MBE = −31.7%
Jan
Mar
May
Jul
Sep
Nov

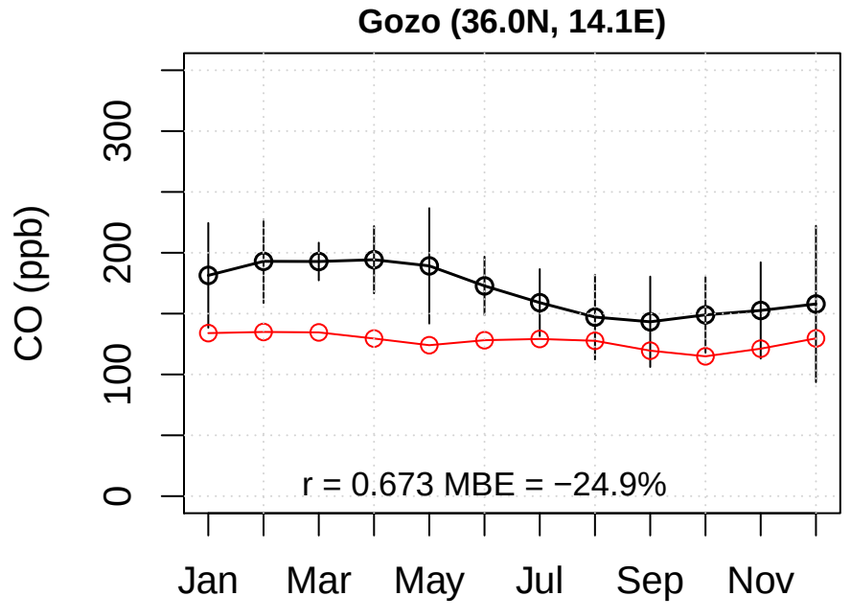

Barrow (71.3N, 156.6W, 11m)
CO (ppb)
0
100
200
300
r = 0.93 MBE = −27.9%
Jan
Mar
May
Jul
Sep
Nov

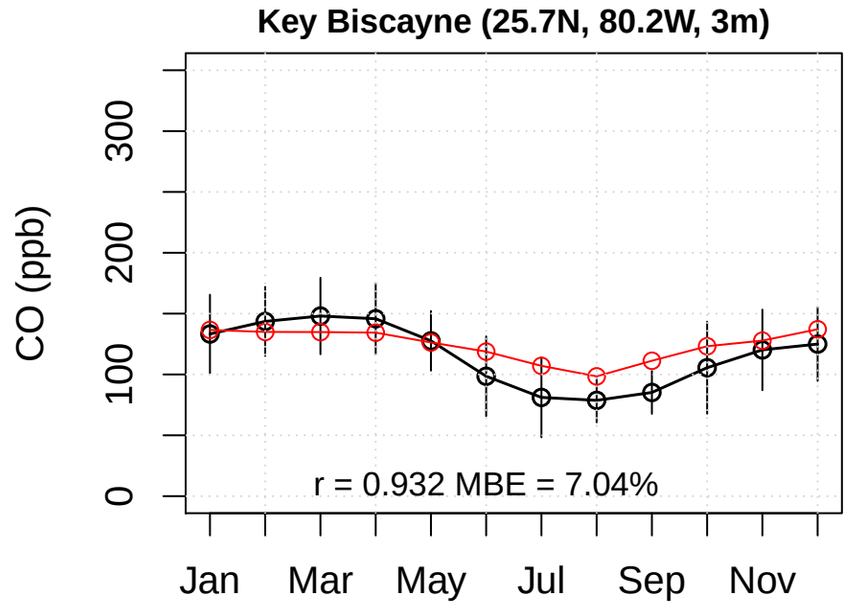

Mace Head (53.3N, 9.9W, 25m)
CO (ppb)
0
100
200
300
r = 0.914 MBE = −18%
Jan
Mar
May
Jul
Sep
Nov

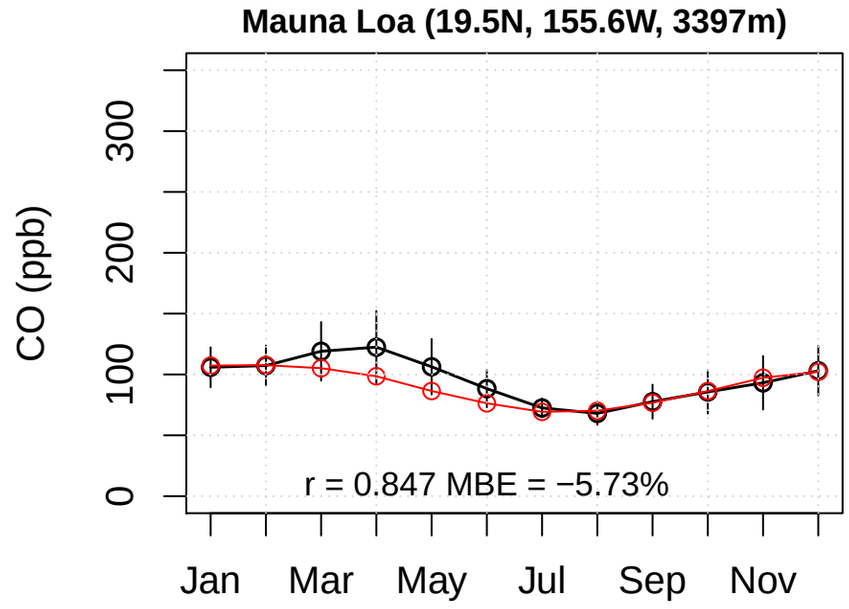

Park Falls (45.9N, 90.2W, 472m)
CO (ppb)
0
100
200
300
r = 0.491 MBE = 9.99%
Jan
Mar
May
Jul
Sep
Nov

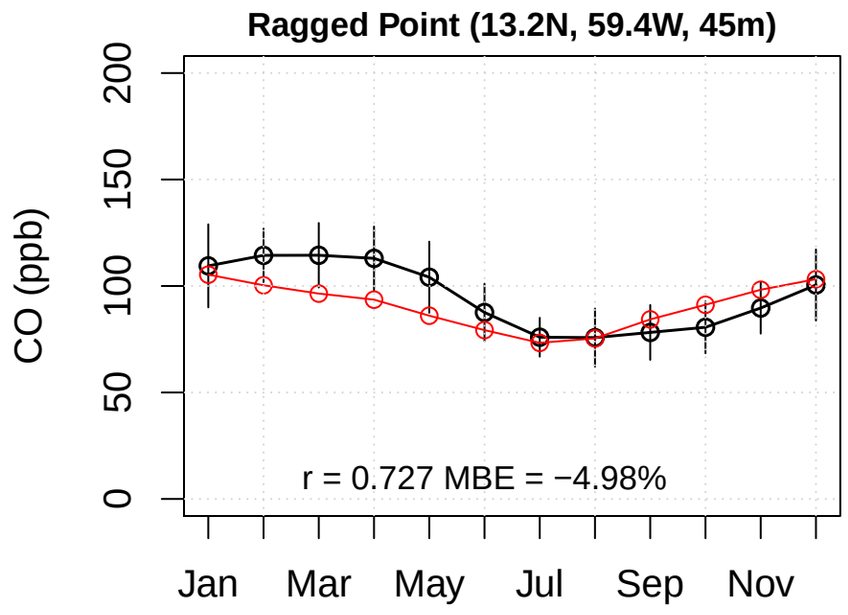

Niwot Ridge (40.0N, 105.6W, 3475m)
CO (ppb)
0
100
200
300
r = −0.57 MBE = 54.4%
Jan
Mar
May
Jul
Sep
Nov

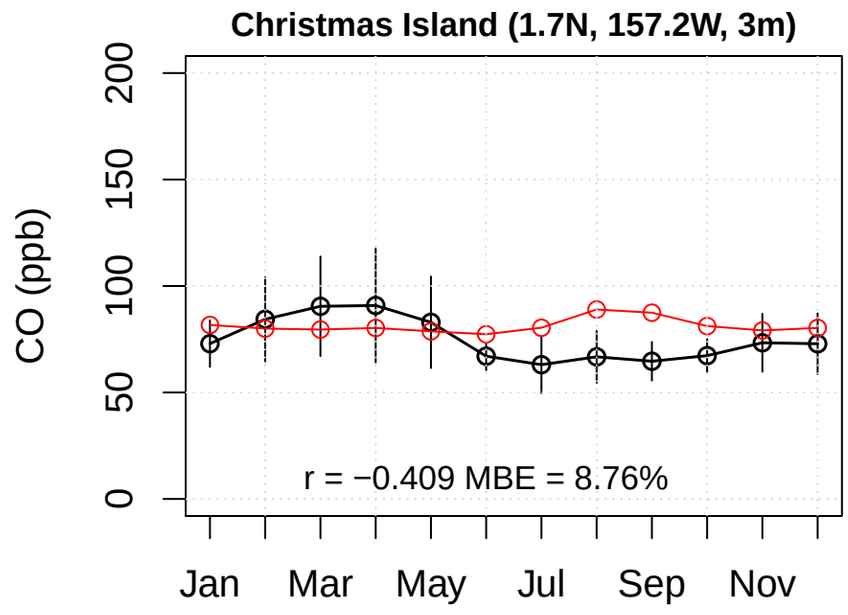

Tae−ahn Peninsula (36.7N, 126.1E, 20m)
CO (ppb)
0
100
200
300
r = 0.413 MBE = 39.1%
Jan
Mar
May
Jul
Sep
Nov

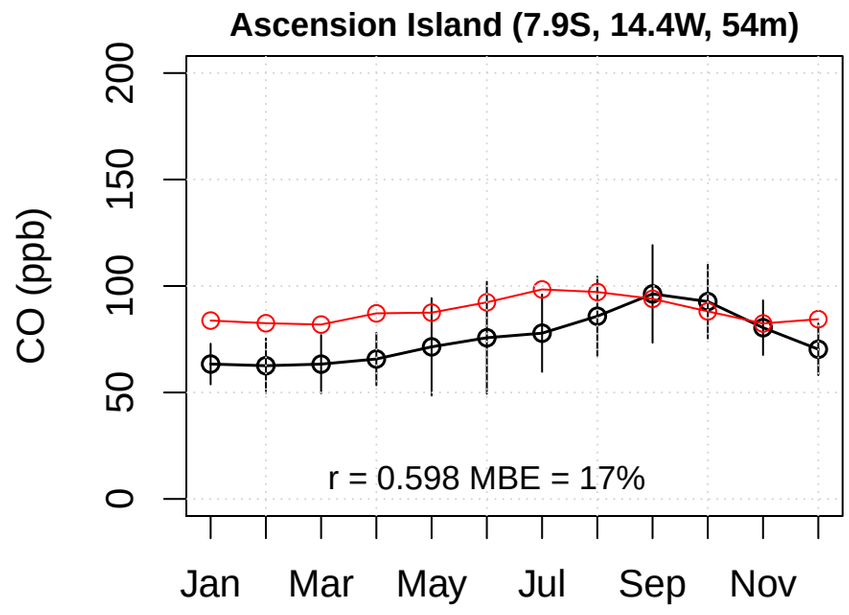

Gozo (36.0N, 14.1E)
CO (ppb)
0
100
200
300
r = 0.673 MBE = −24.9%
Jan
Mar
May
Jul
Sep
Nov

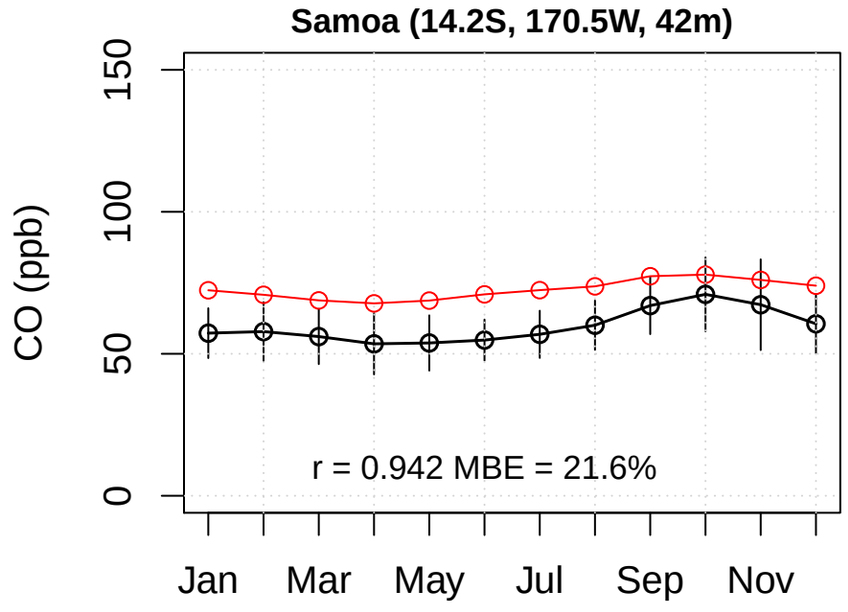

Key Biscayne (25.7N, 80.2W, 3m)
CO (ppb)
0
100
200
300
r = 0.932 MBE = 7.04%
Jan
Mar
May
Jul
Sep
Nov

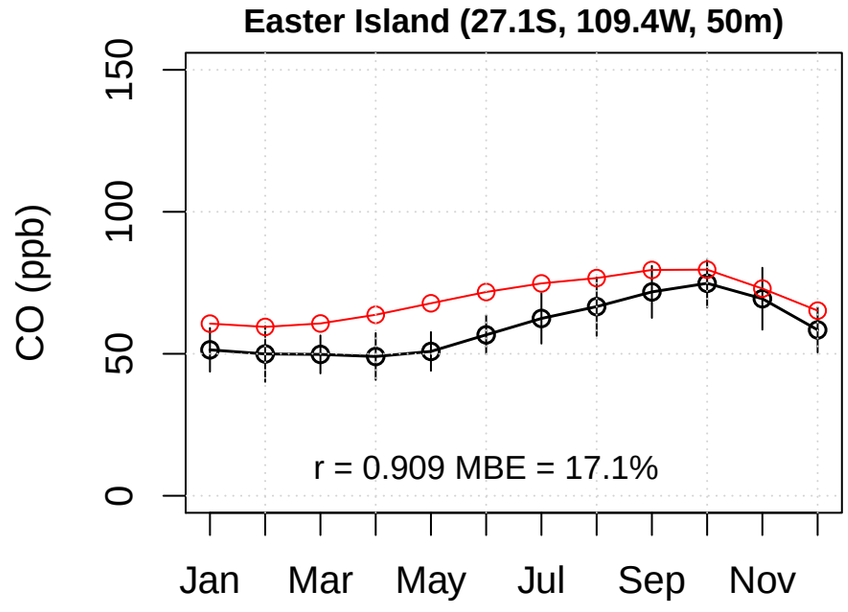

Mauna Loa (19.5N, 155.6W, 3397m)
CO (ppb)
0
100
200
300
r = 0.847 MBE = −5.73%
Jan
Mar
May
Jul
Sep
Nov

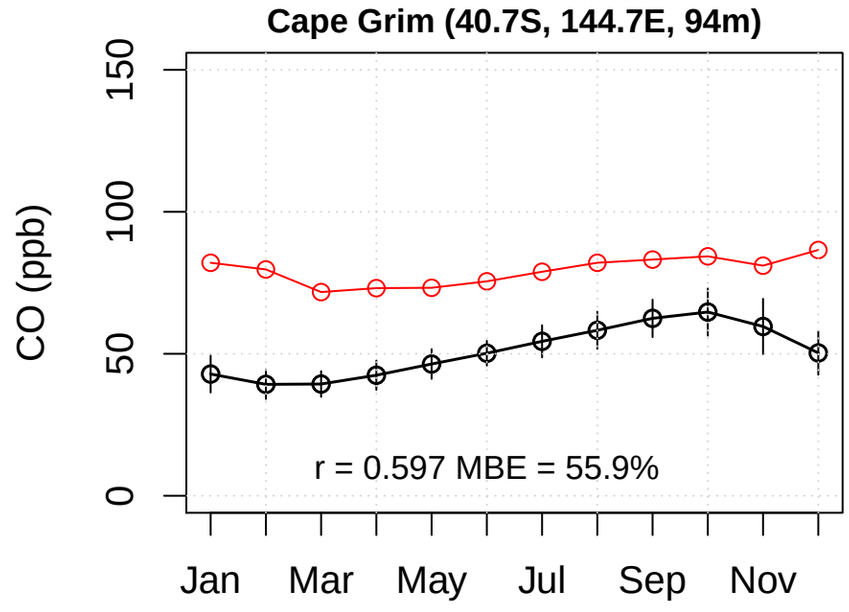

Ragged Point (13.2N, 59.4W, 45m)
CO (ppb)
0
50
100
150
200
r = 0.727 MBE = −4.98%
Jan
Mar
May
Jul
Sep
Nov

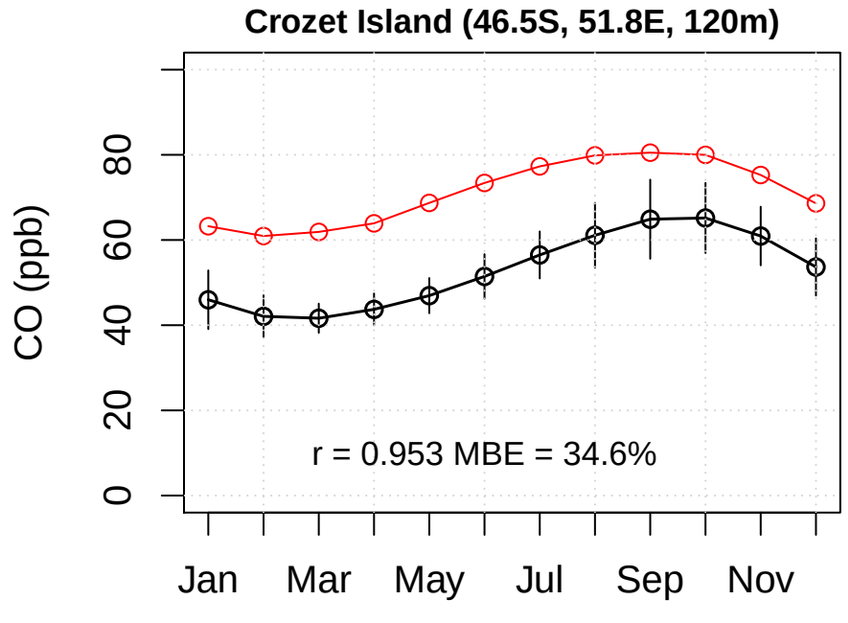

Christmas Island (1.7N, 157.2W, 3m)
CO (ppb)
0
50
100
150
200
r = −0.409 MBE = 8.76%
Jan
Mar
May
Jul
Sep
Nov

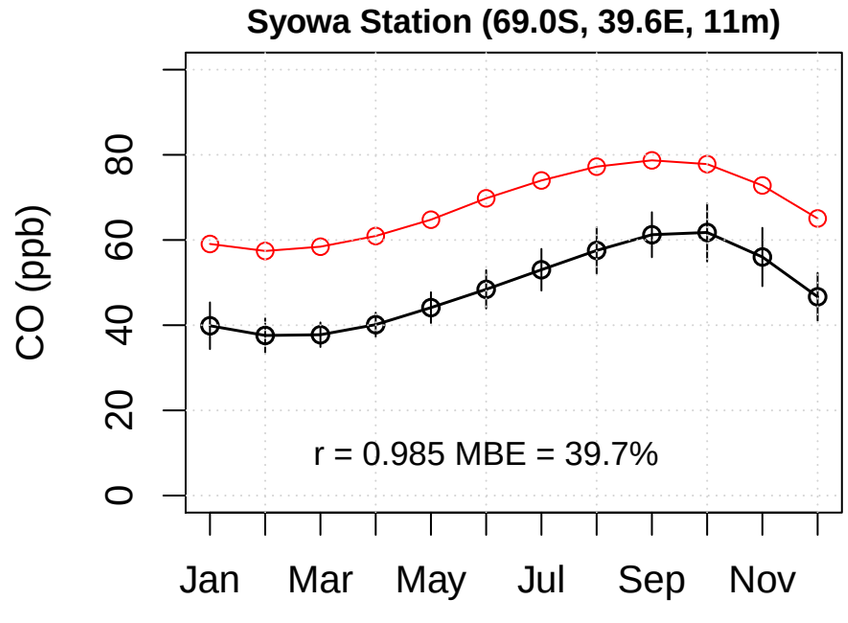

Ascension Island (7.9S, 14.4W, 54m)
CO (ppb)
0
50
100
150
200
r = 0.598 MBE = 17%
Jan
Mar
May
Jul
Sep
Nov

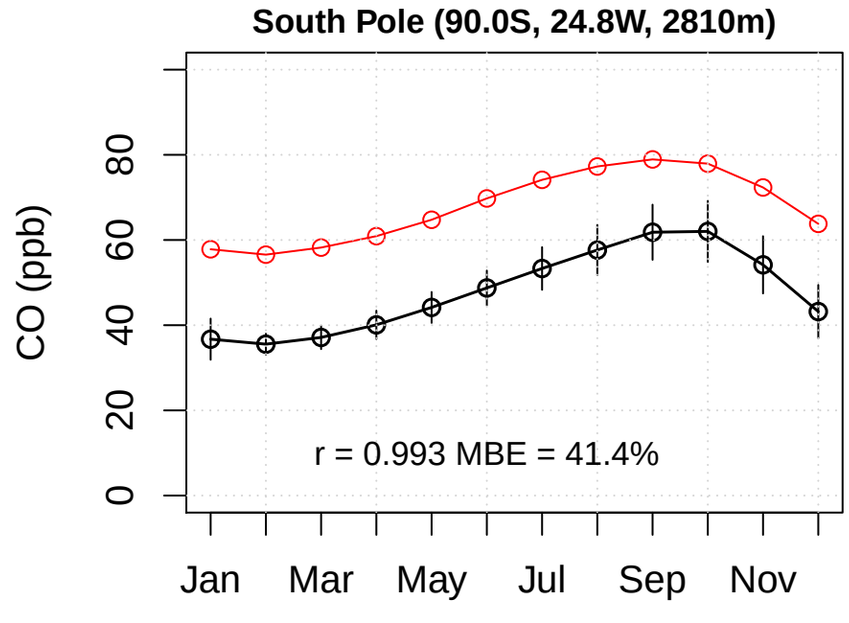

Samoa (14.2S, 170.5W, 42m)
CO (ppb)
0
50
100
150
r = 0.942 MBE = 21.6%
Jan
Mar
May
Jul
Sep
Nov

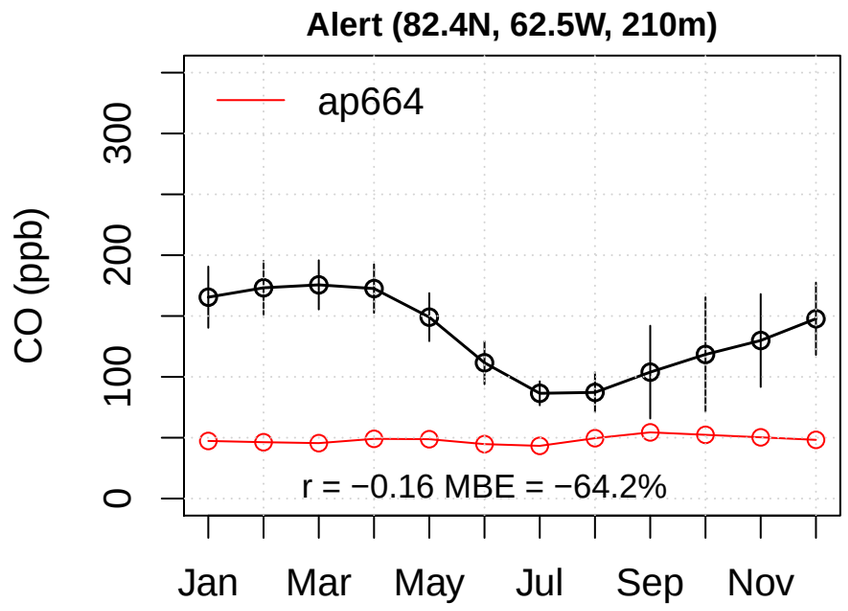

Easter Island (27.1S, 109.4W, 50m)
CO (ppb)
0
50
100
150
r = 0.909 MBE = 17.1%
Jan
Mar
May
Jul
Sep
Nov

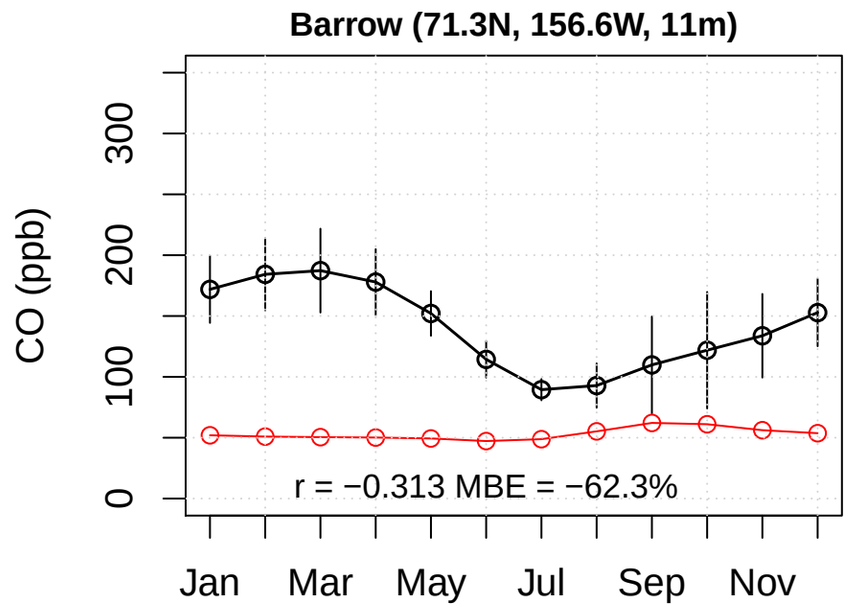

Cape Grim (40.7S, 144.7E, 94m)
CO (ppb)
0
50
100
150
r = 0.597 MBE = 55.9%
Jan
Mar
May
Jul
Sep
Nov

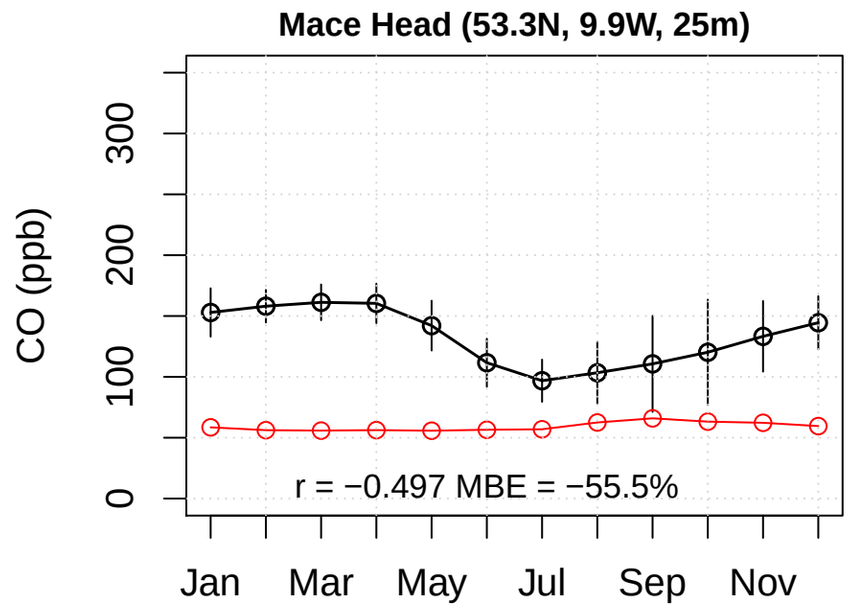

Crozet Island (46.5S, 51.8E, 120m)
CO (ppb)
0
20
40
60
80
r = 0.953 MBE = 34.6%
Jan
Mar
May
Jul
Sep
Nov

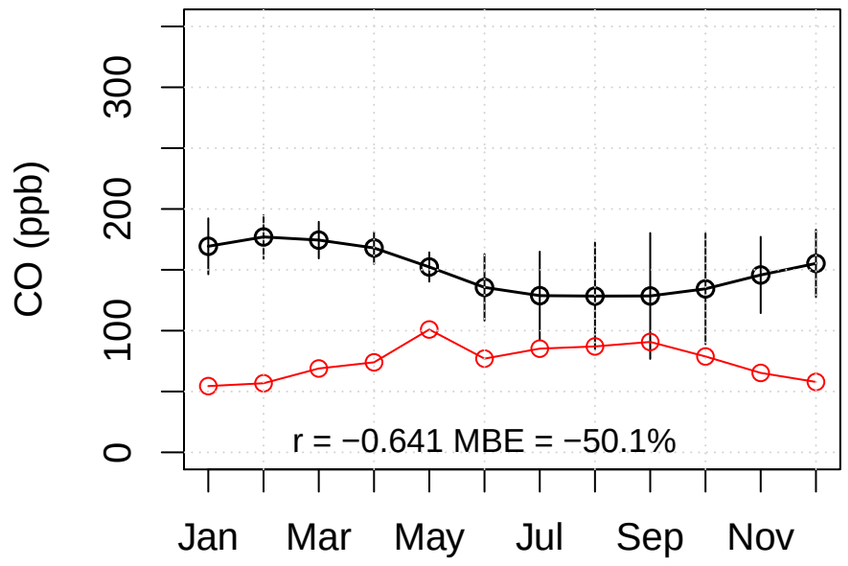

Syowa Station (69.0S, 39.6E, 11m)
CO (ppb)
0
20
40
60
80
r = 0.985 MBE = 39.7%
Jan
Mar
May
Jul
Sep
Nov

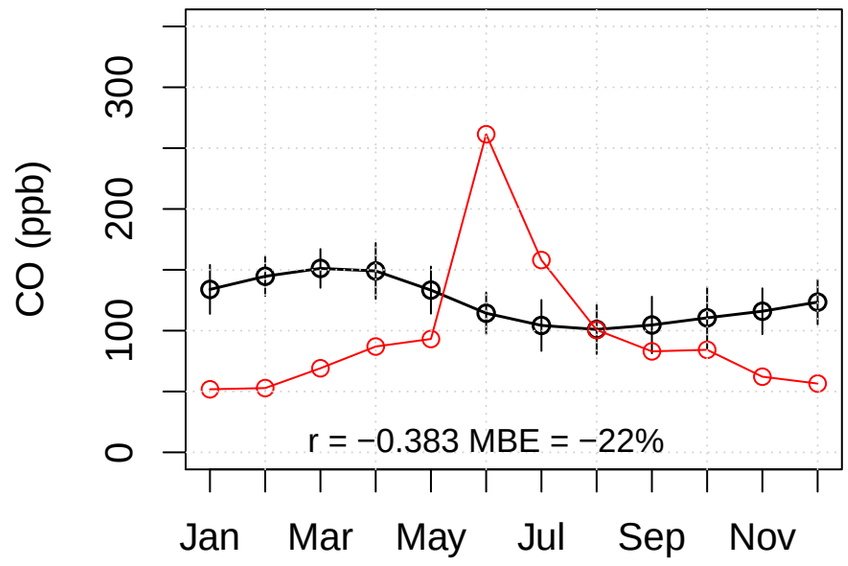

South Pole (90.0S, 24.8W, 2810m)
CO (ppb)
0
20
40
60
80
r = 0.993 MBE = 41.4%
Jan
Mar
May
Jul
Sep
Nov

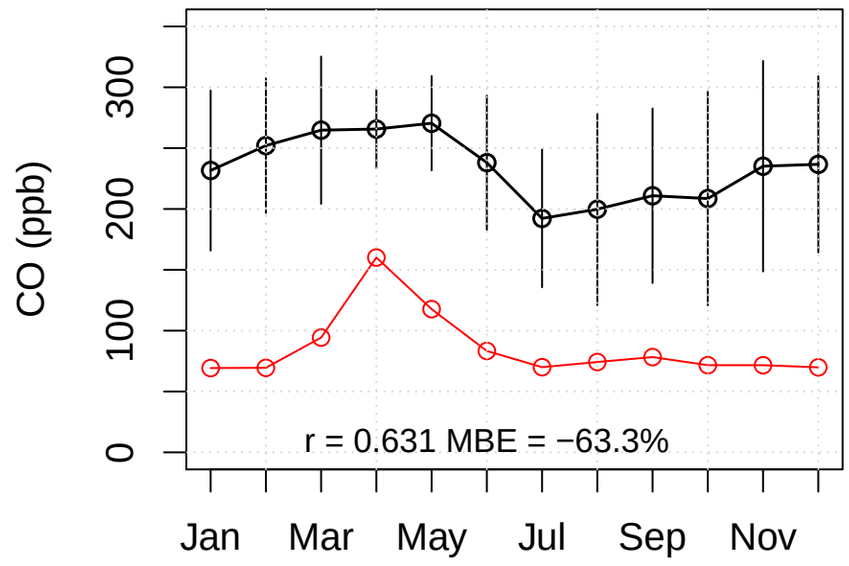

Alert (82.4N, 62.5W, 210m)
ap664
r = −0.16 MBE = −64.2%

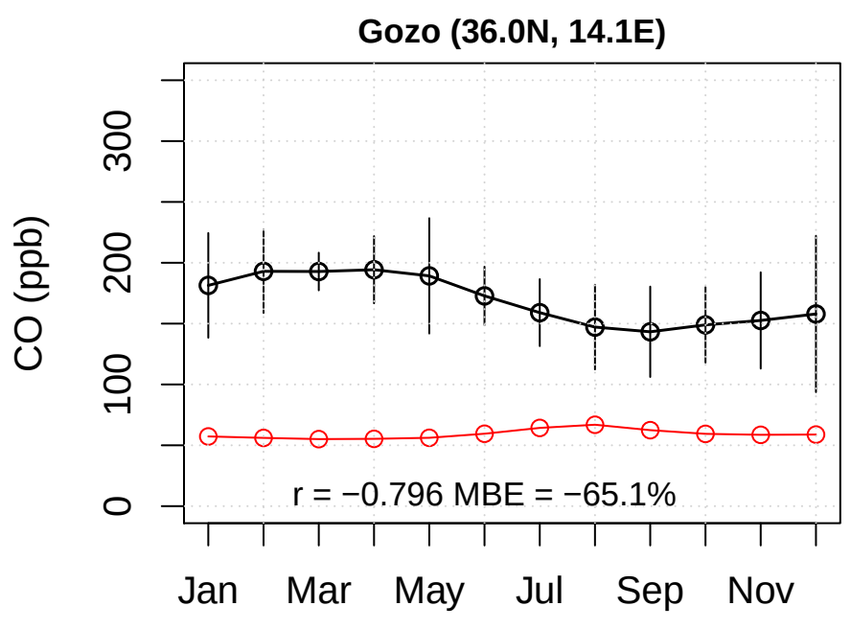

Barrow (71.3N, 156.6W, 11m)
r = −0.313 MBE = −62.3%

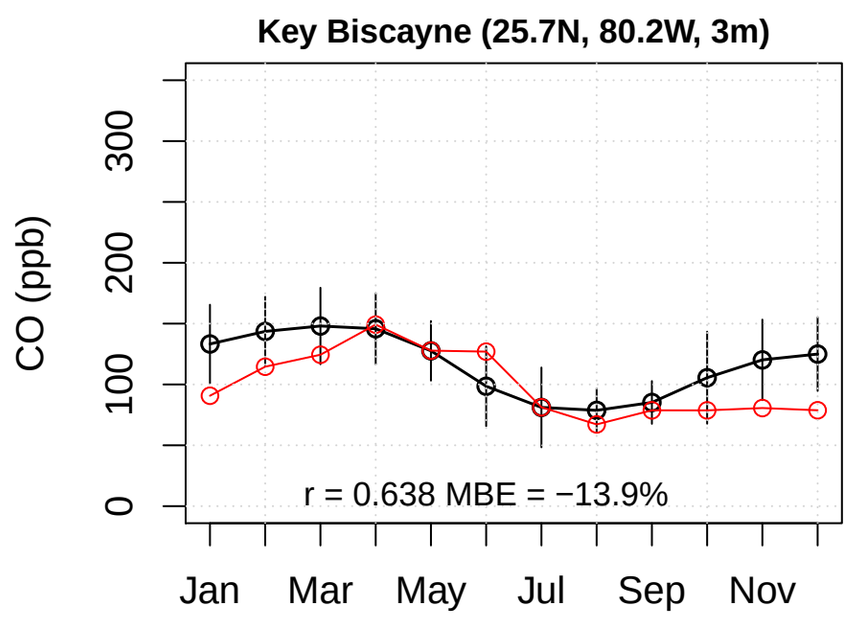

Mace Head (53.3N, 9.9W, 25m)
r = −0.497 MBE = −55.5%

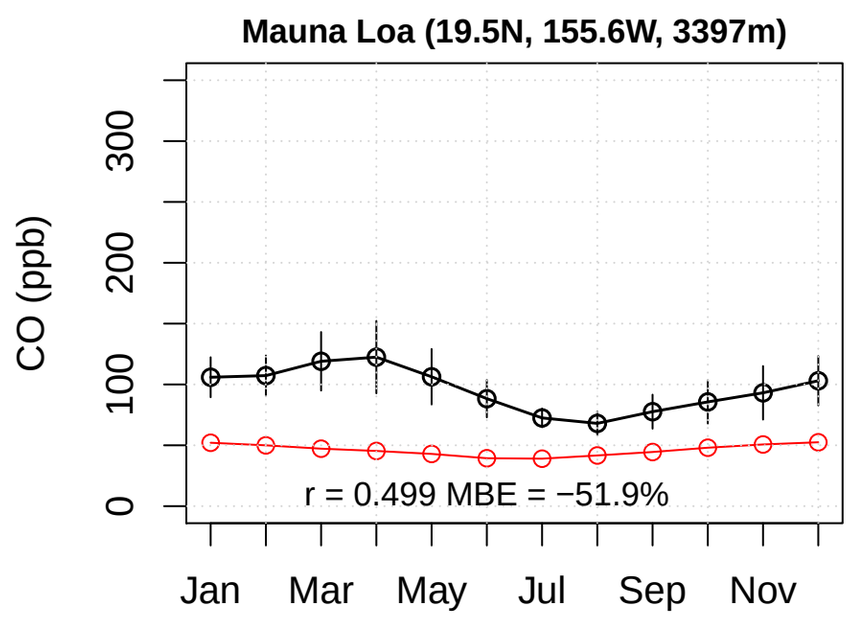

Park Falls (45.9N, 90.2W, 472m)
r = −0.641 MBE = −50.1%

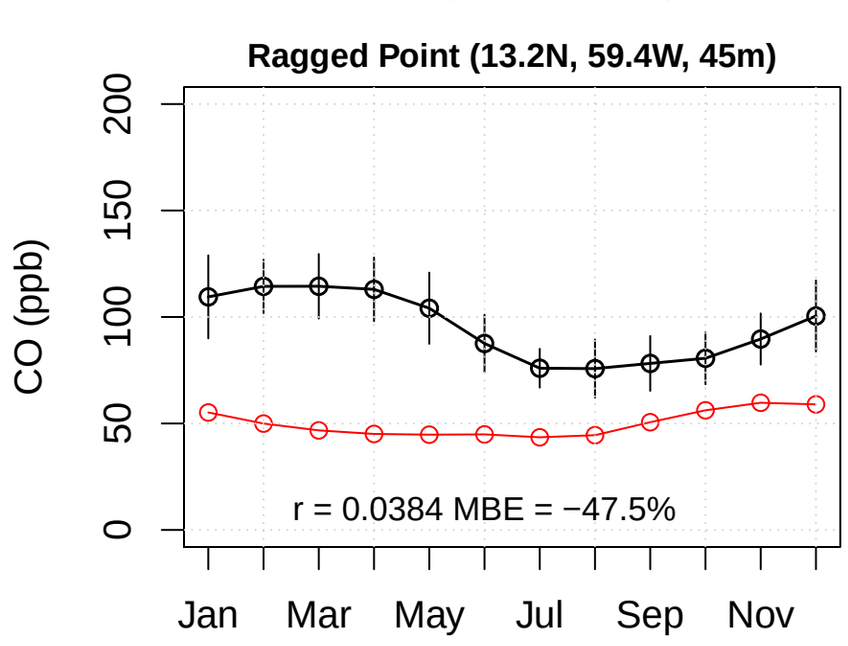

Niwot Ridge (40.0N, 105.6W, 3475m)
r = −0.383 MBE = −22%

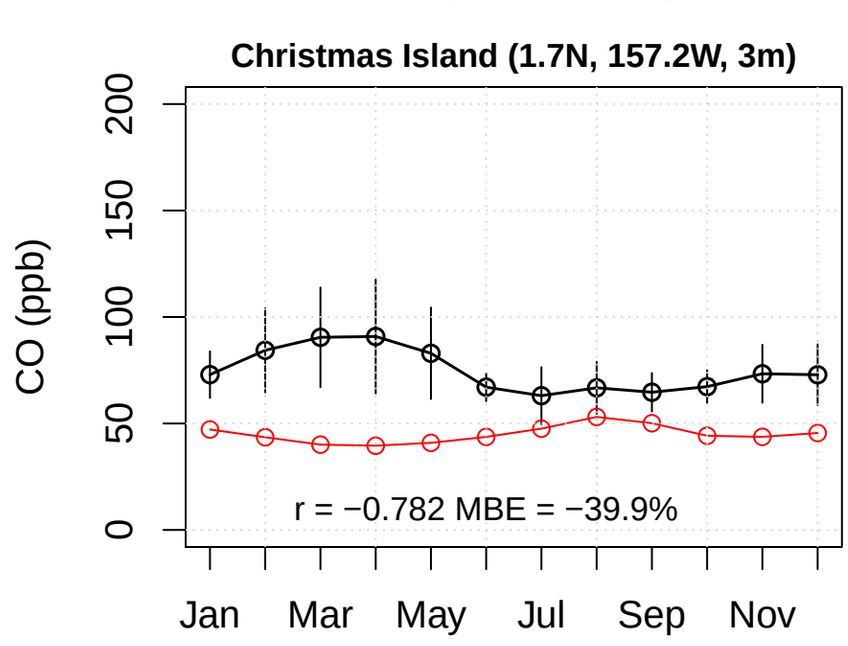

Tae−ahn Peninsula (36.7N, 126.1E, 20m)
r = 0.631 MBE = −63.3%

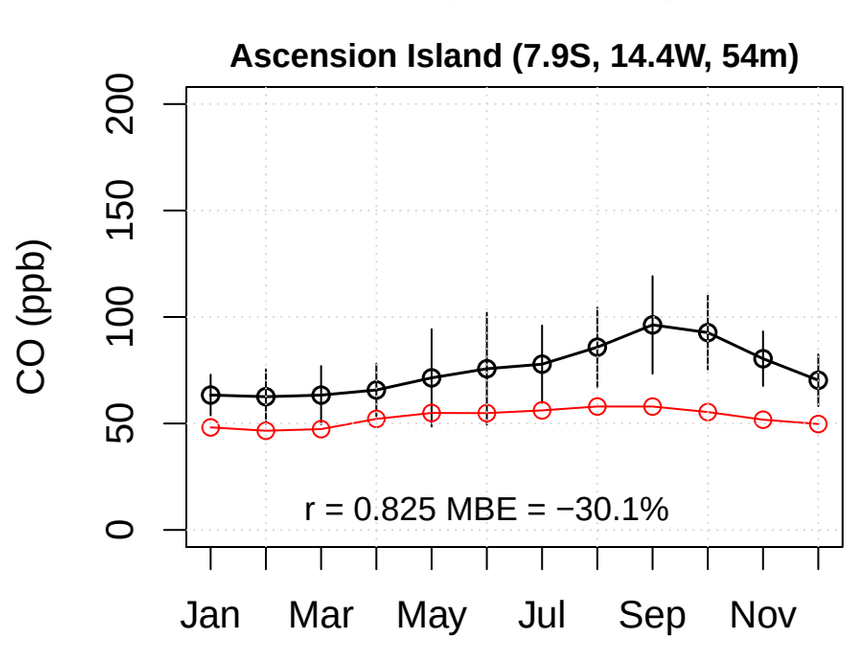

Gozo (36.0N, 14.1E)
r = −0.796 MBE = −65.1%

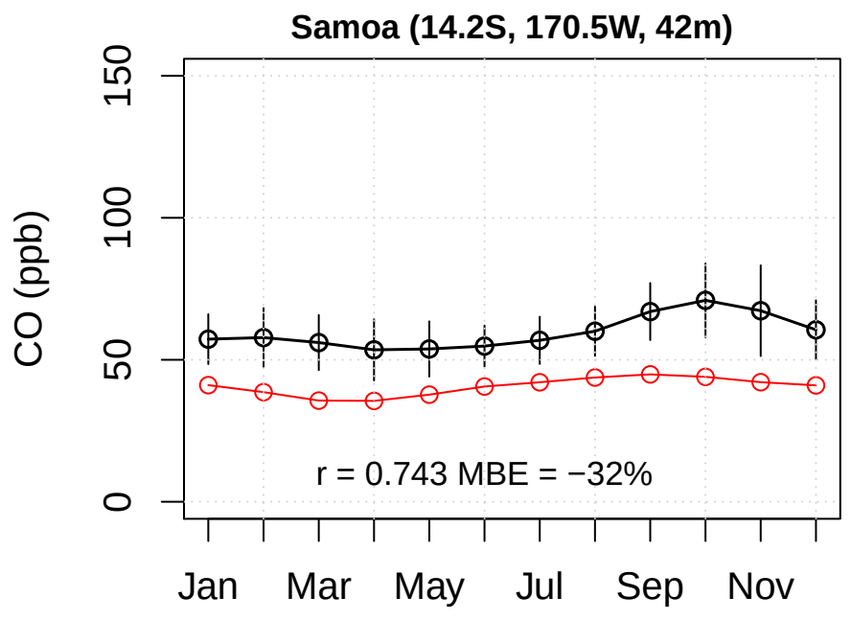

Key Biscayne (25.7N, 80.2W, 3m)
r = 0.638 MBE = −13.9%

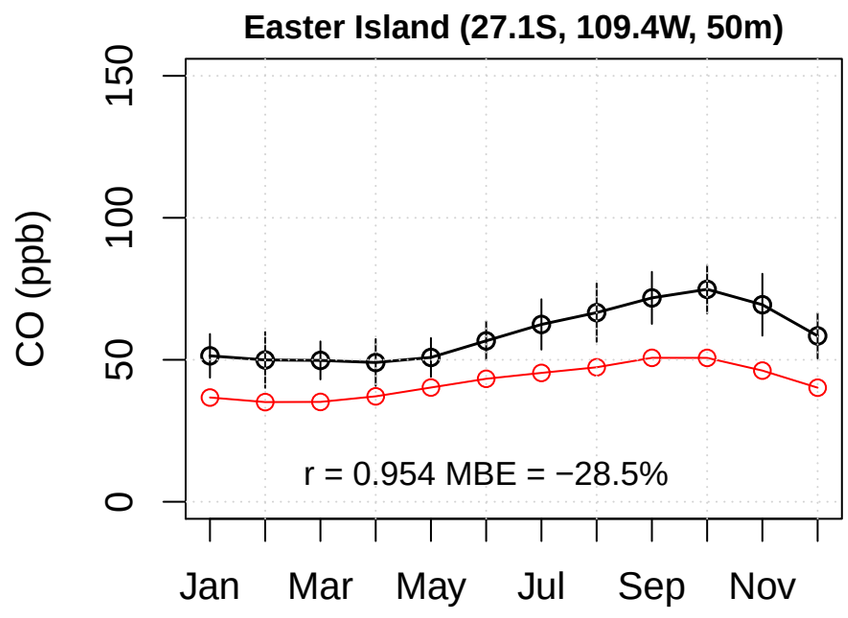

Mauna Loa (19.5N, 155.6W, 3397m)
r = 0.499 MBE = −51.9%

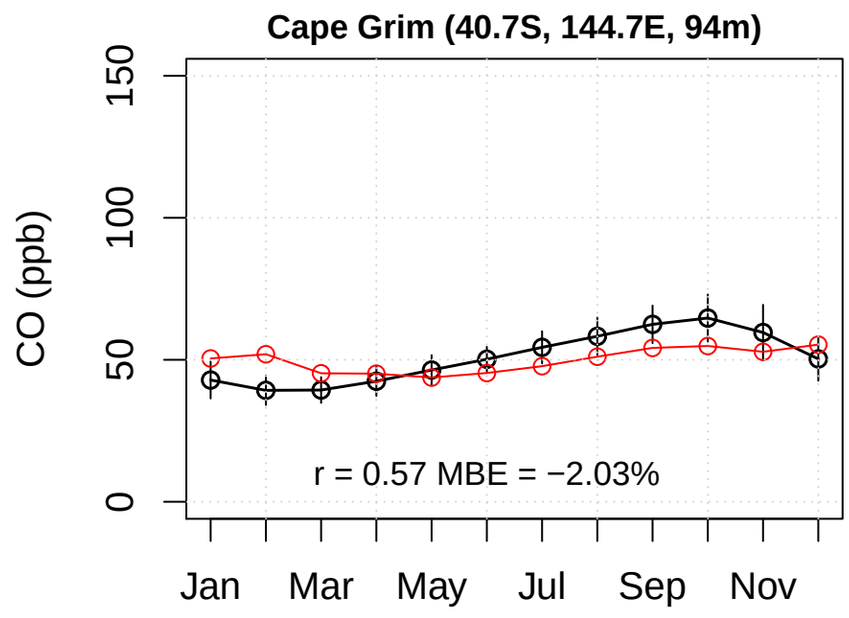

Ragged Point (13.2N, 59.4W, 45m)
r = 0.0384 MBE = −47.5%

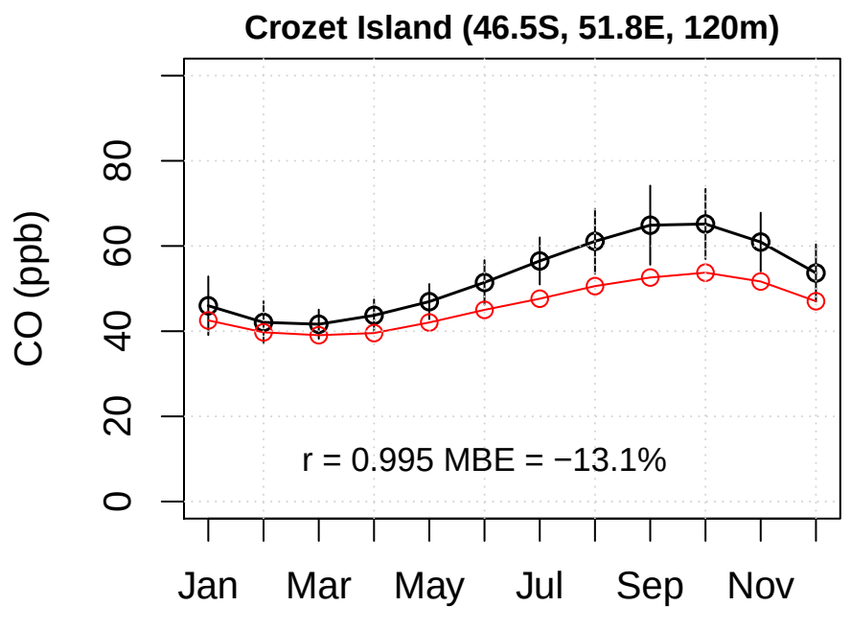

Christmas Island (1.7N, 157.2W, 3m)
r = −0.782 MBE = −39.9%

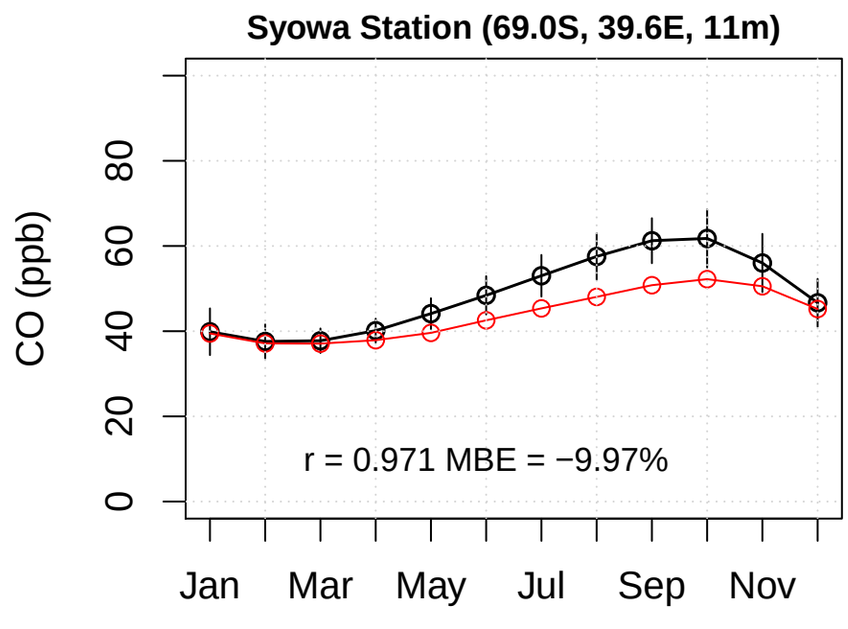

Ascension Island (7.9S, 14.4W, 54m)
r = 0.825 MBE = −30.1%

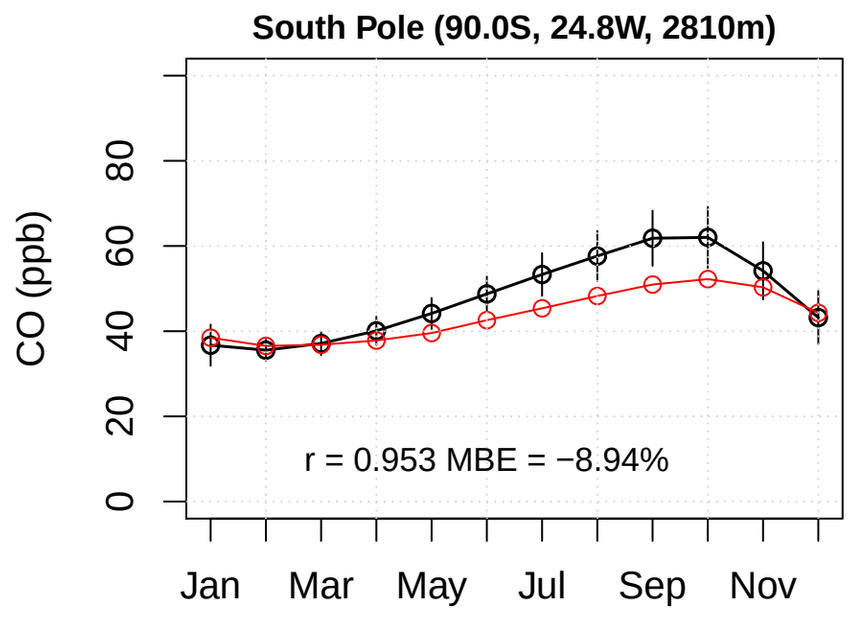

Samoa (14.2S, 170.5W, 42m)
r = 0.743 MBE = −32%

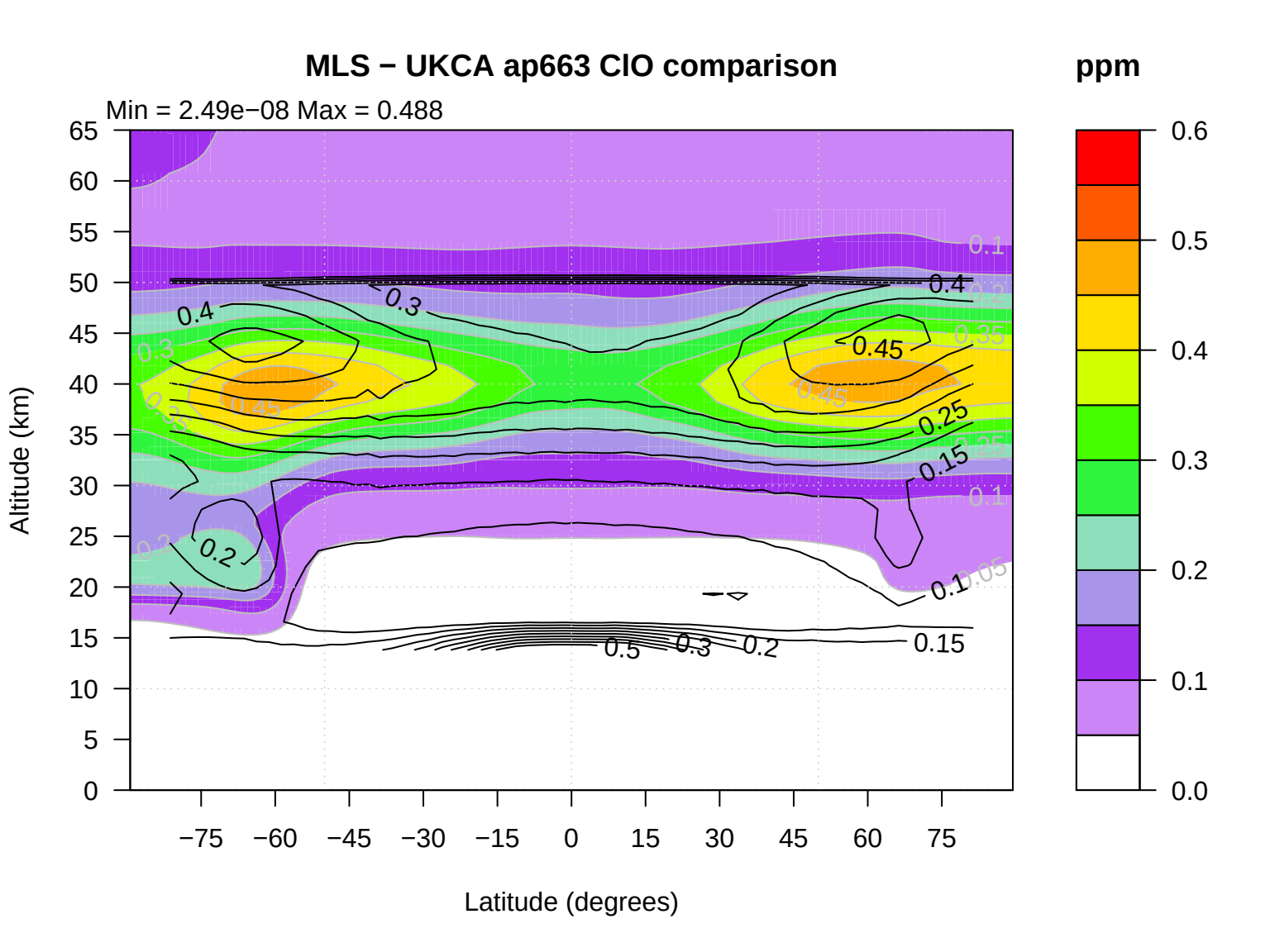

Easter Island (27.1S, 109.4W, 50m)
r = 0.954 MBE = −28.5%

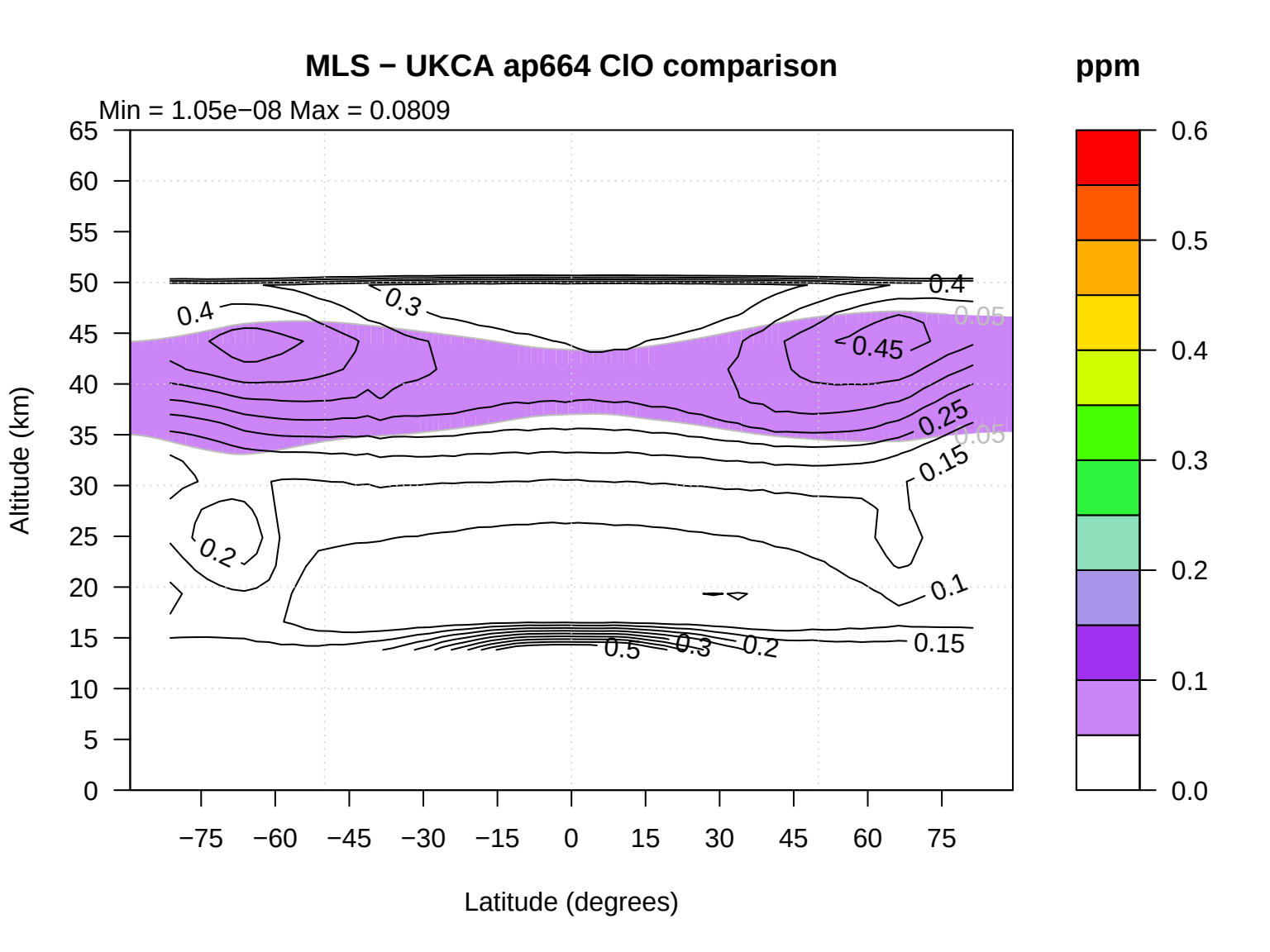

Cape Grim (40.7S, 144.7E, 94m)
r = 0.57 MBE = −2.03%


Crozet Island (46.5S, 51.8E, 120m)
r = 0.995 MBE = −13.1%

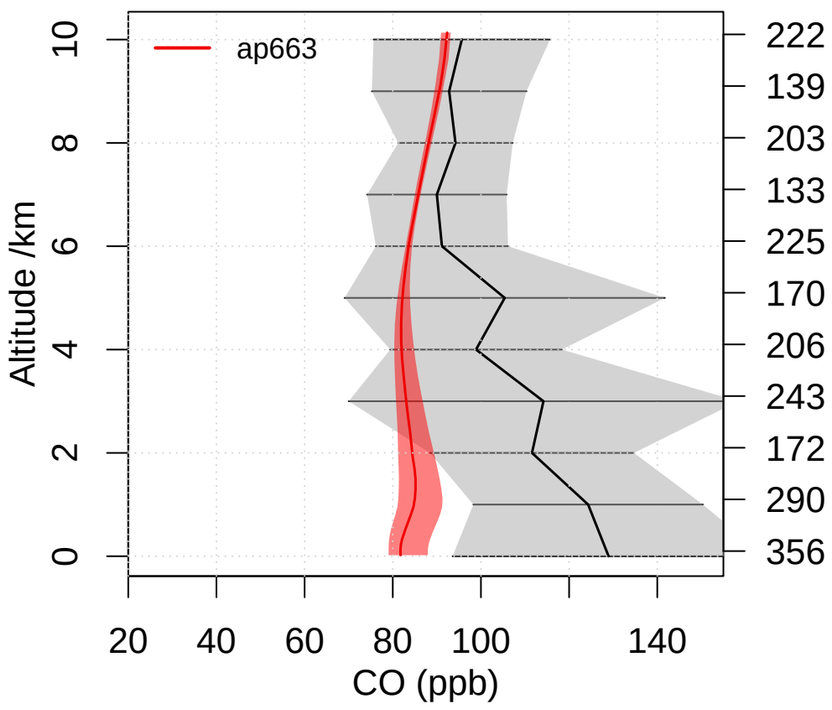

Syowa Station (69.0S, 39.6E, 11m)
r = 0.971 MBE = −9.97%

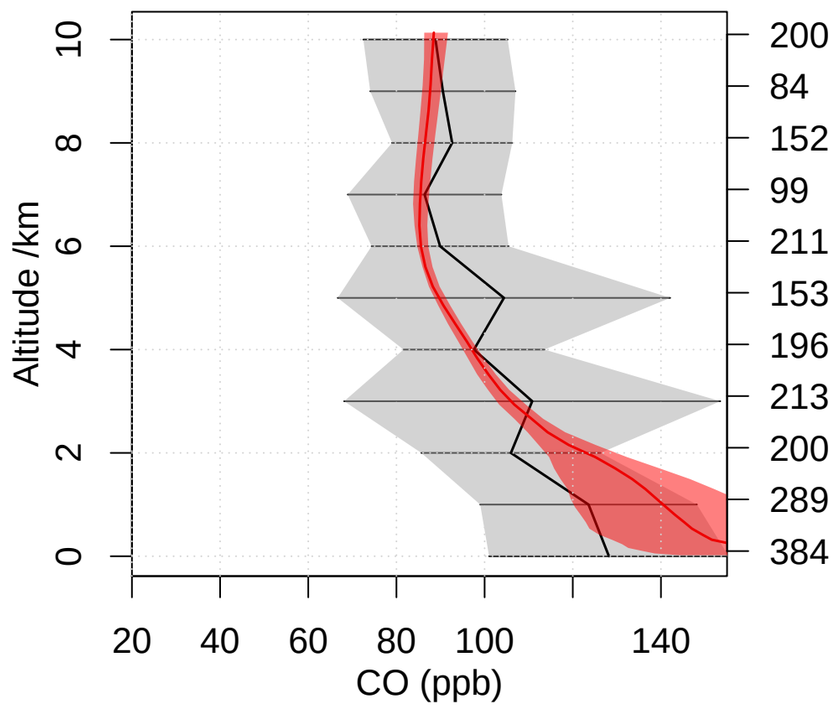

South Pole (90.0S, 24.8W, 2810m)
r = 0.953 MBE = −8.94%

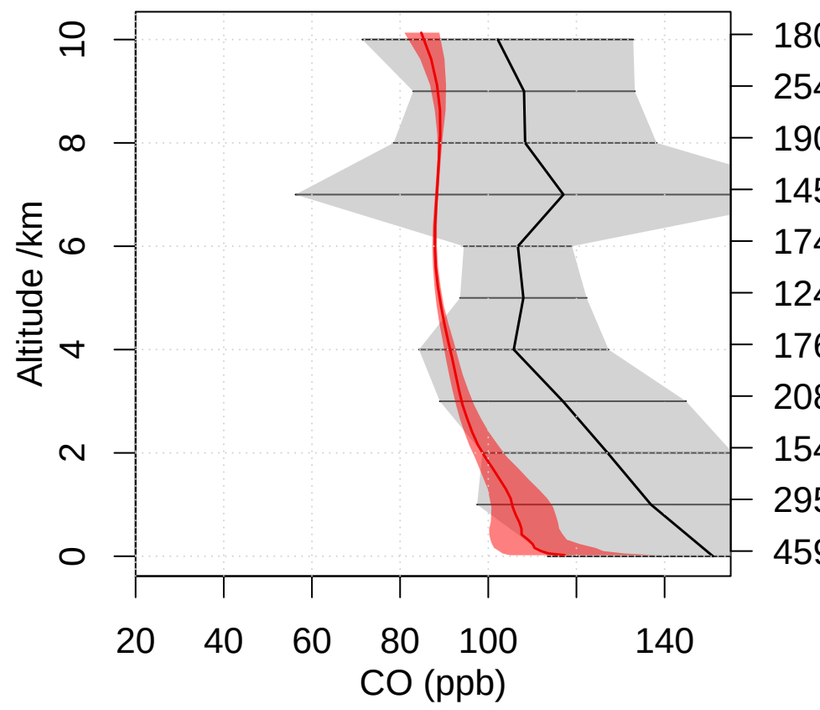

MLS − UKCA ap663 ClO comparison
ppm
Min = 2.49e−08 Max = 0.488
Altitude (km)
Latitude (degrees)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
−75
−60
−45
−30
−15
0
15
30
45
60
75
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.4
0.3
0.45
0.25
0.15
0.2
0.5
0.1

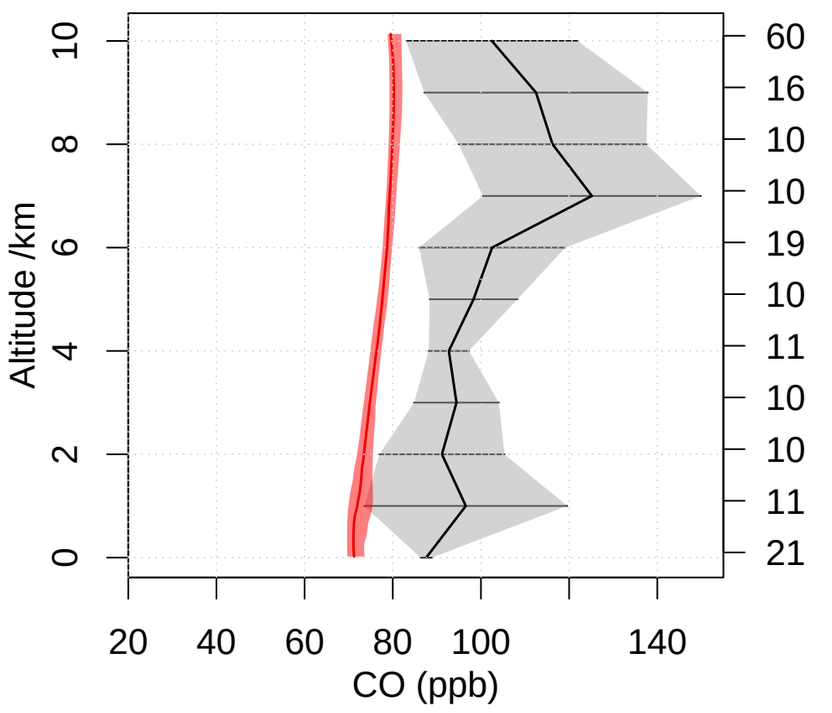

MLS − UKCA ap664 ClO comparison
ppm
Min = 1.05e−08 Max = 0.0809
Altitude (km)
Latitude (degrees)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
−75
−60
−45
−30
−15
0
15
30
45
60
75
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.4
0.3
0.4
0.05
0.45
0.25
0.05
0.15
0.2
0.1
0.5
0.3
0.2
0.15

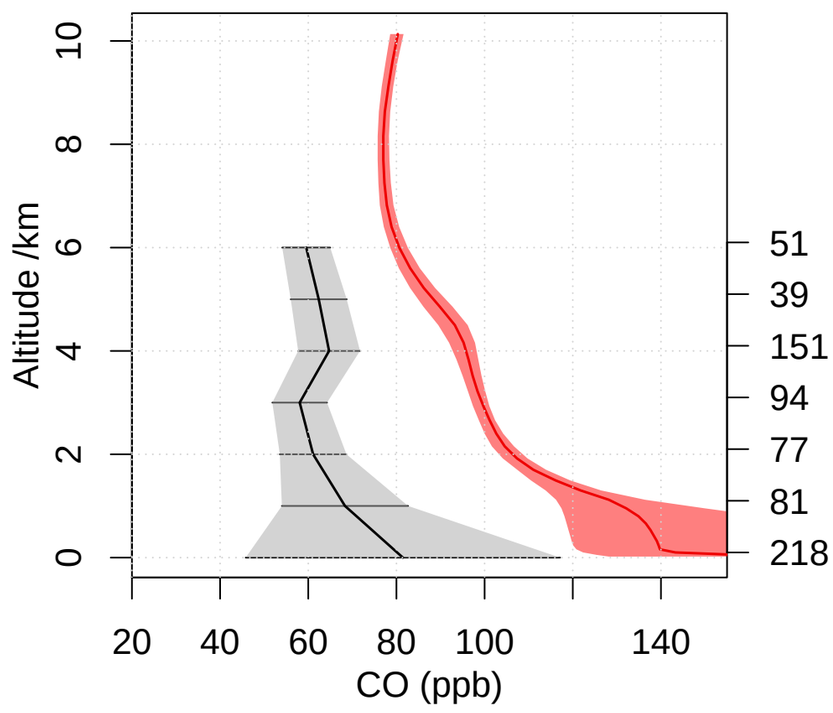
Emmons CO comparison

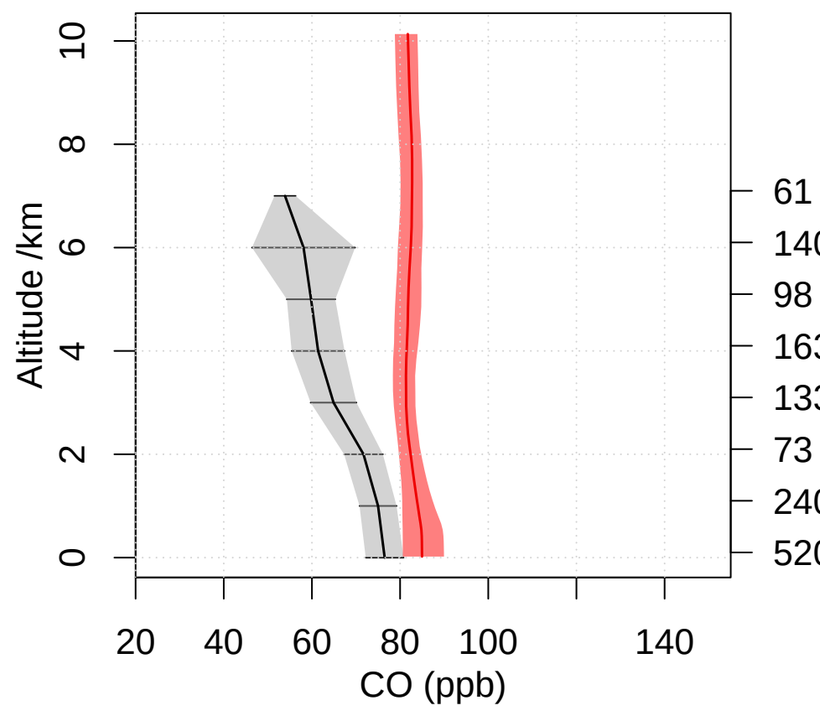


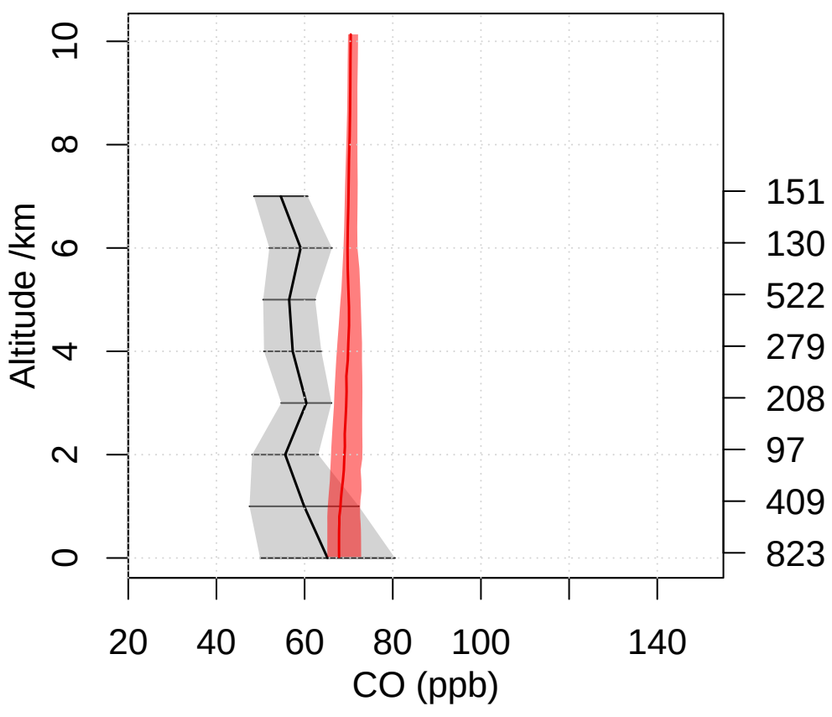


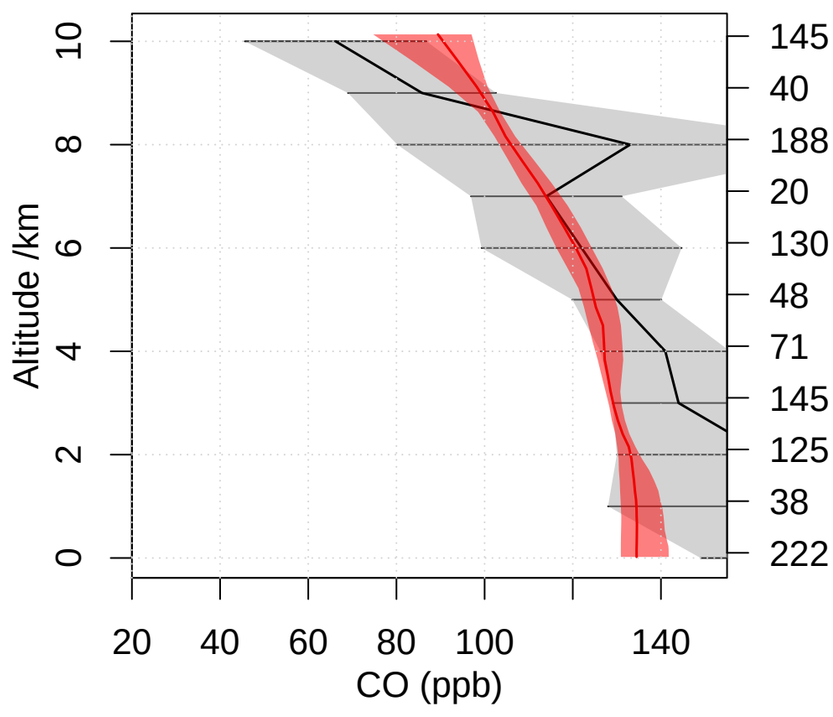


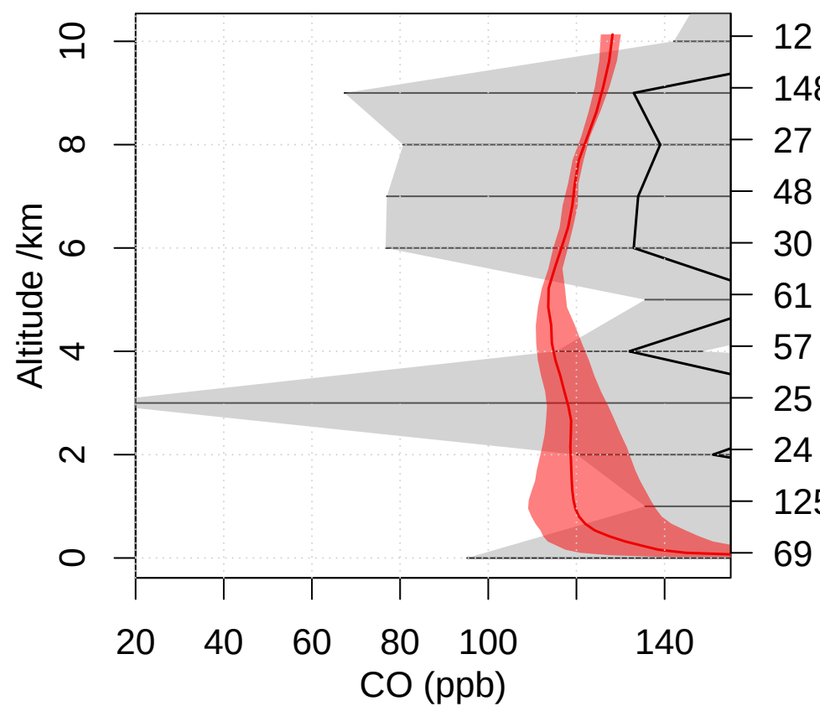


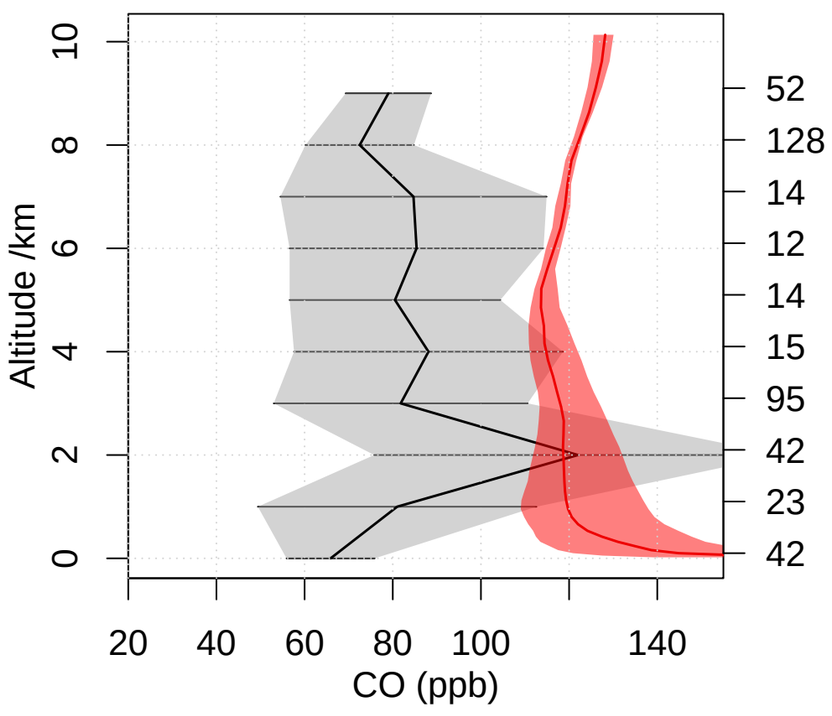


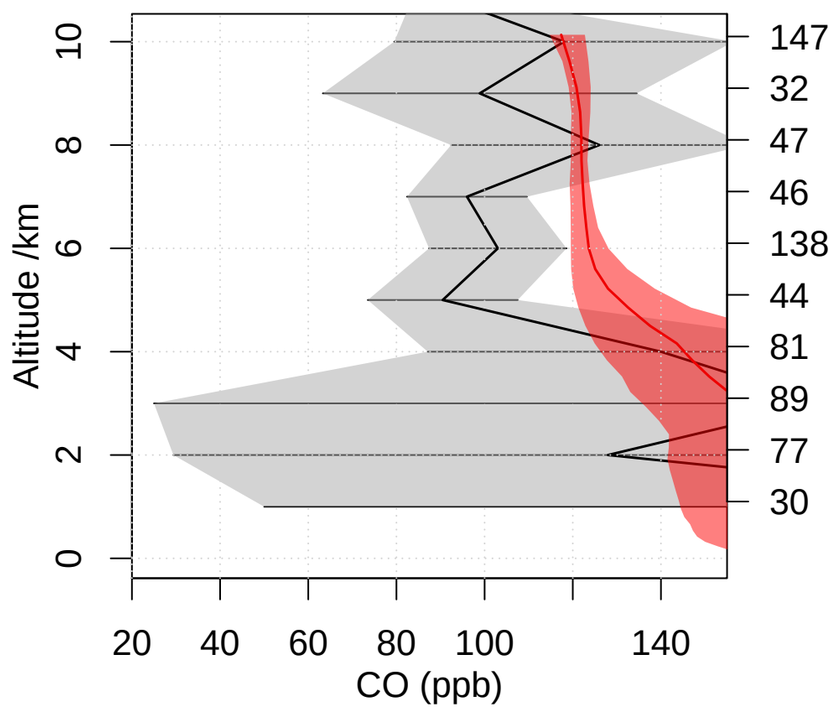


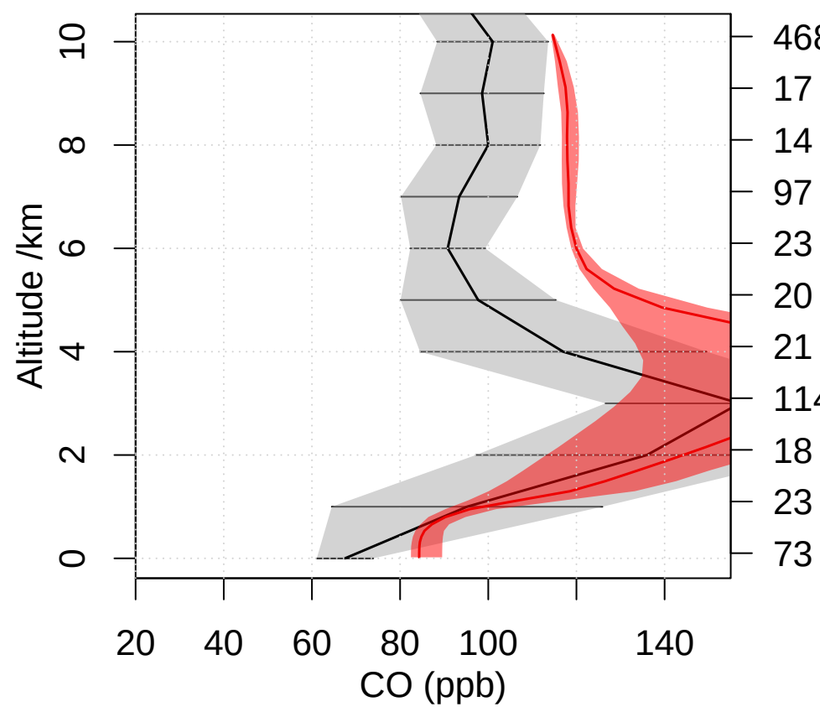




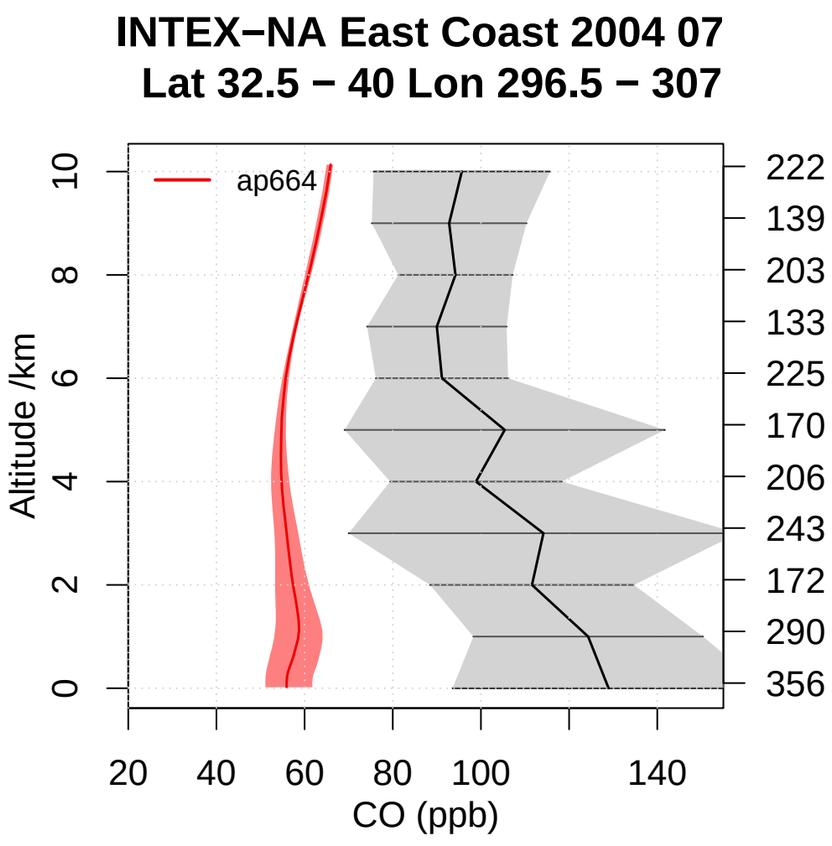


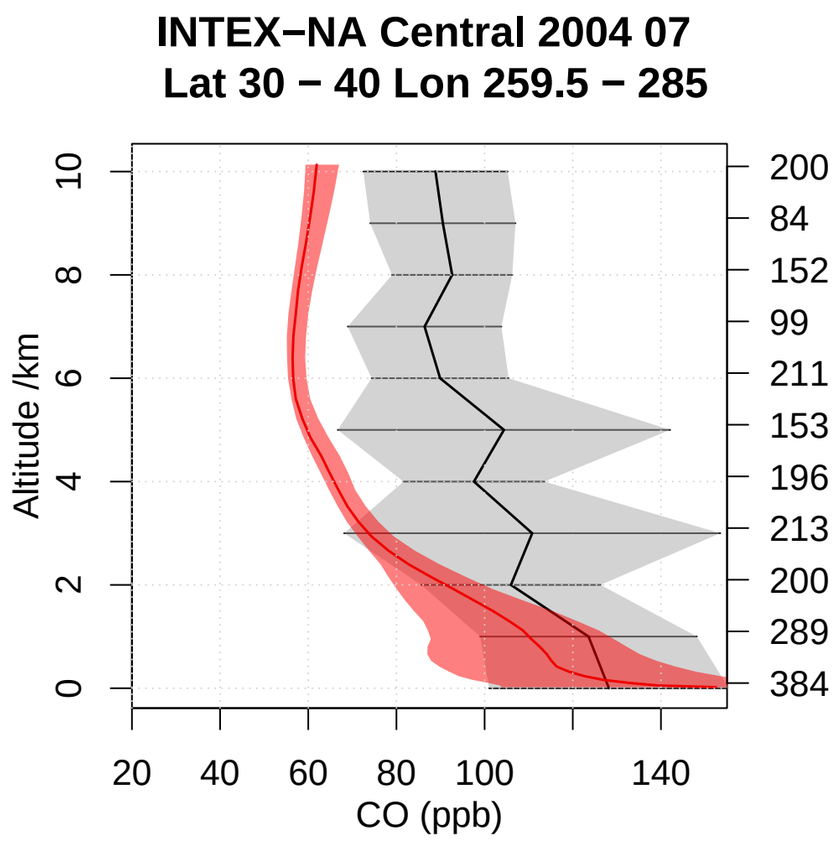


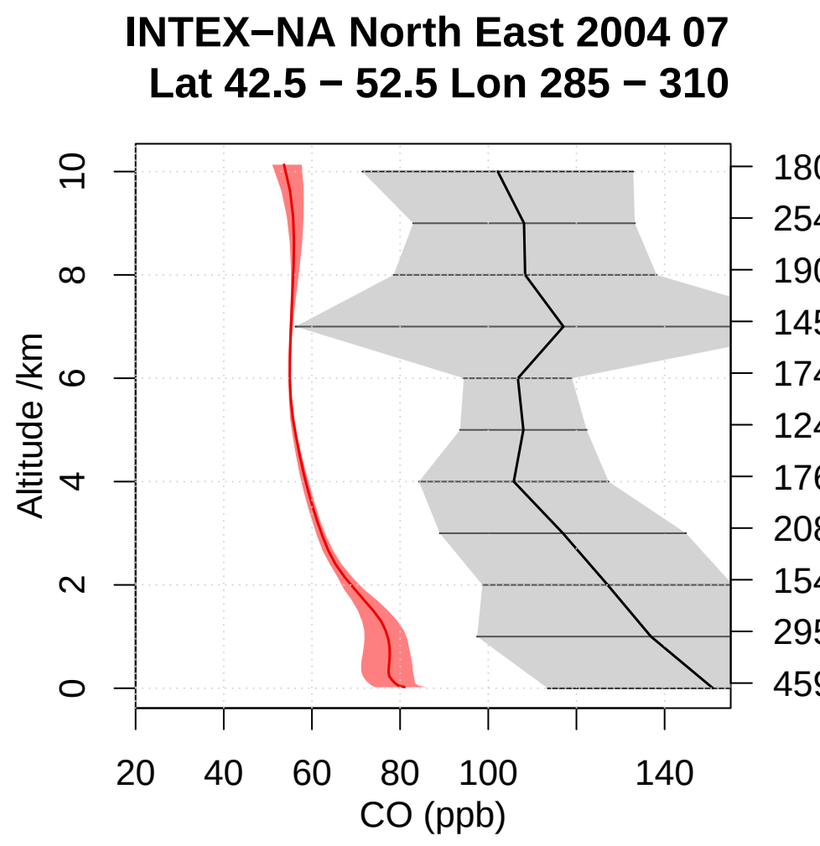


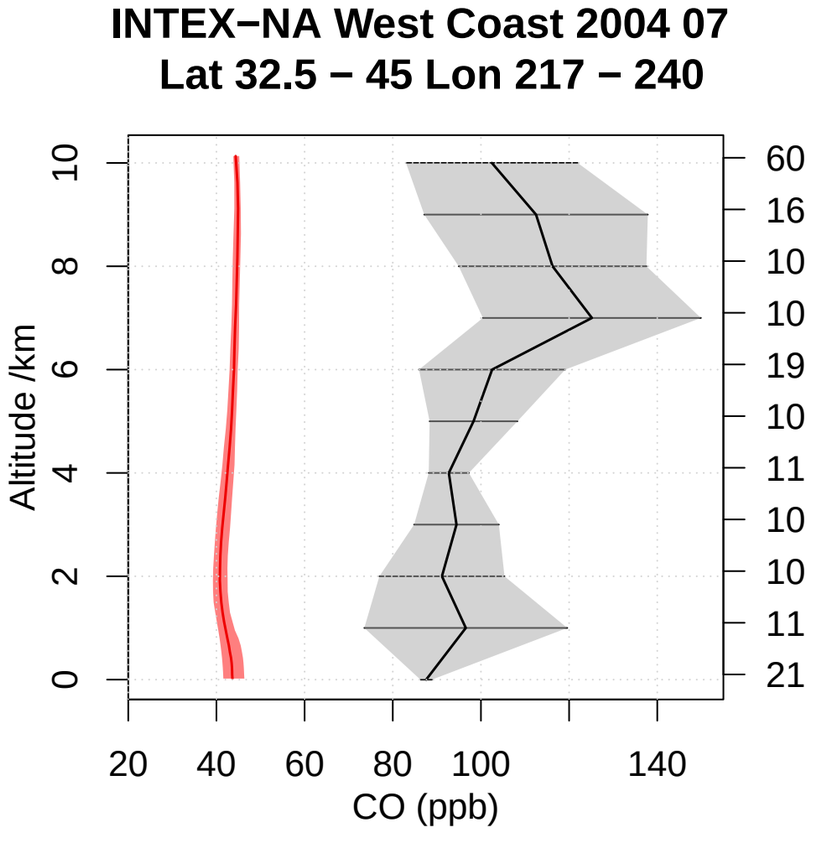


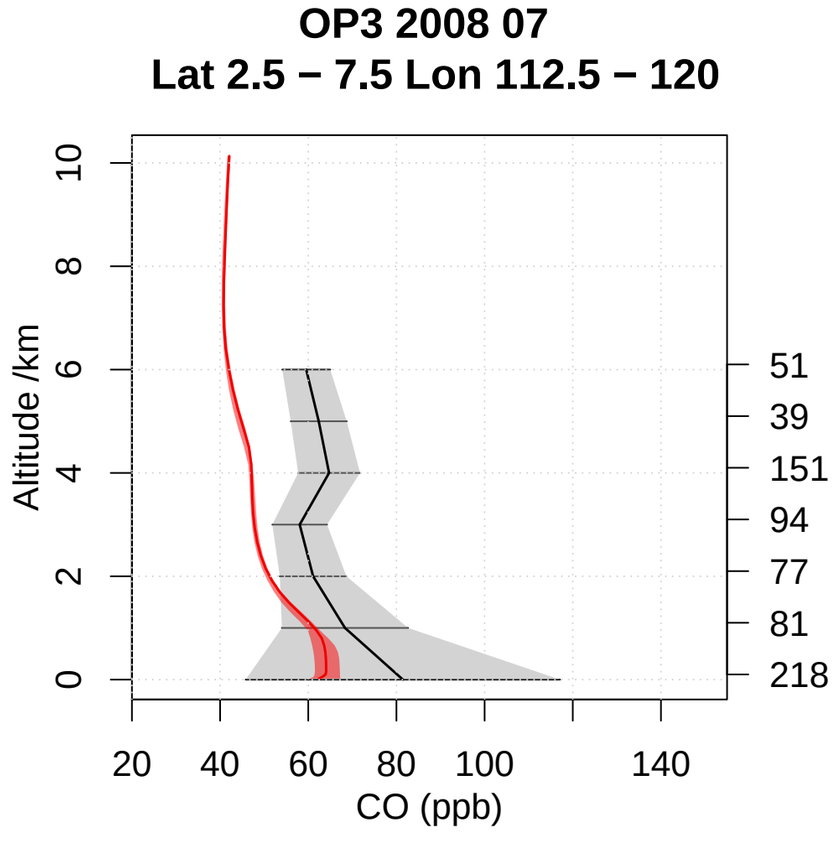
Emmons CO comparison

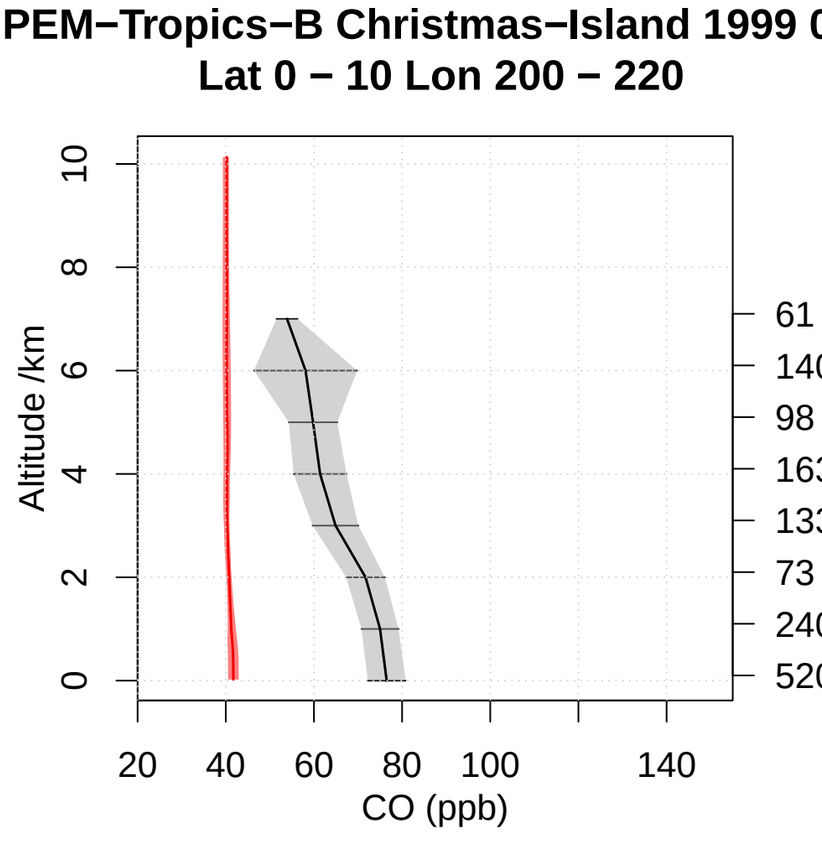


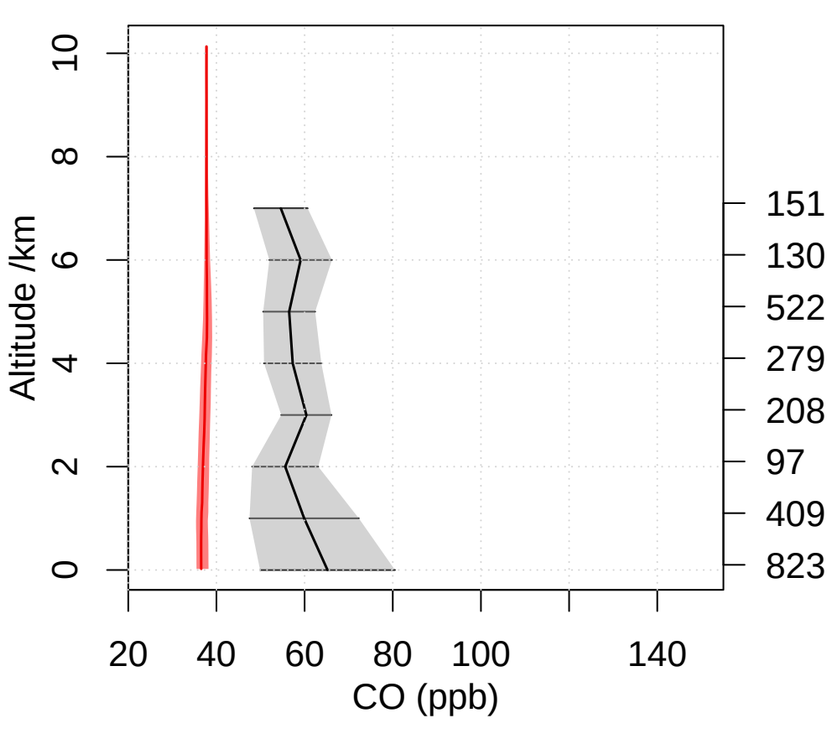


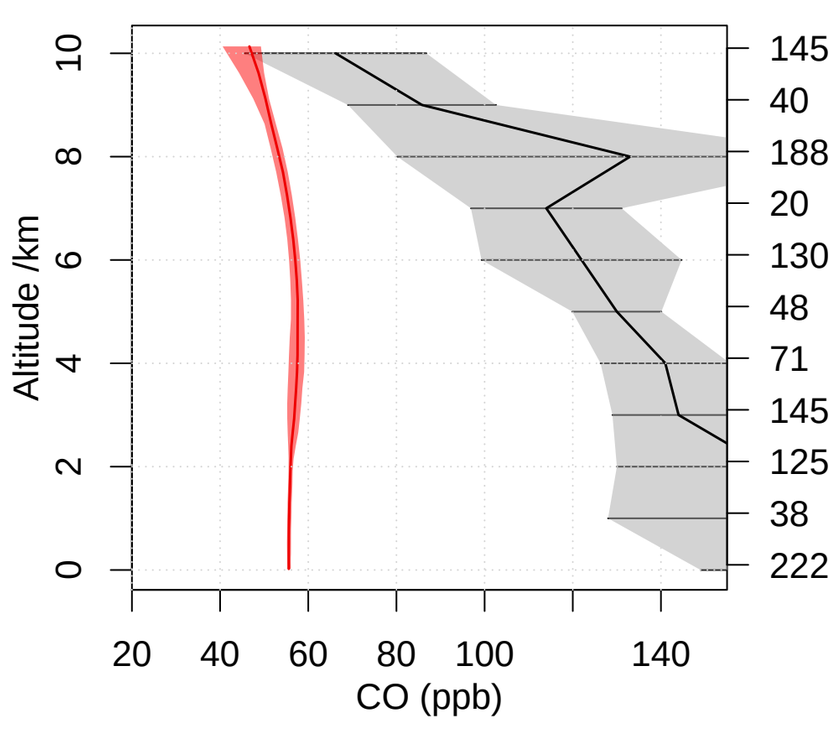


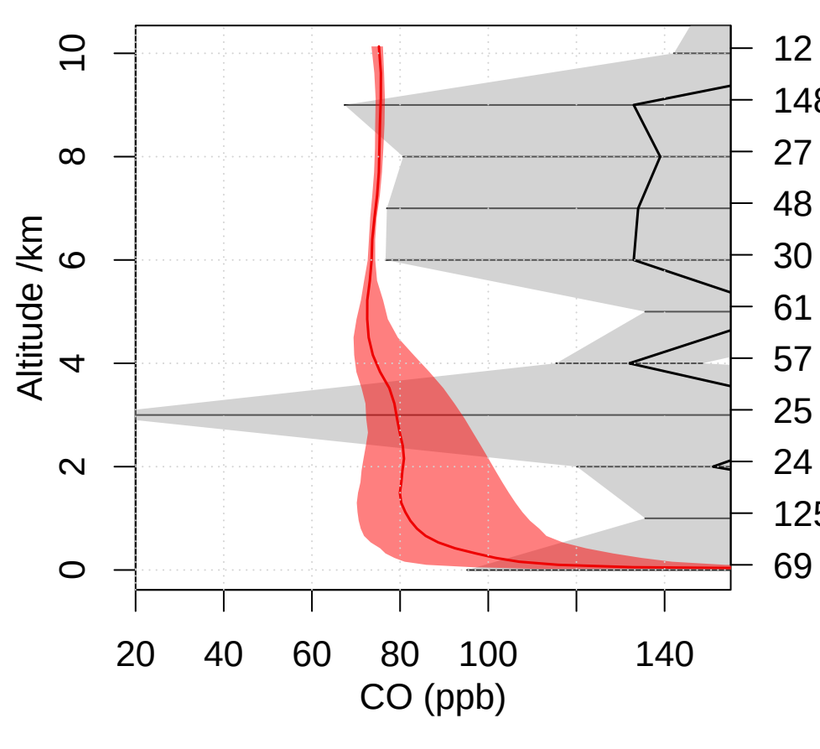


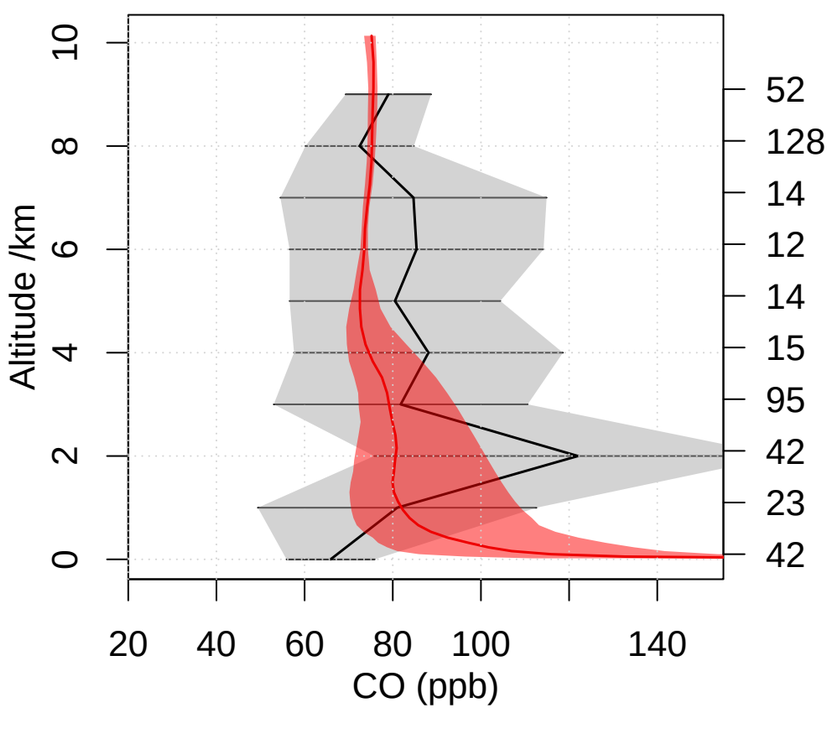


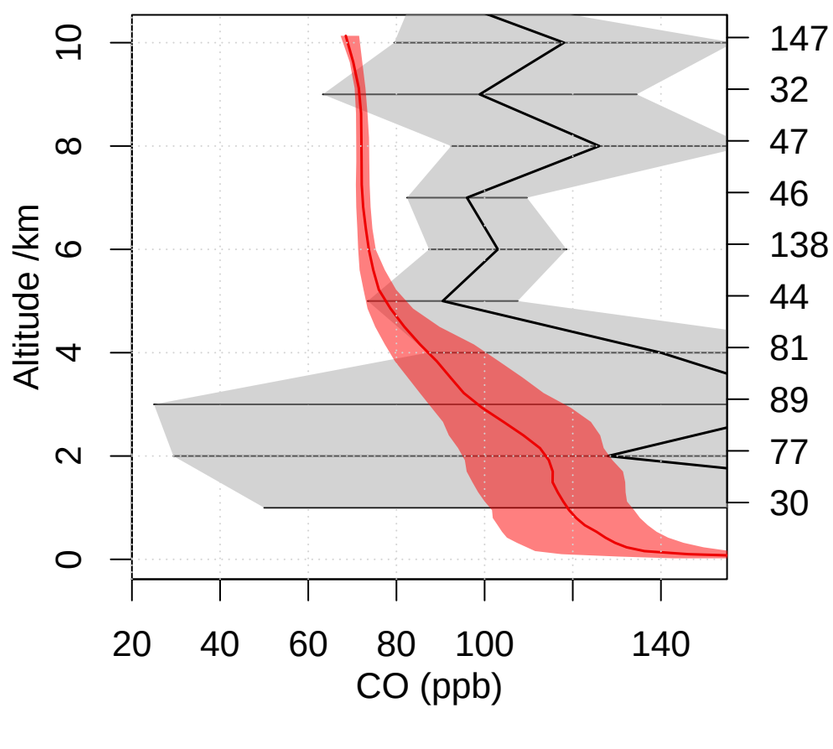


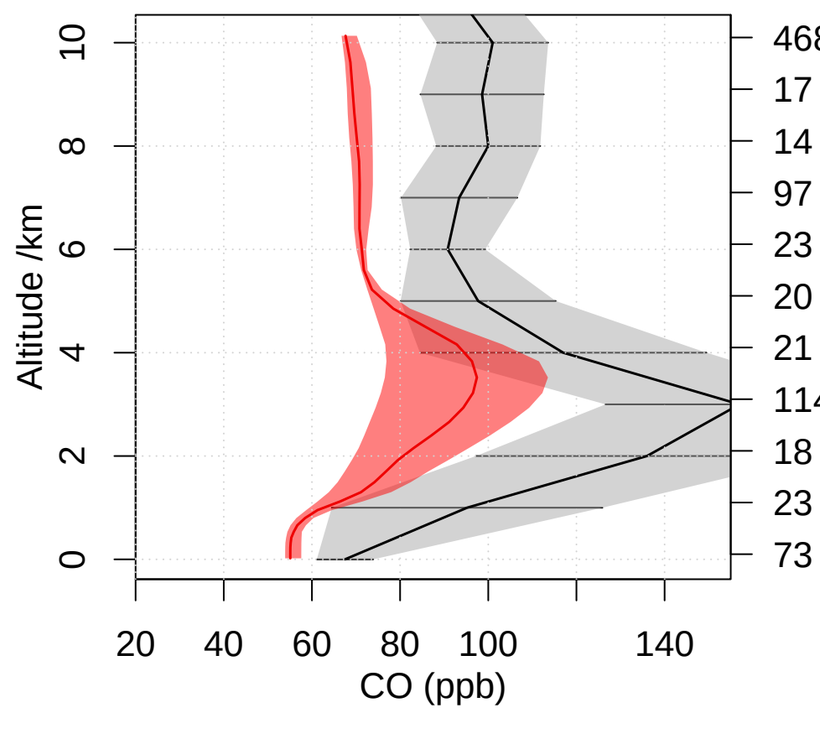




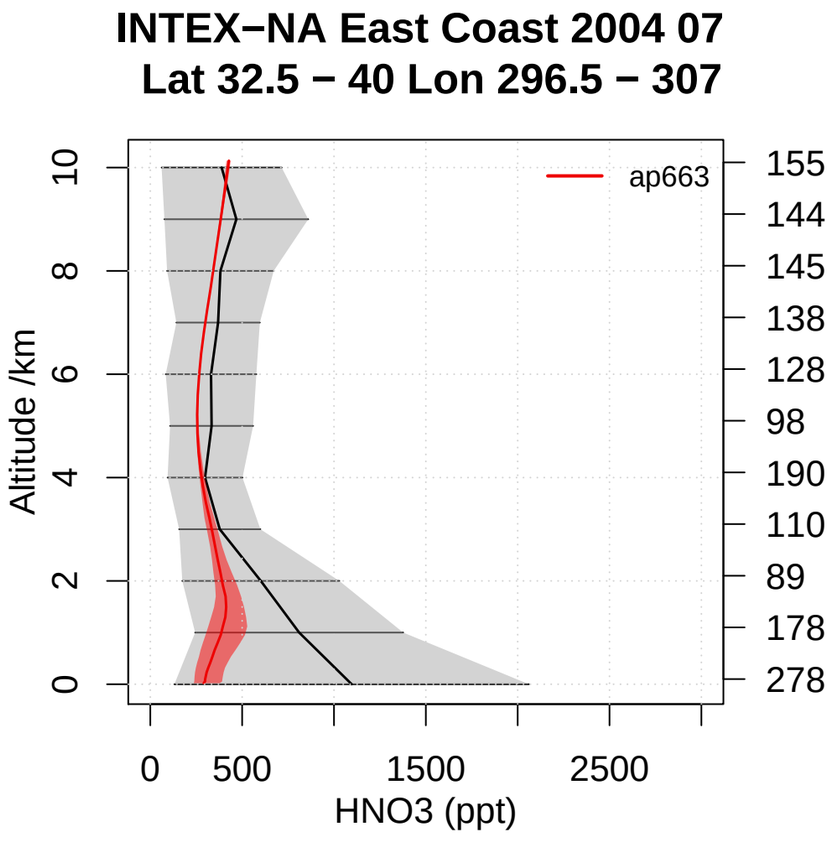


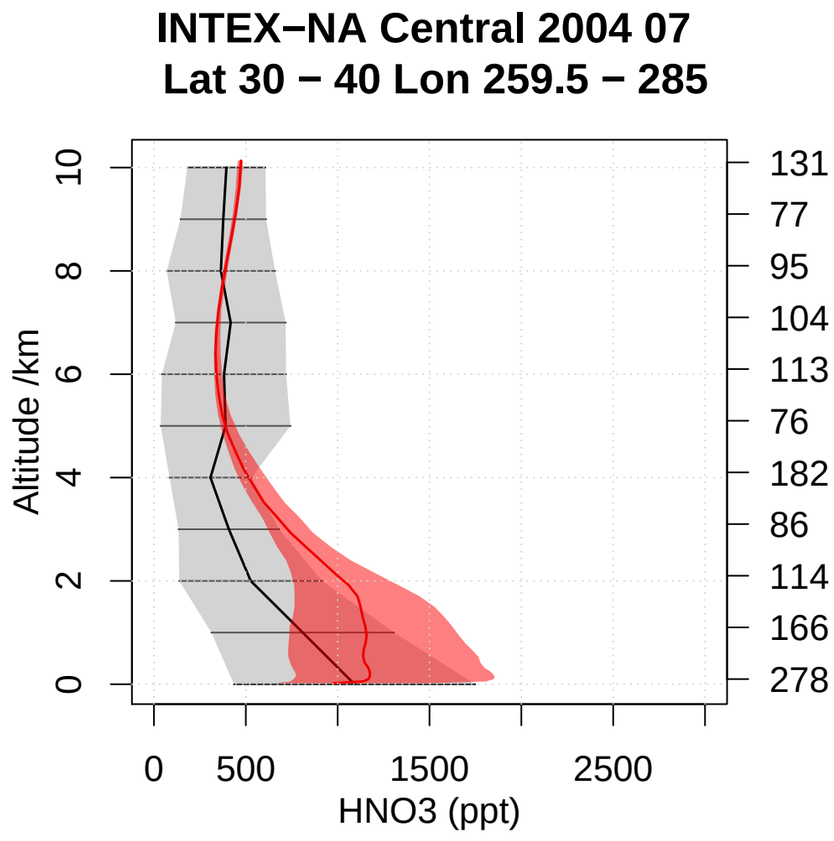


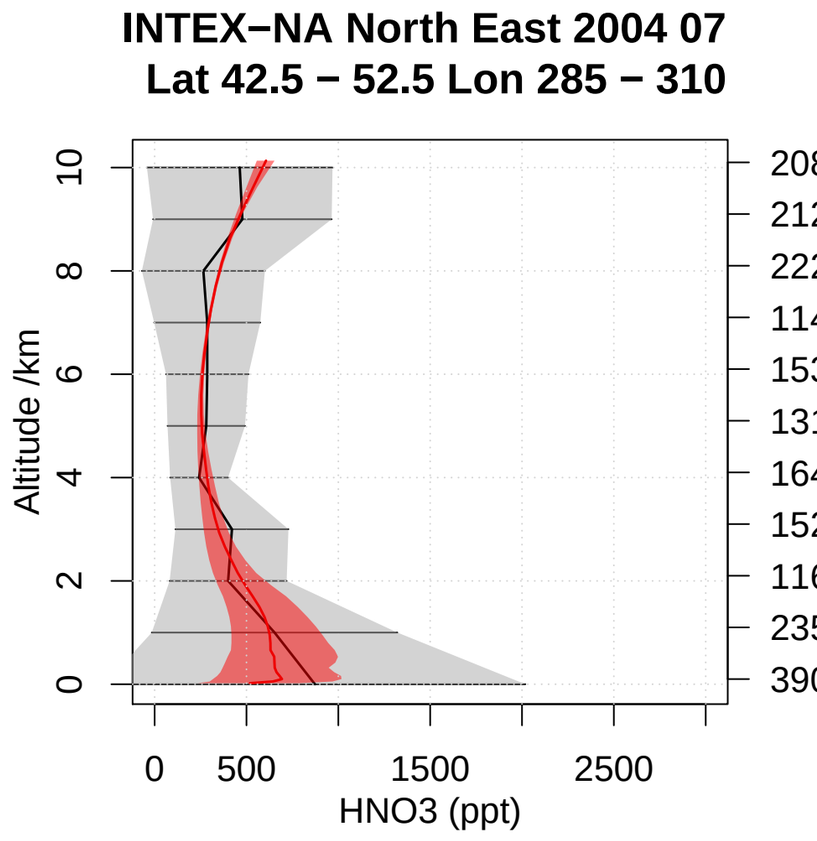


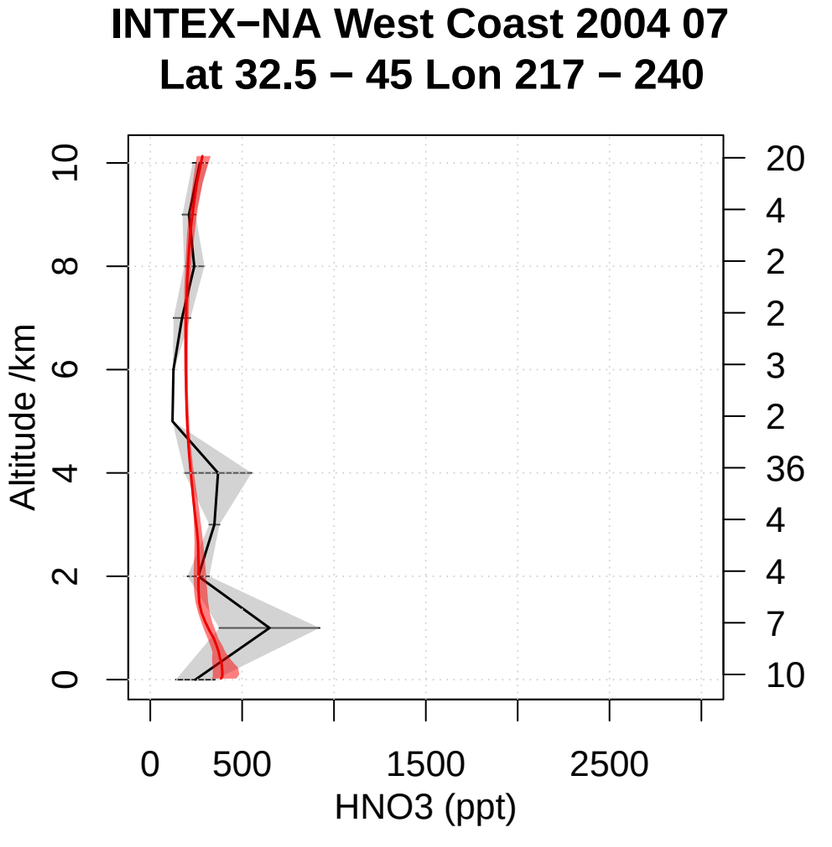


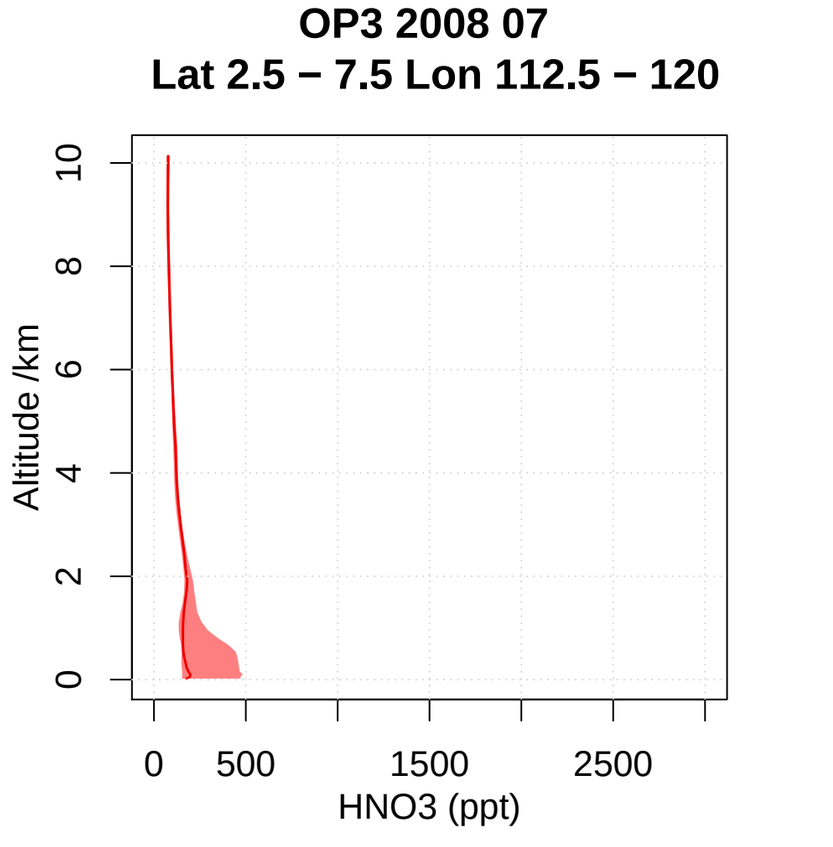
Emmons HNO3 comparison

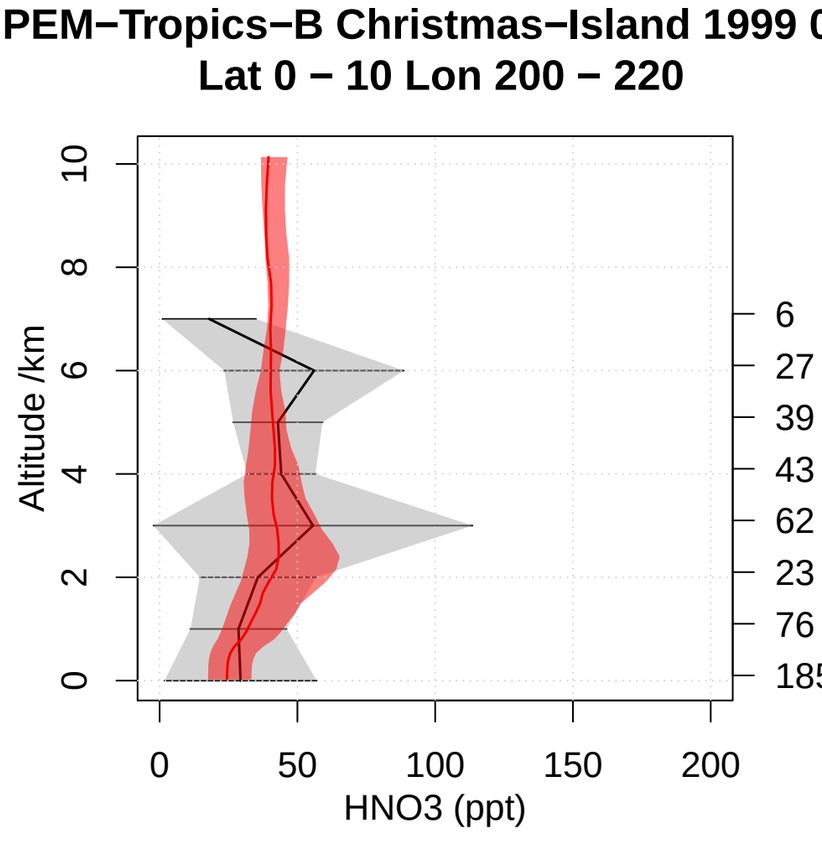


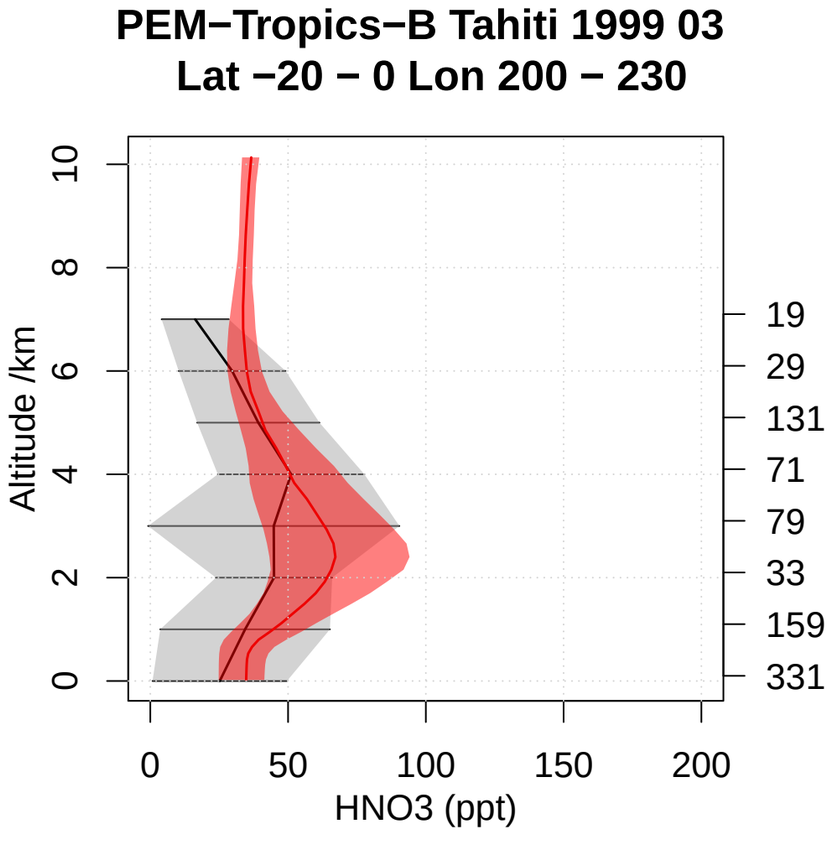


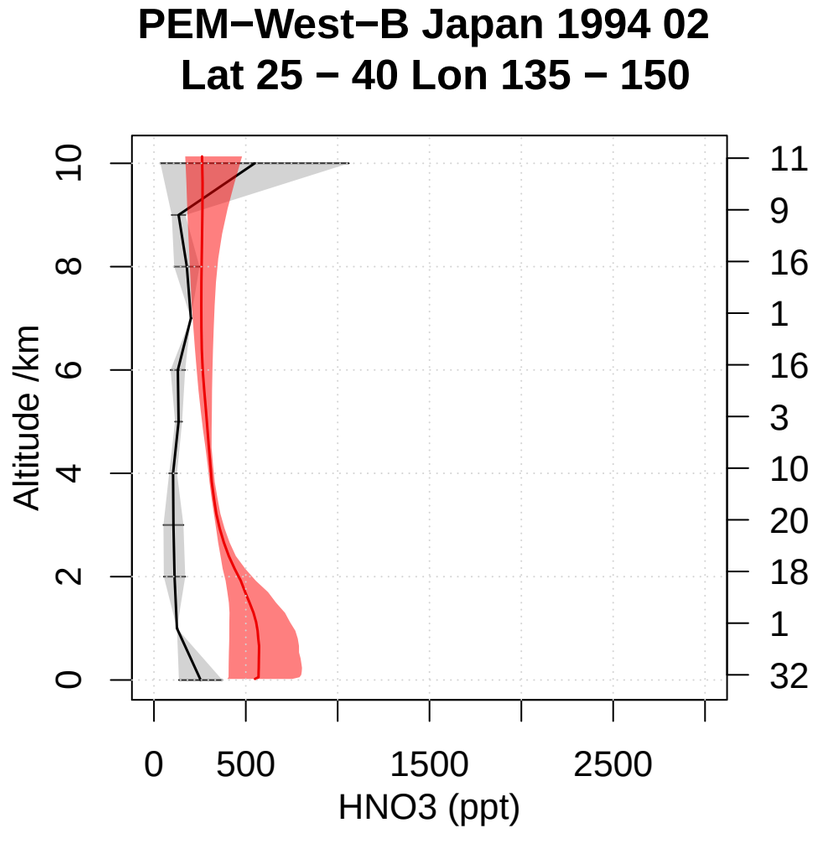


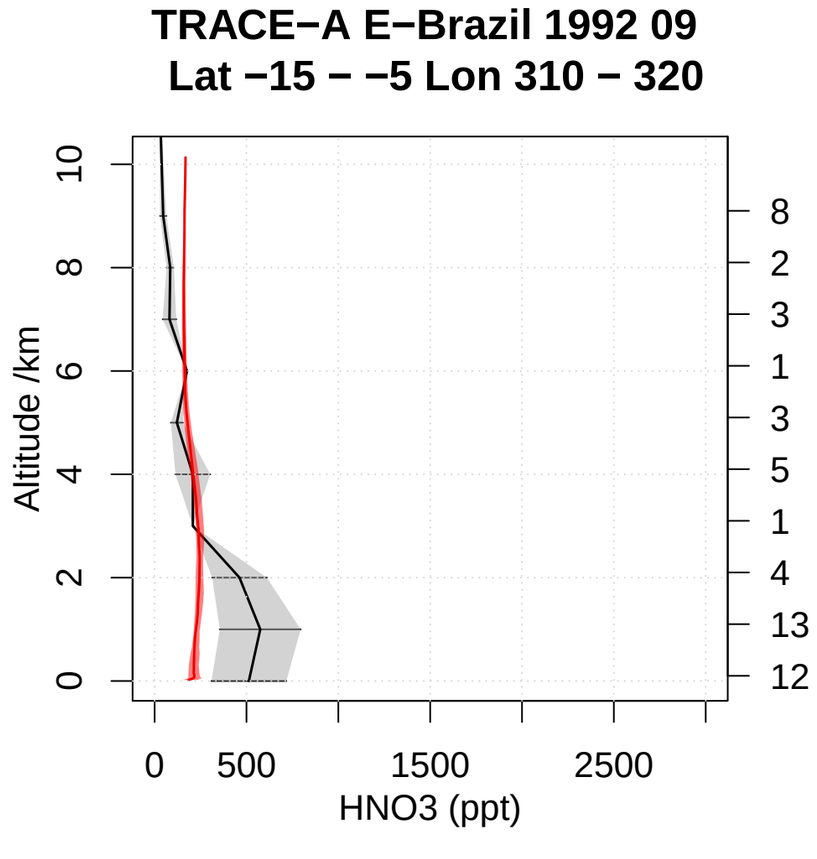


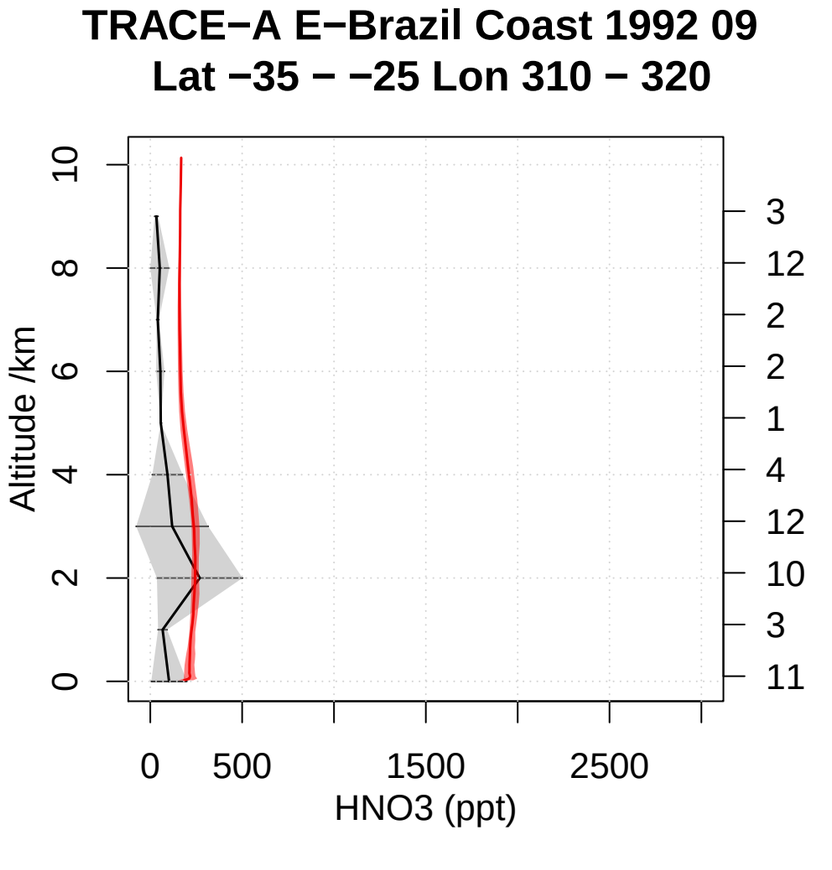


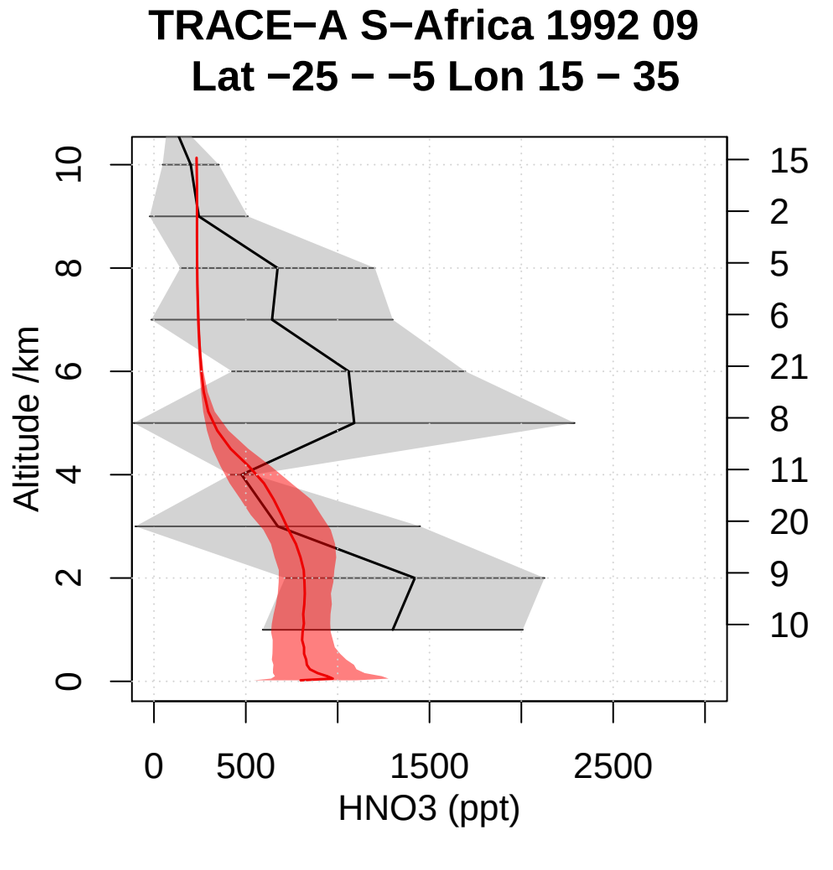


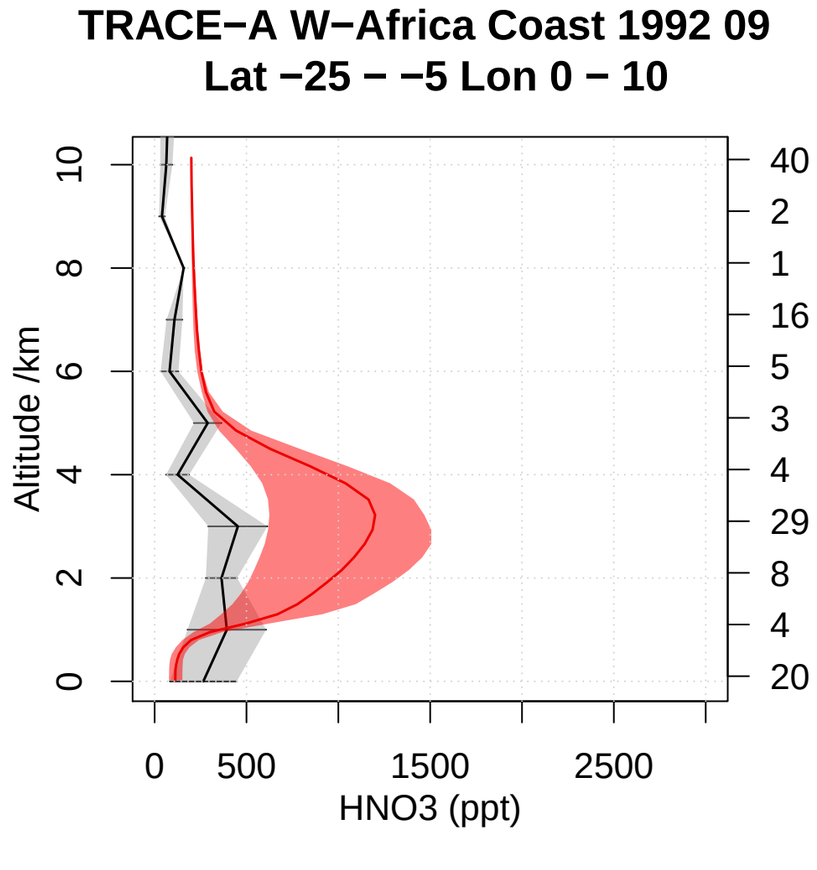




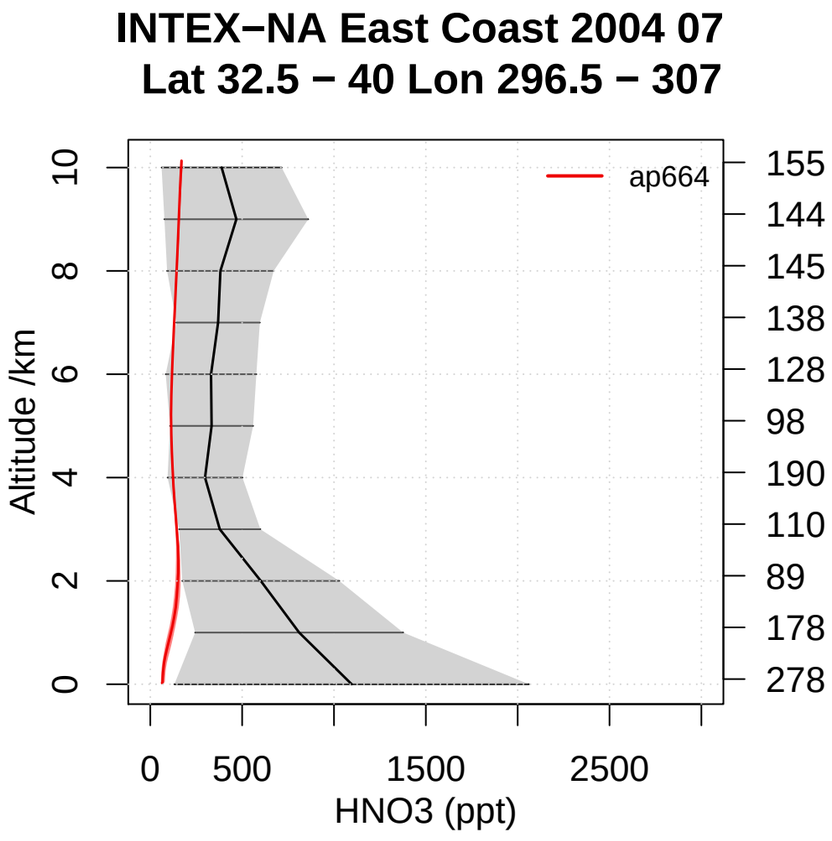


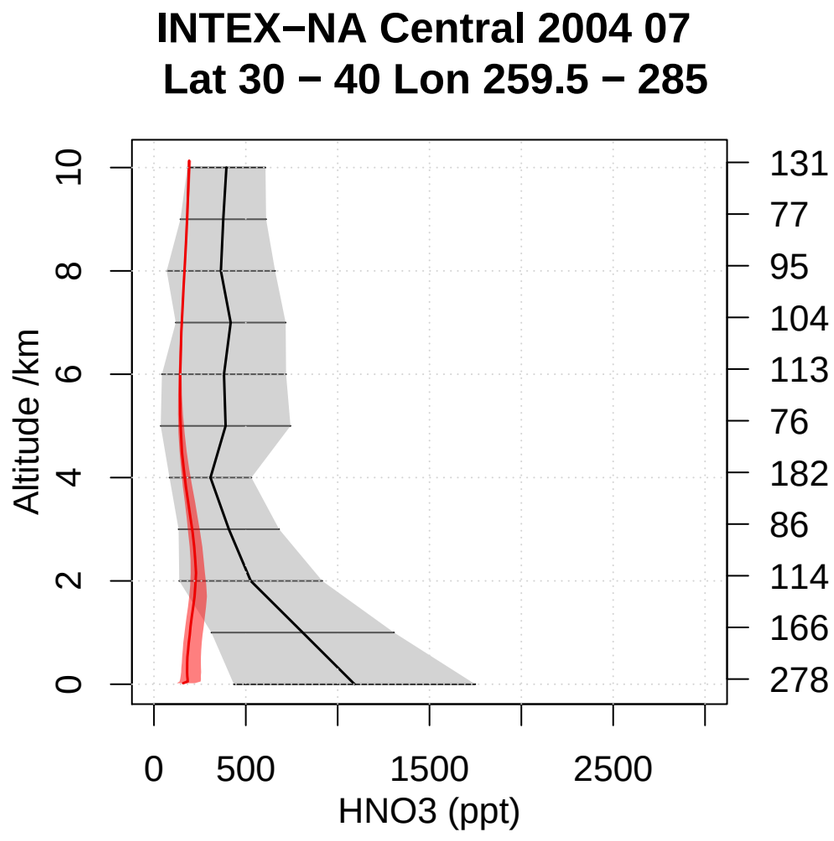


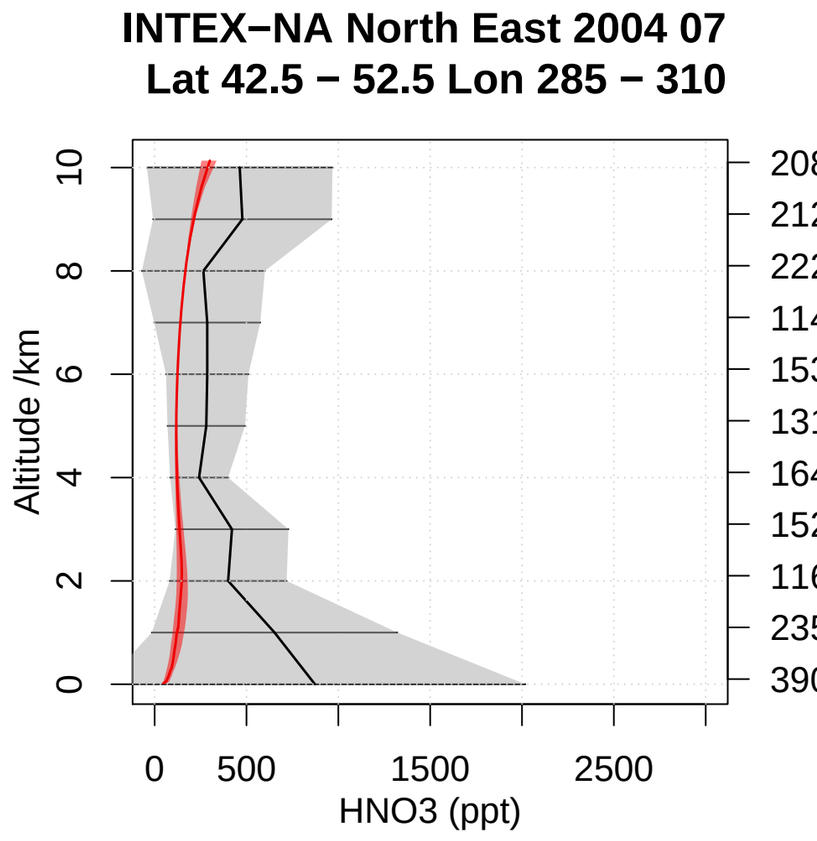


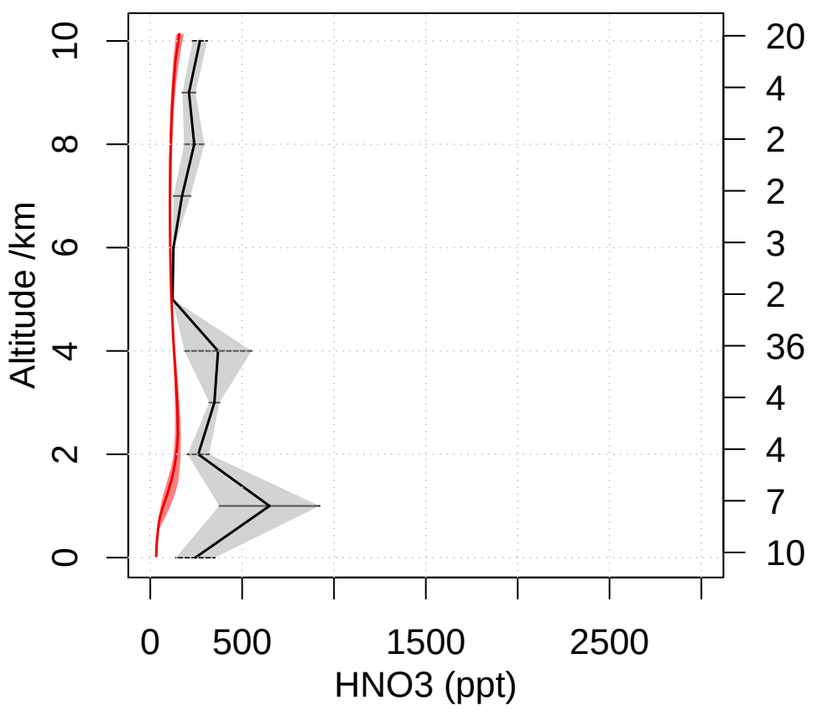


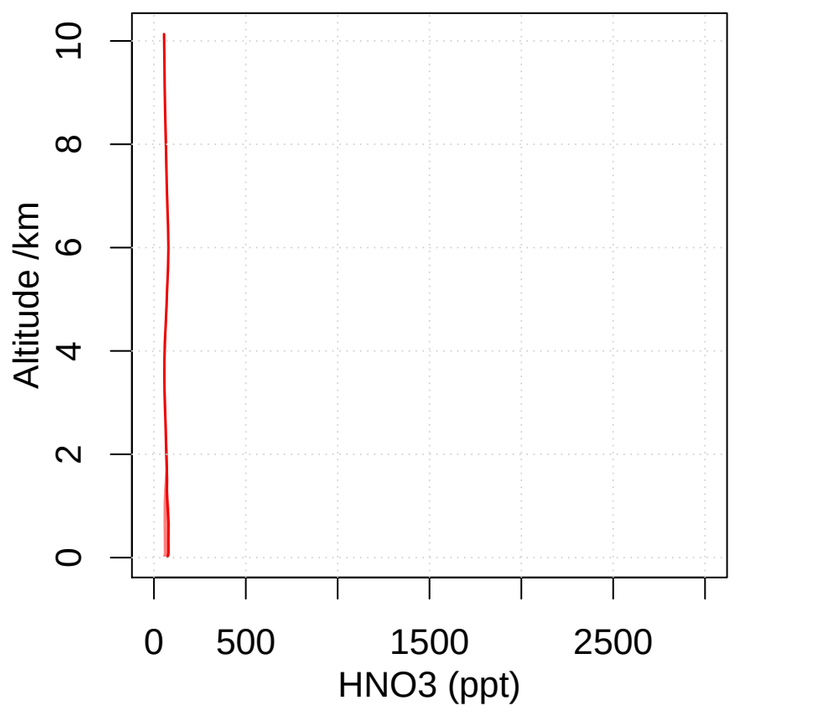
Emmons HNO3 comparison

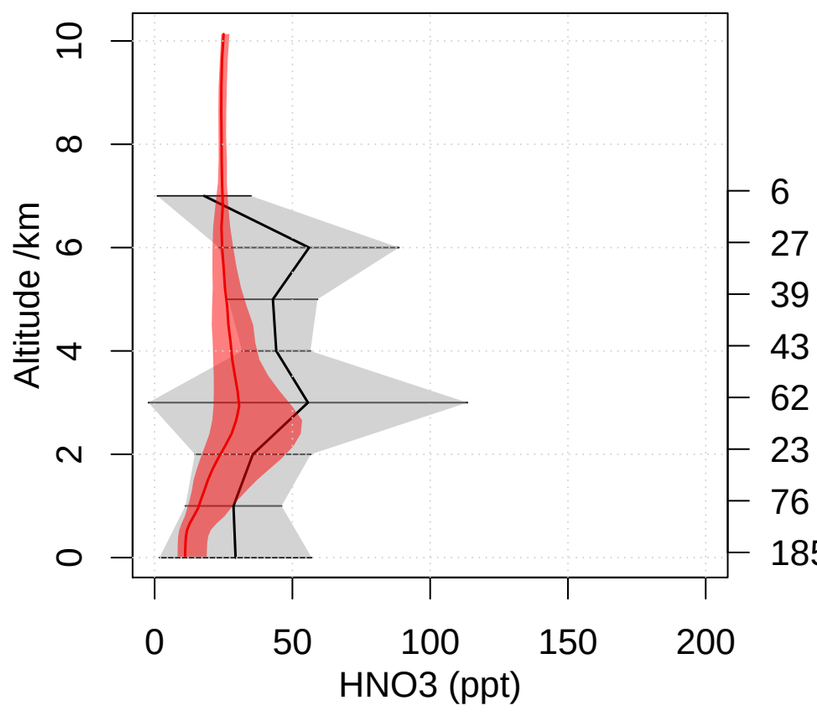


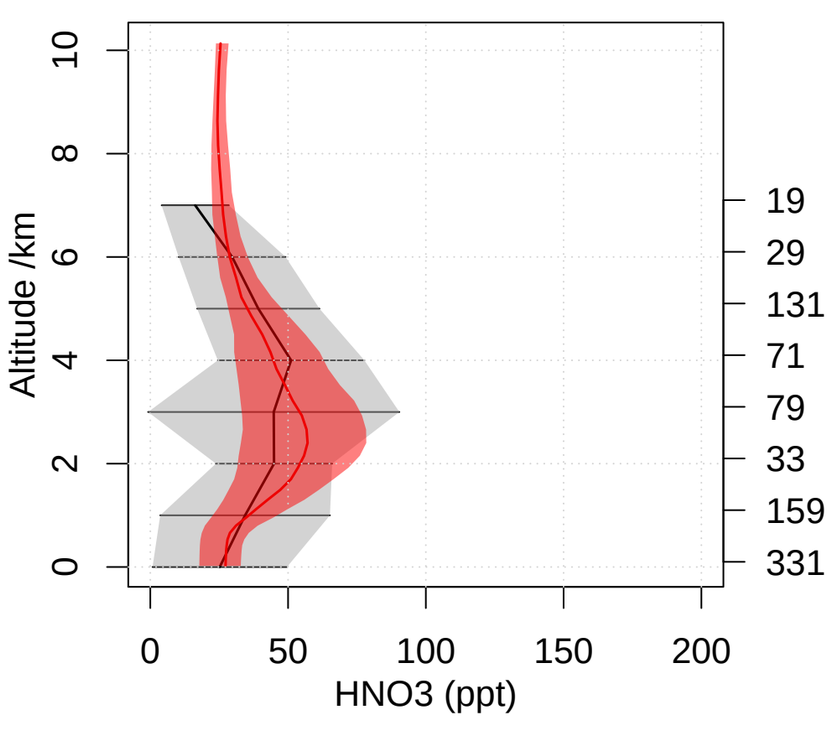


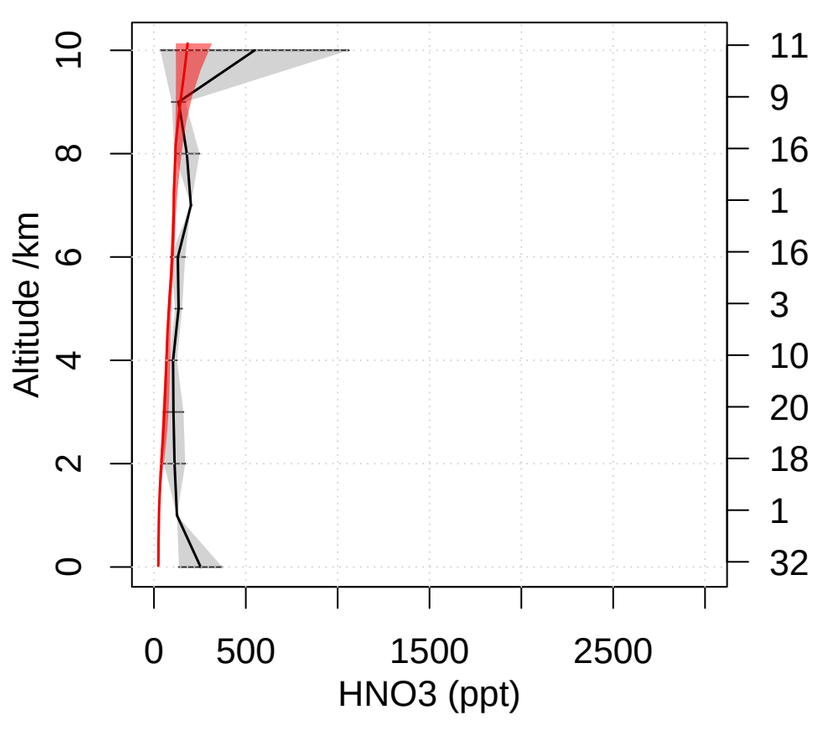


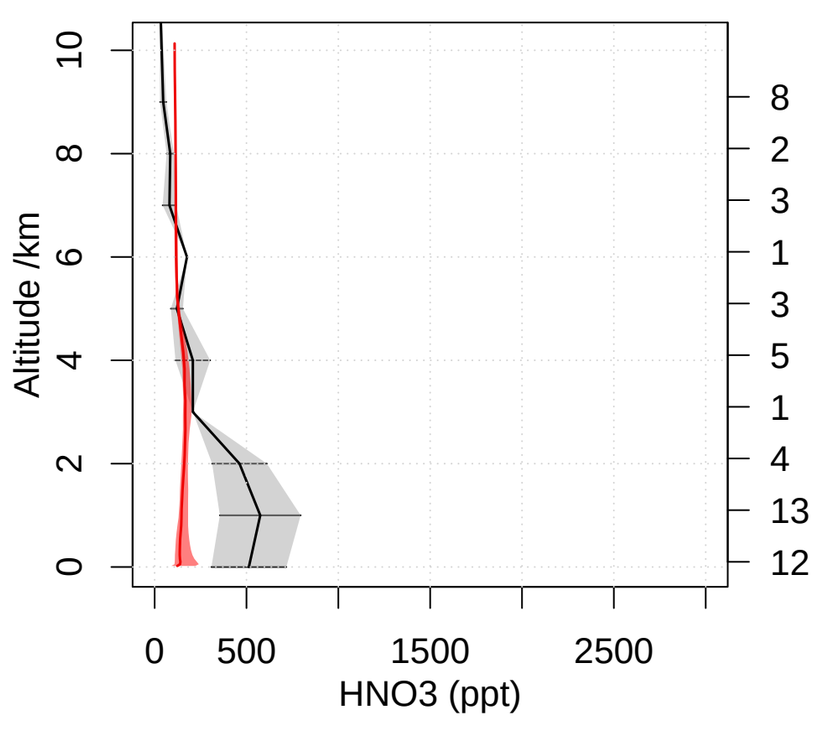


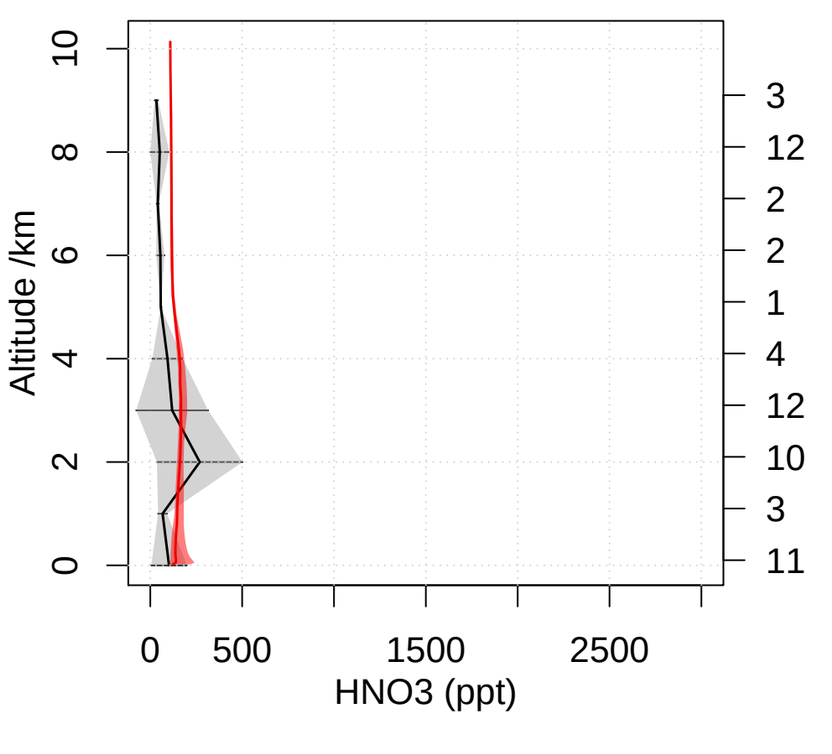


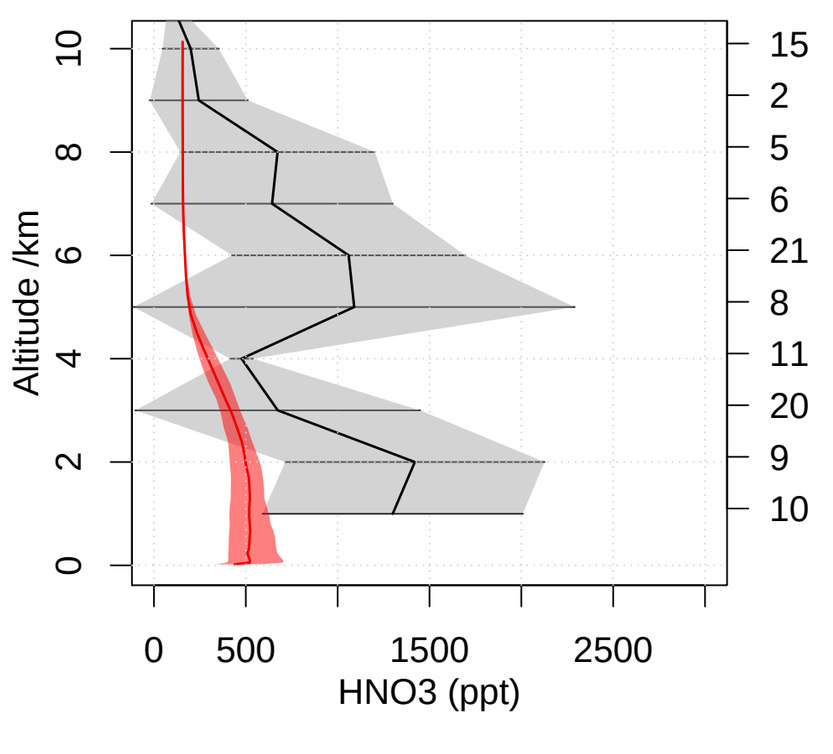


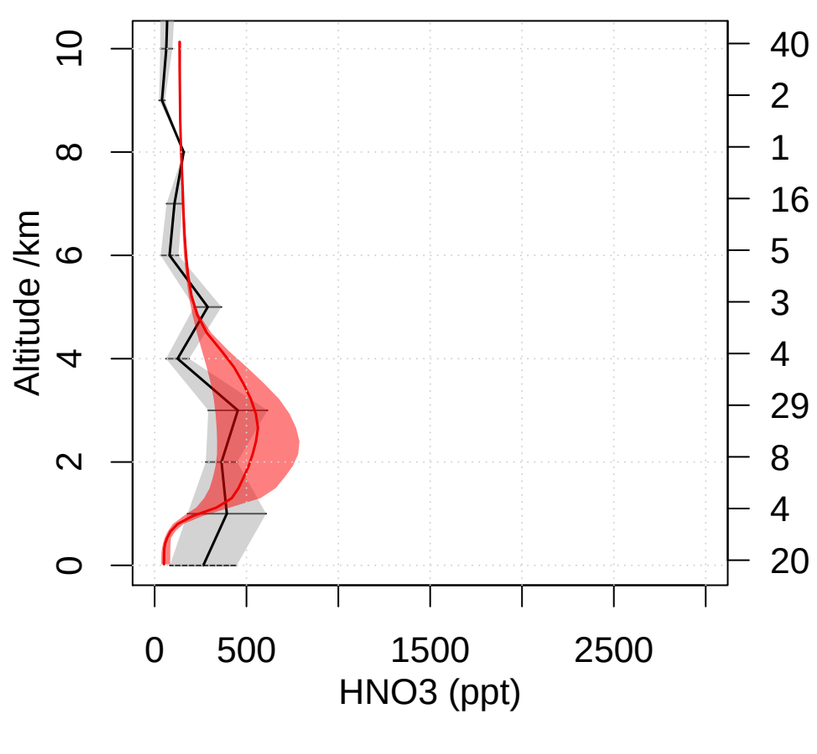






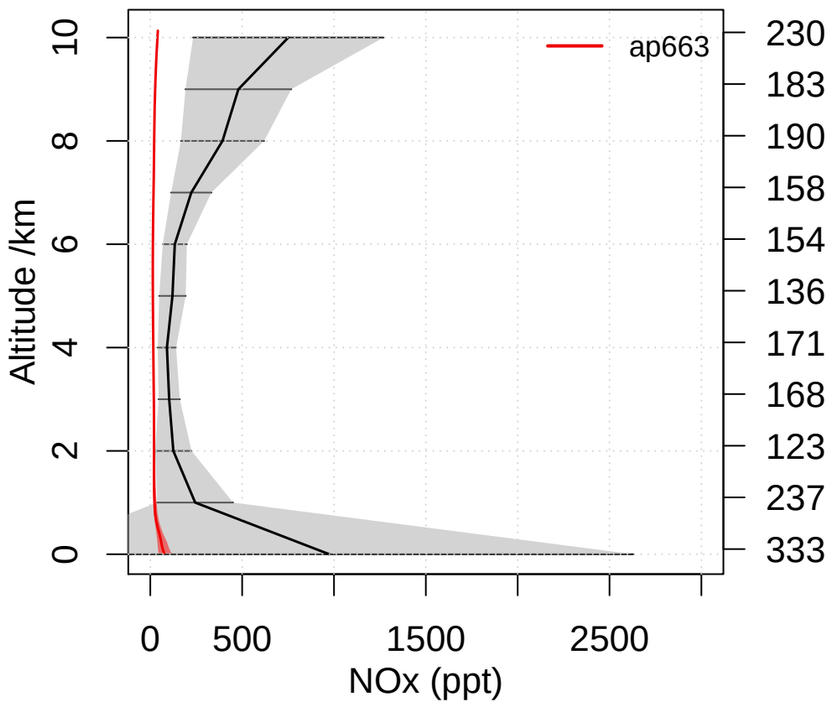




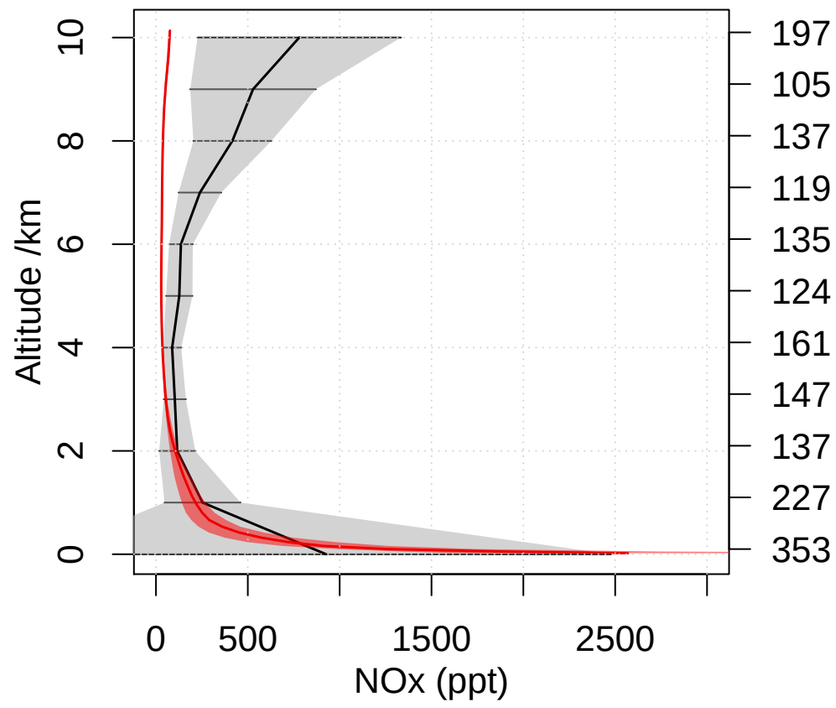


Emmons NOx comparison

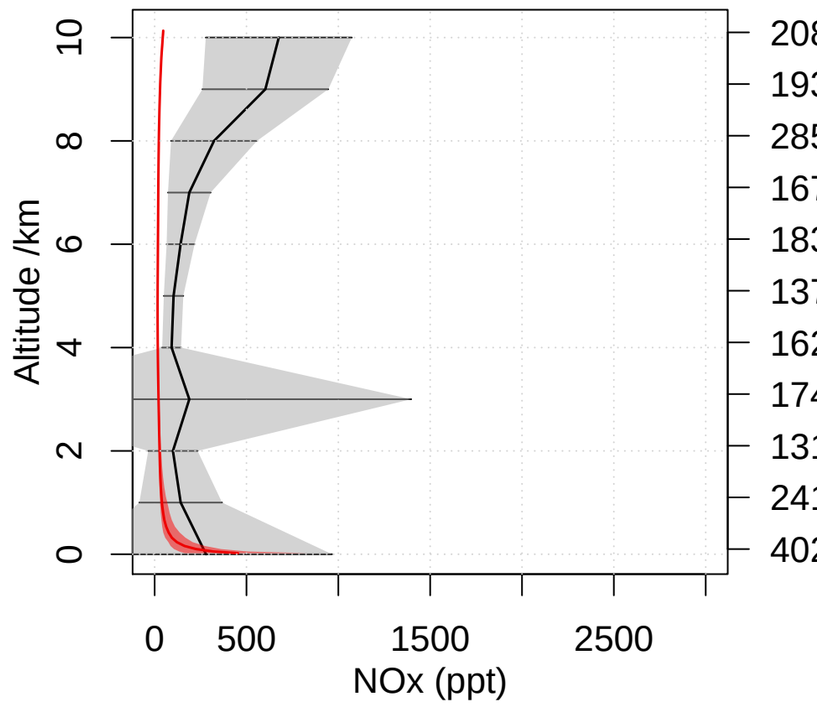
INTEX−NA East Coast 2004 07
Lat 32.5 − 40 Lon 296.5 − 307



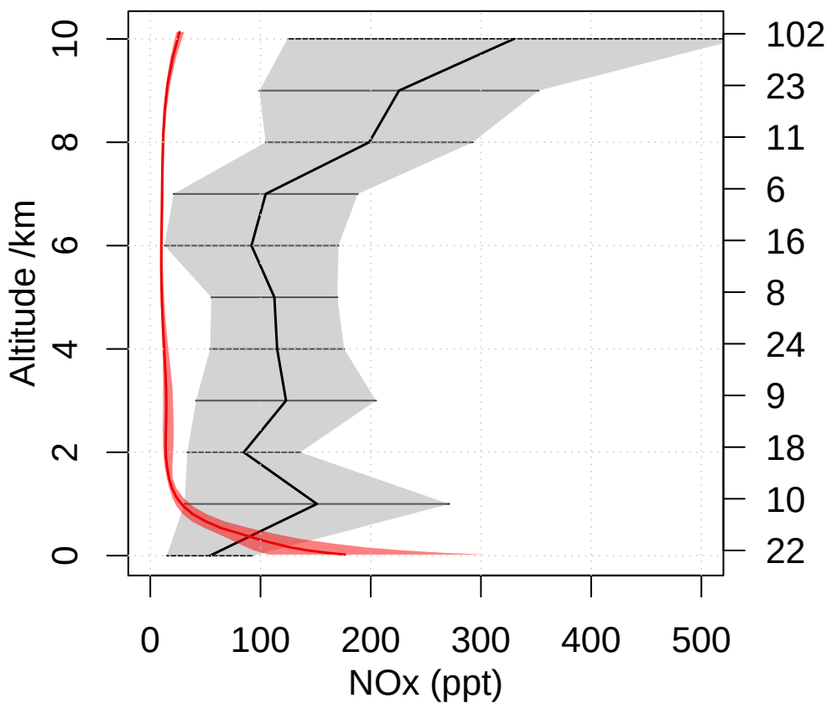
INTEX−NA Central 2004 07
Lat 30 − 40 Lon 259.5 − 285



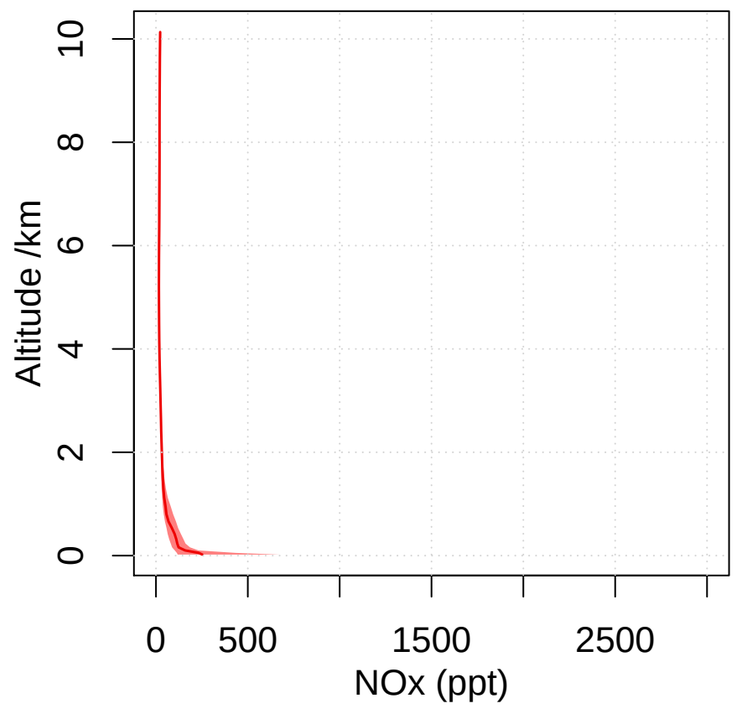
INTEX−NA North East 2004 07
Lat 42.5 − 52.5 Lon 285 − 310



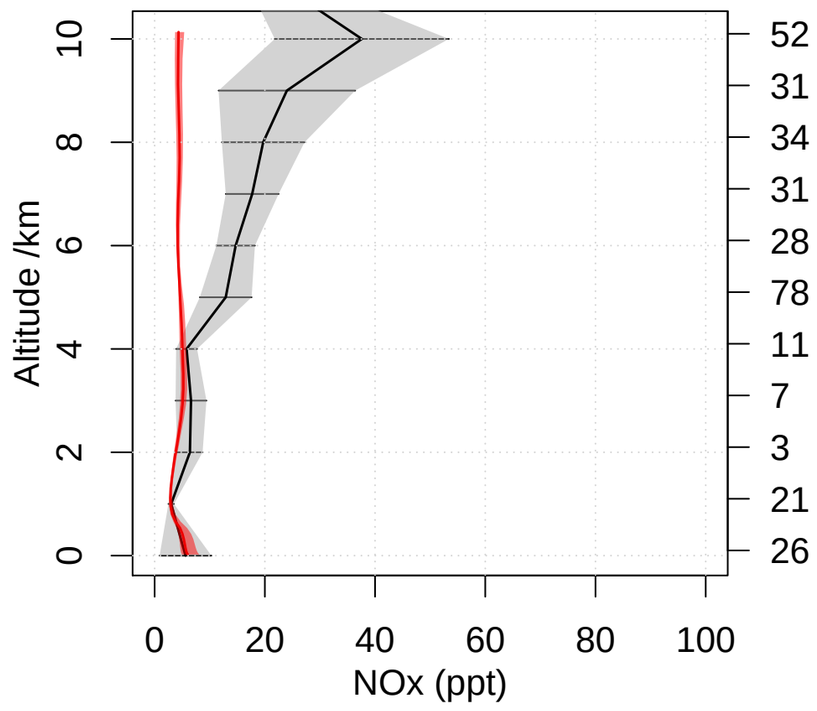
INTEX−NA West Coast 2004 07
Lat 32.5 − 45 Lon 217 − 240



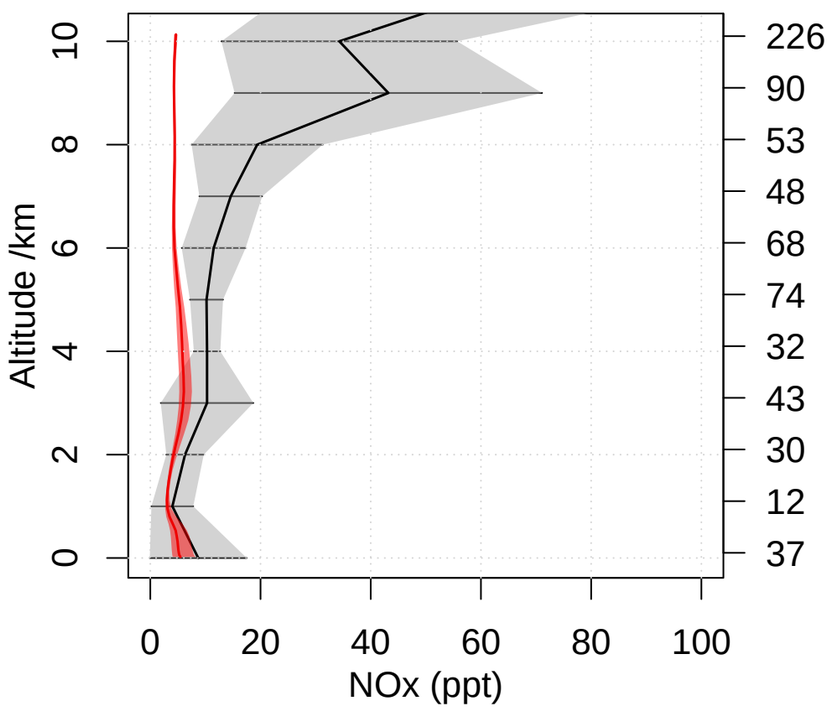
OP3 2008 07
Lat 2.5 − 7.5 Lon 112.5 − 120



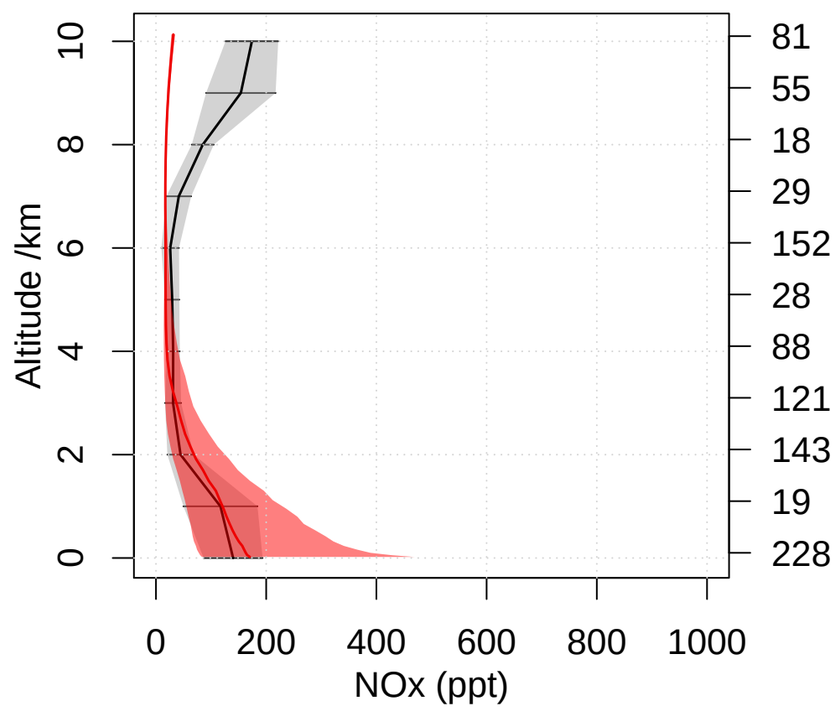
PEM−Tropics−B Christmas−Island 1999 0
Lat 0 − 10 Lon 200 − 220



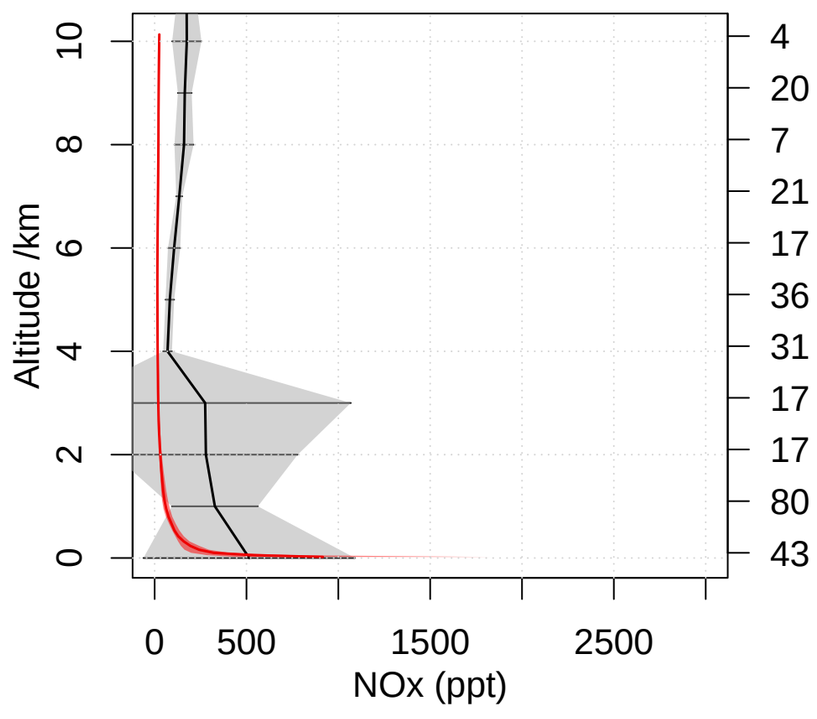
PEM−Tropics−B Tahiti 1999 03
Lat −20 − 0 Lon 200 − 230



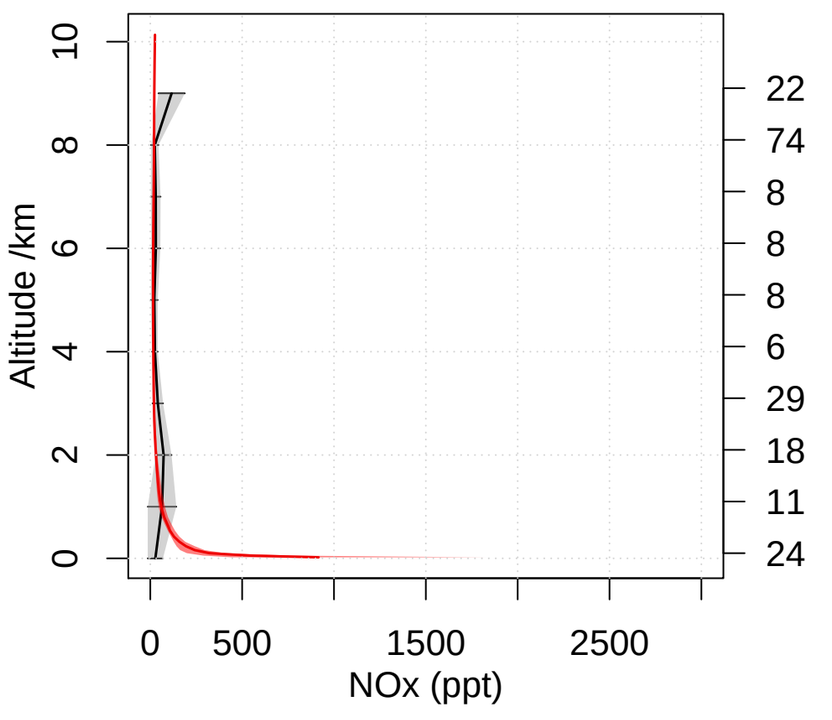
PEM−West−B Japan 1994 02
Lat 25 − 40 Lon 135 − 150



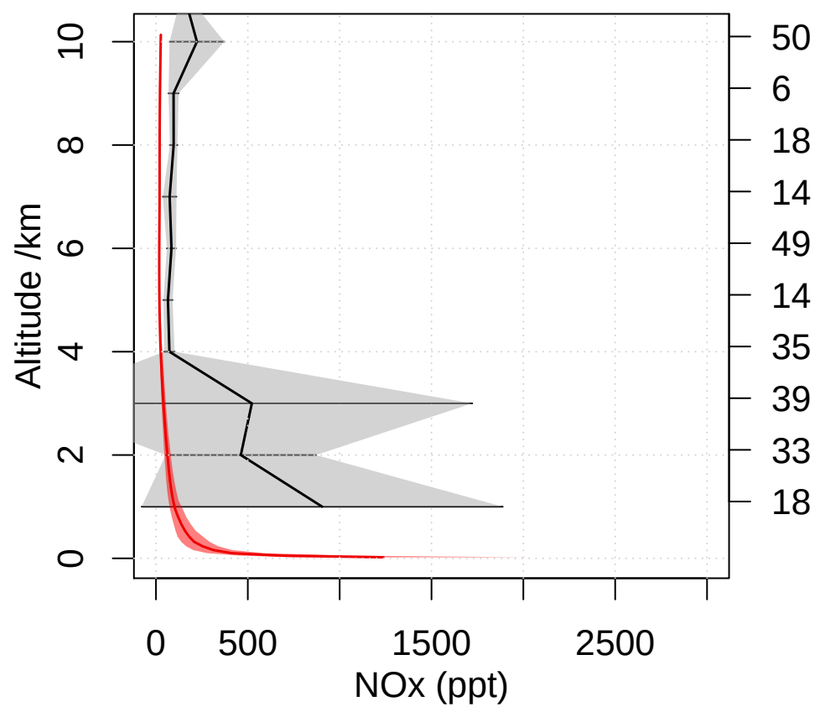
TRACE−A E−Brazil 1992 09
Lat −15 − −5 Lon 310 − 320



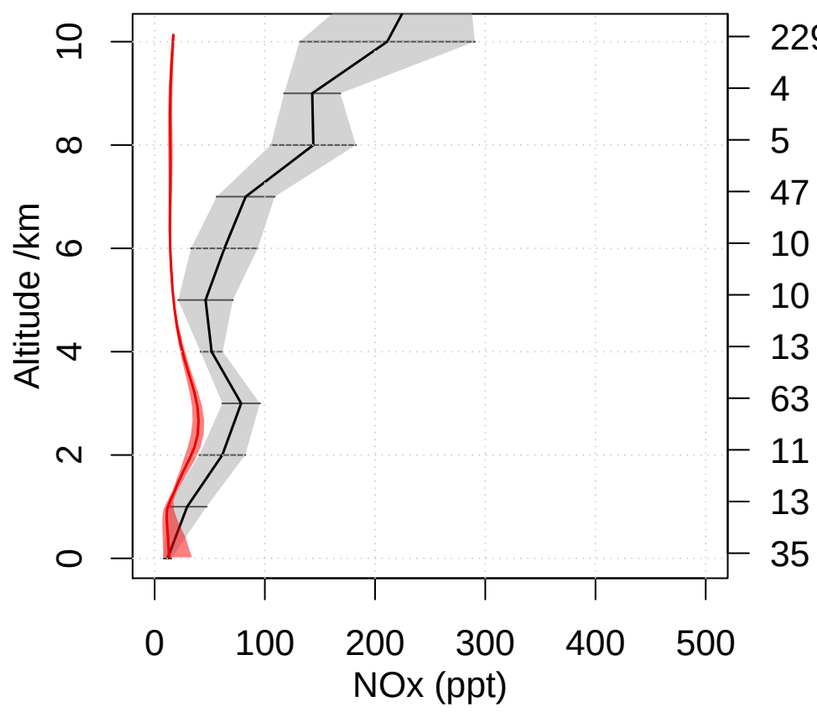
TRACE−A E−Brazil Coast 1992 09
Lat −35 − −25 Lon 310 − 320



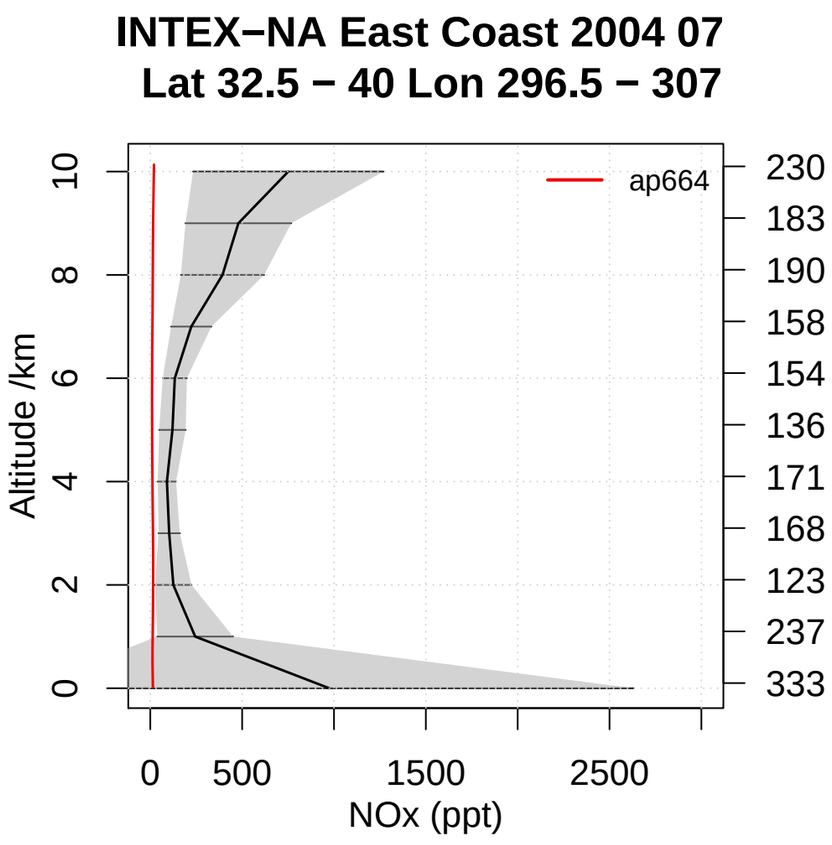
TRACE−A S−Africa 1992 09
Lat −25 − −5 Lon 15 − 35

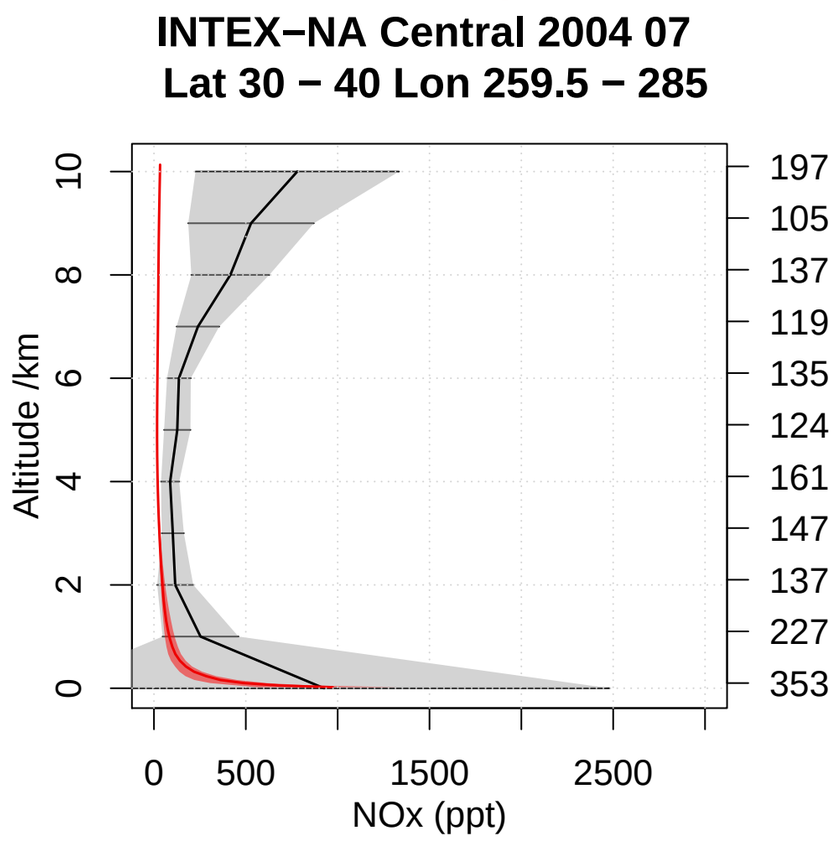


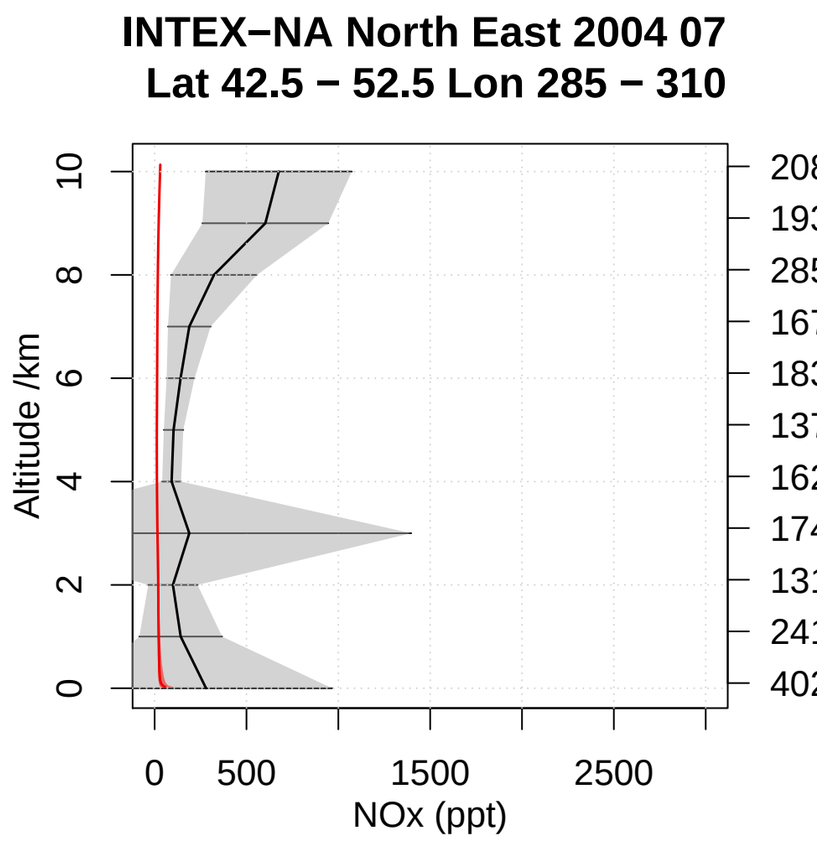
TRACE−A W−Africa Coast 1992 09
Lat −25 − −5 Lon 0 − 10

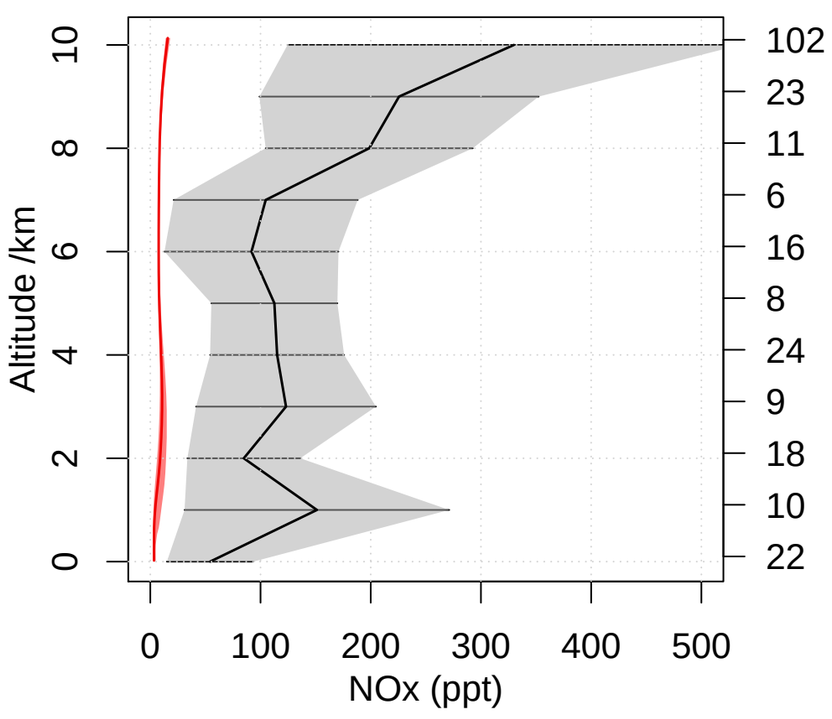


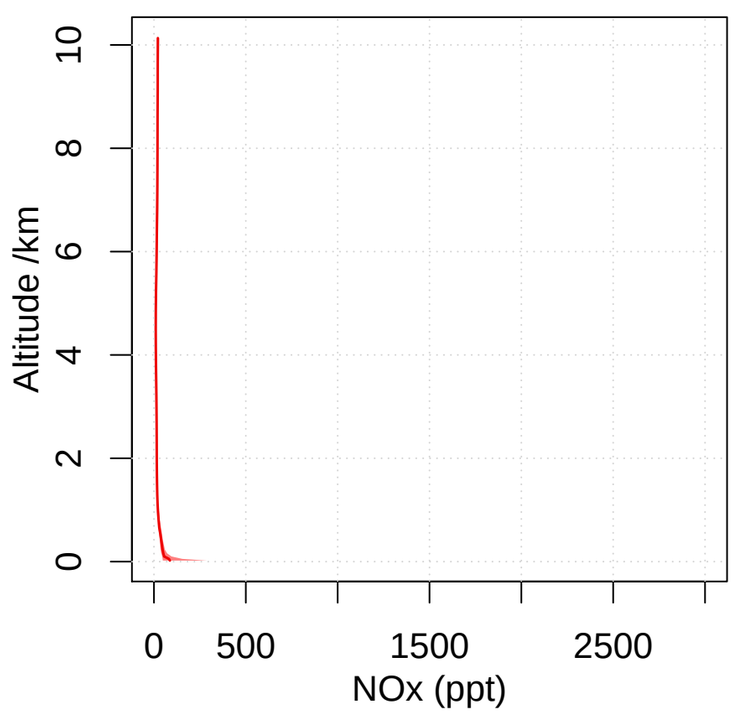
Emmons NOx comparison

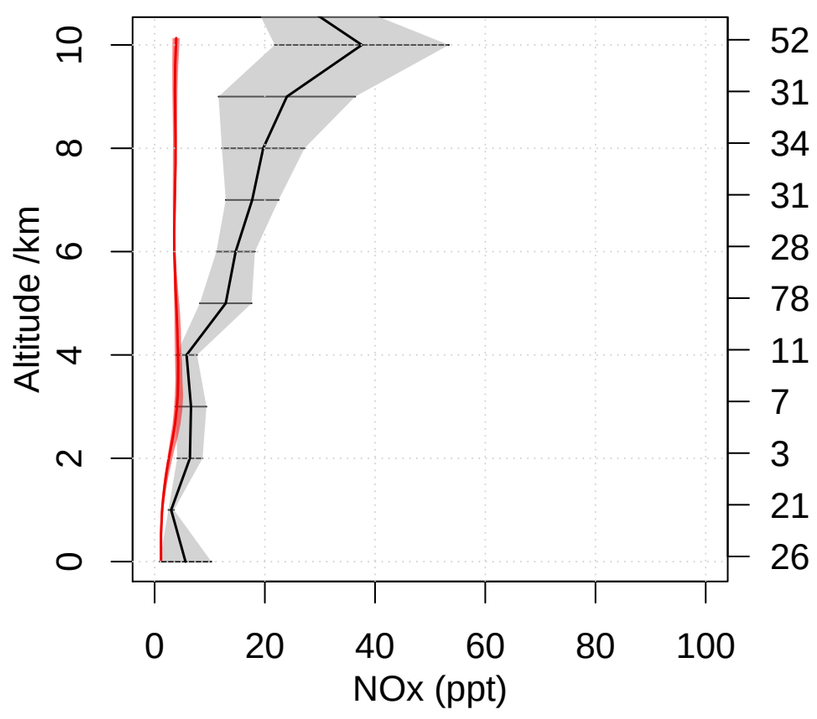


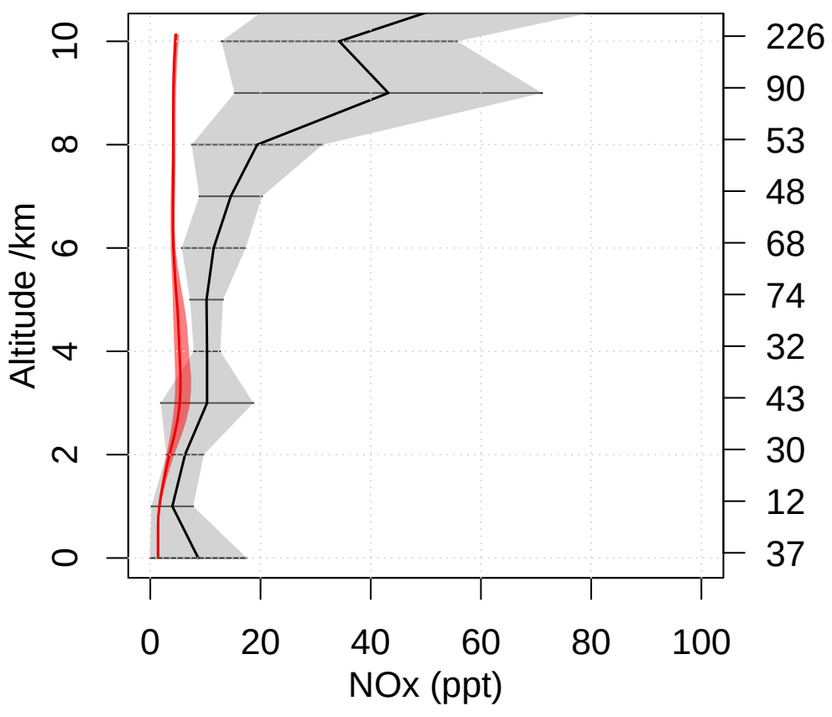


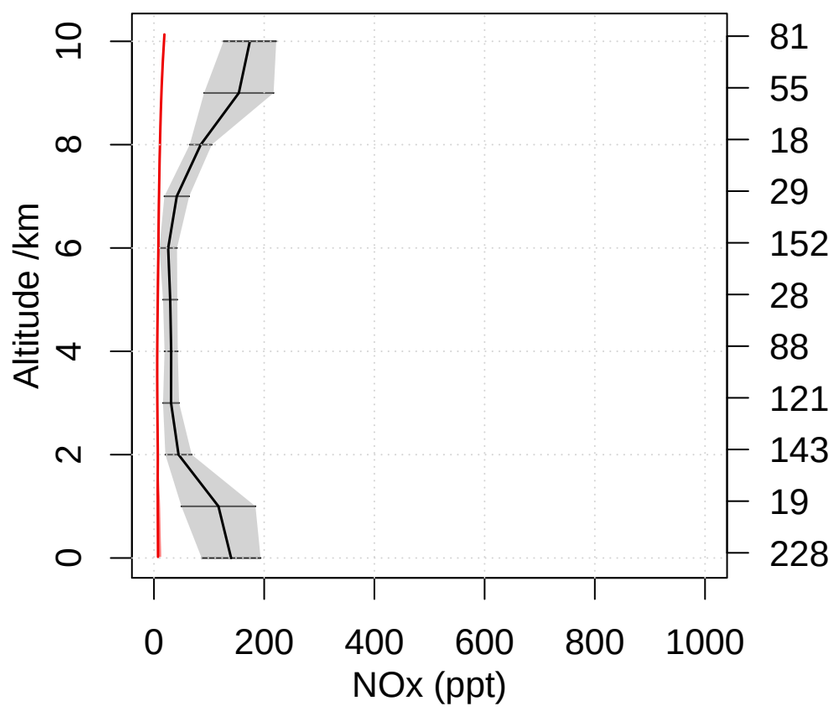


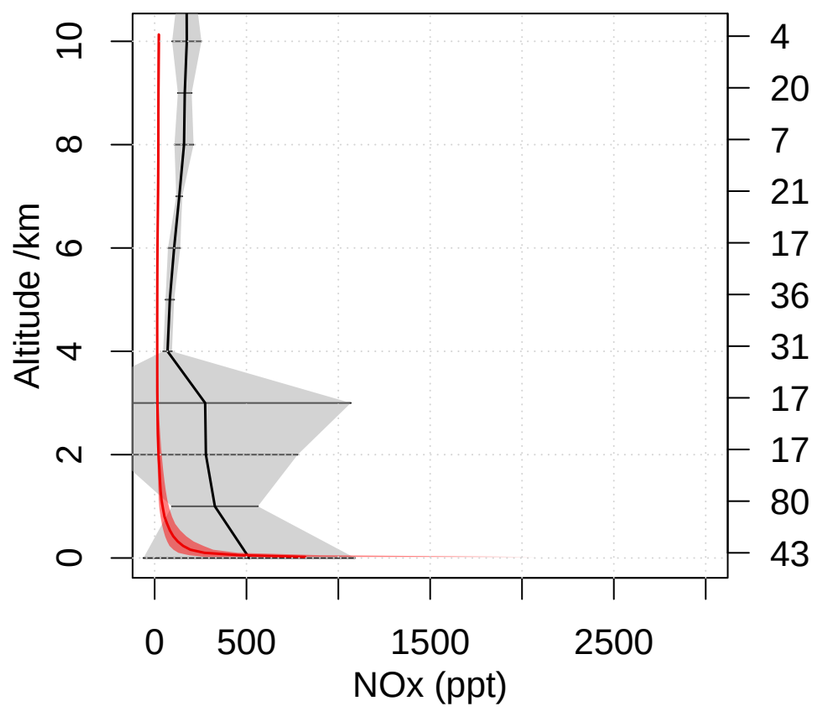


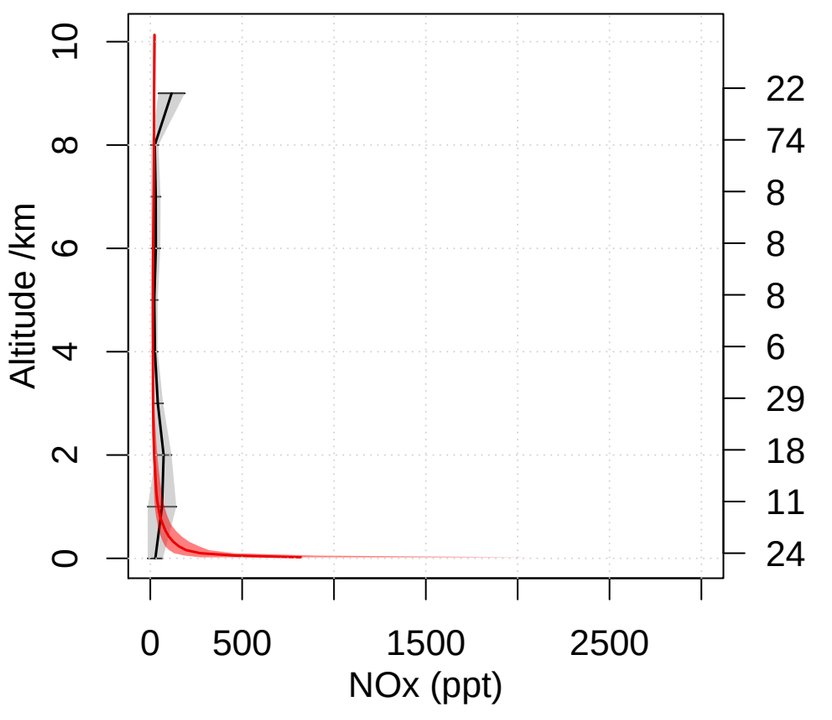


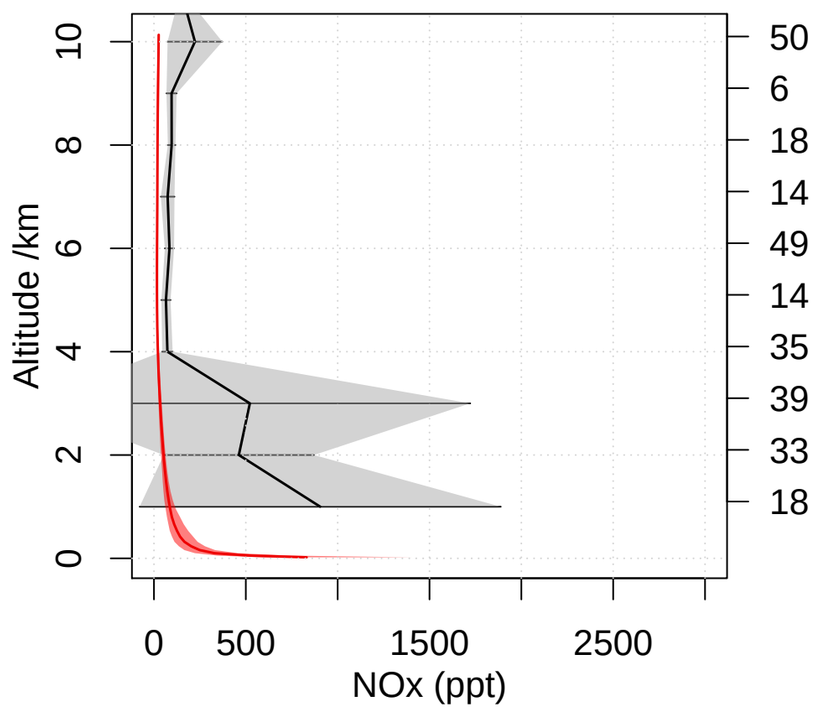


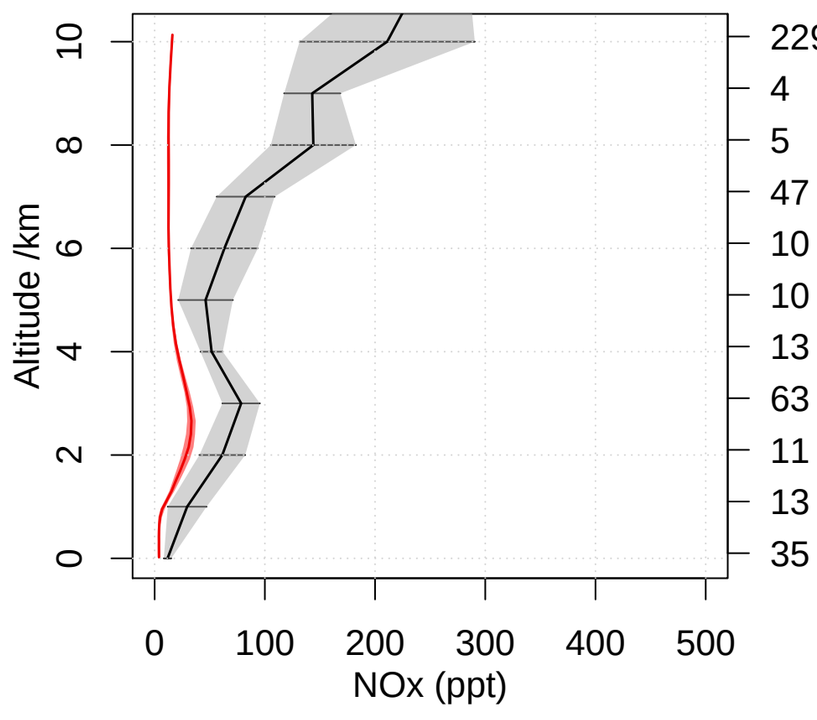


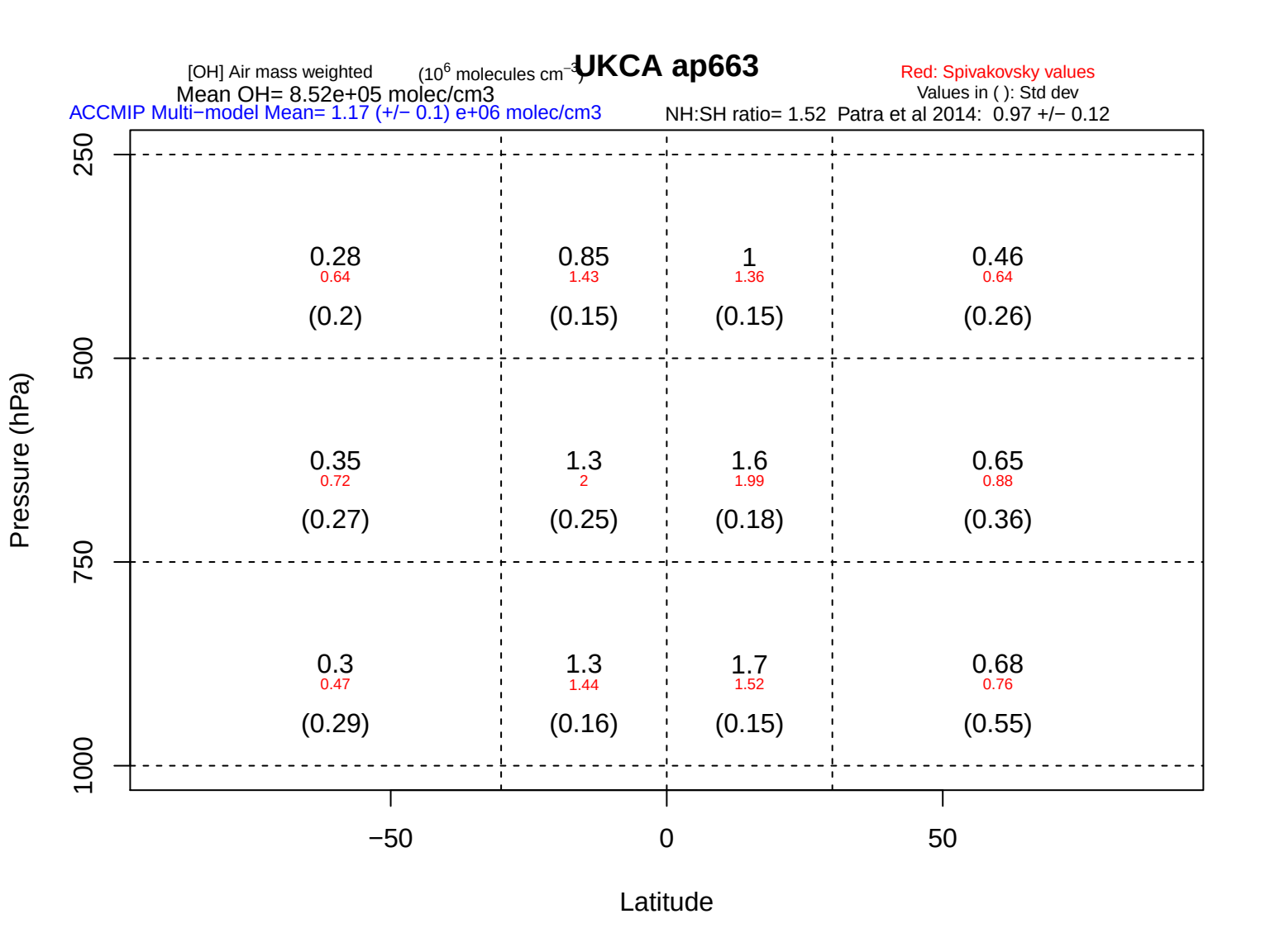


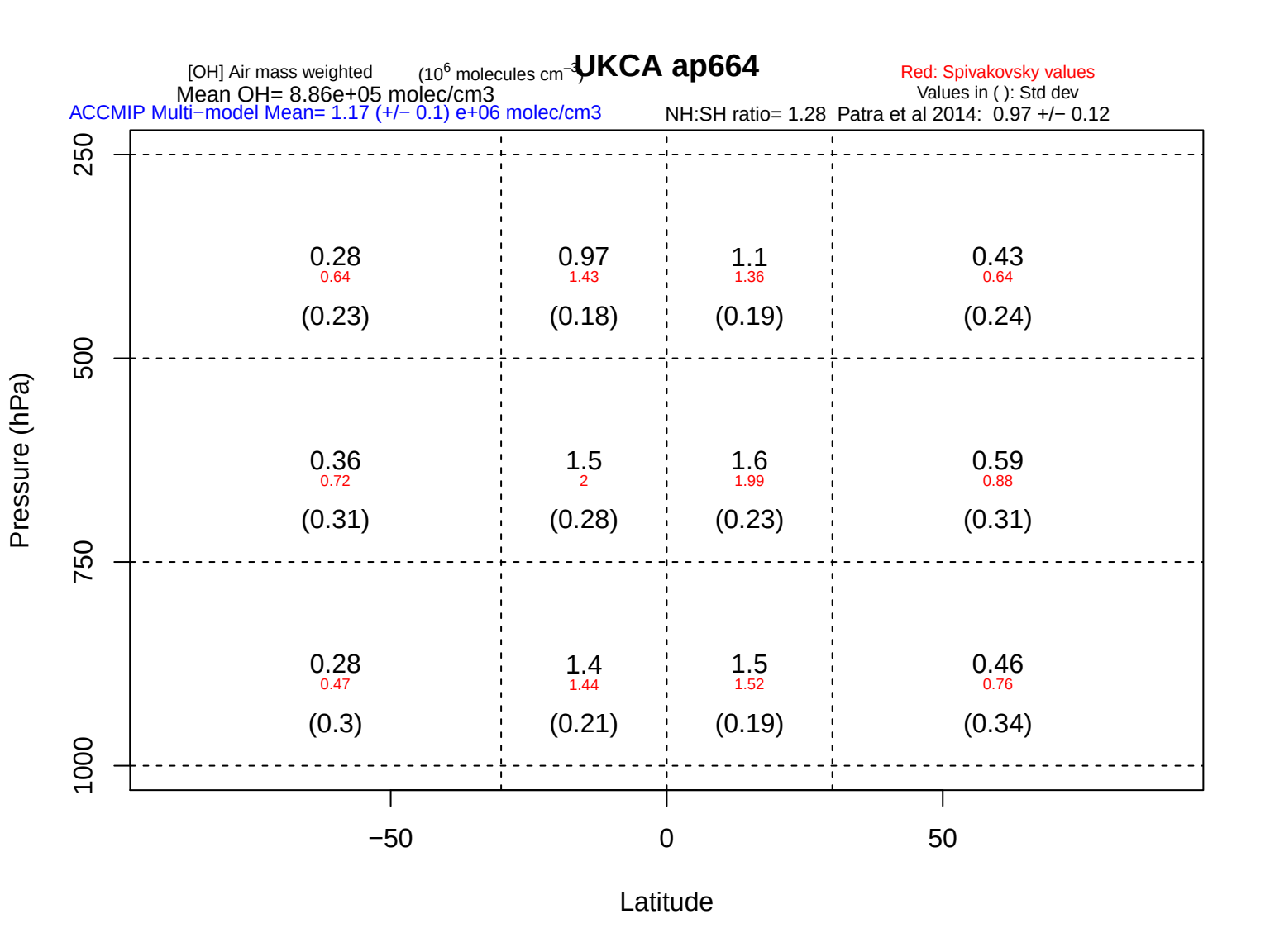


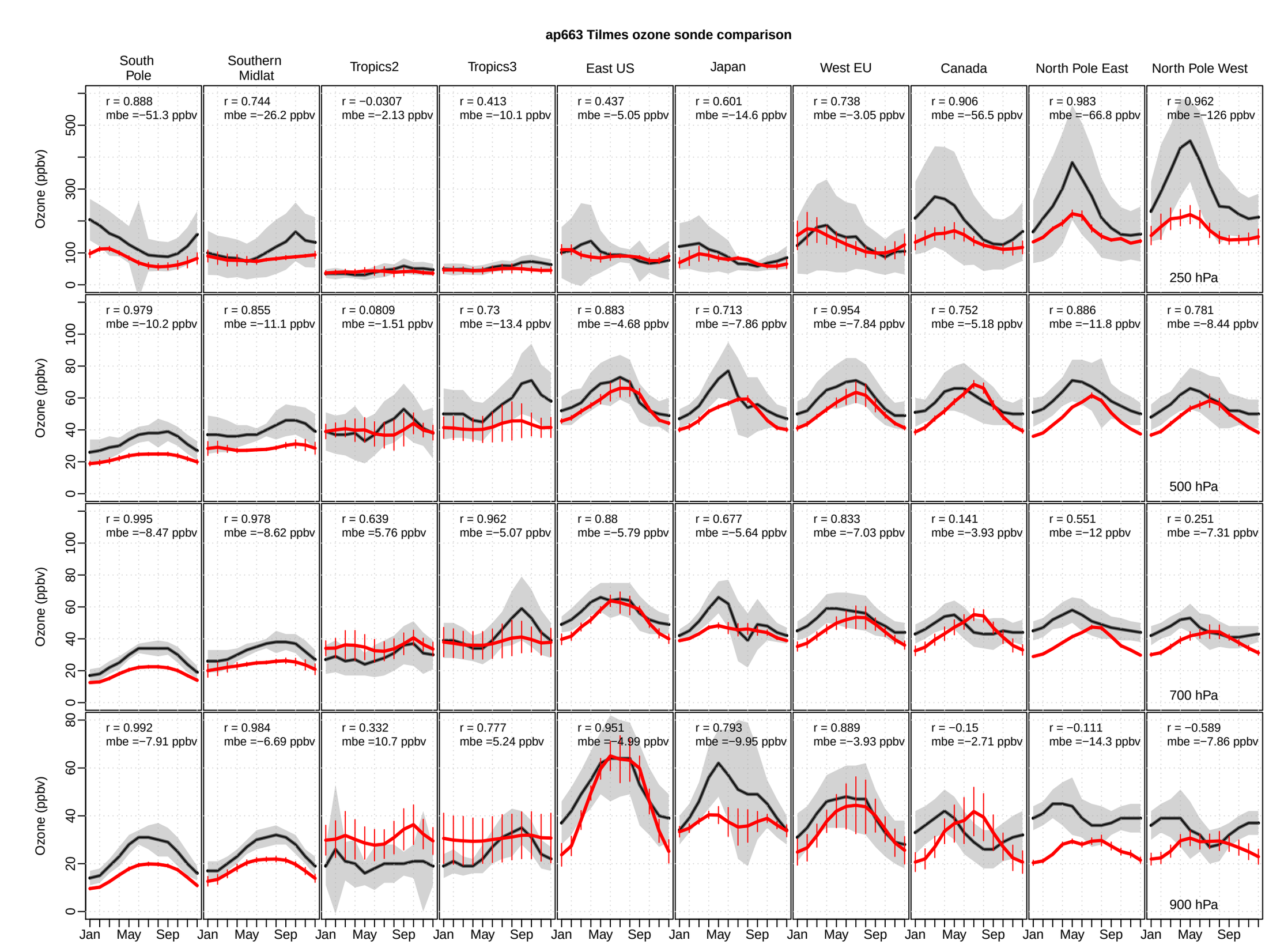


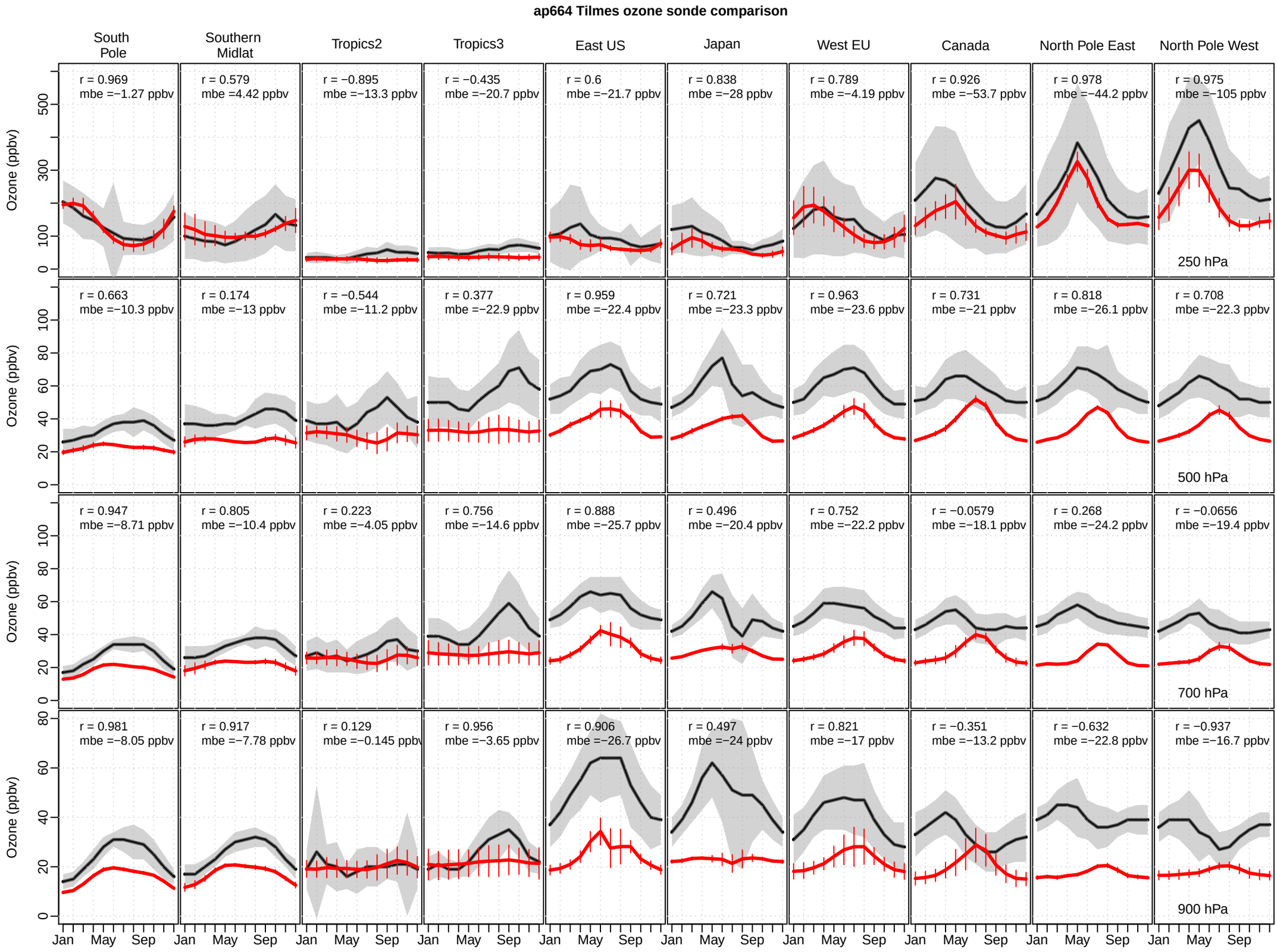


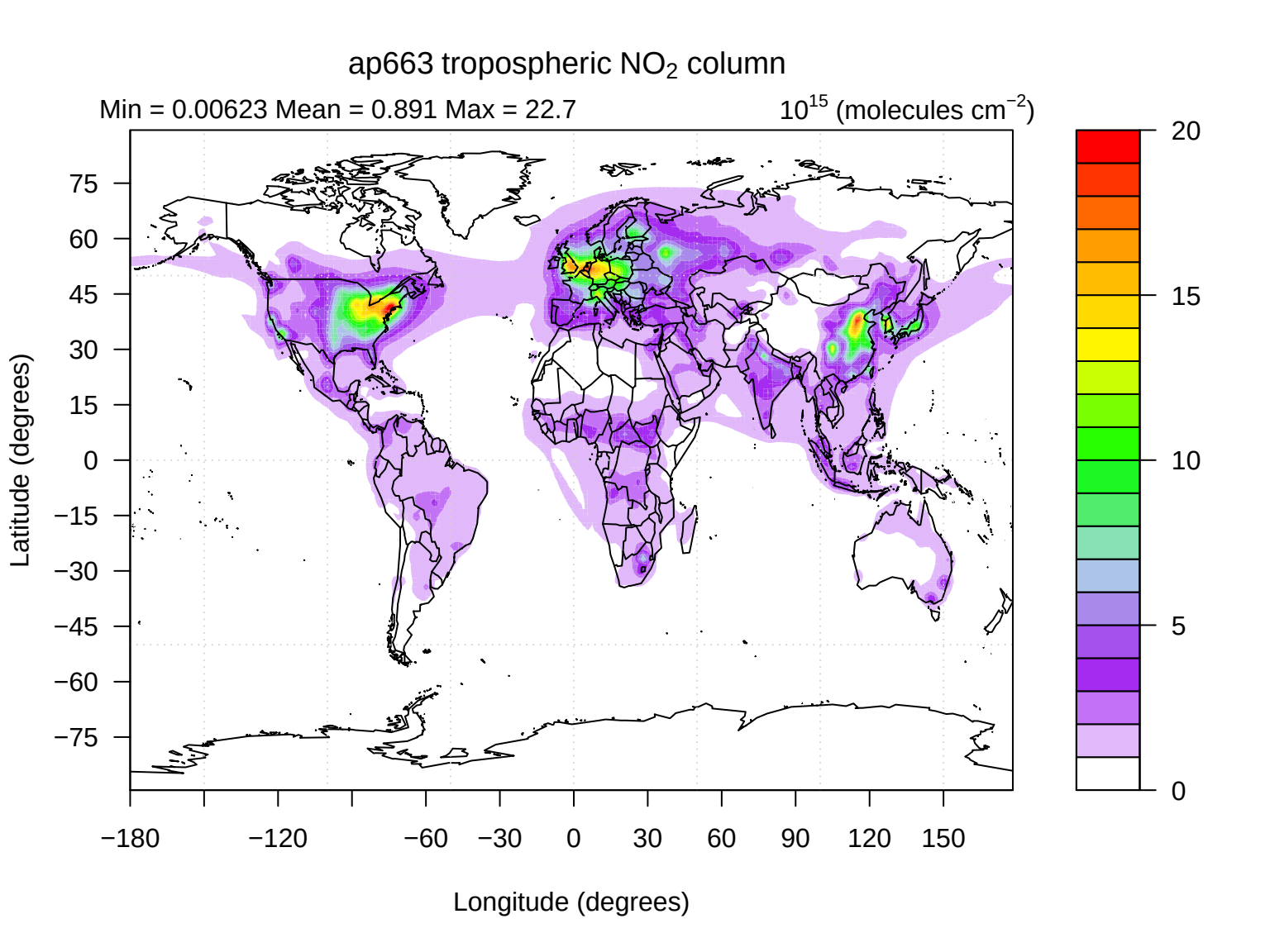


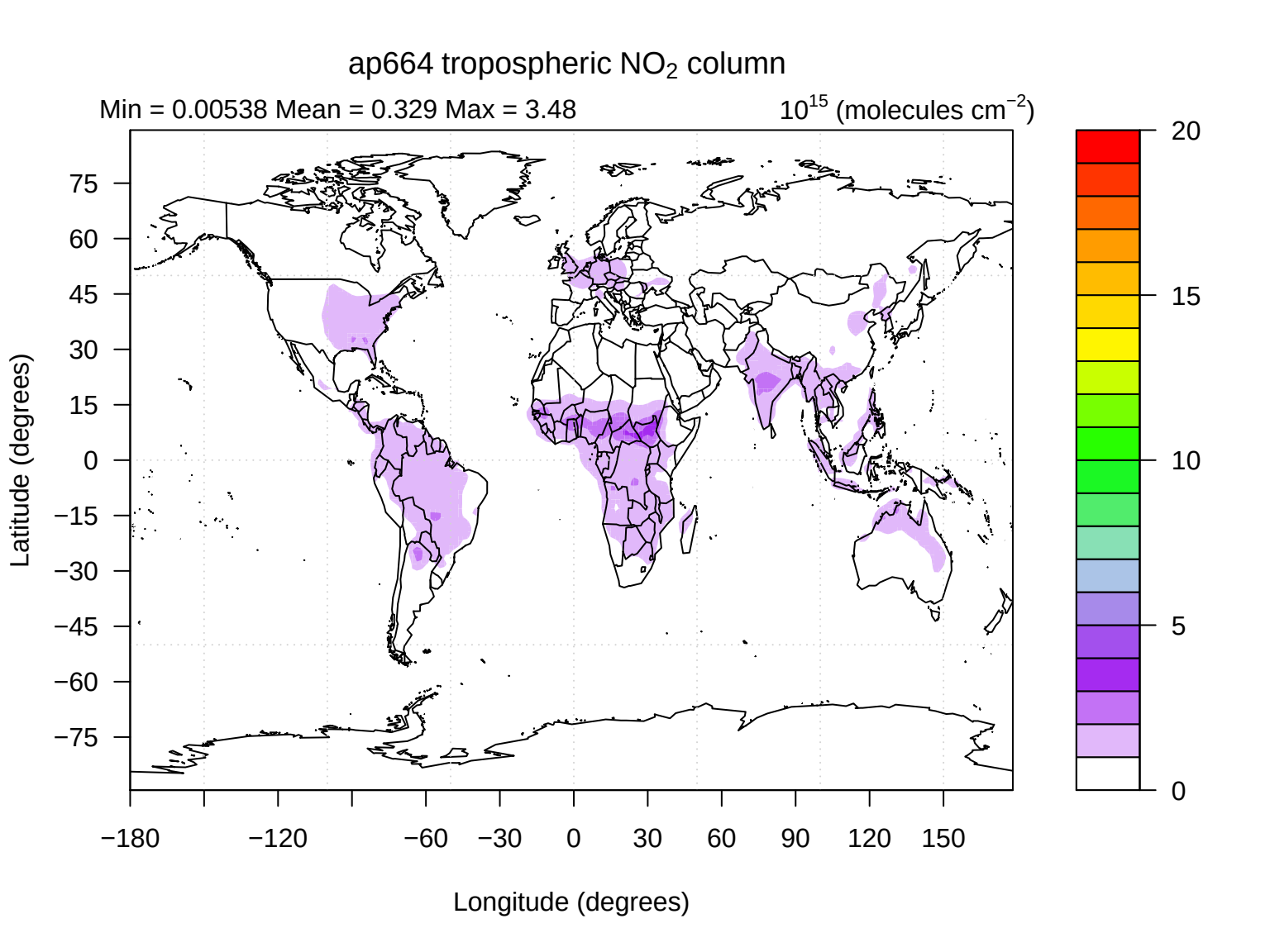

[OH] Air mass weighted (10^6 molecules cm^-3)
UKCA ap663
Red: Spivakovsky values
Values in ( ): Std dev
Mean OH= 8.52e+05 molec/cm3
ACCMIP Multi−model Mean= 1.17 (+/− 0.1) e+06 molec/cm3
NH:SH ratio= 1.52 Patra et al 2014: 0.97 +/− 0.12
0.28
0.64
(0.2)
0.85
1.43
(0.15)
1
1.36
(0.15)
0.46
0.64
(0.26)
0.35
0.72
(0.27)
1.3
2
(0.25)
1.6
1.99
(0.18)
0.65
0.88
(0.36)
0.3
0.47
(0.29)
1.3
1.44
(0.16)
1.7
1.52
(0.15)
0.68
0.76
(0.55)
Pressure (hPa)
250
500
750
1000
−50
0
50
Latitude

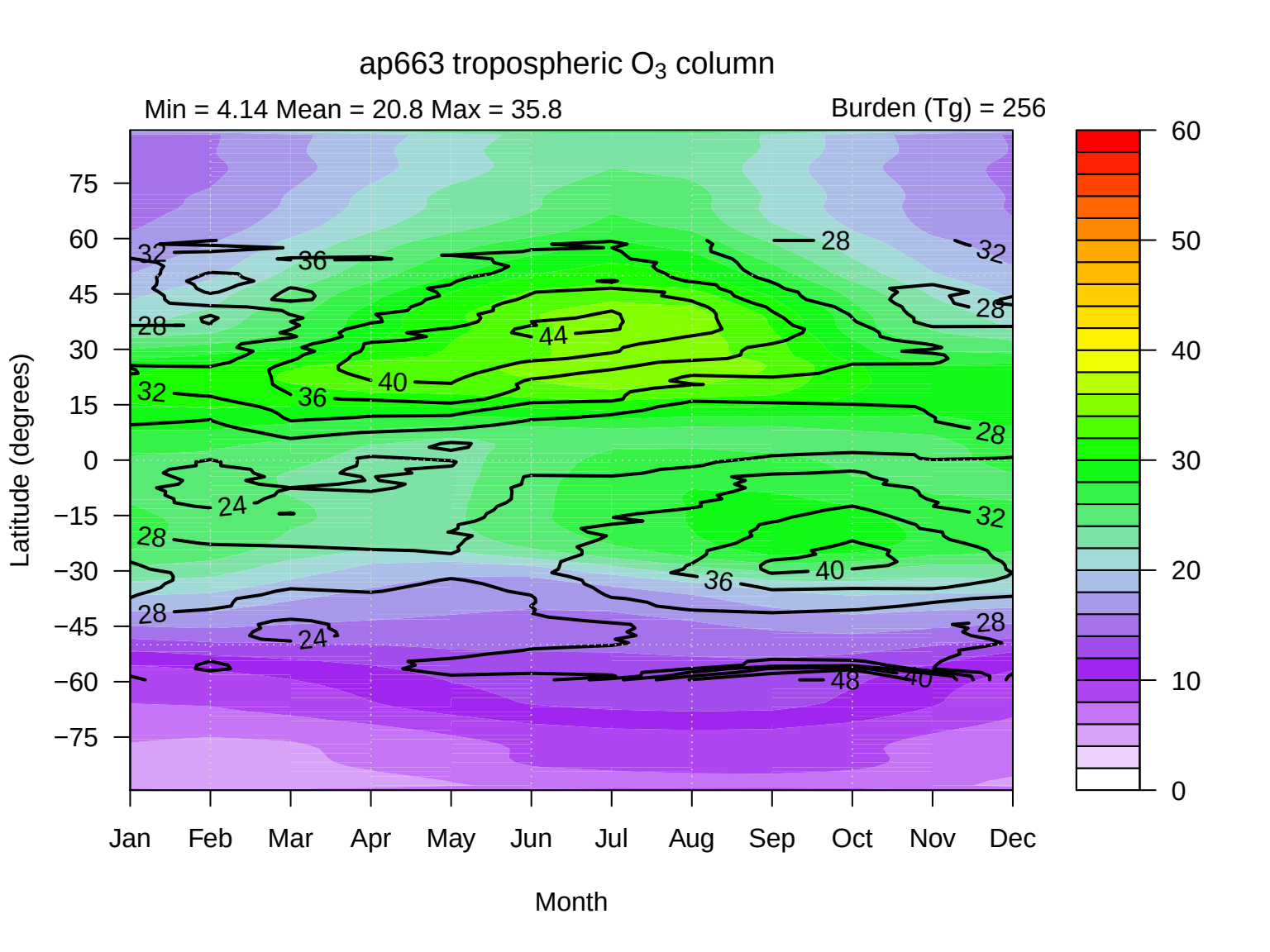

[OH] Air mass weighted (10^6 molecules cm^-3)
UKCA ap664
Red: Spivakovsky values
Values in ( ): Std dev
Mean OH= 8.86e+05 molec/cm3
ACCMIP Multi−model Mean= 1.17 (+/− 0.1) e+06 molec/cm3
NH:SH ratio= 1.28 Patra et al 2014: 0.97 +/− 0.12
0.28
0.64
(0.23)
0.97
1.43
(0.18)
1.1
1.36
(0.19)
0.43
0.64
(0.24)
0.36
0.72
(0.31)
1.5
2
(0.28)
1.6
1.99
(0.23)
0.59
0.88
(0.31)
0.28
0.47
(0.3)
1.4
1.44
(0.21)
1.5
1.52
(0.19)
0.46
0.76
(0.34)
250
500
750
1000
Pressure (hPa)
−50
0
50
Latitude

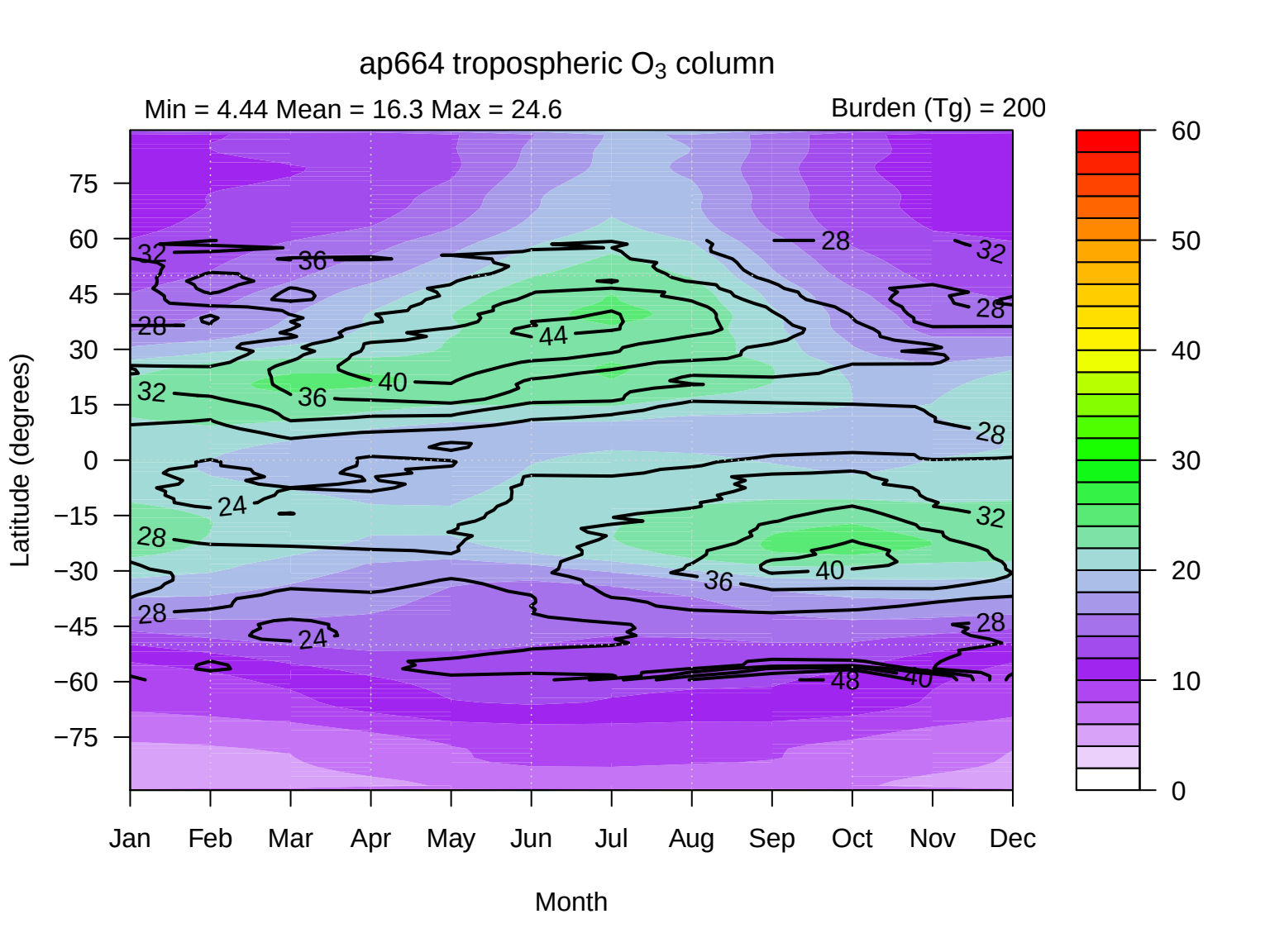

ap663 Tilmes ozone sonde comparison
South Pole
Southern Midlat
Tropics2
Tropics3
East US
Japan
West EU
Canada
North Pole East
North Pole West
Ozone (ppbv)
r = 0.888
mbe =−51.3 ppbv
r = 0.744
mbe =−26.2 ppbv
r = −0.0307
mbe =−2.13 ppbv
r = 0.413
mbe =−10.1 ppbv
r = 0.437
mbe =−5.05 ppbv
r = 0.601
mbe =−14.6 ppbv
r = 0.738
mbe =−3.05 ppbv
r = 0.906
mbe =−56.5 ppbv
r = 0.983
mbe =−66.8 ppbv
r = 0.962
mbe =−126 ppbv
250 hPa
r = 0.979
mbe =−10.2 ppbv
r = 0.855
mbe =−11.1 ppbv
r = 0.0809
mbe =−1.51 ppbv
r = 0.73
mbe =−13.4 ppbv
r = 0.883
mbe =−4.68 ppbv
r = 0.713
mbe =−7.86 ppbv
r = 0.954
mbe =−7.84 ppbv
r = 0.752
mbe =−5.18 ppbv
r = 0.886
mbe =−11.8 ppbv
r = 0.781
mbe =−8.44 ppbv
500 hPa
r = 0.995
mbe =−8.47 ppbv
r = 0.978
mbe =−8.62 ppbv
r = 0.639
mbe =5.76 ppbv
r = 0.962
mbe =−5.07 ppbv
r = 0.88
mbe =−5.79 ppbv
r = 0.677
mbe =−5.64 ppbv
r = 0.833
mbe =−7.03 ppbv
r = 0.141
mbe =−3.93 ppbv
r = 0.551
mbe =−12 ppbv
r = 0.251
mbe =−7.31 ppbv
700 hPa
r = 0.992
mbe =−7.91 ppbv
r = 0.984
mbe =−6.69 ppbv
r = 0.332
mbe =10.7 ppbv
r = 0.777
mbe =5.24 ppbv
r = 0.951
mbe =−4.99 ppbv
r = 0.793
mbe =−9.95 ppbv
r = 0.889
mbe =−3.93 ppbv
r = −0.15
mbe =−2.71 ppbv
r = −0.111
mbe =−14.3 ppbv
r = −0.589
mbe =−7.86 ppbv
900 hPa
Jan
May
Sep


ap664 Tilmes ozone sonde comparison
South Pole
Southern Midlat
Tropics2
Tropics3
East US
Japan
West EU
Canada
North Pole East
North Pole West
Ozone (ppbv)
r = 0.969
mbe =−1.27 ppbv
r = 0.579
mbe =4.42 ppbv
r = −0.895
mbe =−13.3 ppbv
r = −0.435
mbe =−20.7 ppbv
r = 0.6
mbe =−21.7 ppbv
r = 0.838
mbe =−28 ppbv
r = 0.789
mbe =−4.19 ppbv
r = 0.926
mbe =−53.7 ppbv
r = 0.978
mbe =−44.2 ppbv
r = 0.975
mbe =−105 ppbv
250 hPa
r = 0.663
mbe =−10.3 ppbv
r = 0.174
mbe =−13 ppbv
r = −0.544
mbe =−11.2 ppbv
r = 0.377
mbe =−22.9 ppbv
r = 0.959
mbe =−22.4 ppbv
r = 0.721
mbe =−23.3 ppbv
r = 0.963
mbe =−23.6 ppbv
r = 0.731
mbe =−21 ppbv
r = 0.818
mbe =−26.1 ppbv
r = 0.708
mbe =−22.3 ppbv
500 hPa
r = 0.947
mbe =−8.71 ppbv
r = 0.805
mbe =−10.4 ppbv
r = 0.223
mbe =−4.05 ppbv
r = 0.756
mbe =−14.6 ppbv
r = 0.888
mbe =−25.7 ppbv
r = 0.496
mbe =−20.4 ppbv
r = 0.752
mbe =−22.2 ppbv
r = −0.0579
mbe =−18.1 ppbv
r = 0.268
mbe =−24.2 ppbv
r = −0.0656
mbe =−19.4 ppbv
700 hPa
r = 0.981
mbe =−8.05 ppbv
r = 0.917
mbe =−7.78 ppbv
r = 0.129
mbe =−0.145 ppbv
r = 0.956
mbe =−3.65 ppbv
r = 0.906
mbe =−26.7 ppbv
r = 0.497
mbe =−24 ppbv
r = 0.821
mbe =−17 ppbv
r = −0.351
mbe =−13.2 ppbv
r = −0.632
mbe =−22.8 ppbv
r = −0.937
mbe =−16.7 ppbv
900 hPa
Jan
May
Sep


ap663 tropospheric NO2 column
Min = 0.00623 Mean = 0.891 Max = 22.7
10^15 (molecules cm^-2)
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
−180
−120
−60
−30
0
30
60
90
120
150
Longitude (degrees)
20
15
10
5
0

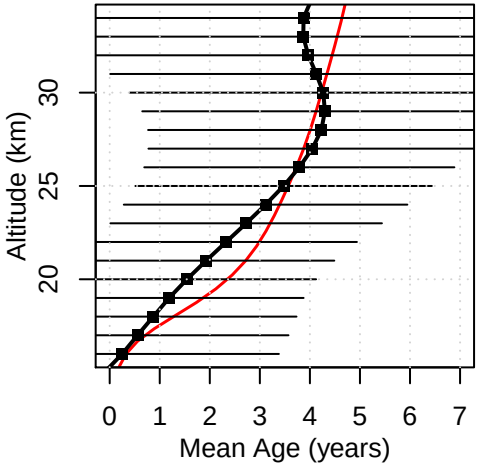

ap664 tropospheric NO2 column
Min = 0.00538 Mean = 0.329 Max = 3.48
10^15 (molecules cm^-2)
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
−180
−120
−60
−30
0
30
60
90
120
150
Longitude (degrees)
20
15
10
5
0


ap663 tropospheric O_3 column
Min = 4.14 Mean = 20.8 Max = 35.8
Burden (Tg) = 256
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
60
50
40
30
20
10
0

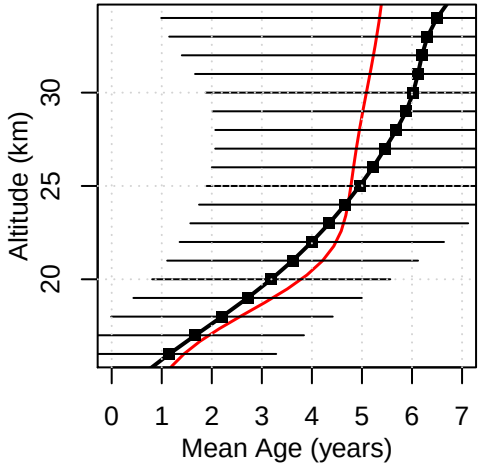

ap664 tropospheric O_3 column
Min = 4.44 Mean = 16.3 Max = 24.6
Burden (Tg) = 200
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
60
50
40
30
20
10
0

UKCA ap663 Mean Age of Air

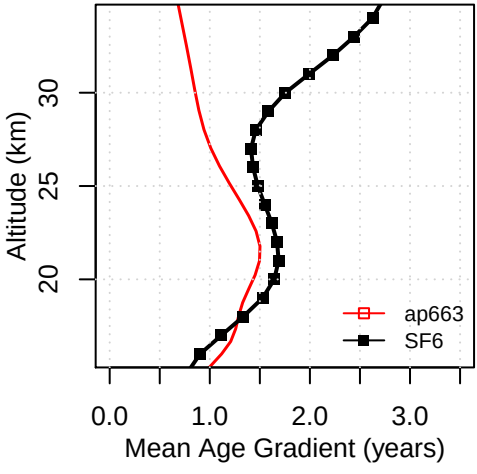
Tropical Mean Age Profile



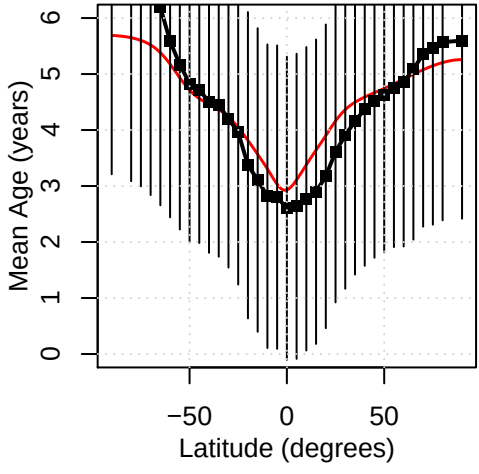
Midlatitude Mean Age Profile



Trop−Midlat Mean Age Gradient Prof

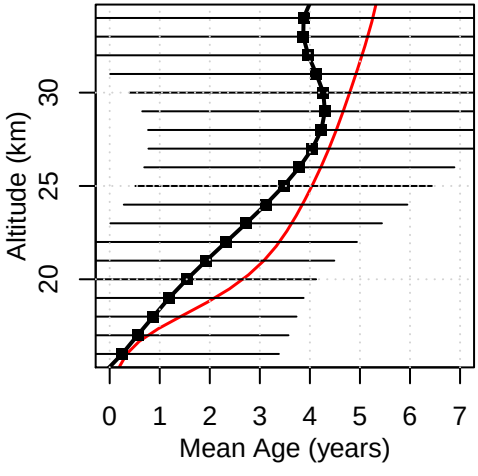


Mean Age, 23km (~50hPa)

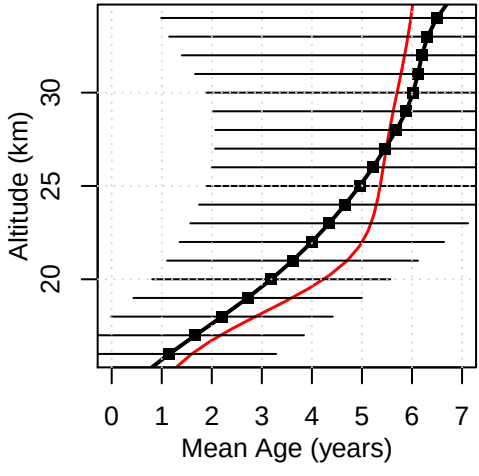


UKCA ap664 Mean Age of Air

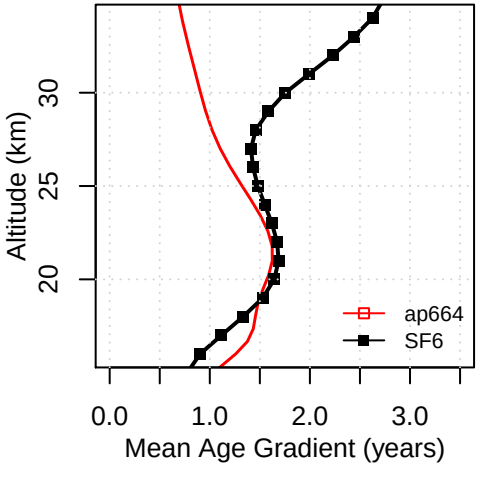
Tropical Mean Age Profile



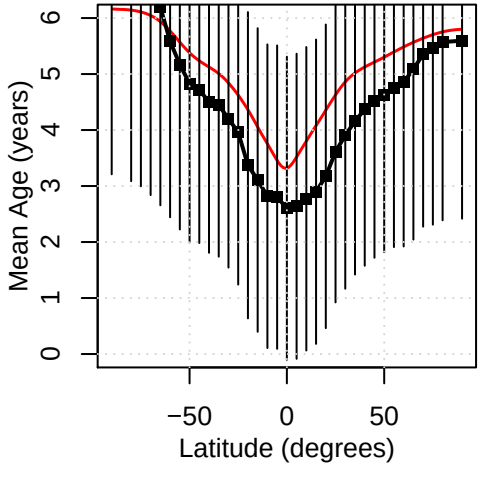
Midlatitude Mean Age Profile

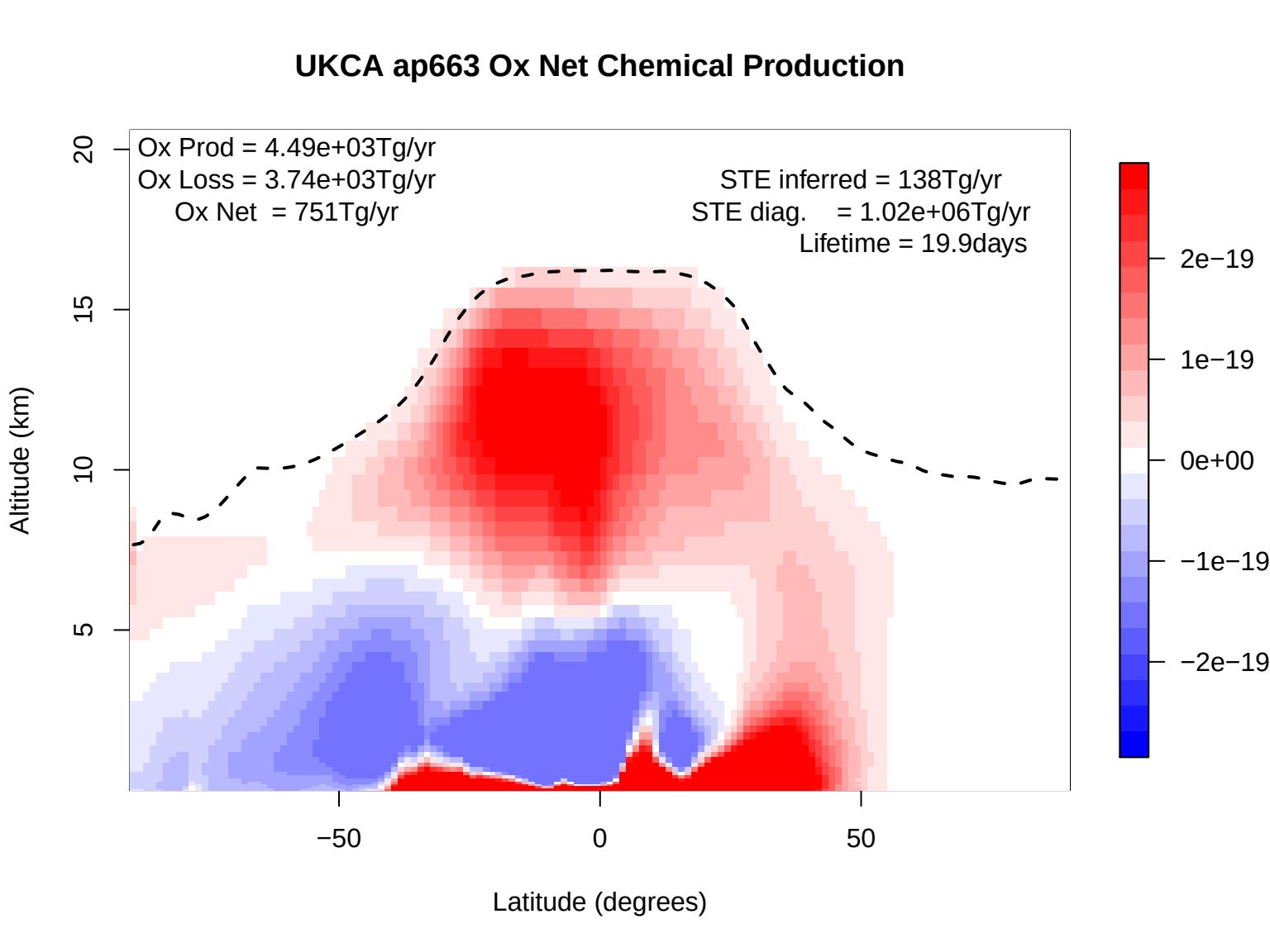


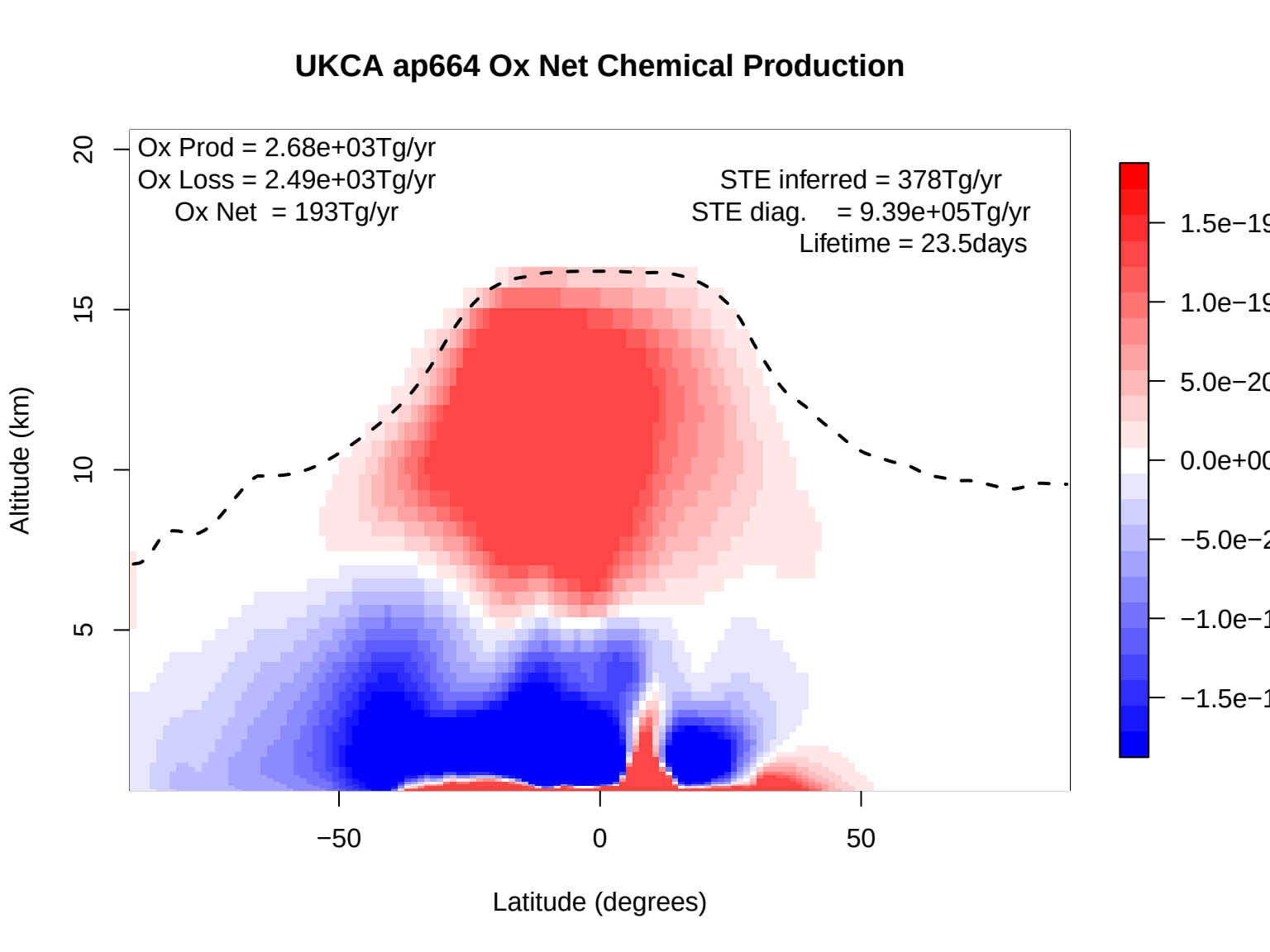
Trop−Midlat Mean Age Gradient Prof

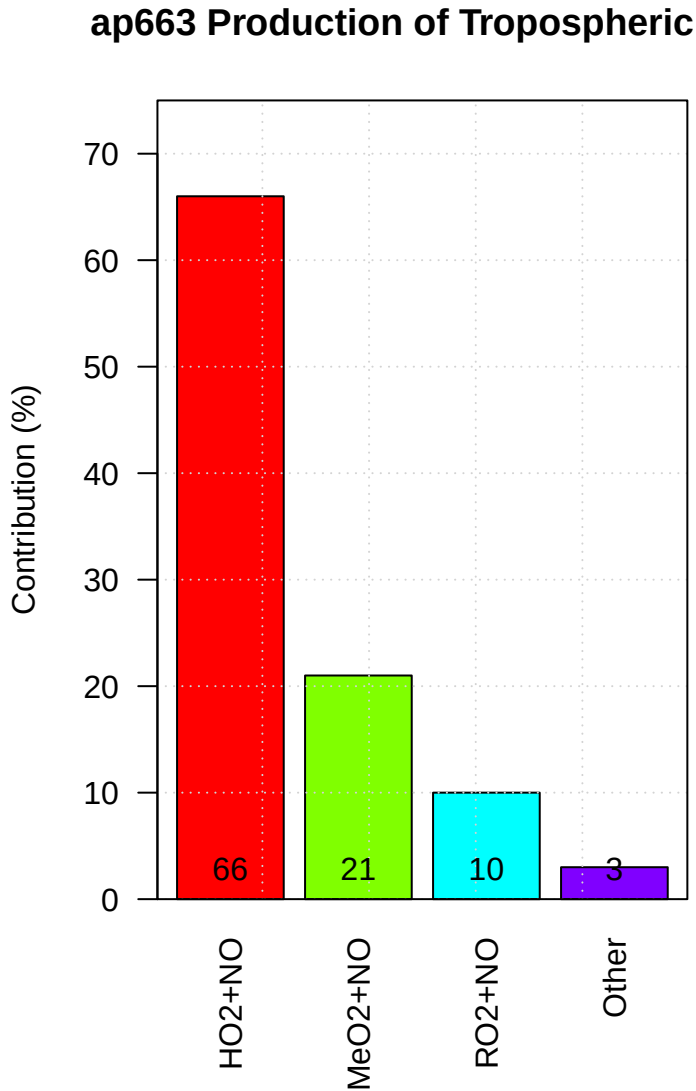


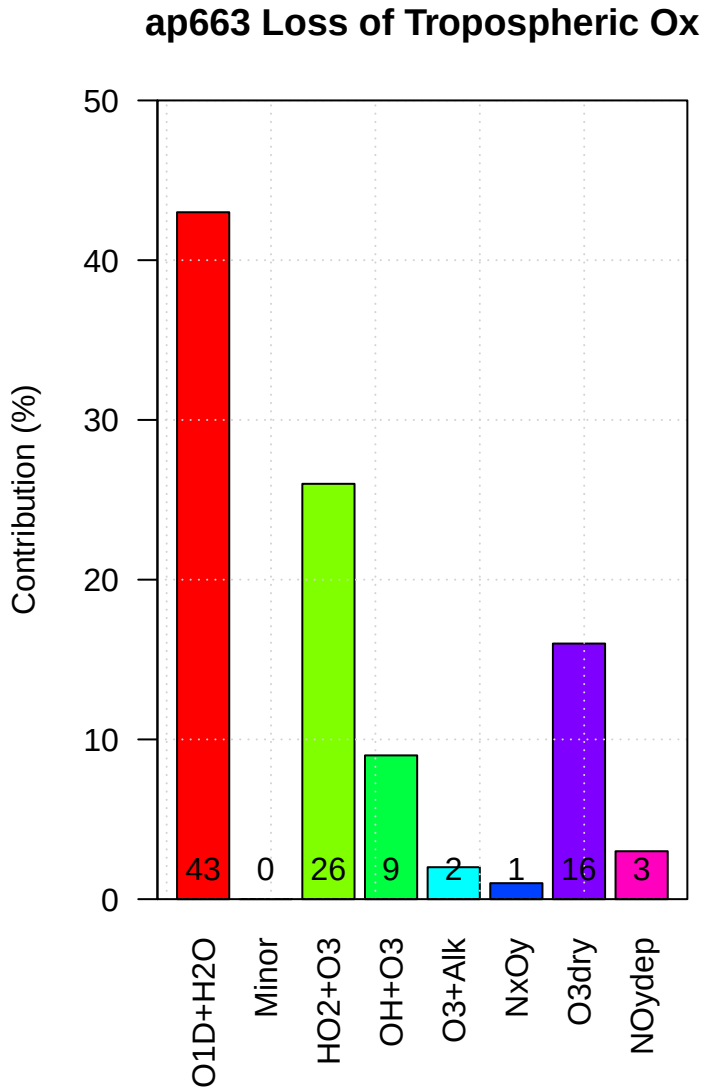
Mean Age, 23km (~50hPa)

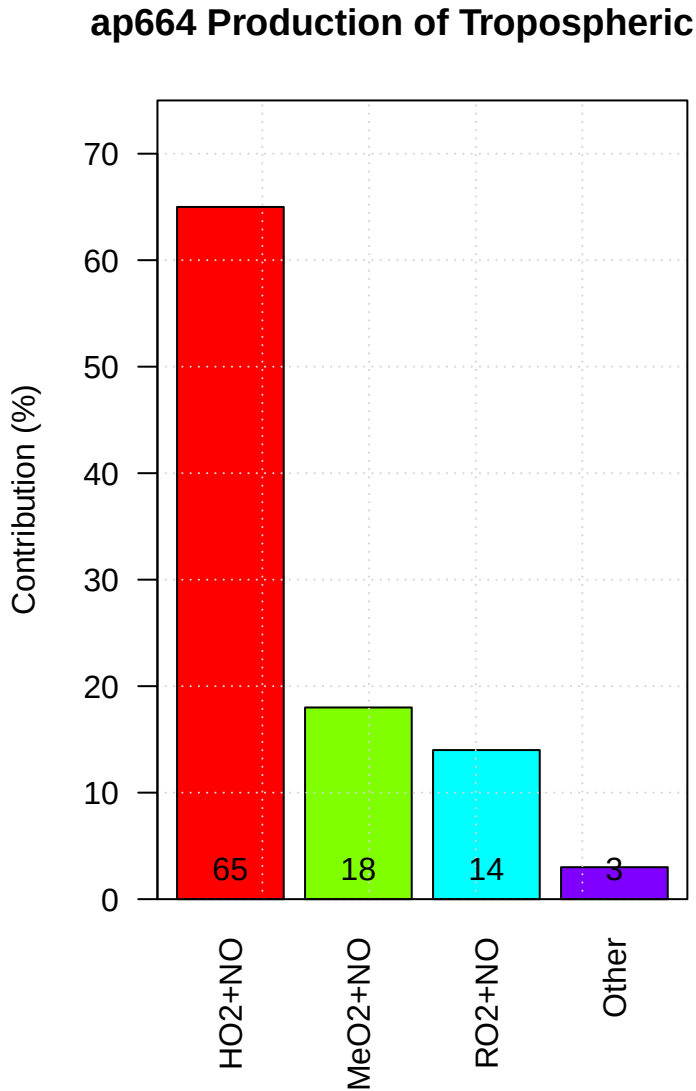


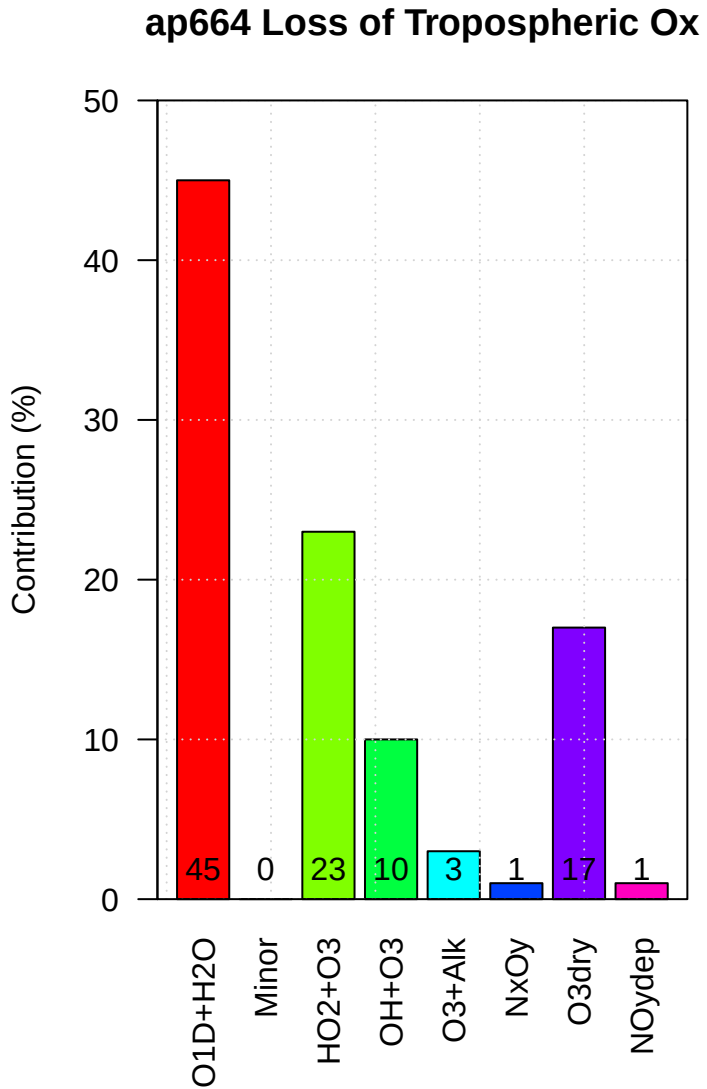

UKCA ap663 Ox Net Chemical Production
Ox Prod = 4.49e+03Tg/yr
Ox Loss = 3.74e+03Tg/yr
Ox Net = 751Tg/yr
STE inferred = 138Tg/yr
STE diag. = 1.02e+06Tg/yr
Lifetime = 19.9days
Altitude (km)
20
15
10
5
−50
0
50
Latitude (degrees)
2e−19
1e−19
0e+00
−1e−19
−2e−19

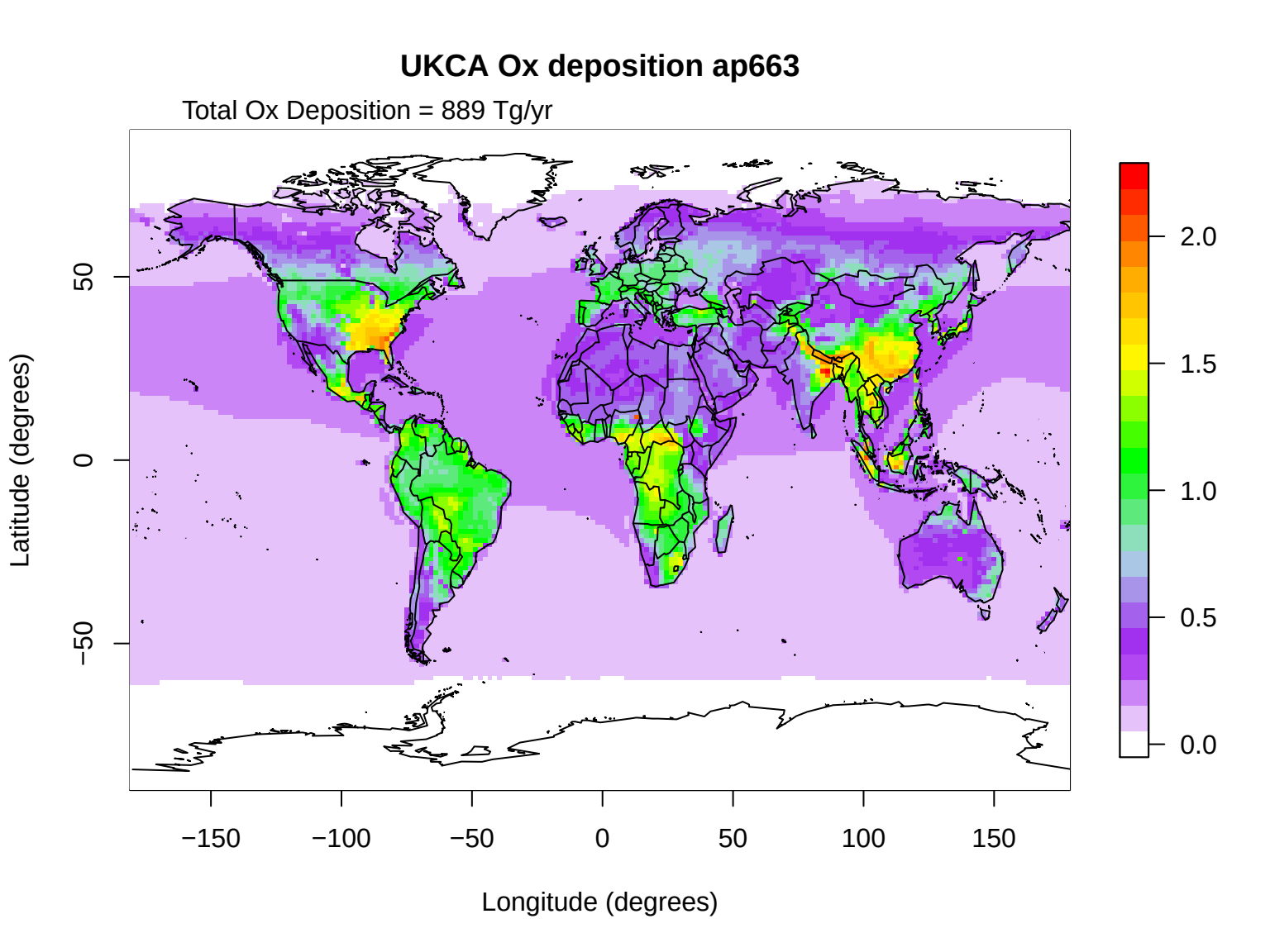

UKCA ap664 Ox Net Chemical Production
Ox Prod = 2.68e+03Tg/yr
Ox Loss = 2.49e+03Tg/yr
Ox Net = 193Tg/yr
STE inferred = 378Tg/yr
STE diag. = 9.39e+05Tg/yr
Lifetime = 23.5days
Altitude (km)
5
10
15
20
−50
0
50
Latitude (degrees)
1.5e−19
1.0e−19
5.0e−20
0.0e+00
−5.0e−2
−1.0e−1
−1.5e−1

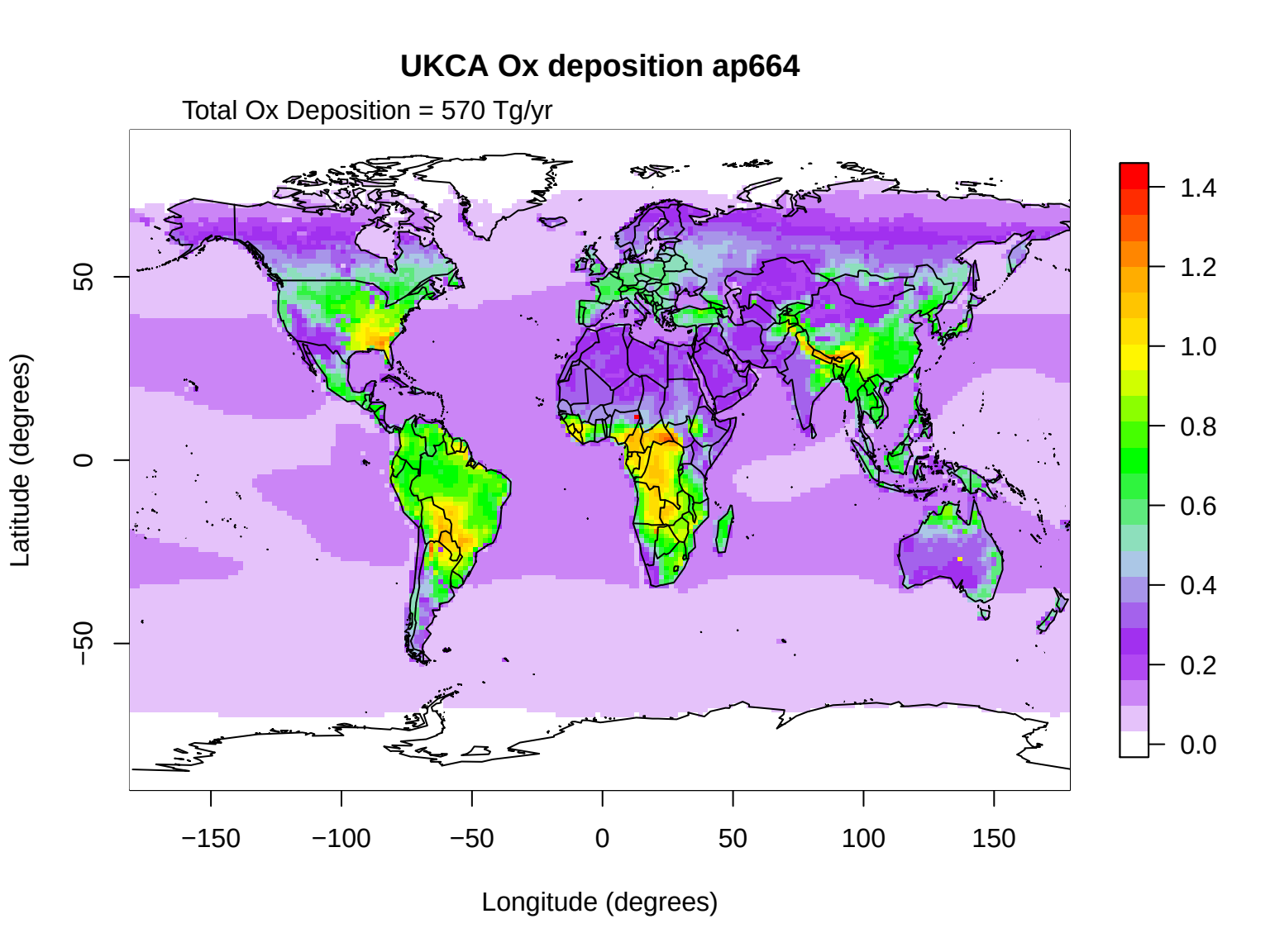

ap663 Production of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
60
70
66
21
10
3
HO2+NO
MeO2+NO
RO2+NO
Other

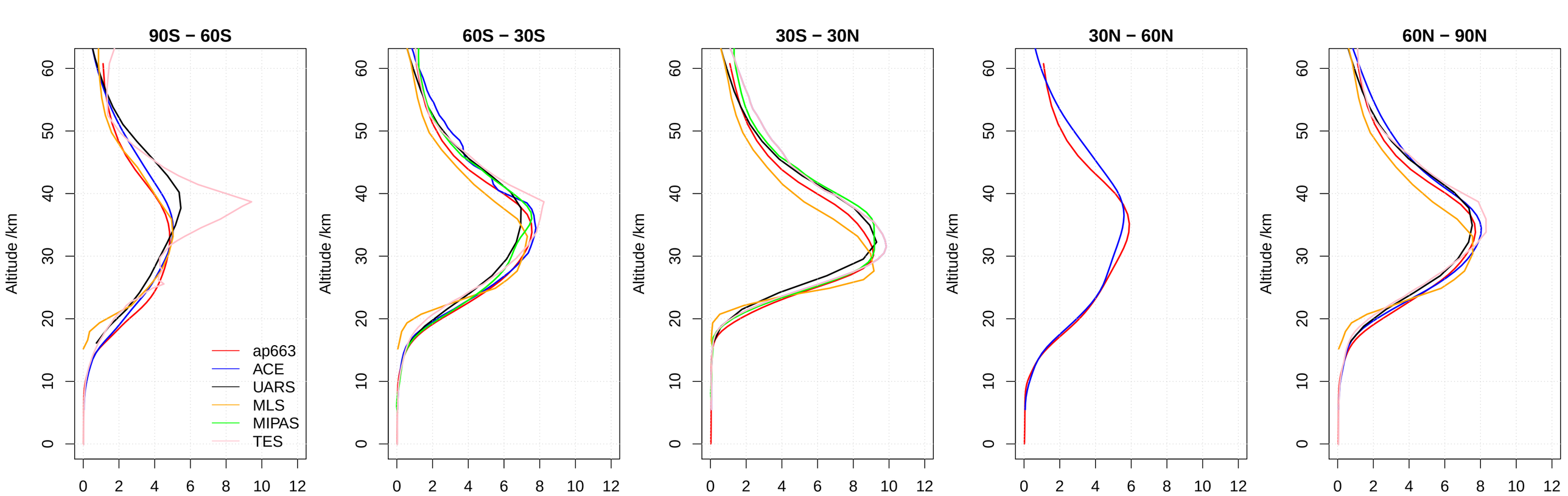

ap663 Loss of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
43
0
26
9
2
1
16
3
O1D+H2O
Minor
HO2+O3
OH+O3
O3+Alk
NxOy
O3dry
NOydep

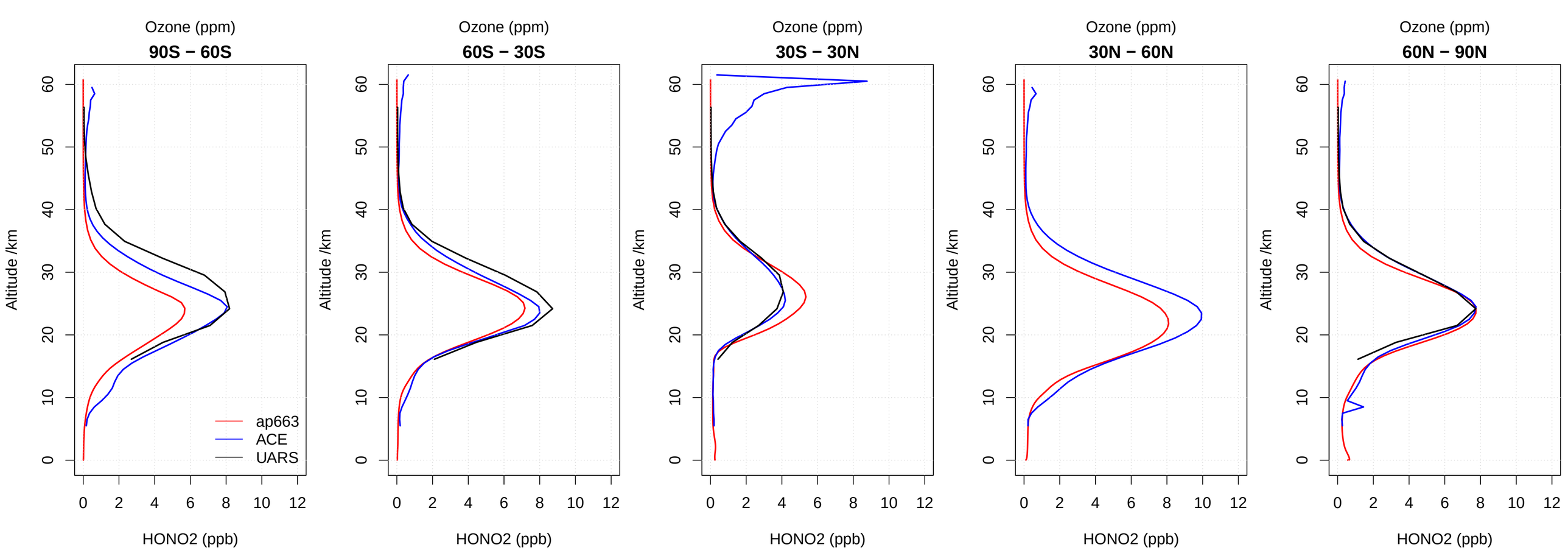

ap664 Production of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
60
70
65
18
14
3
HO2+NO
MeO2+NO
RO2+NO
Other

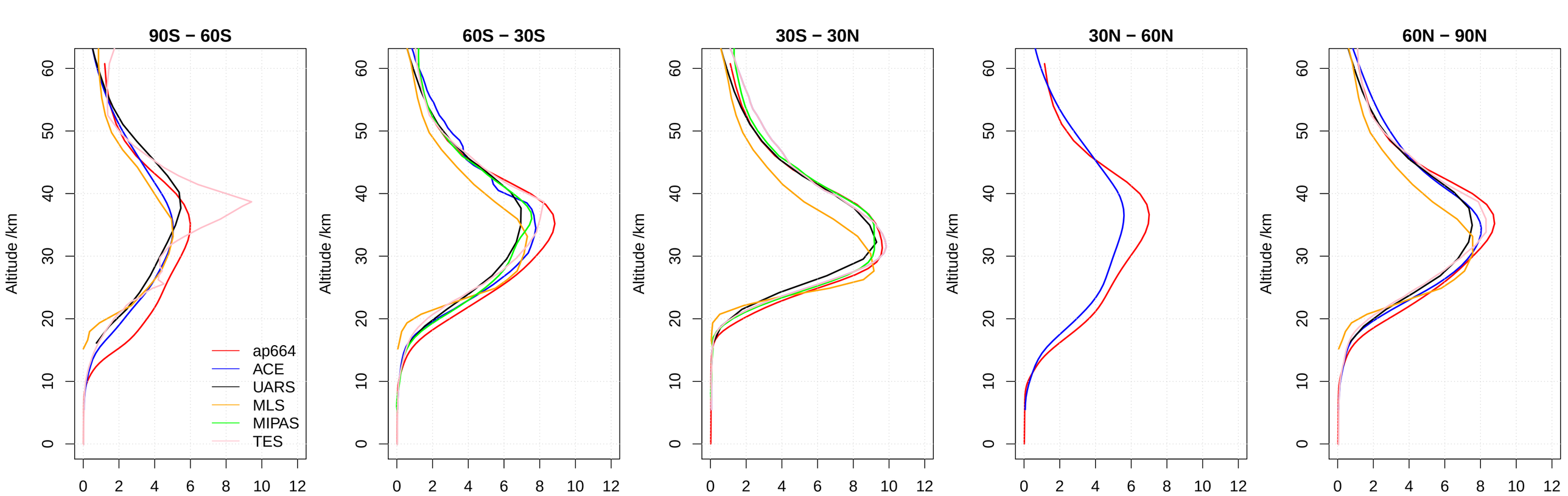

ap664 Loss of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
45
0
23
10
3
1
17
1
O1D+H2O
Minor
HO2+O3
OH+O3
O3+Alk
NxOy
O3dry
NOydep

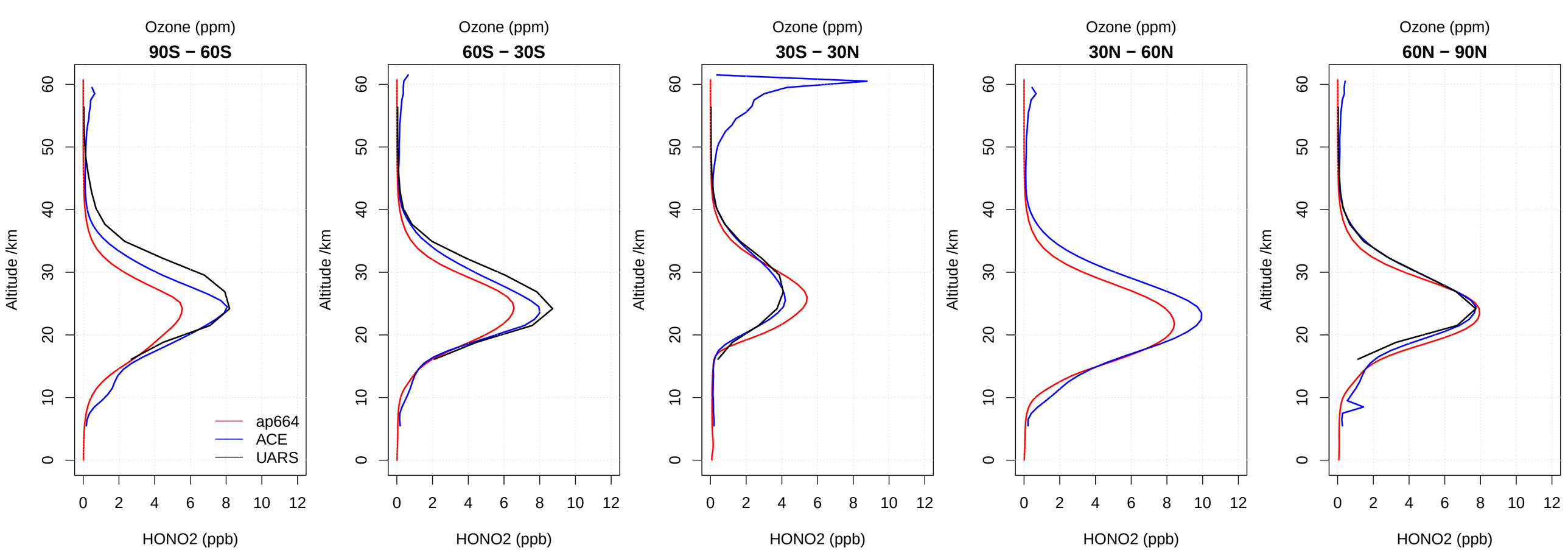

UKCA Ox deposition ap663
Total Ox Deposition = 889 Tg/yr
Latitude (degrees)
50
0
−50
−150
−100
−50
0
50
100
150
Longitude (degrees)
2.0
1.5
1.0
0.5
0.0

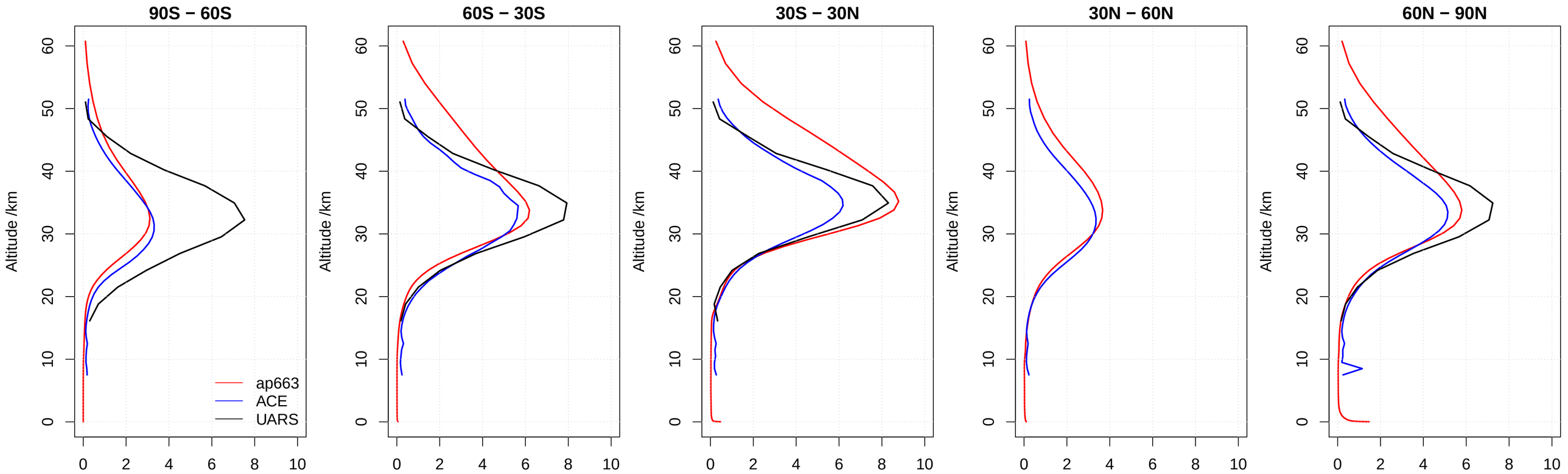

UKCA Ox deposition ap664
Total Ox Deposition = 570 Tg/yr
Latitude (degrees)
50
0
−50
−150
−100
−50
0
50
100
150
Longitude (degrees)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

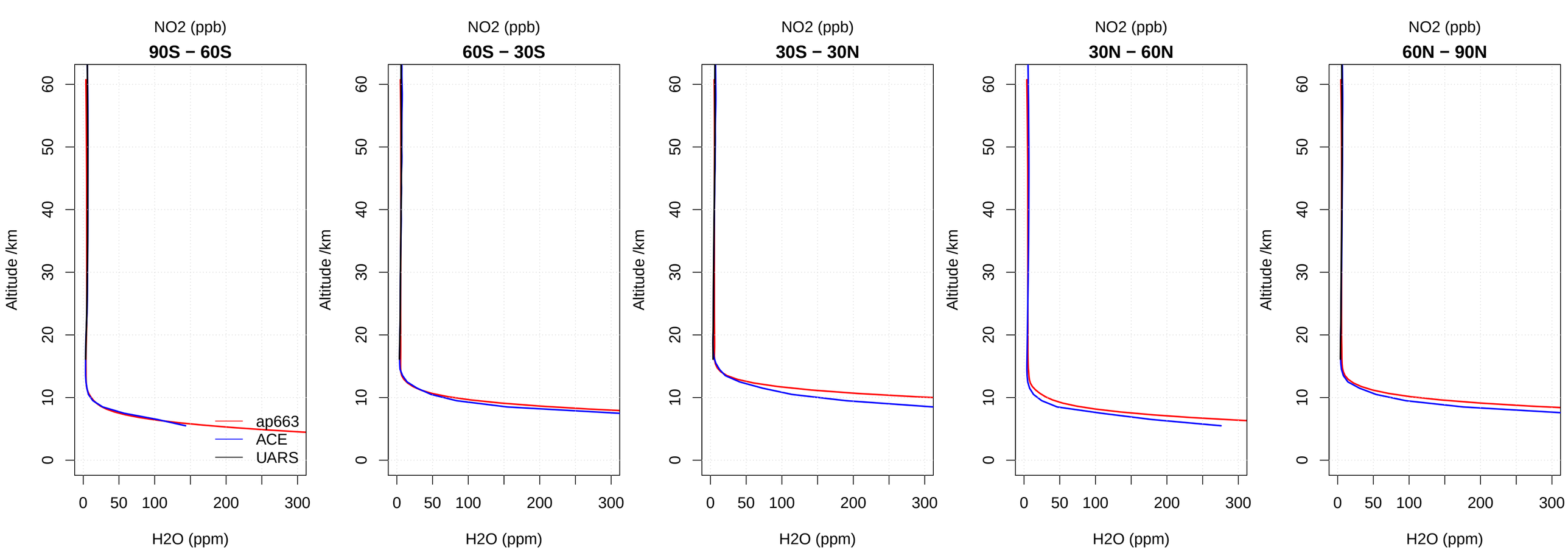

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
2
4
6
8
10
12
ap663
ACE
UARS
MLS
MIPAS
TES

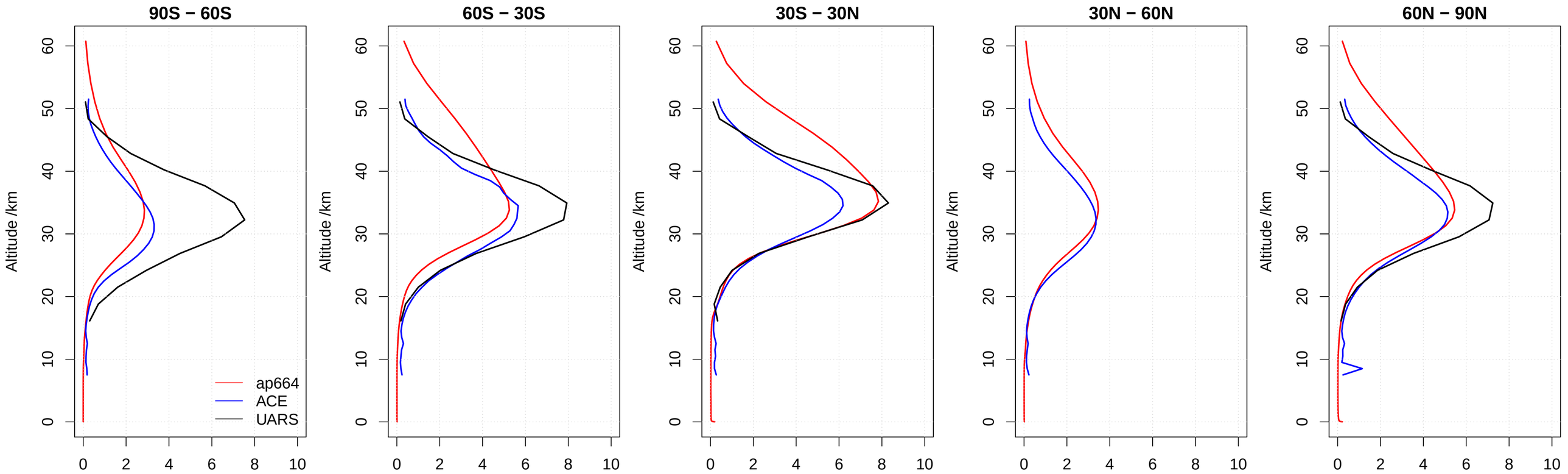

Ozone (ppm)
90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
2
4
6
8
10
12
HONO2 (ppb)
ap663
ACE
UARS

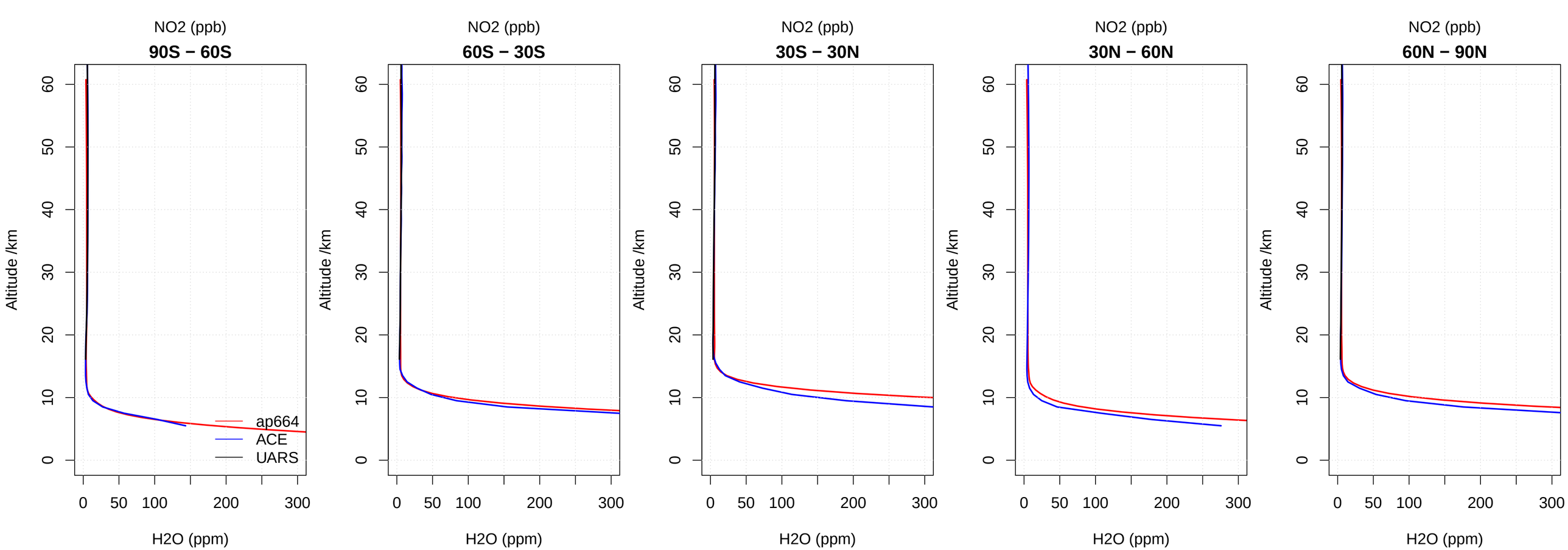

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
ap664
ACE
UARS
MLS
MIPAS
TES

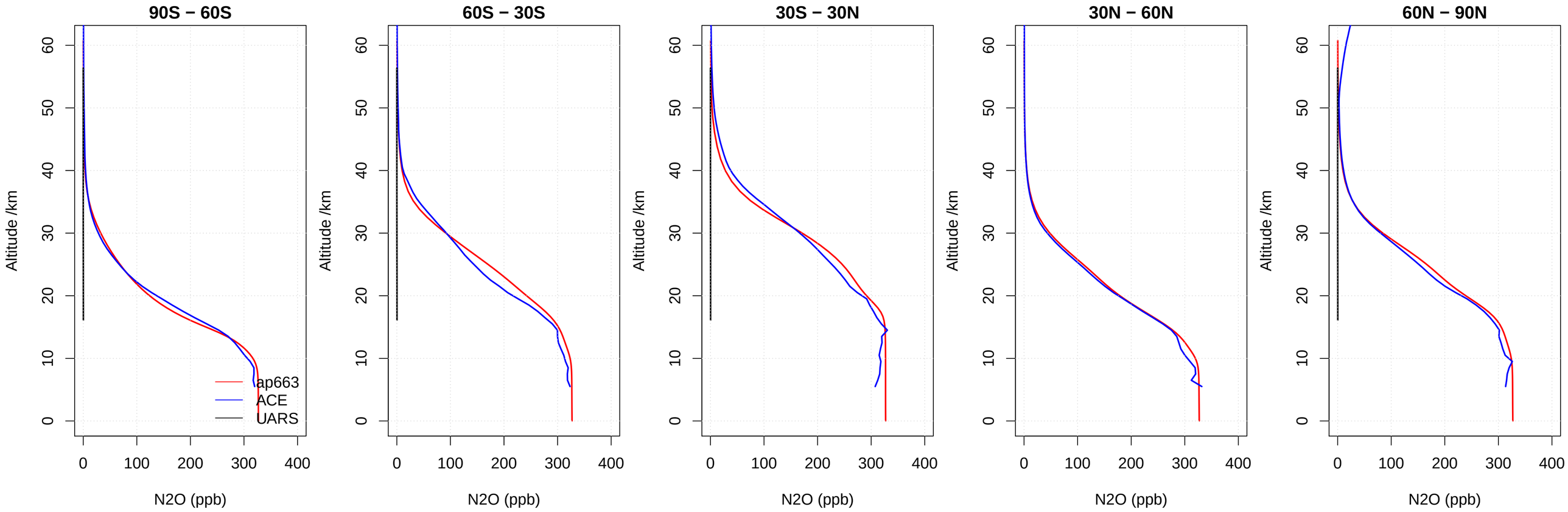

Ozone (ppm)
90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
HONO2 (ppb)
ap664
ACE
UARS

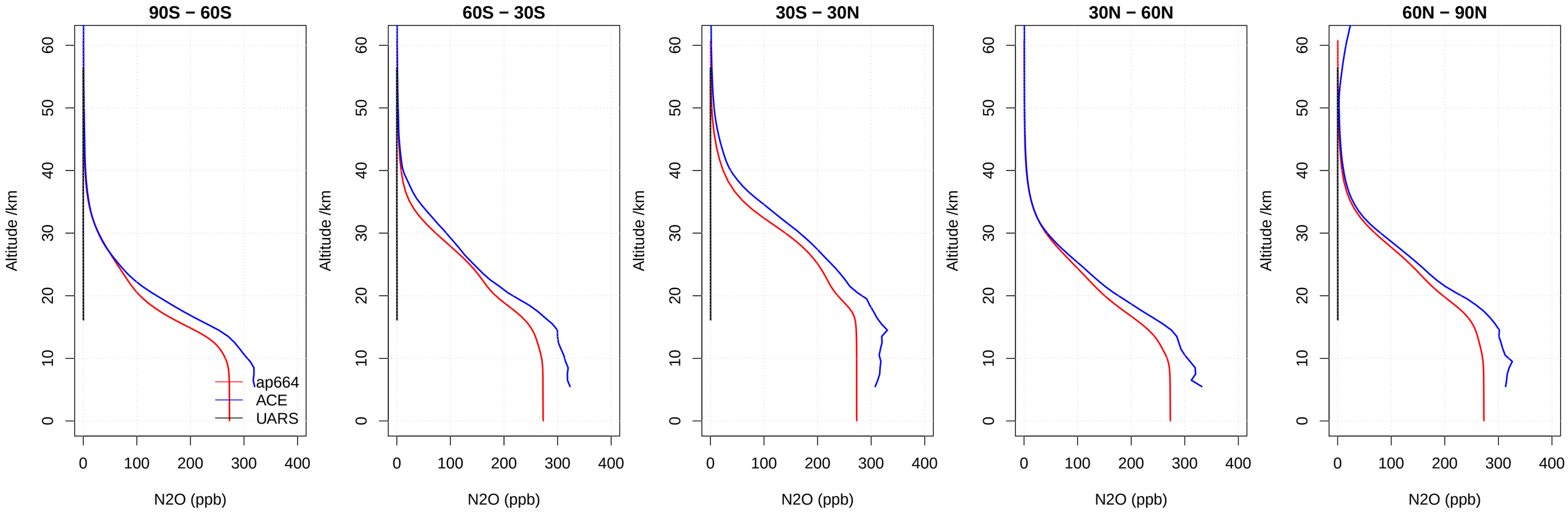

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
2
4
6
8
10
ap663
ACE
UARS

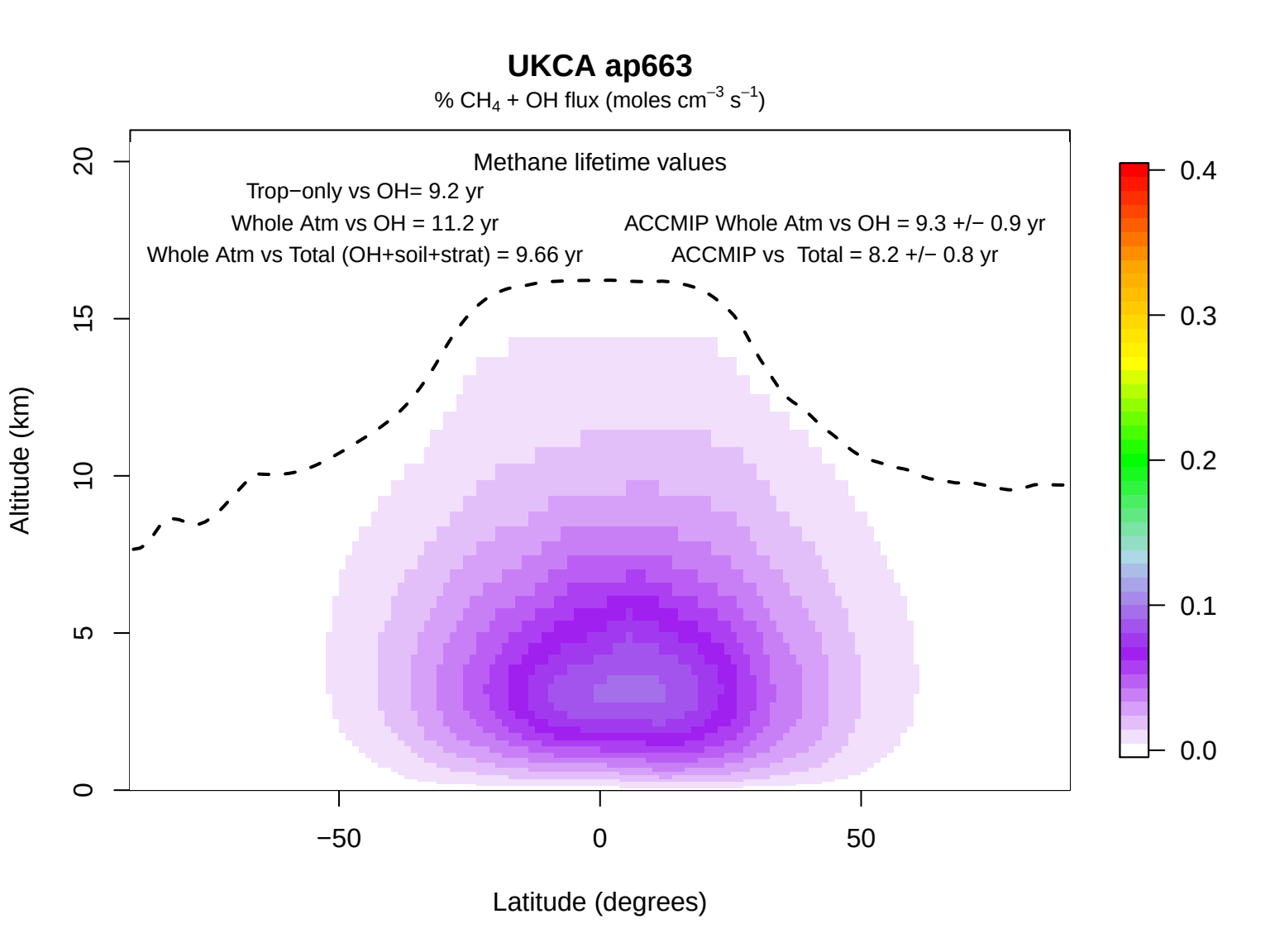

NO2 (ppb)
90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
50
100
200
300
H2O (ppm)
ap663
ACE
UARS

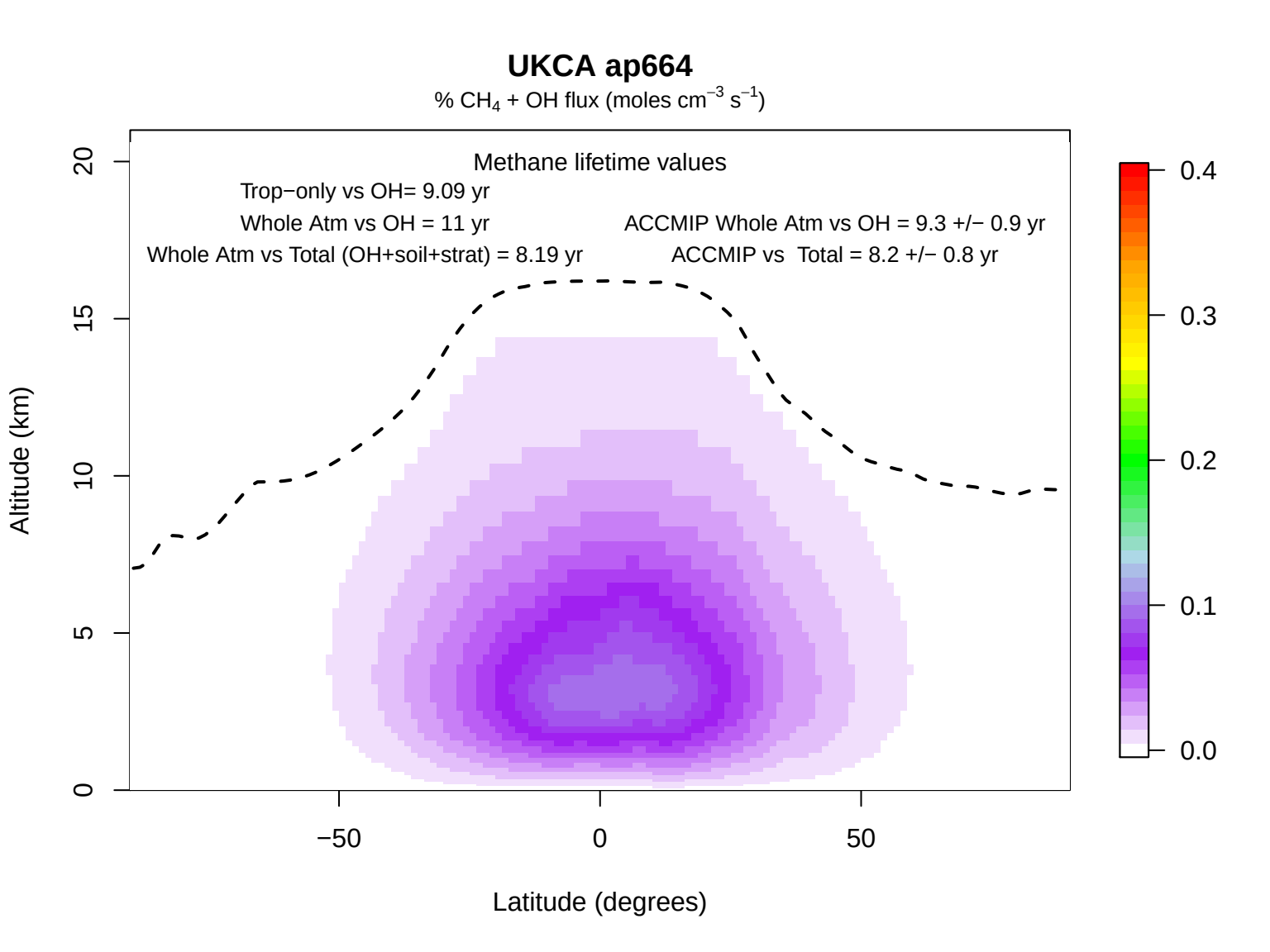

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
2
4
6
8
10
ap664
ACE
UARS

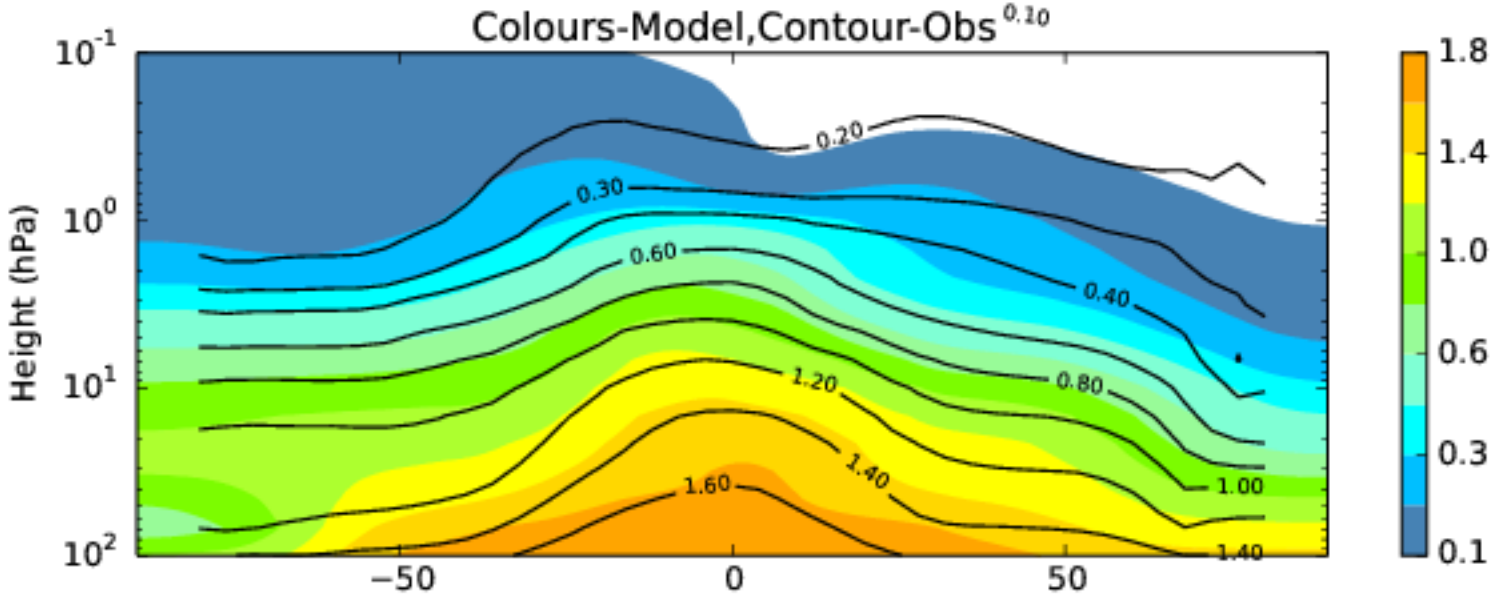

NO2 (ppb)
90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
50
100
200
300
H2O (ppm)
ap664
ACE
UARS

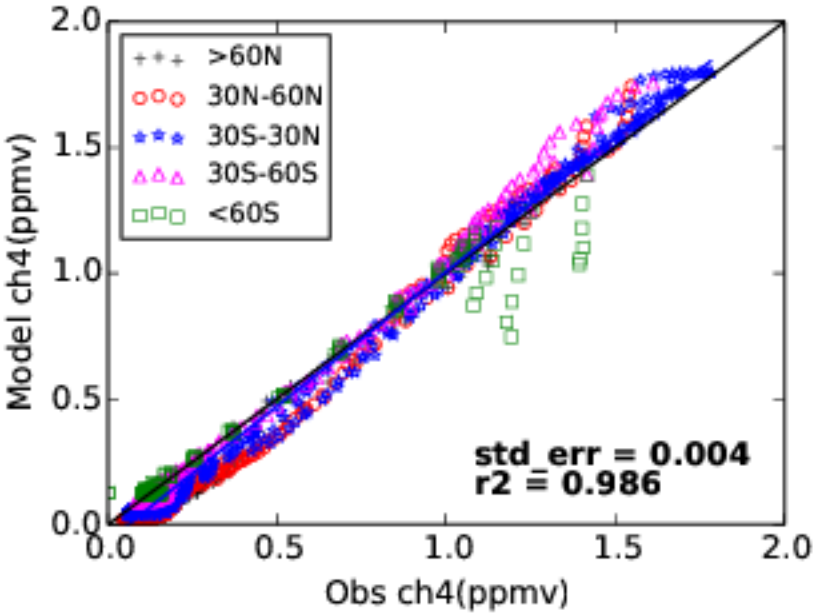

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
N2O (ppb)
ap663
ACE
UARS
0
10
20
30
40
50
60
0
100
200
300
400


90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
0
10
20
30
40
50
60
0
100
200
300
400
N2O (ppb)
ap664
ACE
UARS

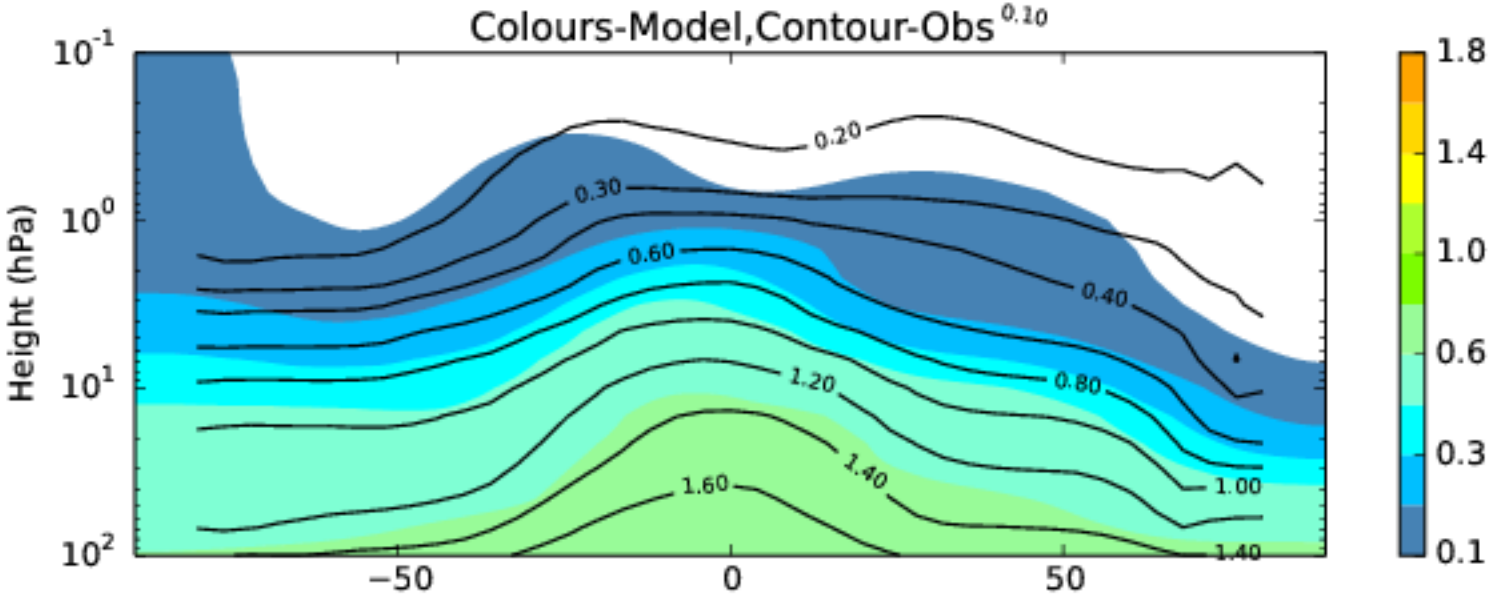

UKCA ap663
% CH4 + OH flux (moles cm−3 s−1)
Methane lifetime values
Trop−only vs OH= 9.2 yr
Whole Atm vs OH = 11.2 yr
Whole Atm vs Total (OH+soil+strat) = 9.66 yr
ACCMIP Whole Atm vs OH = 9.3 +/− 0.9 yr
ACCMIP vs Total = 8.2 +/− 0.8 yr
Altitude (km)
0
5
10
15
20
−50
0
50
Latitude (degrees)
0.4
0.3
0.2
0.1
0.0

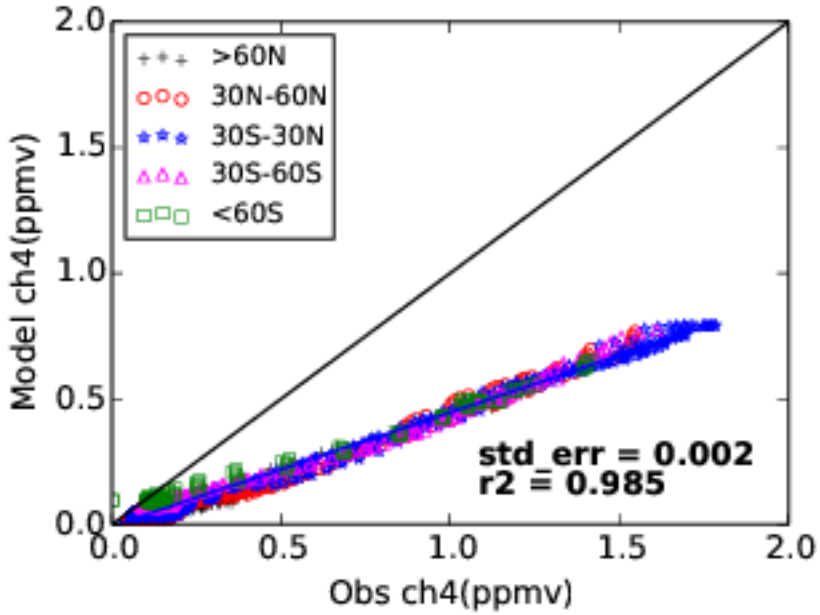

UKCA ap664
% CH4 + OH flux (moles cm−3 s−1)
Methane lifetime values
Trop−only vs OH= 9.09 yr
Whole Atm vs OH = 11 yr
Whole Atm vs Total (OH+soil+strat) = 8.19 yr
ACCMIP Whole Atm vs OH = 9.3 +/− 0.9 yr
ACCMIP vs Total = 8.2 +/− 0.8 yr
Altitude (km)
0
5
10
15
20
−50
0
50
Latitude (degrees)
0.4
0.3
0.2
0.1
0.0



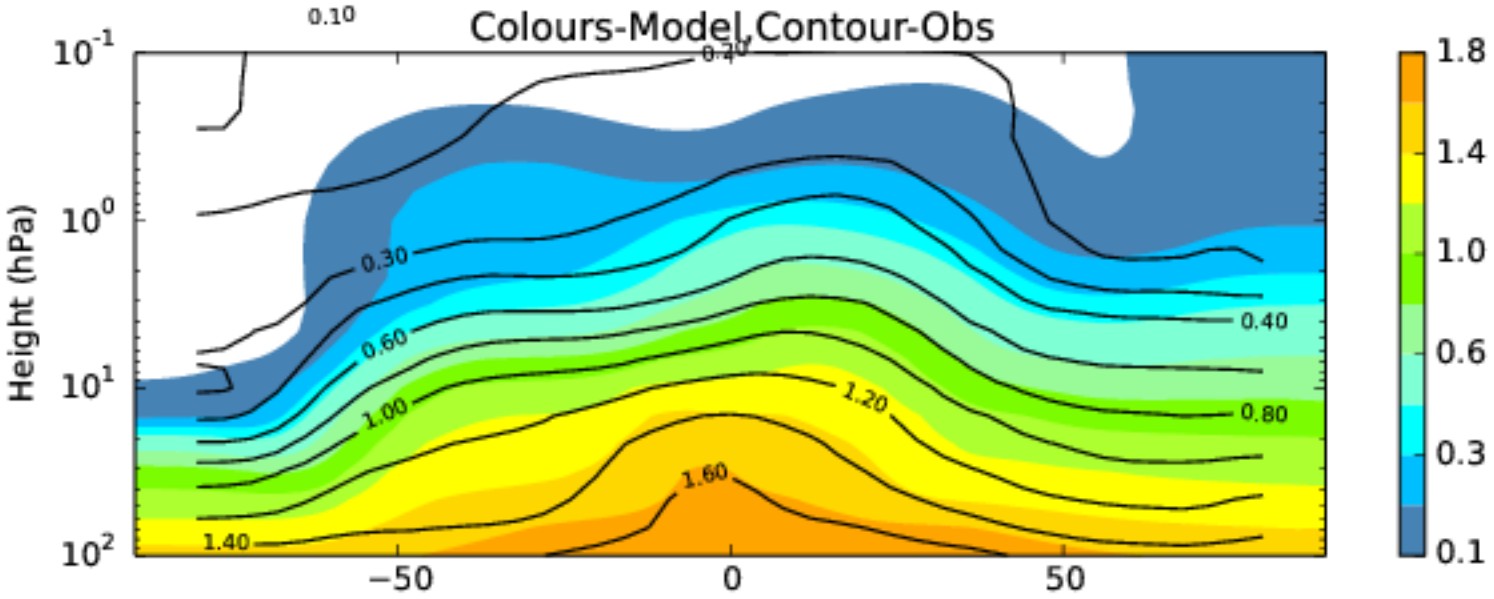


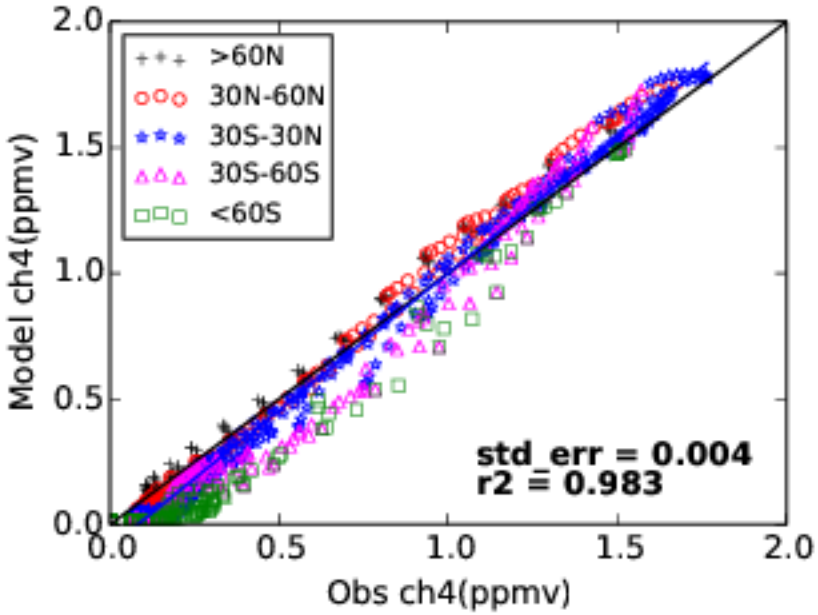
UKCA ap663 vs HALOE:
CH4 (ppmv) Jan



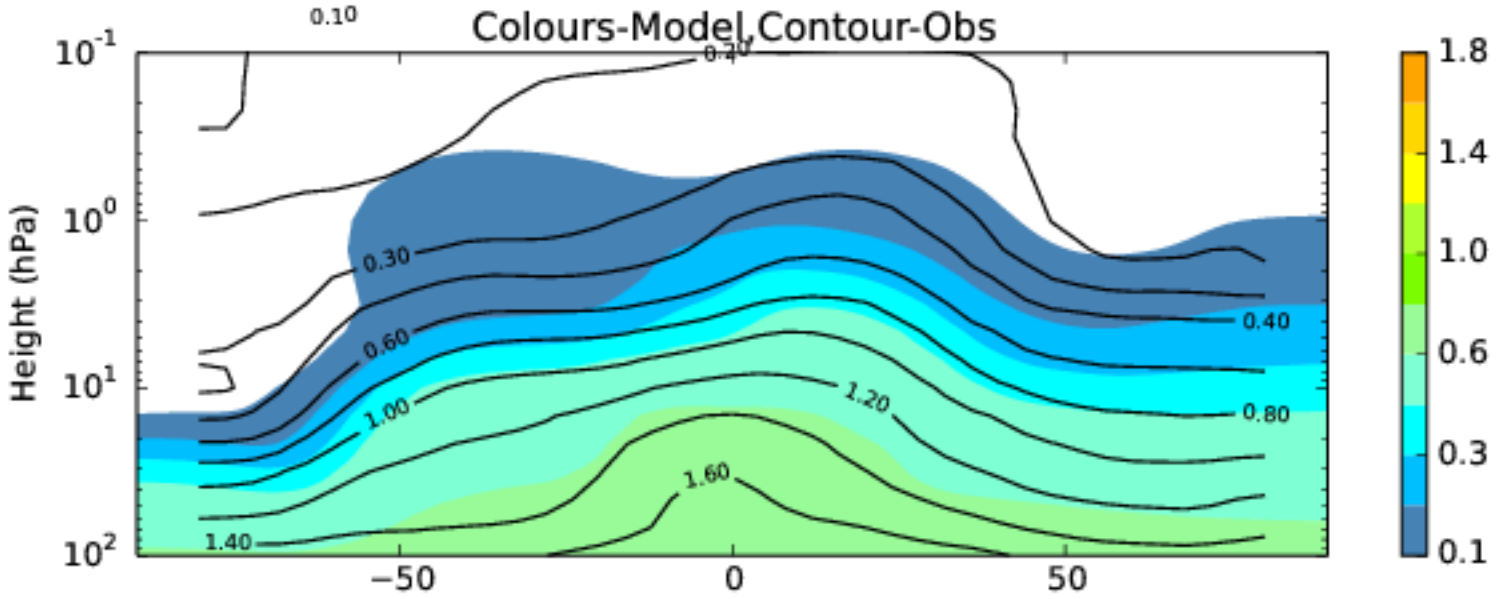


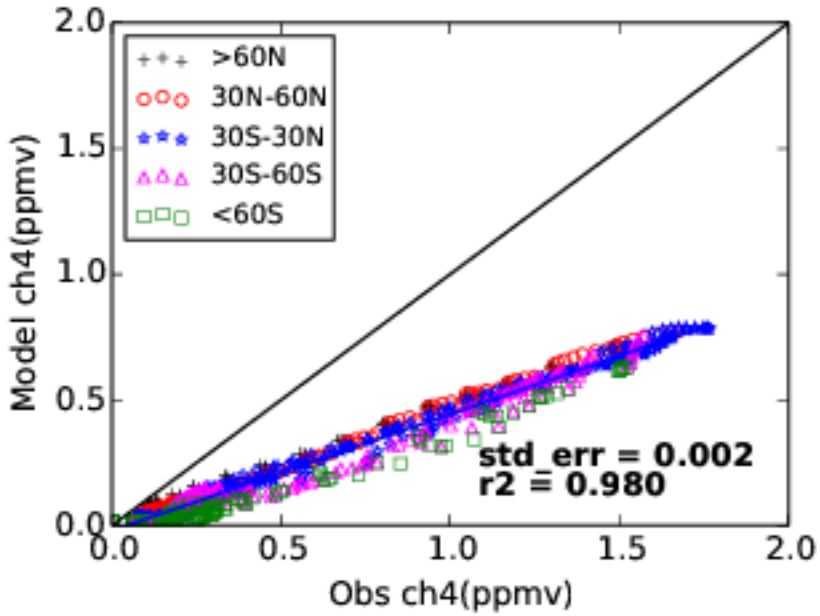
UKCA ap664 vs HALOE:
CH4 (ppmv) Jan



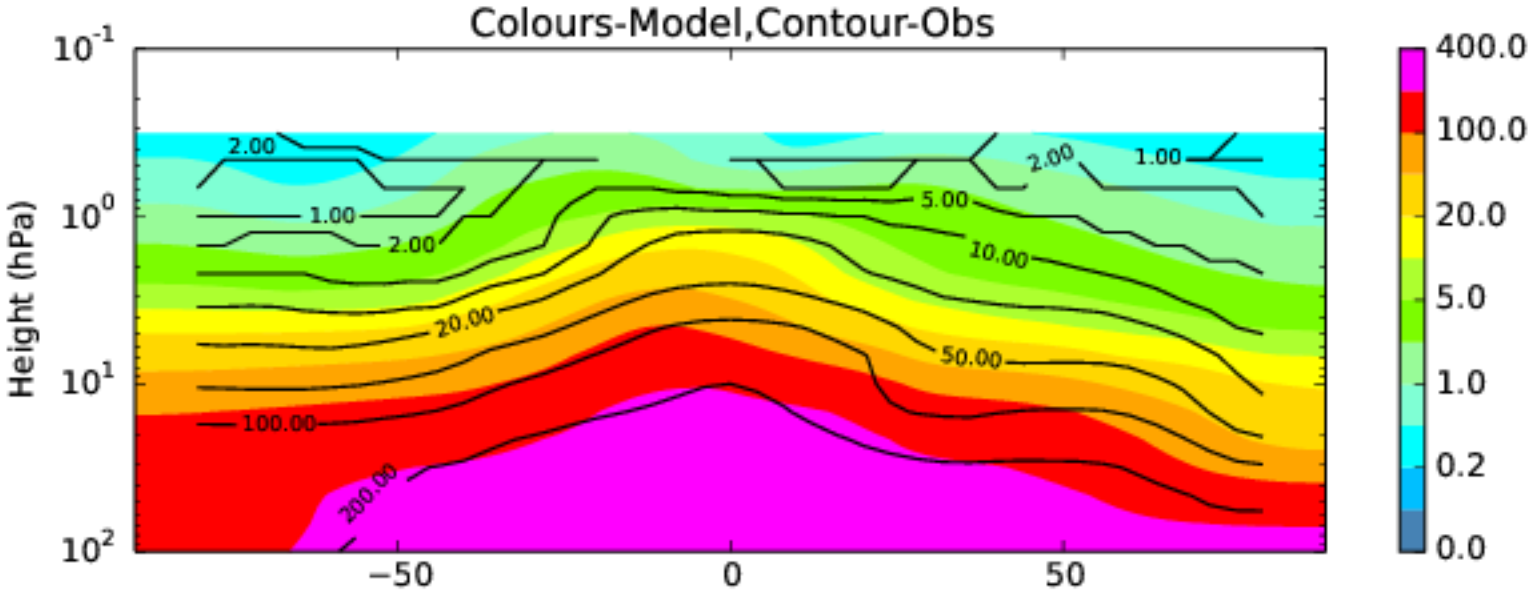


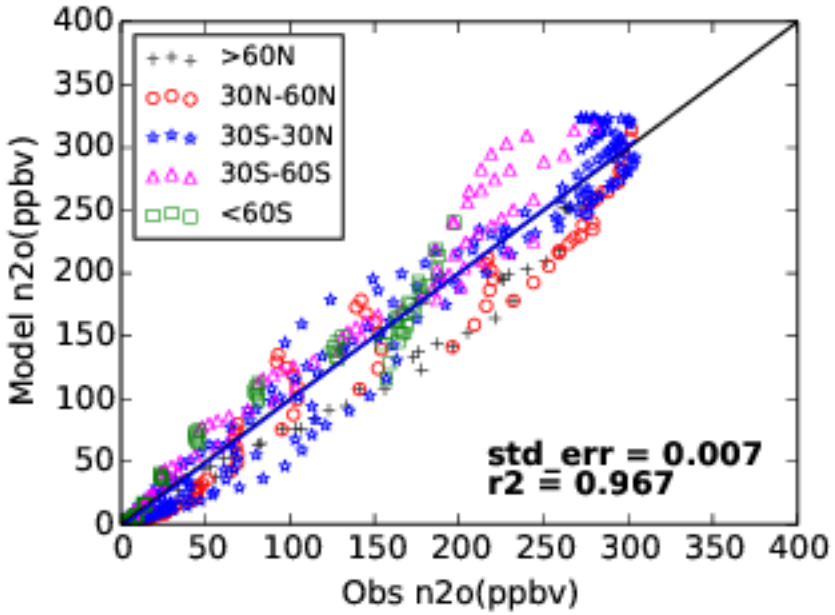
UKCA ap663 vs HALOE:
CH4 (ppmv) Jul



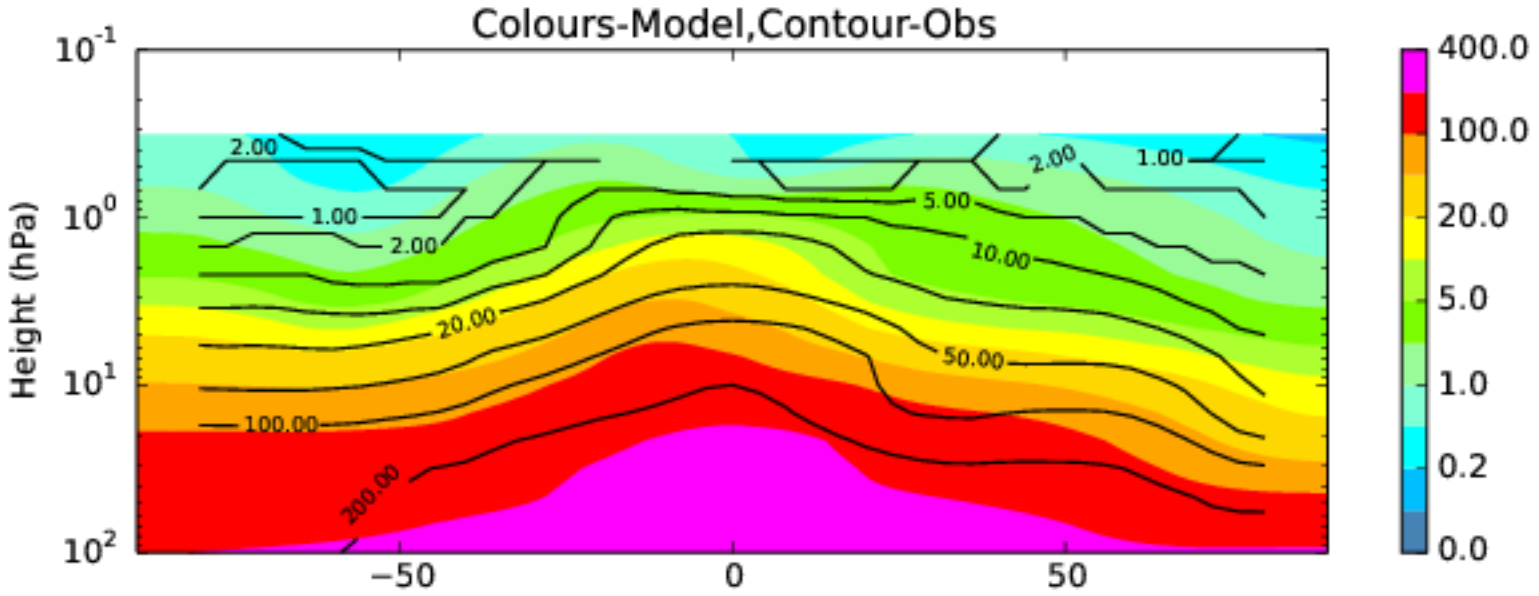


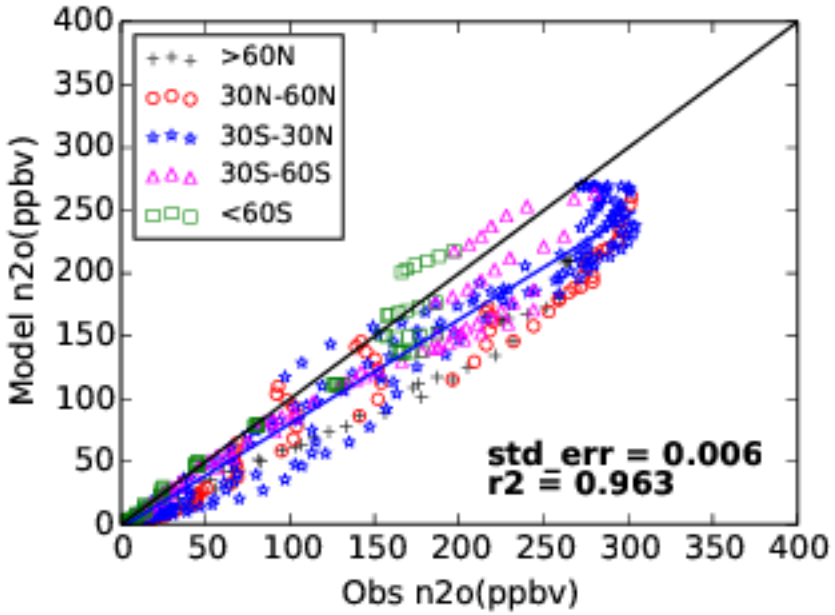
UKCA ap664 vs HALOE:
CH4 (ppmv) Jul



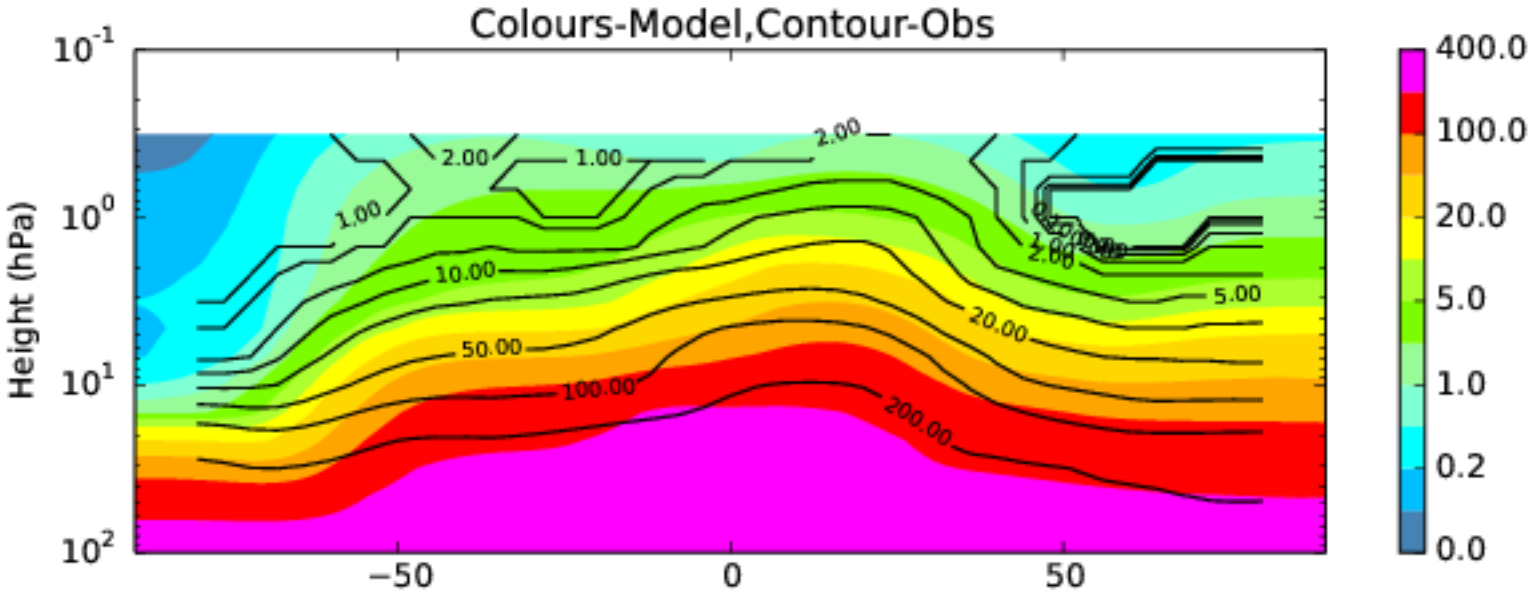


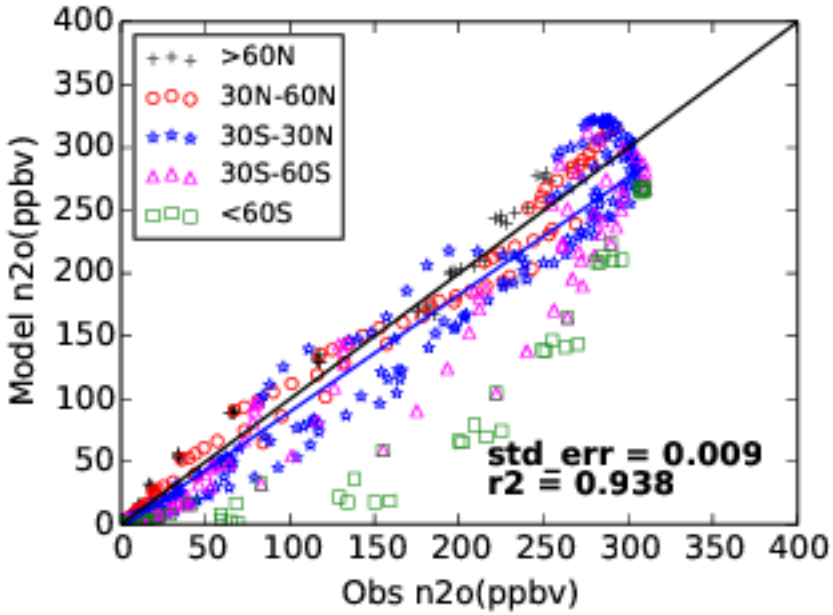
UKCA ap663 vs HALOE:
N2O (ppmv) Jan



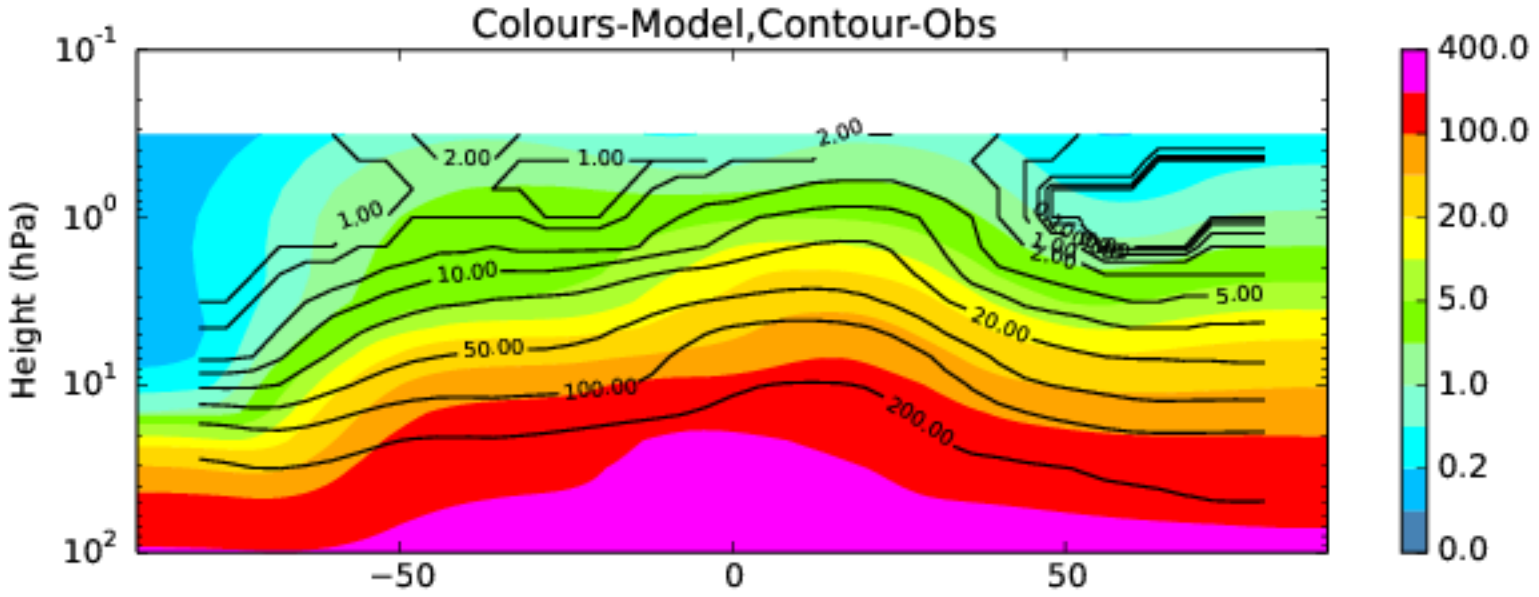


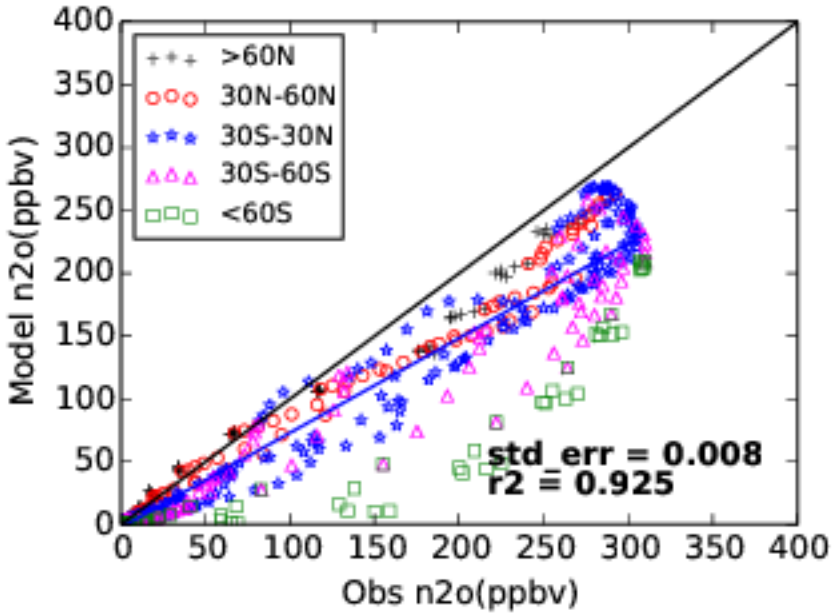
UKCA ap664 vs HALOE:
N2O (ppmv) Jan



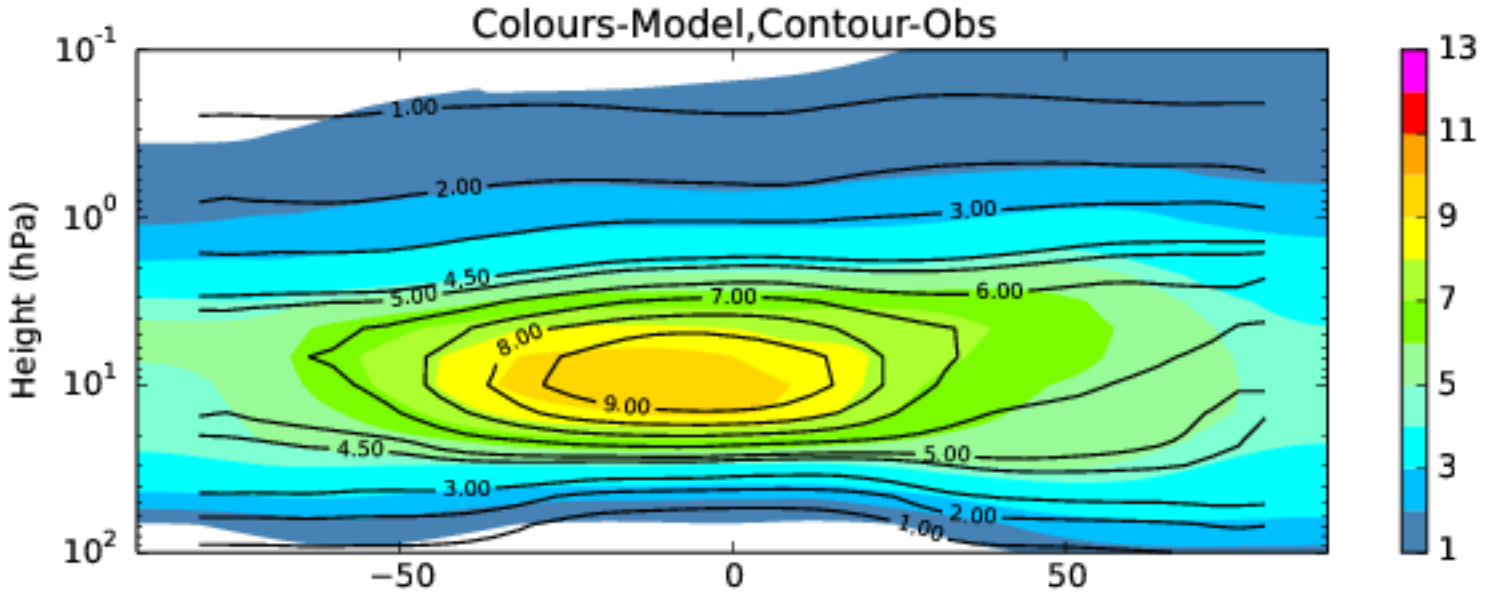


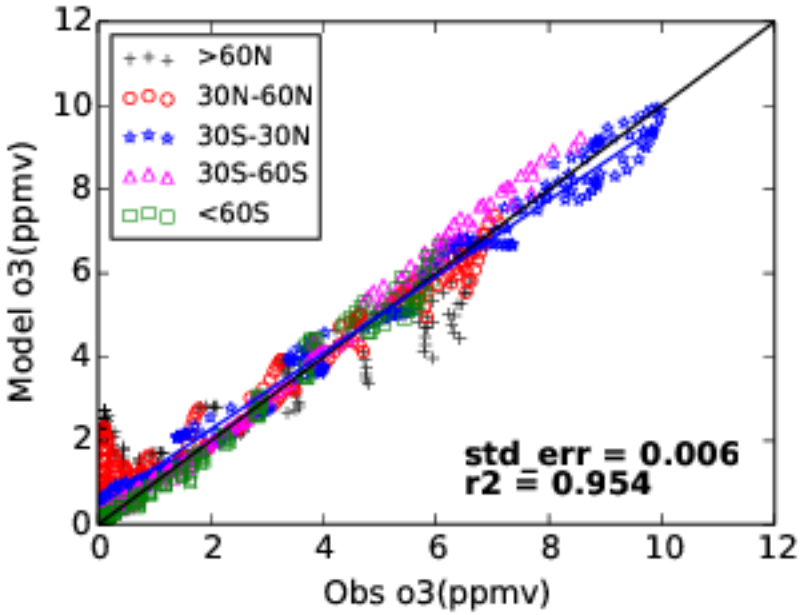
UKCA ap663 vs HALOE:
N2O (ppmv) Jul



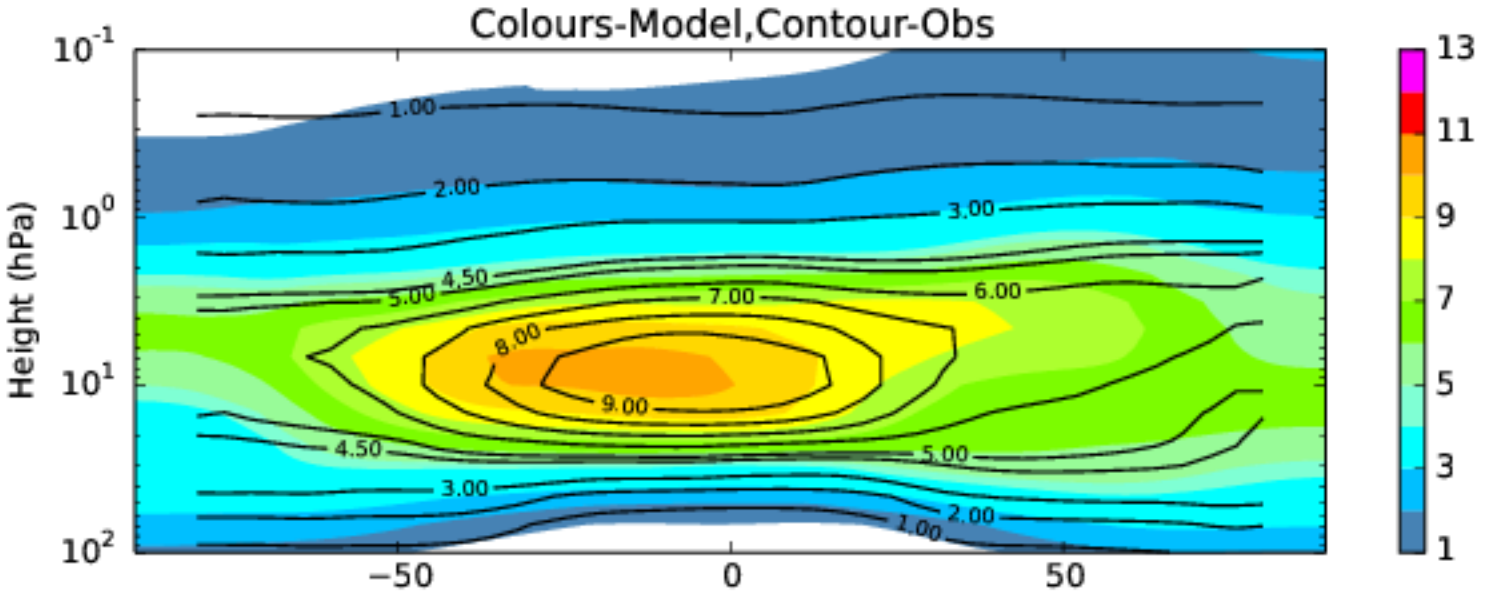


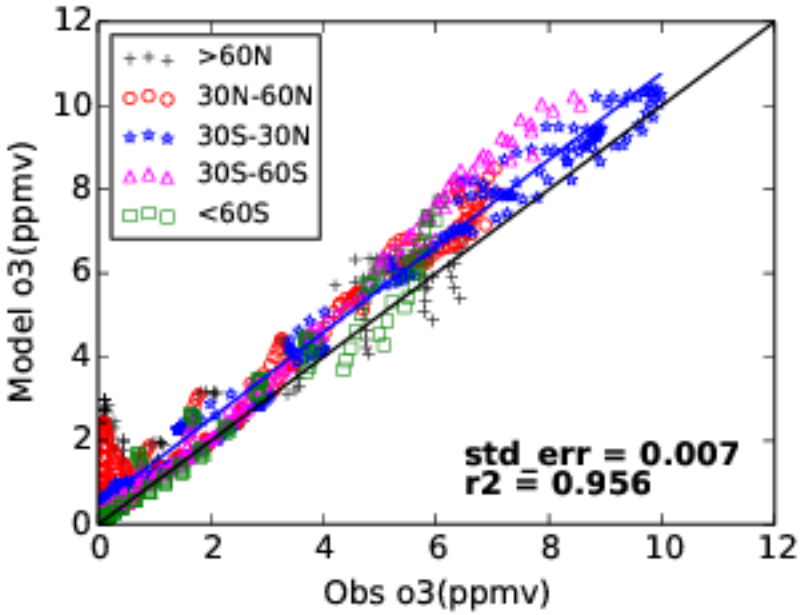
UKCA ap664 vs HALOE:
N2O (ppmv) Jul



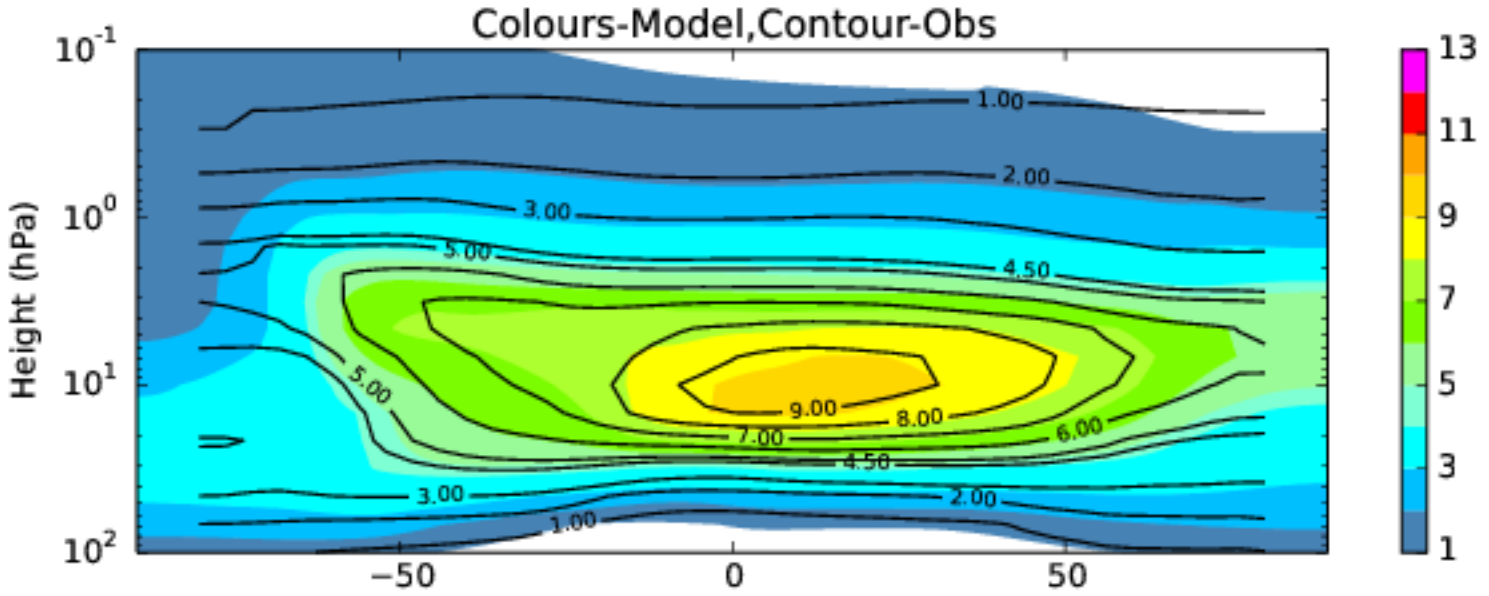


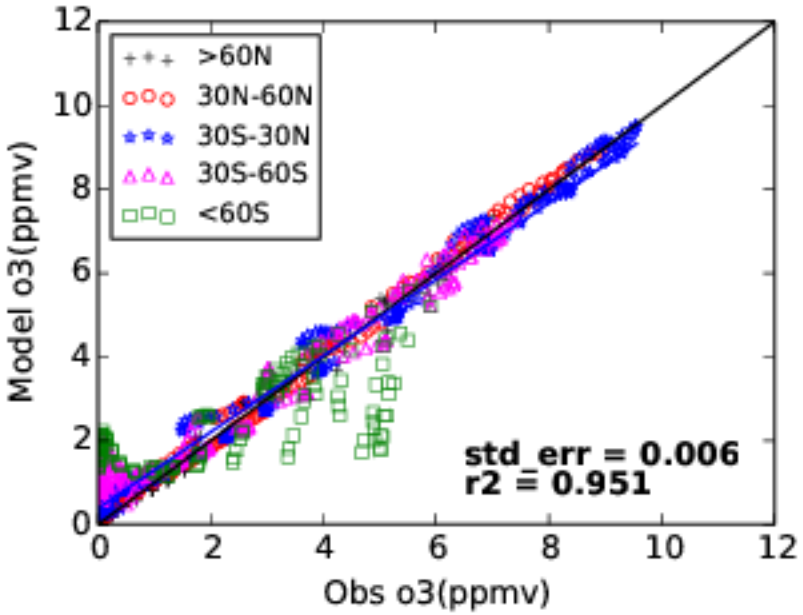
UKCA ap663 vs HALOE:
O3 (ppmv) Jan



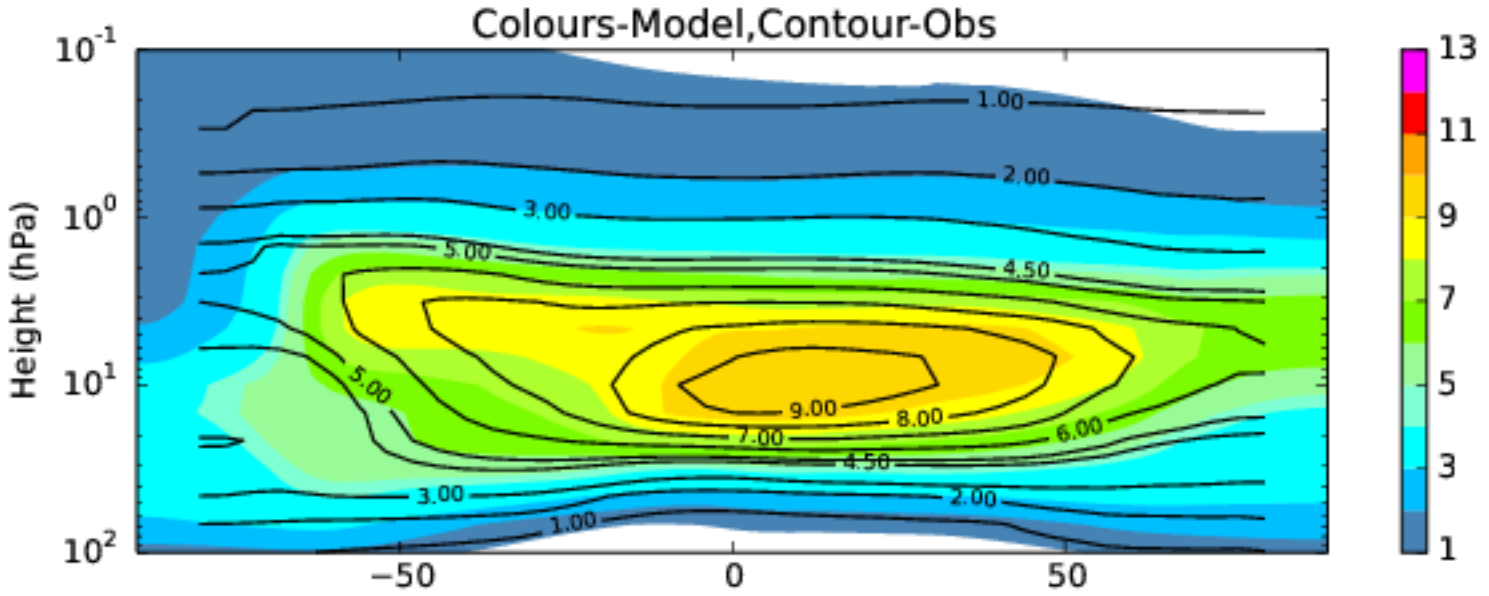


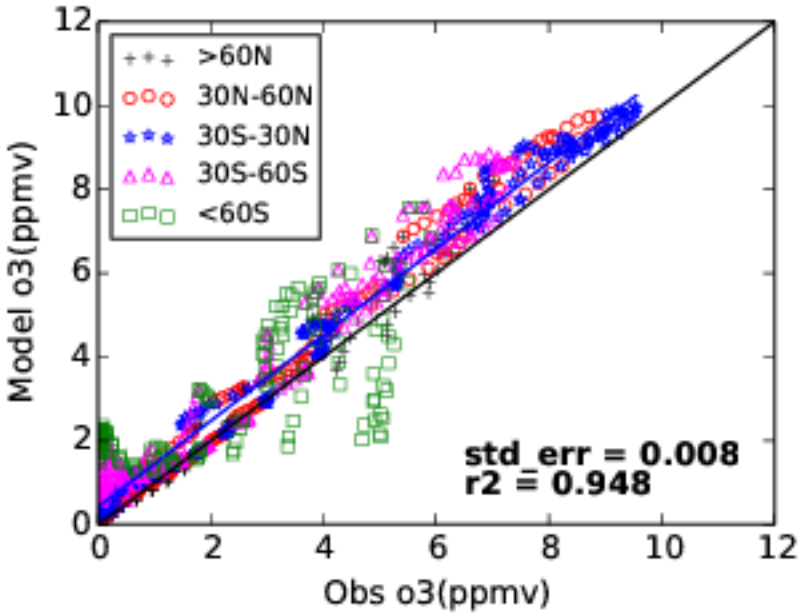
UKCA ap664 vs HALOE:
O3 (ppmv) Jan



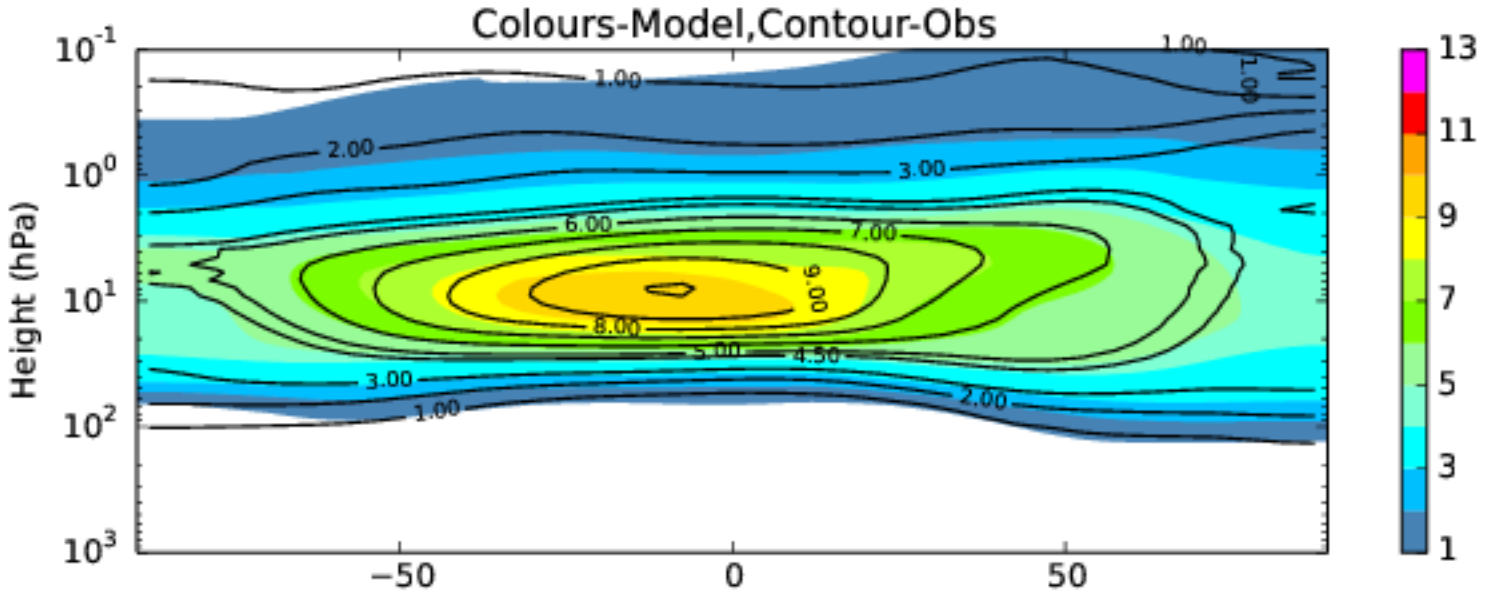


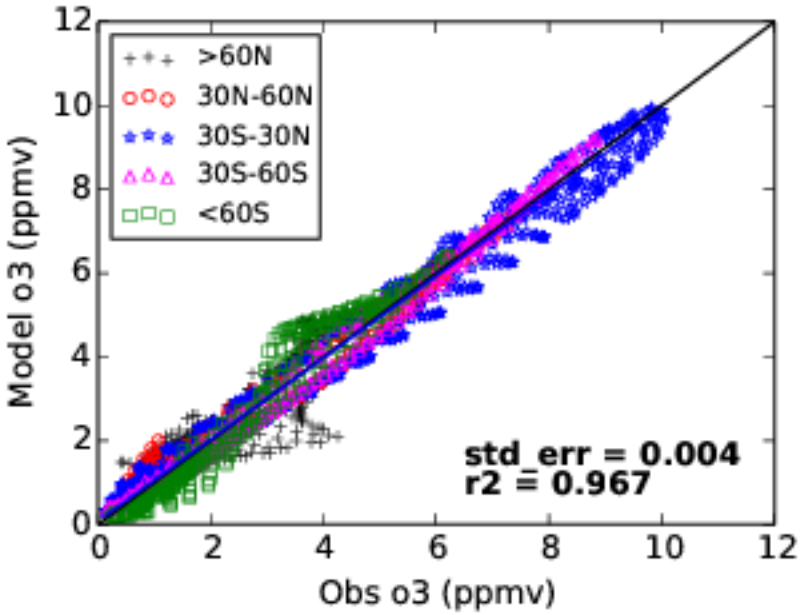
UKCA ap663 vs HALOE:
O3 (ppmv) Jul



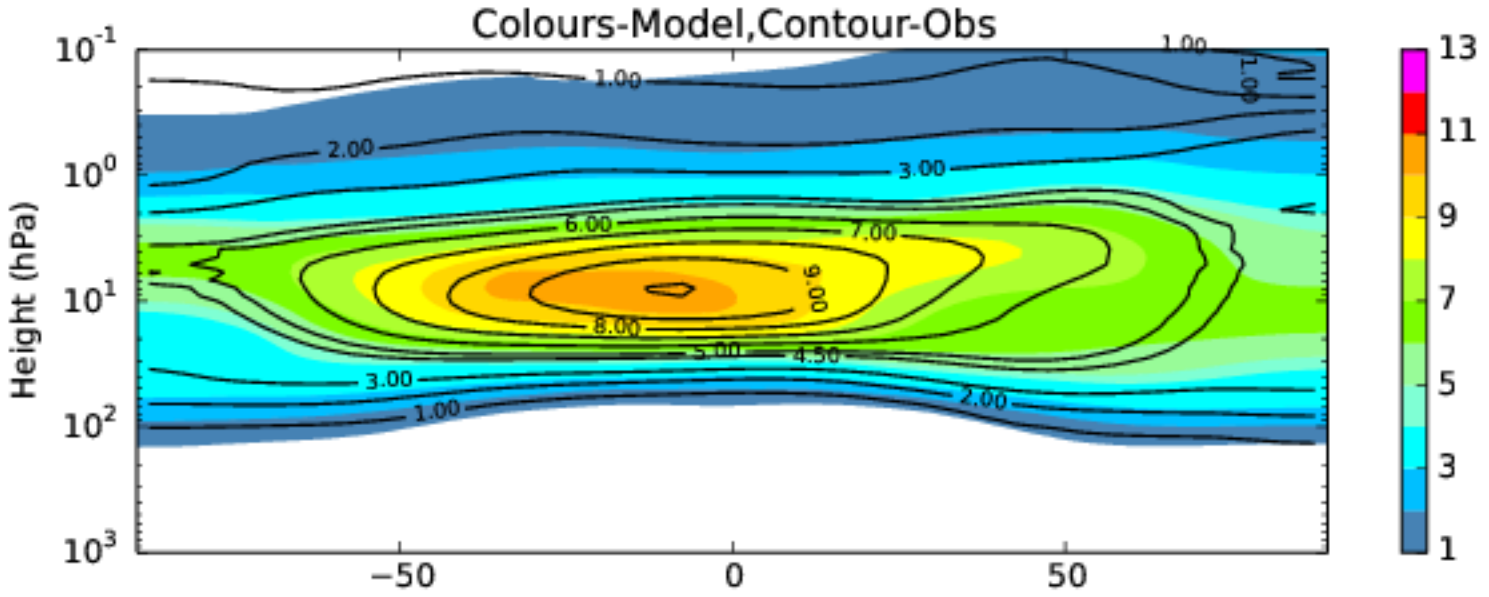


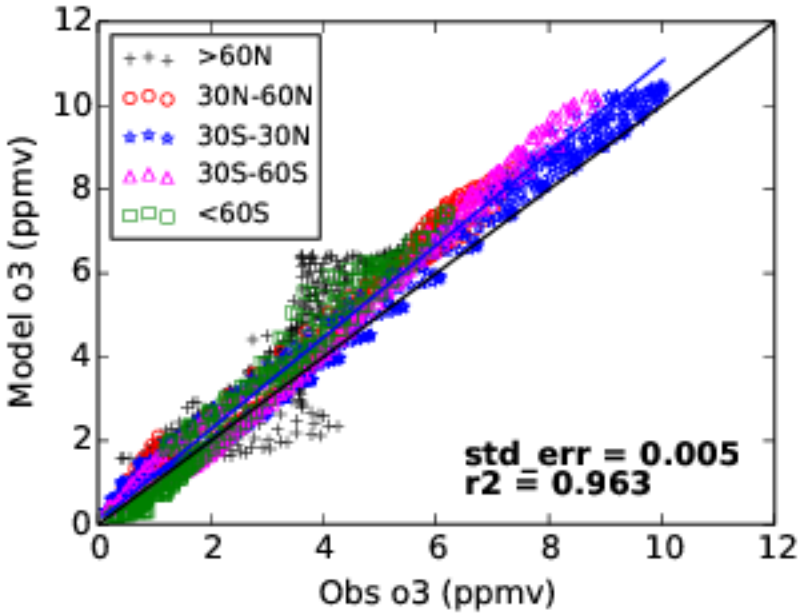
UKCA ap664 vs HALOE:
O3 (ppmv) Jul



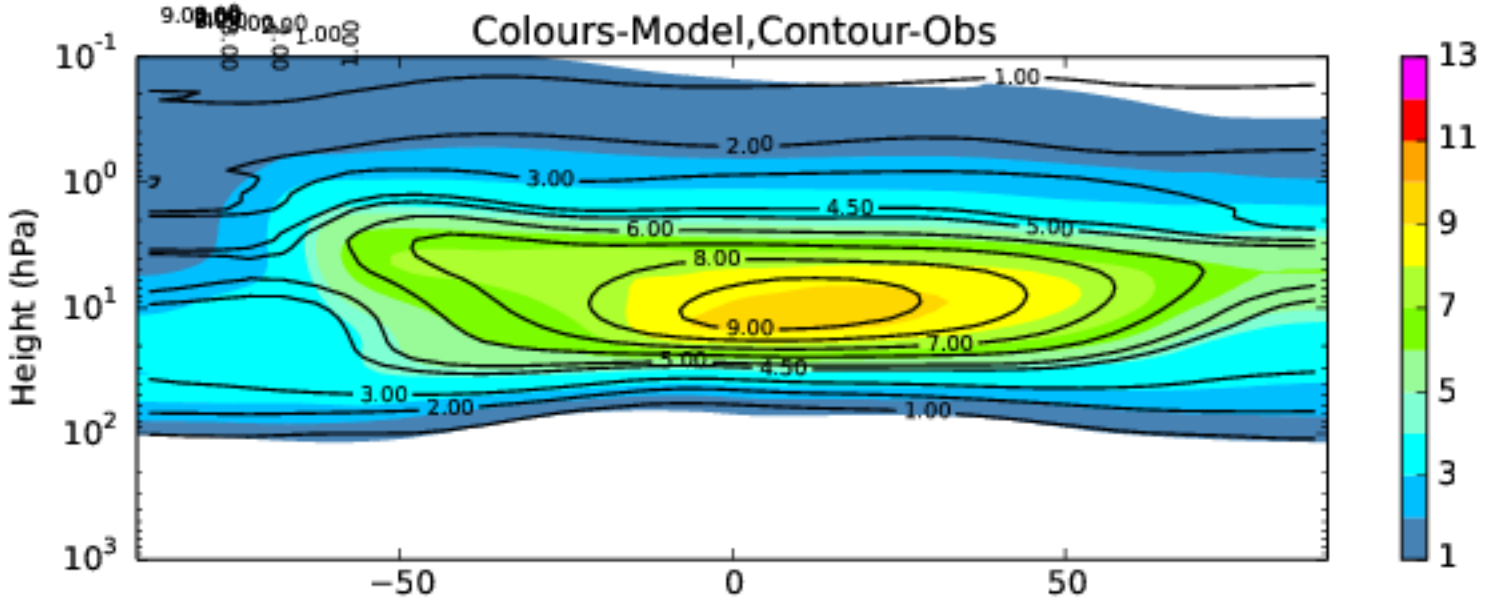


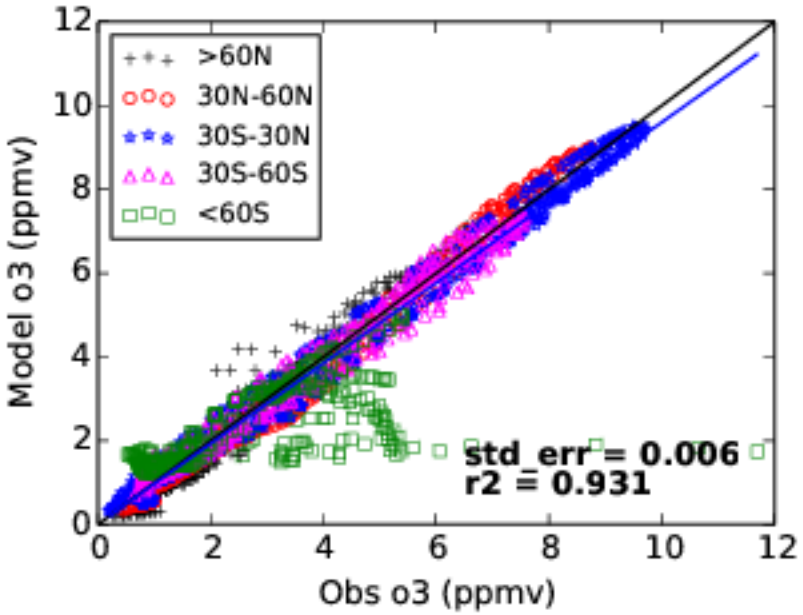
UKCA ap663 vs NIWA-CCMVal:
O3 (ppmv) Jan



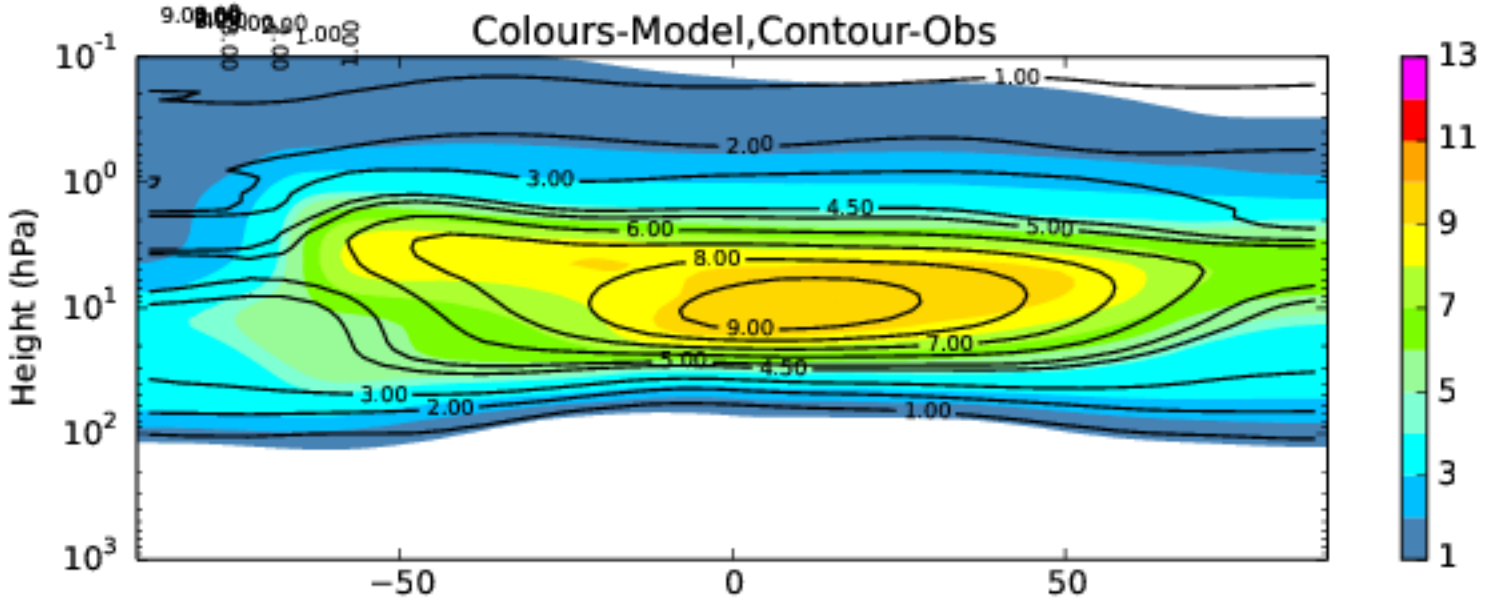


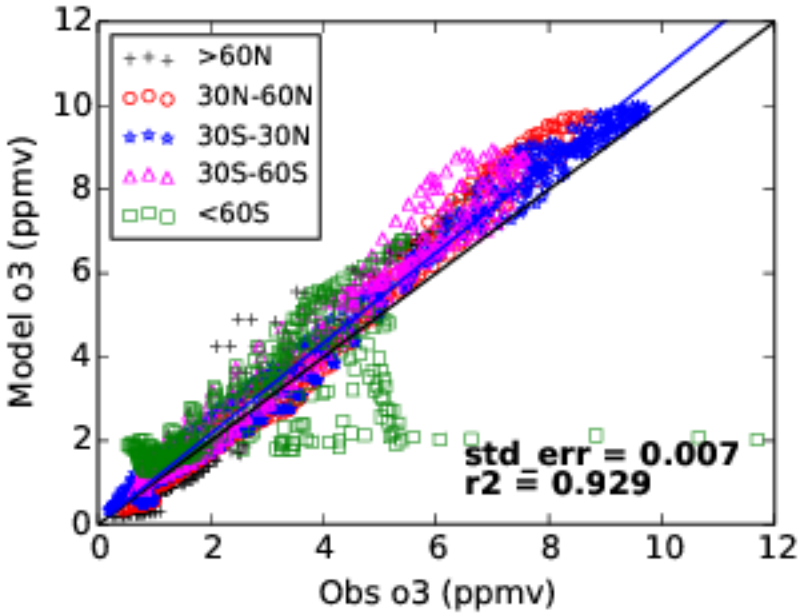
UKCA ap664 vs NIWA-CCMVal:
O3 (ppmv) Jan



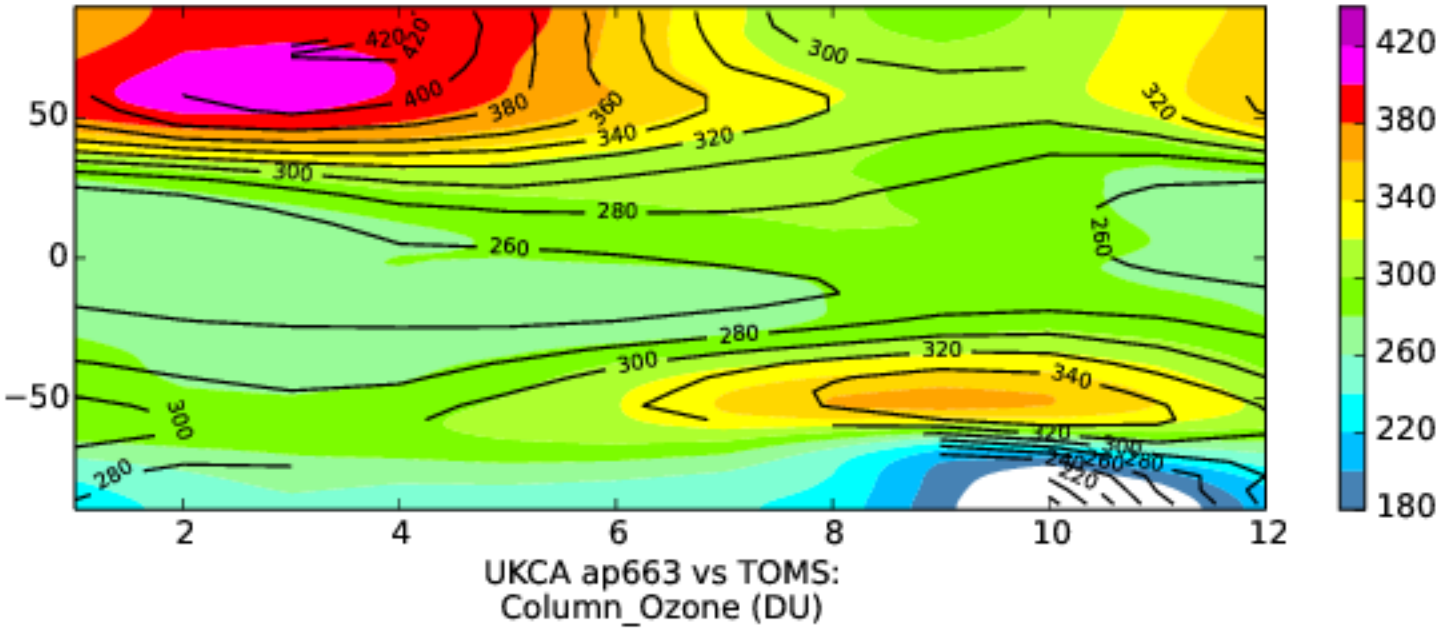


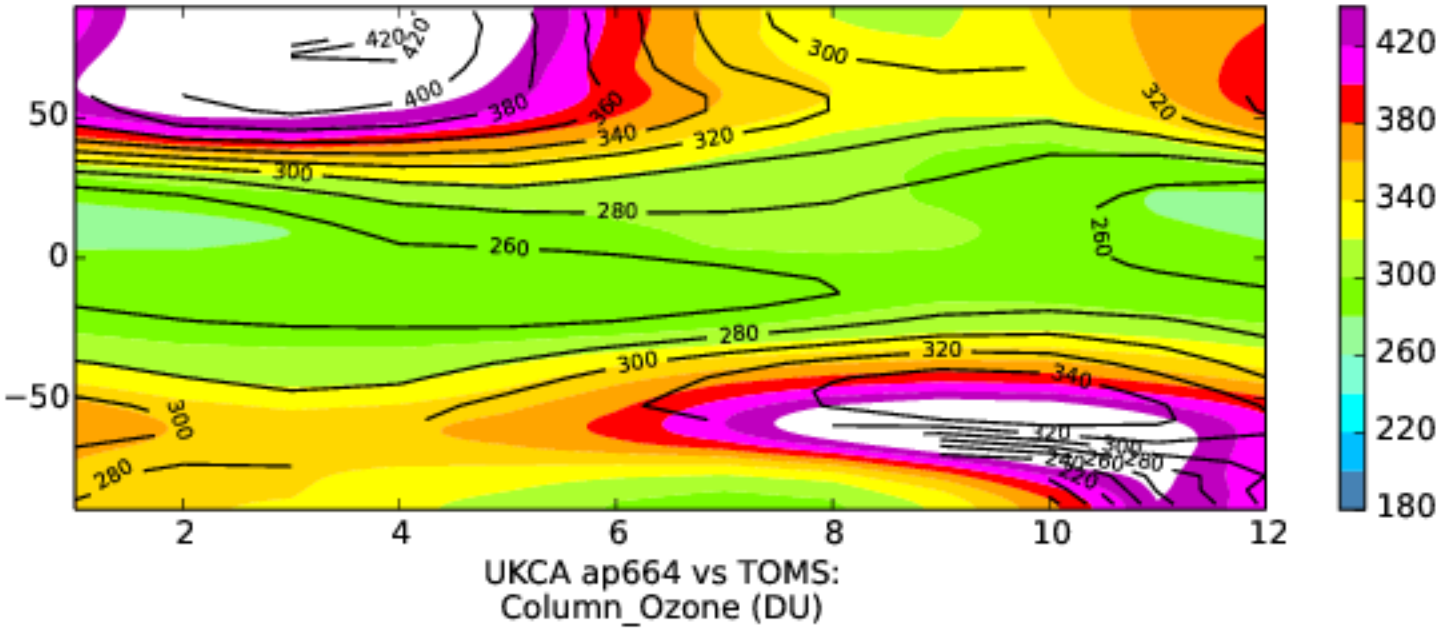
UKCA ap663 vs NIWA-CCMVal:
O3 (ppmv) Jul





UKCA ap664 vs NIWA-CCMVal:
O3 (ppmv) Jul


50
0
−50
2
4
6
8
10
12
420
380
340
300
260
220
180
UKCA ap663 vs TOMS:
Column_Ozone (DU)


50
0
−50
2
4
6
8
10
12
420
380
340
300
260
220
180
UKCA ap664 vs TOMS:
Column_Ozone (DU)