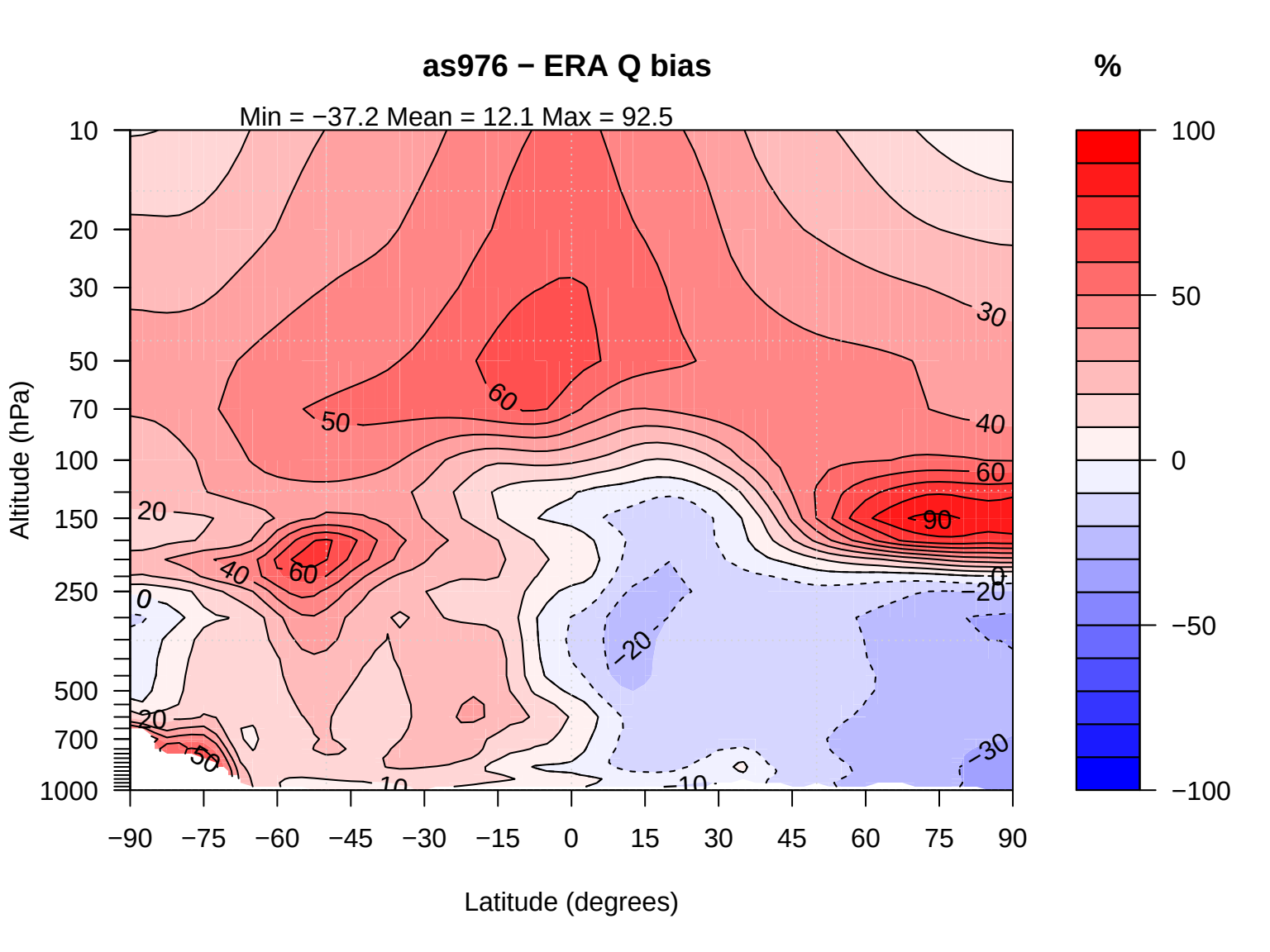
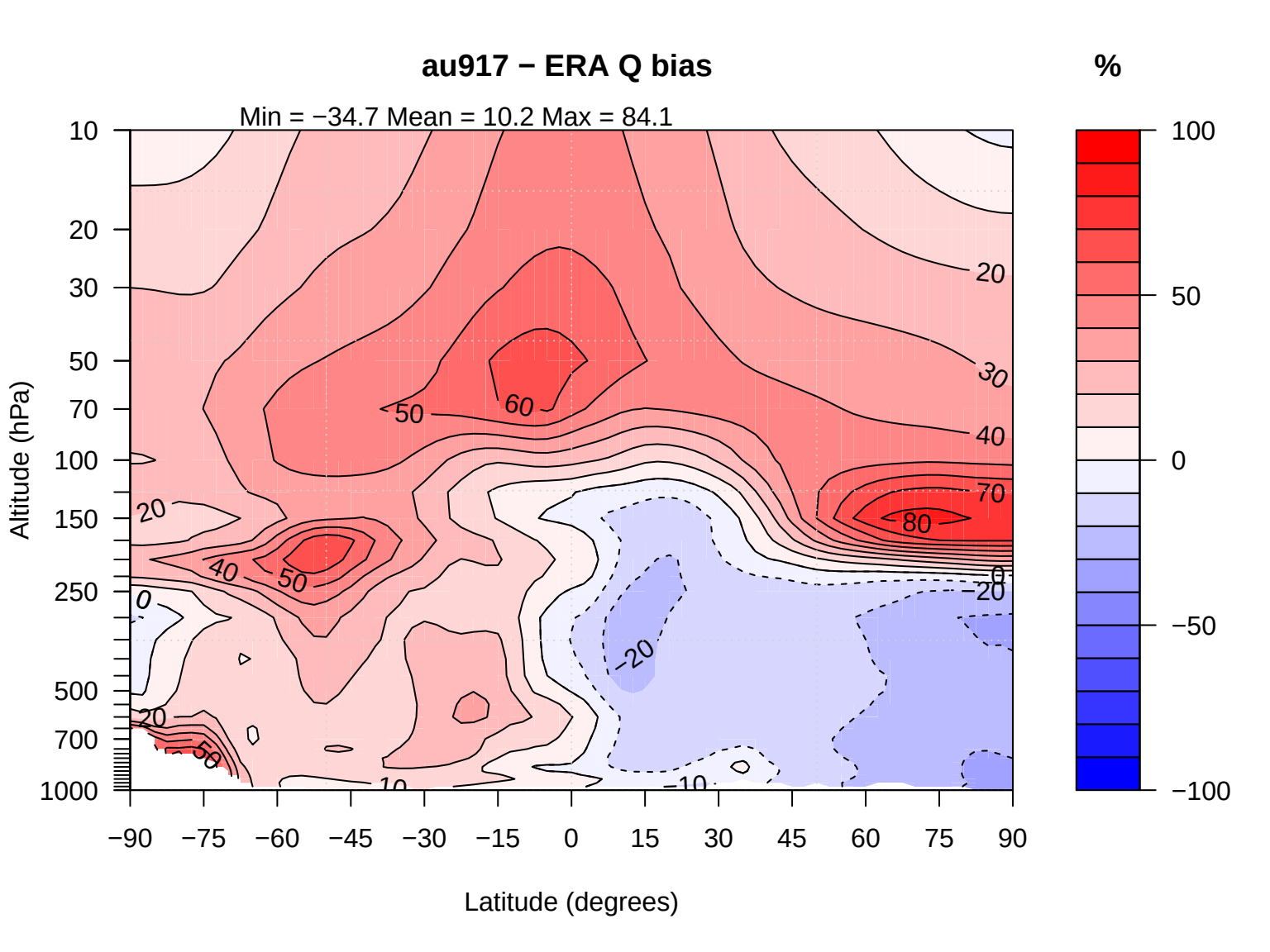
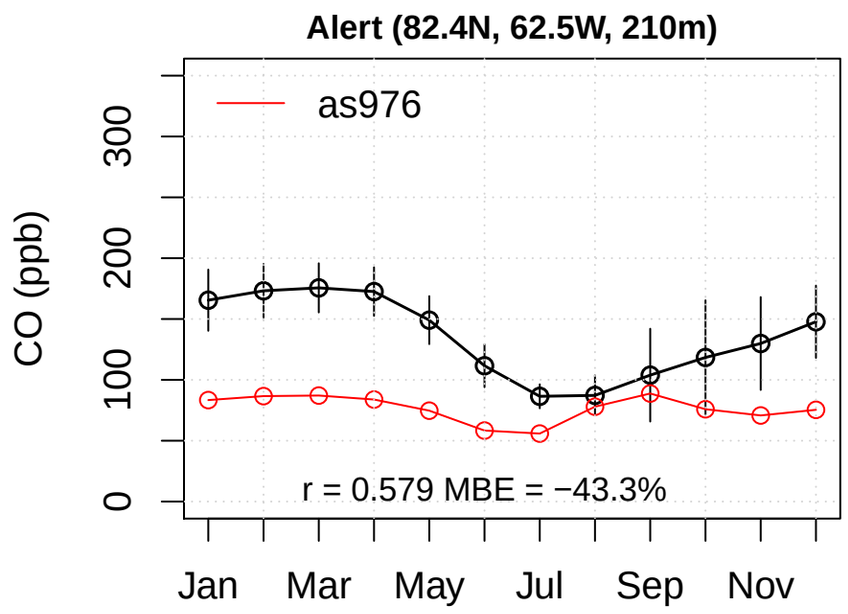
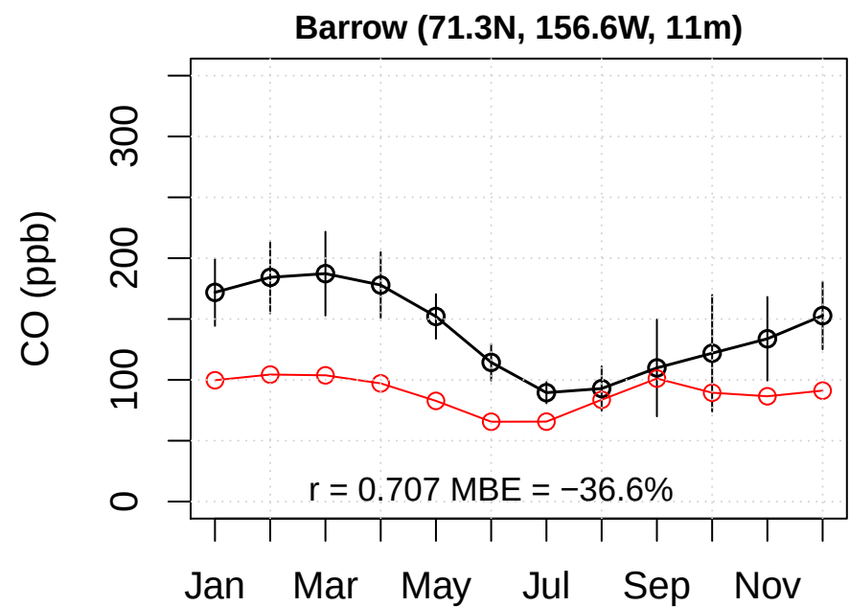
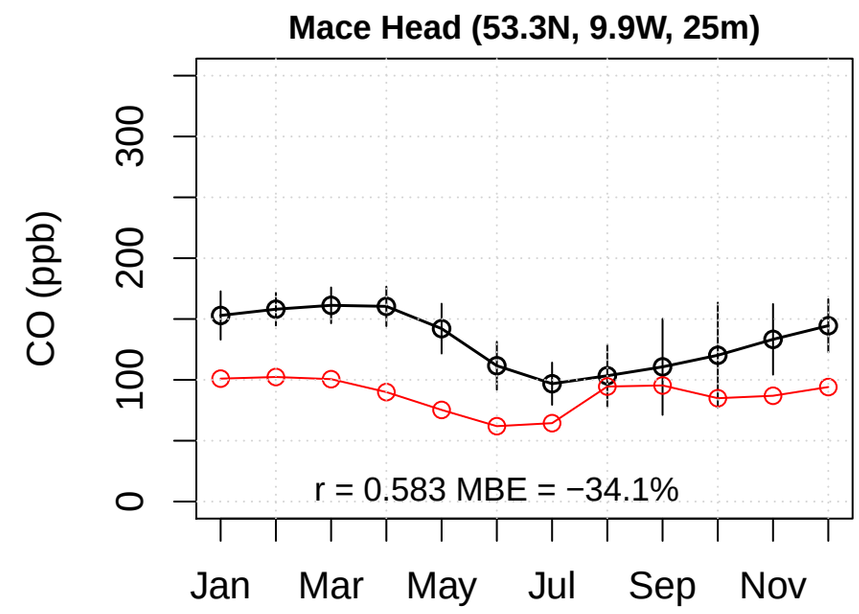
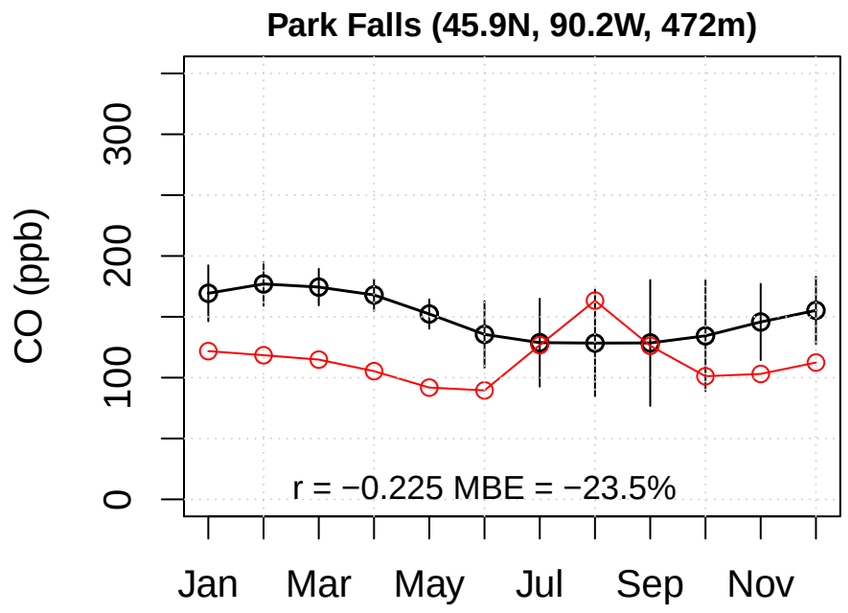

as976 − ERA Q bias
%
Min = −37.2 Mean = 12.1 Max = 92.5
Altitude (hPa)
10
20
30
50
70
100
150
250
500
700
1000
−90
−75
−60
−45
−30
−15
0
15
30
45
60
75
90
Latitude (degrees)
100
50
0
−50
−100

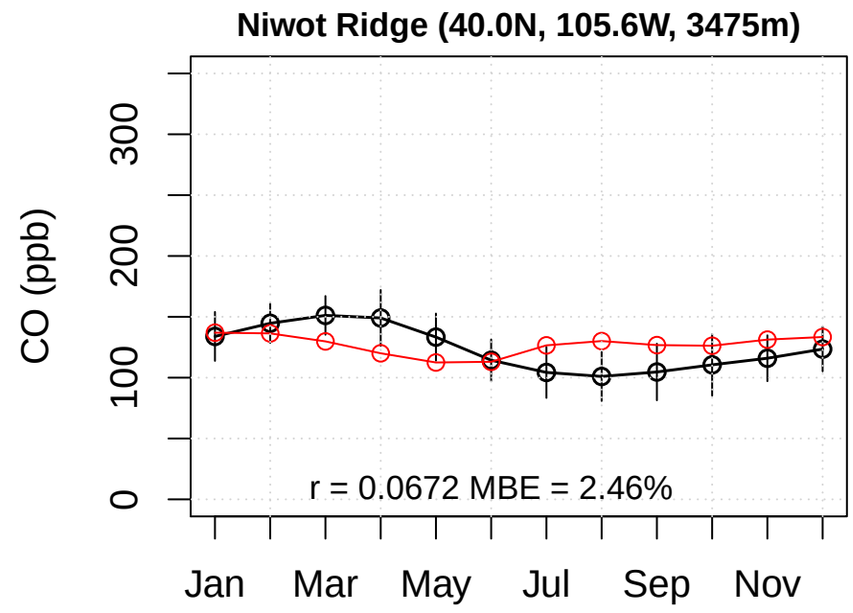

au917 − ERA Q bias
Min = −34.7 Mean = 10.2 Max = 84.1
%
Altitude (hPa)
Latitude (degrees)
10
20
30
50
70
100
150
250
500
700
1000
−90
−75
−60
−45
−30
−15
0
15
30
45
60
75
90
100
50
0
−50
−100

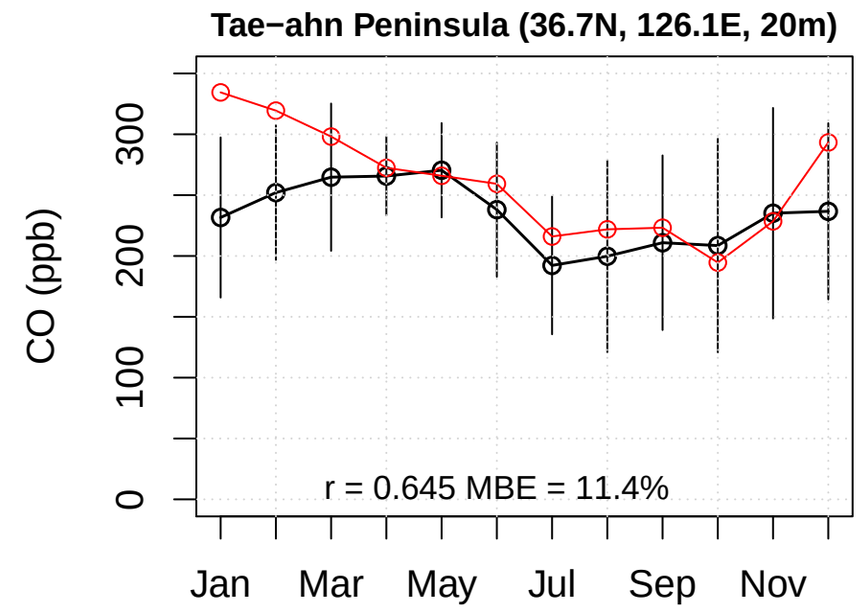

Alert (82.4N, 62.5W, 210m)
as976
CO (ppb)
0
100
200
300
r = 0.579 MBE = −43.3%
Jan
Mar
May
Jul
Sep
Nov

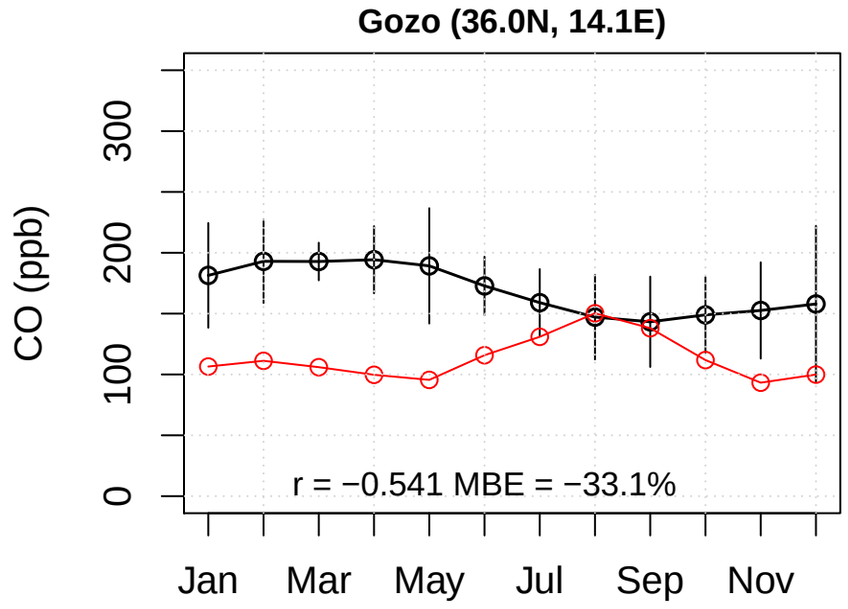

Barrow (71.3N, 156.6W, 11m)
CO (ppb)
0
100
200
300
r = 0.707 MBE = −36.6%
Jan
Mar
May
Jul
Sep
Nov

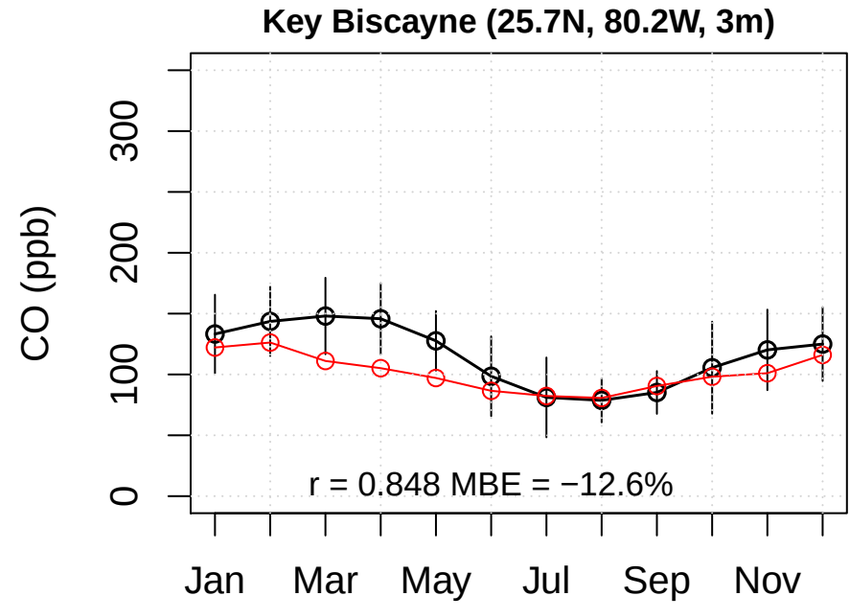

Mace Head (53.3N, 9.9W, 25m)
CO (ppb)
0
100
200
300
r = 0.583 MBE = −34.1%
Jan
Mar
May
Jul
Sep
Nov

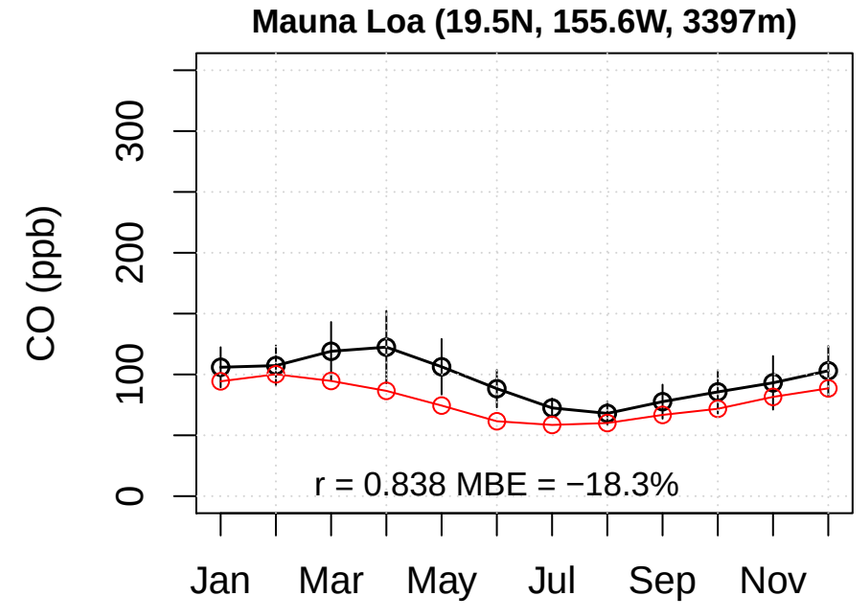

Park Falls (45.9N, 90.2W, 472m)
CO (ppb)
0
100
200
300
r = −0.225 MBE = −23.5%
Jan
Mar
May
Jul
Sep
Nov

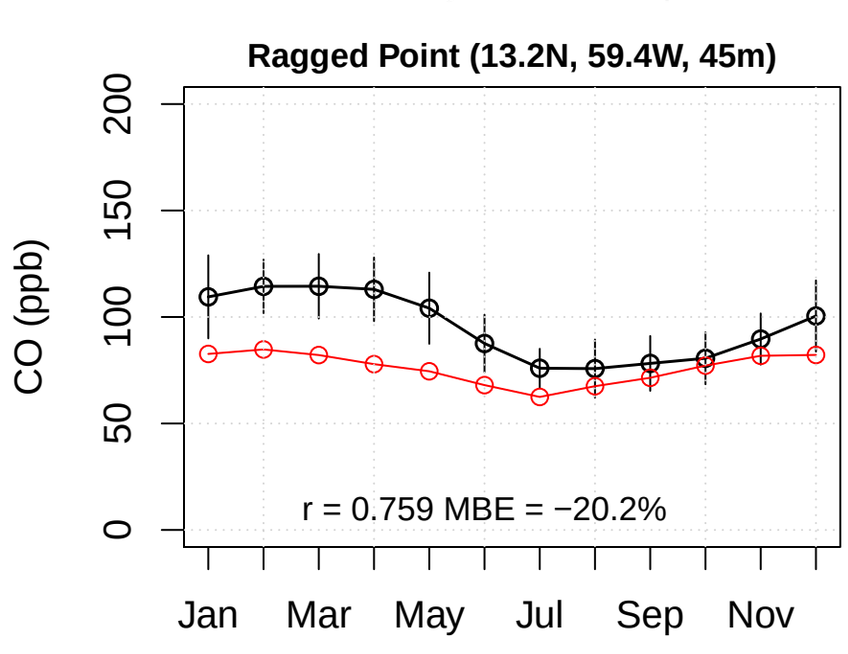

Niwot Ridge (40.0N, 105.6W, 3475m)
CO (ppb)
0
100
200
300
r = 0.0672 MBE = 2.46%
Jan
Mar
May
Jul
Sep
Nov

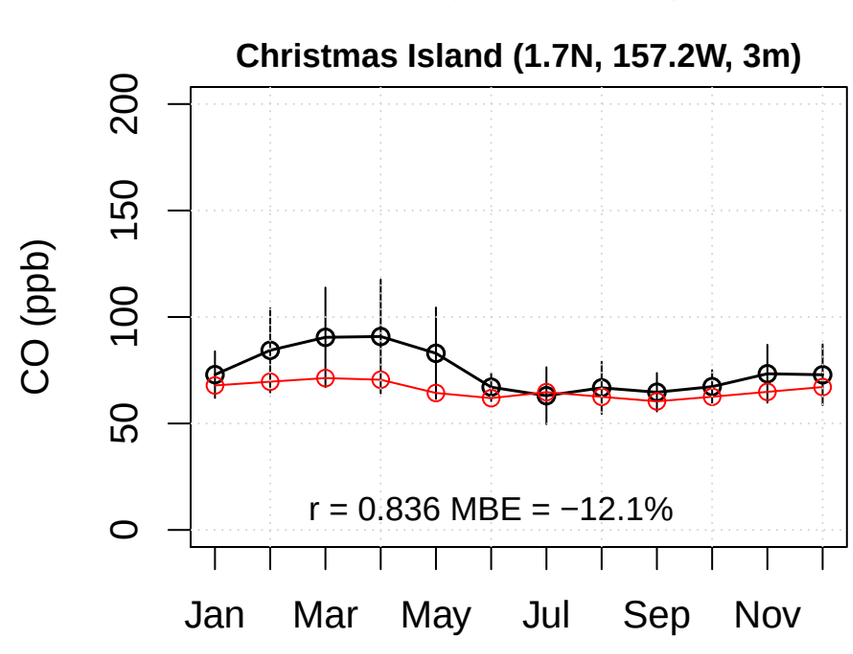

Tae−ahn Peninsula (36.7N, 126.1E, 20m)
CO (ppb)
0
100
200
300
r = 0.645 MBE = 11.4%
Jan
Mar
May
Jul
Sep
Nov

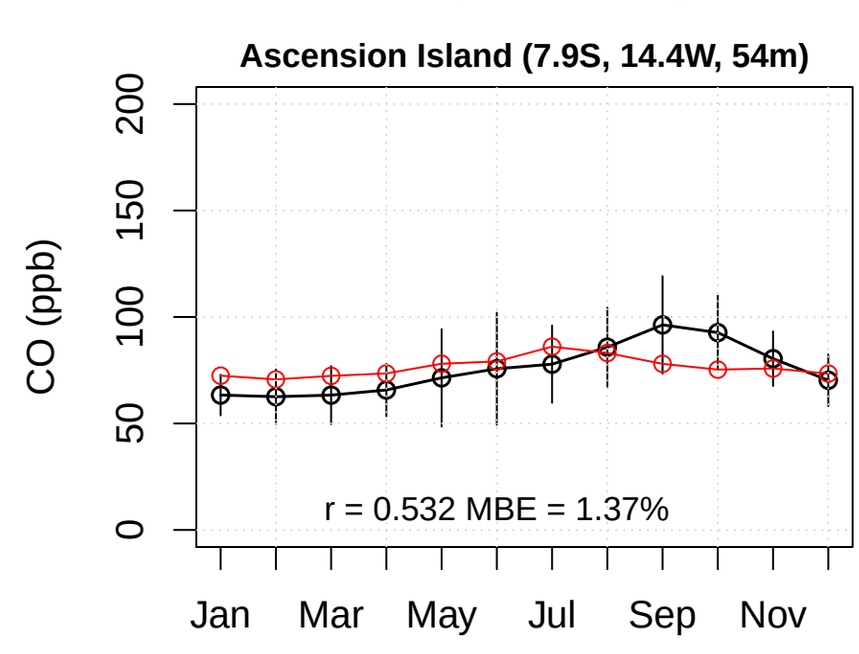

Gozo (36.0N, 14.1E)
CO (ppb)
0
100
200
300
r = −0.541 MBE = −33.1%
Jan
Mar
May
Jul
Sep
Nov

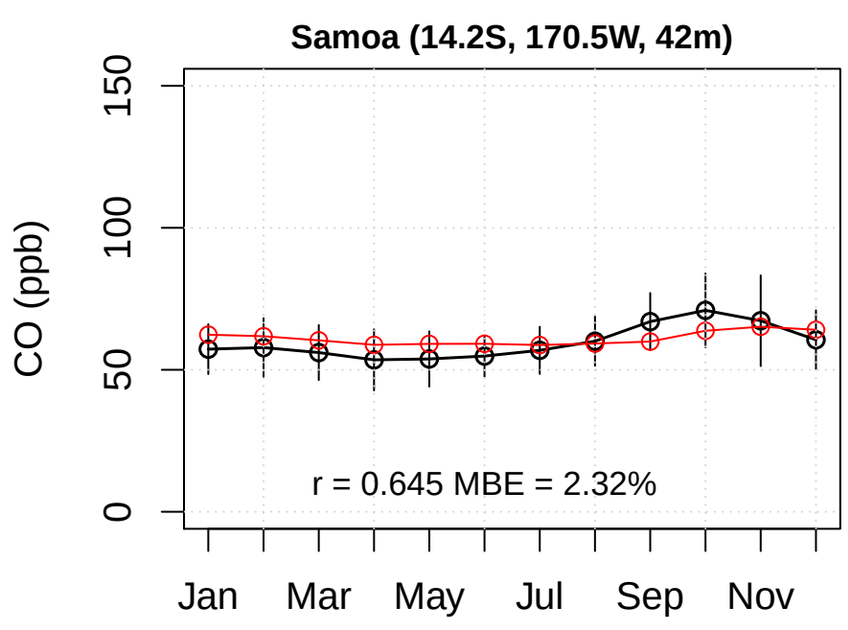

Key Biscayne (25.7N, 80.2W, 3m)
CO (ppb)
0
100
200
300
r = 0.848 MBE = −12.6%
Jan
Mar
May
Jul
Sep
Nov

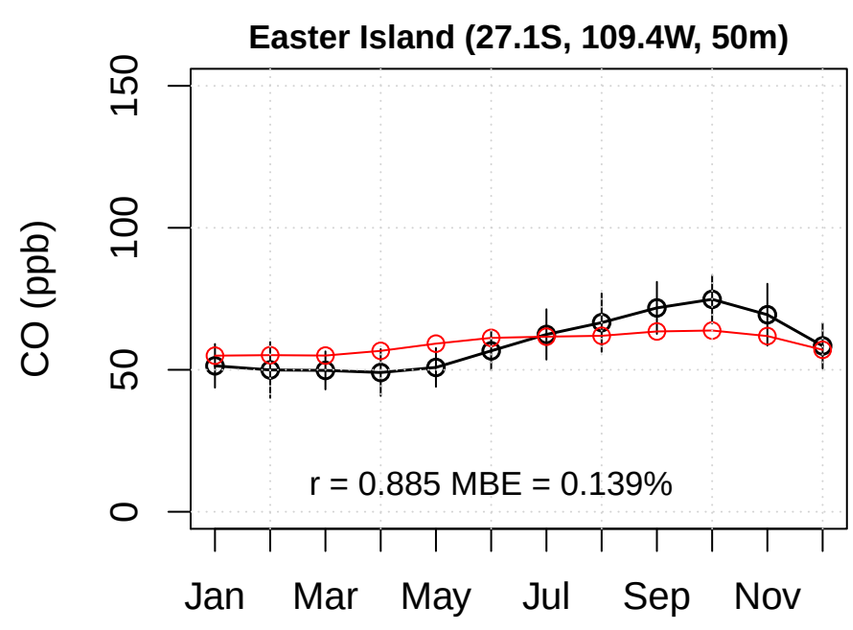

Mauna Loa (19.5N, 155.6W, 3397m)
CO (ppb)
0
100
200
300
r = 0.838 MBE = −18.3%
Jan
Mar
May
Jul
Sep
Nov

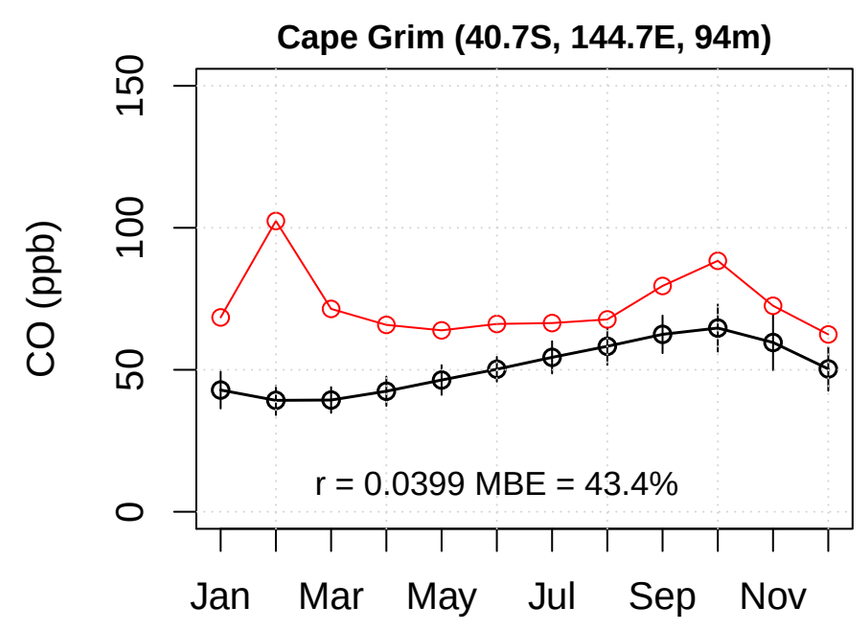

Ragged Point (13.2N, 59.4W, 45m)
CO (ppb)
0
50
100
150
200
r = 0.759 MBE = −20.2%
Jan
Mar
May
Jul
Sep
Nov

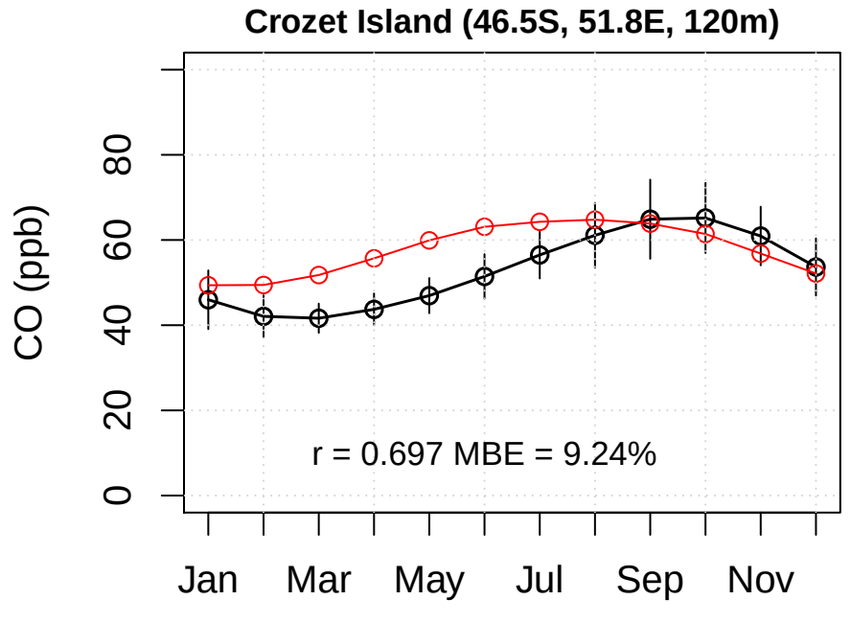

Christmas Island (1.7N, 157.2W, 3m)
CO (ppb)
0
50
100
150
200
r = 0.836 MBE = −12.1%
Jan
Mar
May
Jul
Sep
Nov

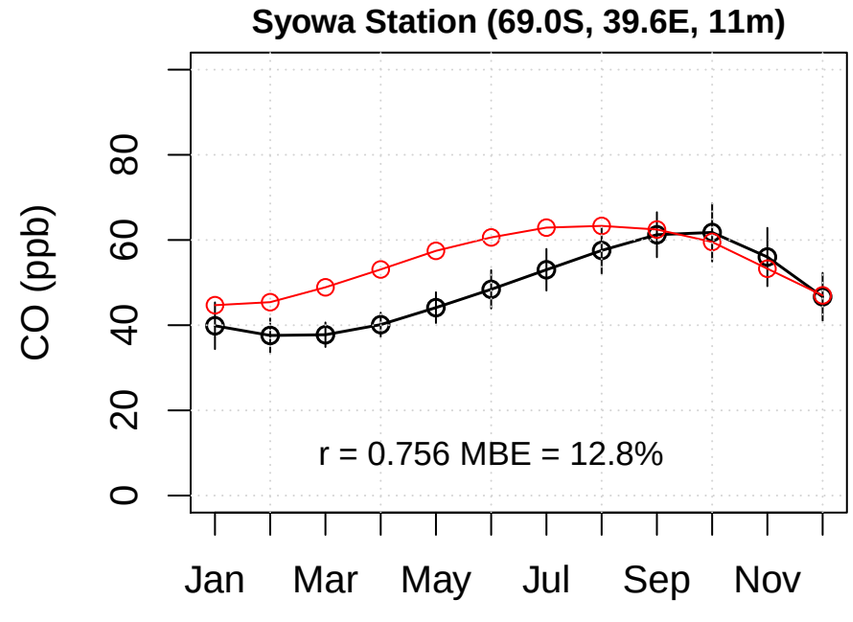

Ascension Island (7.9S, 14.4W, 54m)
CO (ppb)
0
50
100
150
200
r = 0.532 MBE = 1.37%
Jan
Mar
May
Jul
Sep
Nov

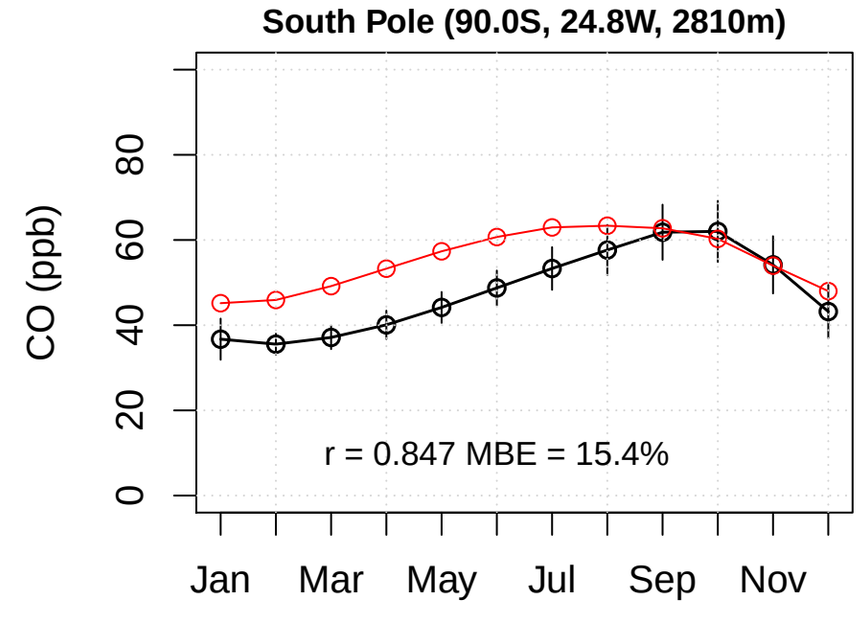

Samoa (14.2S, 170.5W, 42m)
CO (ppb)
0
50
100
150
r = 0.645 MBE = 2.32%
Jan
Mar
May
Jul
Sep
Nov

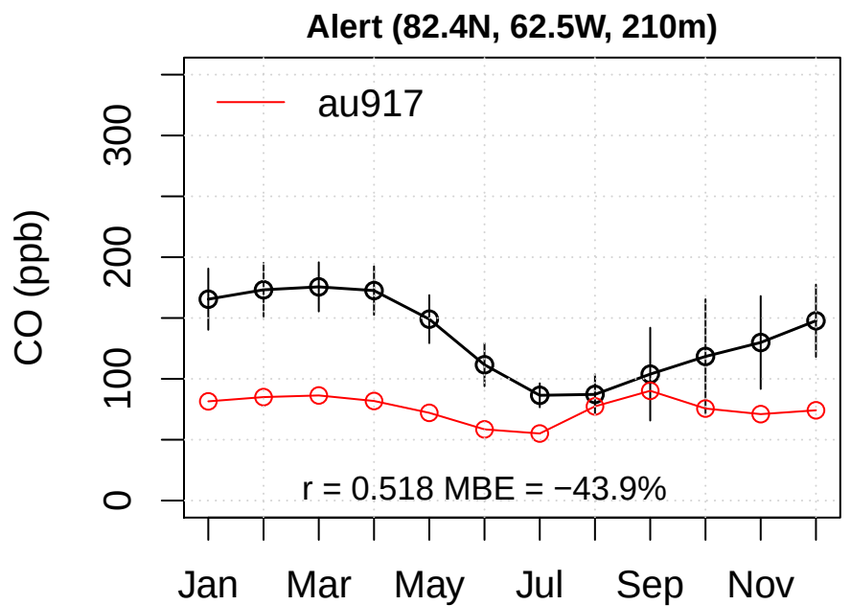

Easter Island (27.1S, 109.4W, 50m)
CO (ppb)
0
50
100
150
r = 0.885 MBE = 0.139%
Jan
Mar
May
Jul
Sep
Nov

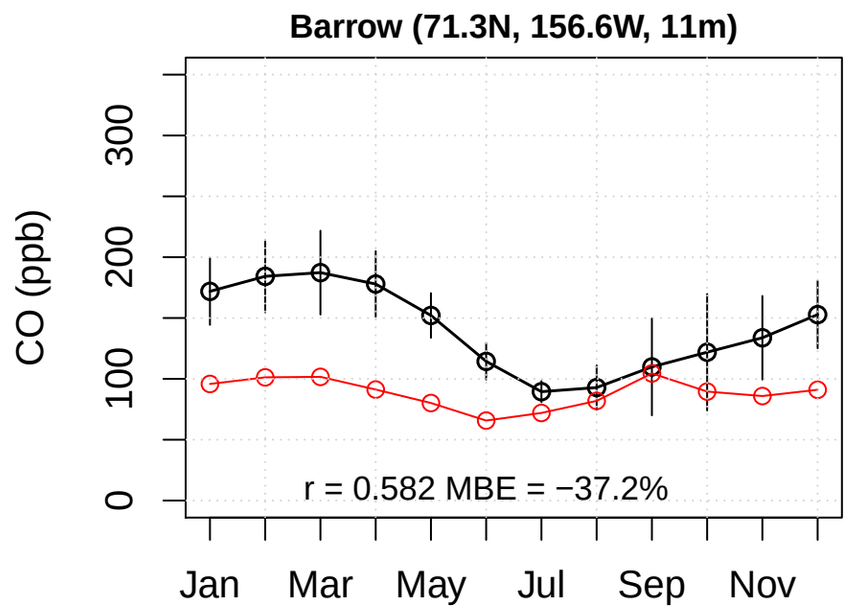

Cape Grim (40.7S, 144.7E, 94m)
CO (ppb)
0
50
100
150
r = 0.0399 MBE = 43.4%
Jan
Mar
May
Jul
Sep
Nov

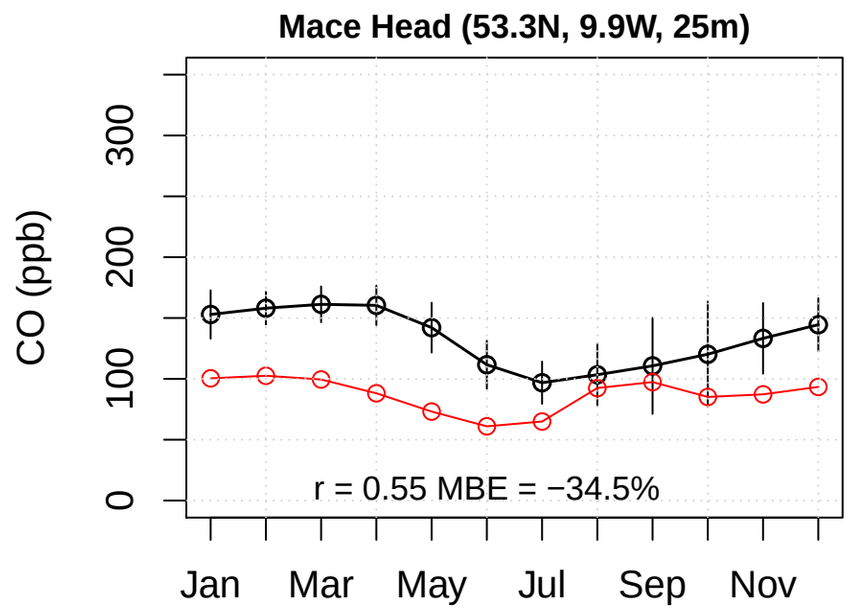

Crozet Island (46.5S, 51.8E, 120m)
CO (ppb)
0
20
40
60
80
r = 0.697 MBE = 9.24%
Jan
Mar
May
Jul
Sep
Nov

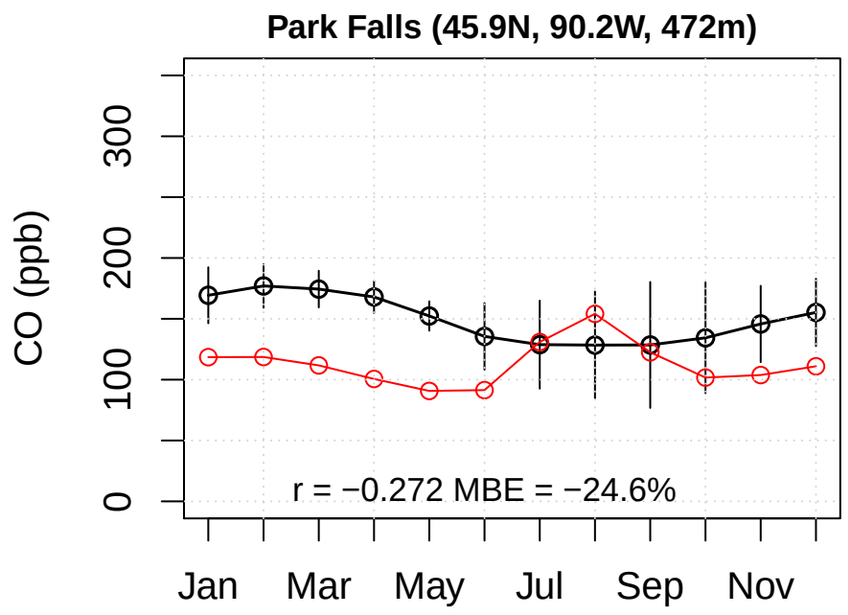

Syowa Station (69.0S, 39.6E, 11m)
CO (ppb)
0
20
40
60
80
r = 0.756 MBE = 12.8%
Jan
Mar
May
Jul
Sep
Nov

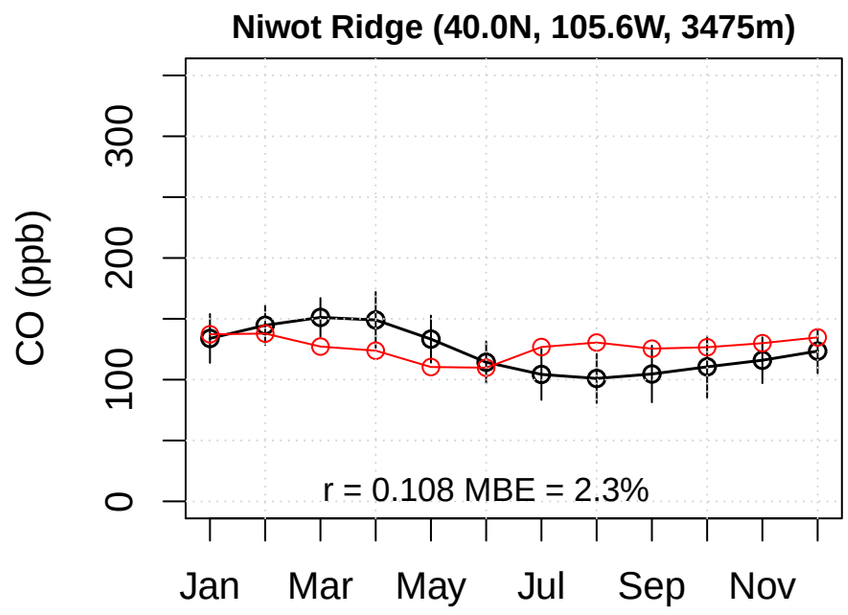

South Pole (90.0S, 24.8W, 2810m)
CO (ppb)
0
20
40
60
80
r = 0.847 MBE = 15.4%
Jan
Mar
May
Jul
Sep
Nov

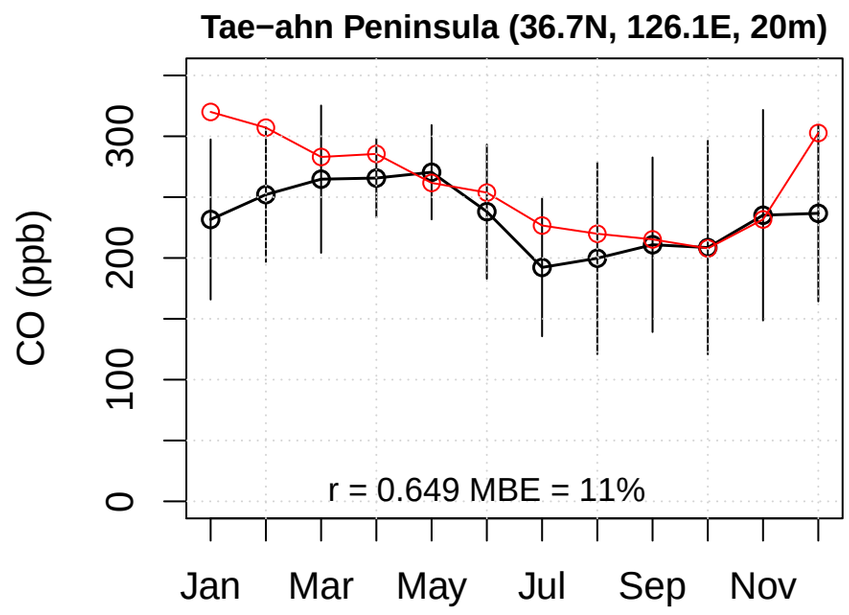

Alert (82.4N, 62.5W, 210m)
au917
CO (ppb)
0
100
200
300
r = 0.518 MBE = −43.9%
Jan
Mar
May
Jul
Sep
Nov

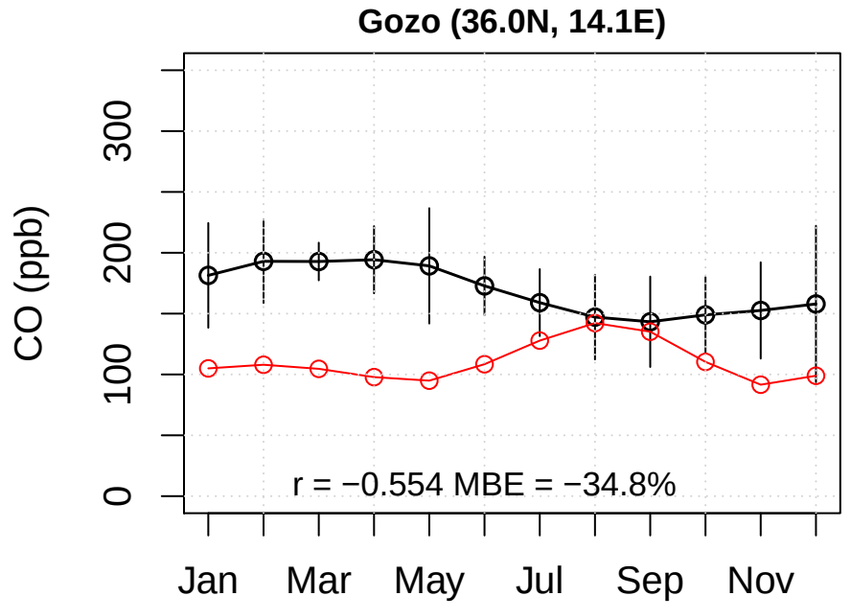

Barrow (71.3N, 156.6W, 11m)
CO (ppb)
0
100
200
300
r = 0.582 MBE = −37.2%
Jan
Mar
May
Jul
Sep
Nov

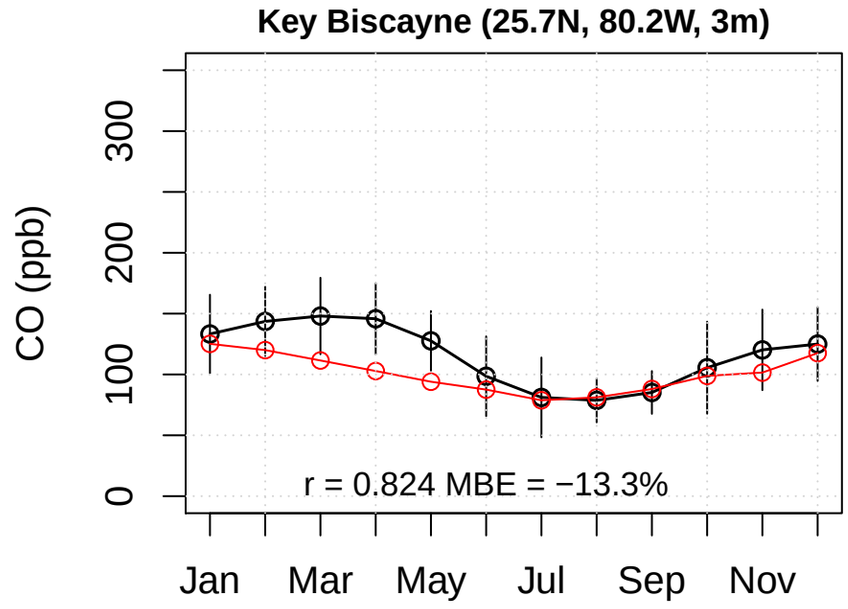

Mace Head (53.3N, 9.9W, 25m)
CO (ppb)
0
100
200
300
r = 0.55 MBE = −34.5%
Jan
Mar
May
Jul
Sep
Nov

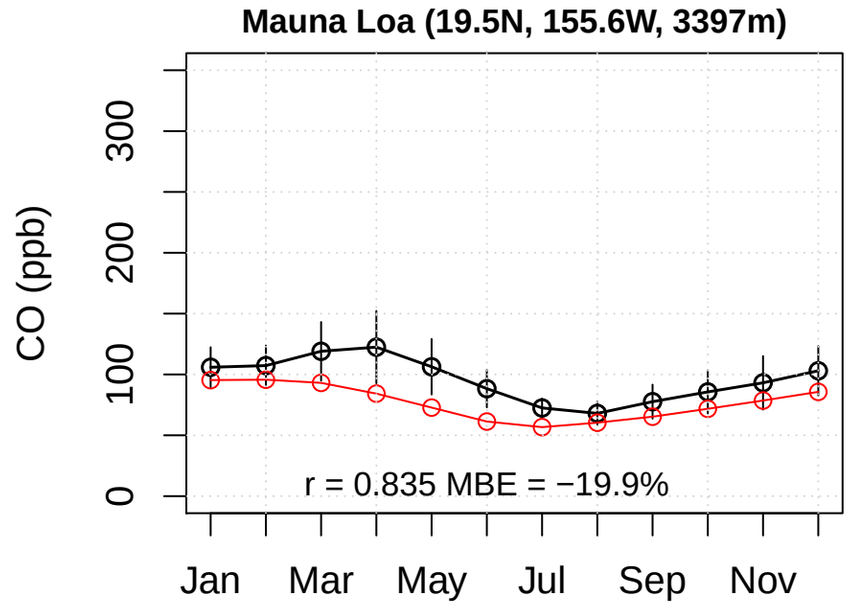

Park Falls (45.9N, 90.2W, 472m)
CO (ppb)
0
100
200
300
r = −0.272 MBE = −24.6%
Jan
Mar
May
Jul
Sep
Nov

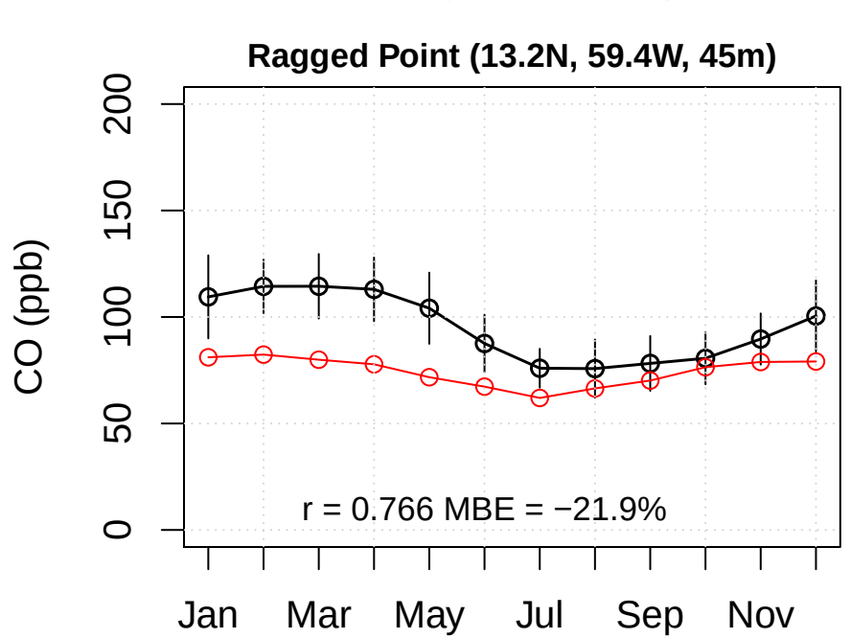

Niwot Ridge (40.0N, 105.6W, 3475m)
CO (ppb)
0
100
200
300
r = 0.108 MBE = 2.3%
Jan
Mar
May
Jul
Sep
Nov

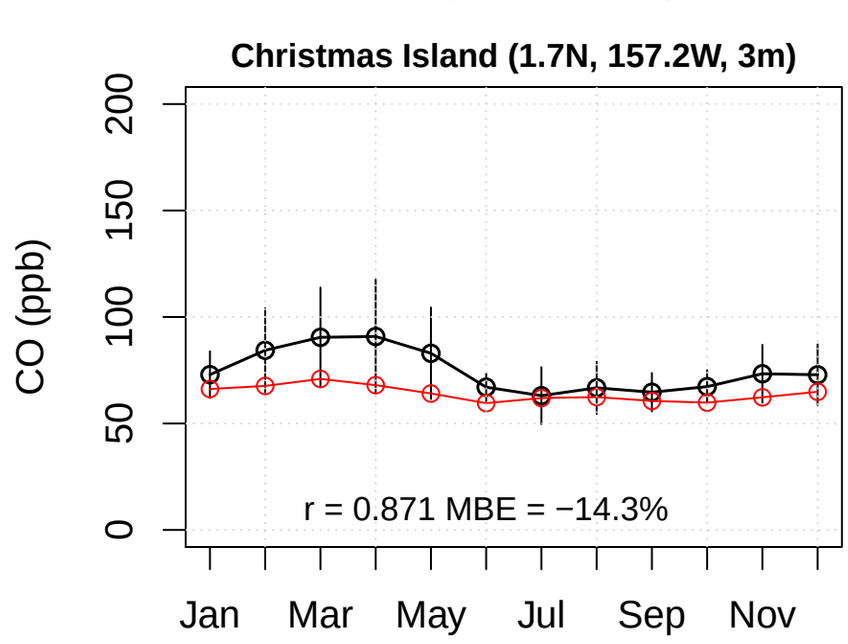

Tae−ahn Peninsula (36.7N, 126.1E, 20m)
CO (ppb)
0
100
200
300
r = 0.649 MBE = 11%
Jan
Mar
May
Jul
Sep
Nov

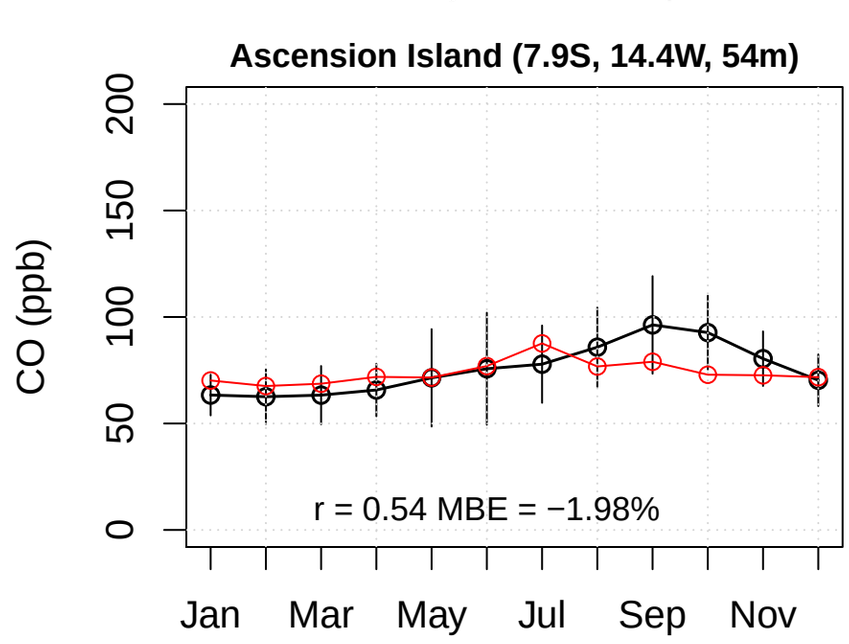

Gozo (36.0N, 14.1E)
CO (ppb)
0
100
200
300
r = −0.554 MBE = −34.8%
Jan
Mar
May
Jul
Sep
Nov

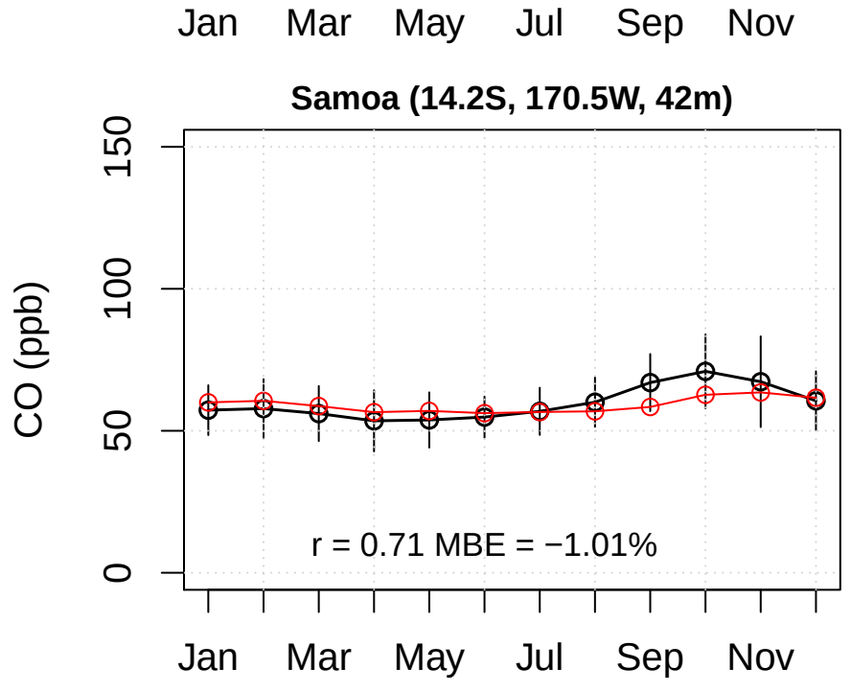

Key Biscayne (25.7N, 80.2W, 3m)
CO (ppb)
0
100
200
300
r = 0.824 MBE = −13.3%
Jan
Mar
May
Jul
Sep
Nov

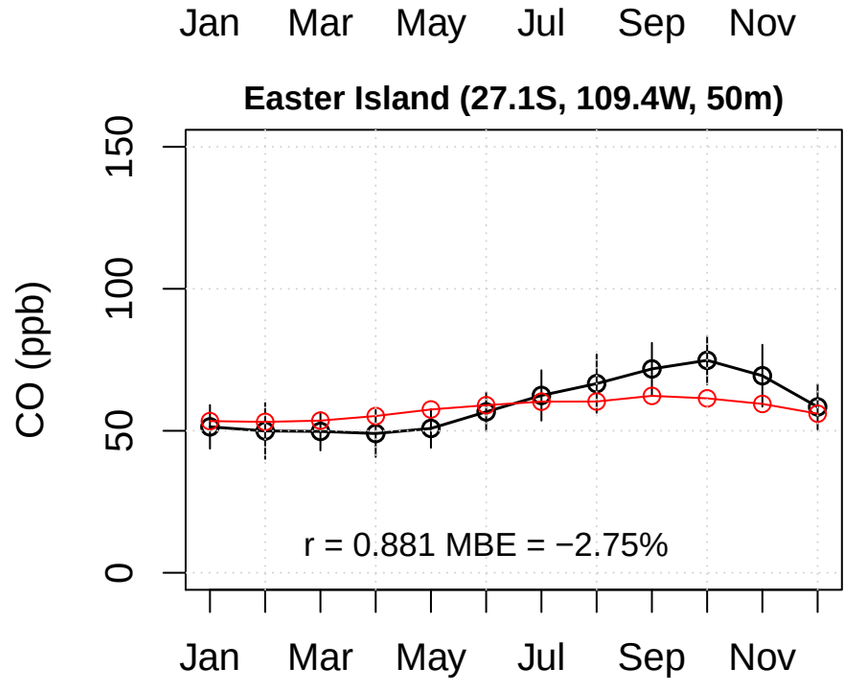

Mauna Loa (19.5N, 155.6W, 3397m)
CO (ppb)
0
100
200
300
r = 0.835 MBE = −19.9%
Jan
Mar
May
Jul
Sep
Nov

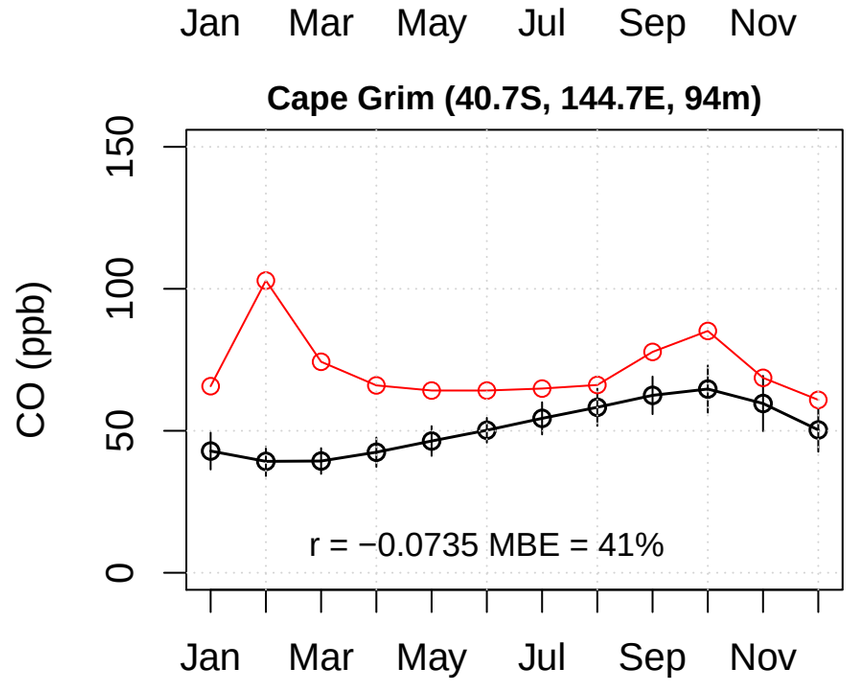

Ragged Point (13.2N, 59.4W, 45m)
CO (ppb)
0
50
100
150
200
r = 0.766 MBE = −21.9%
Jan
Mar
May
Jul
Sep
Nov

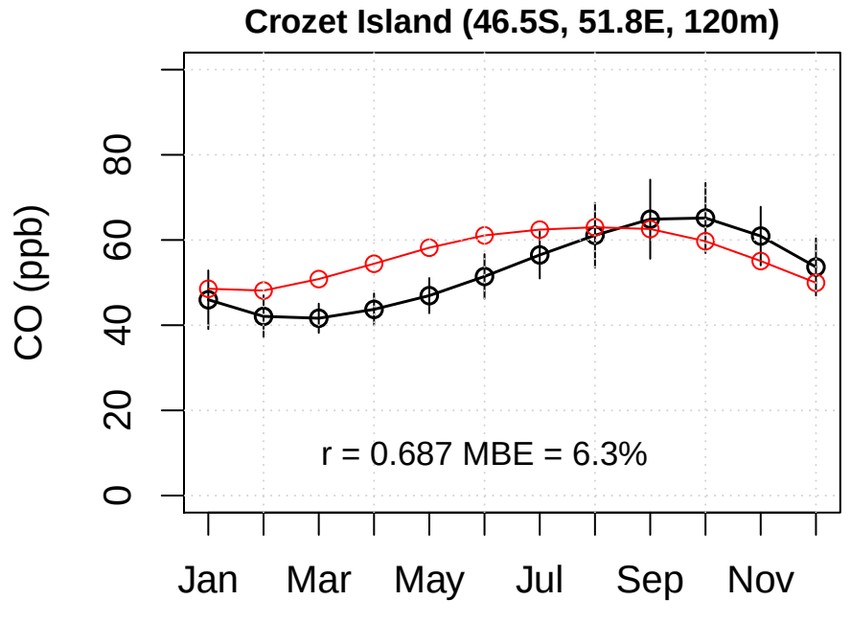

Christmas Island (1.7N, 157.2W, 3m)
CO (ppb)
0
50
100
150
200
r = 0.871 MBE = −14.3%
Jan
Mar
May
Jul
Sep
Nov

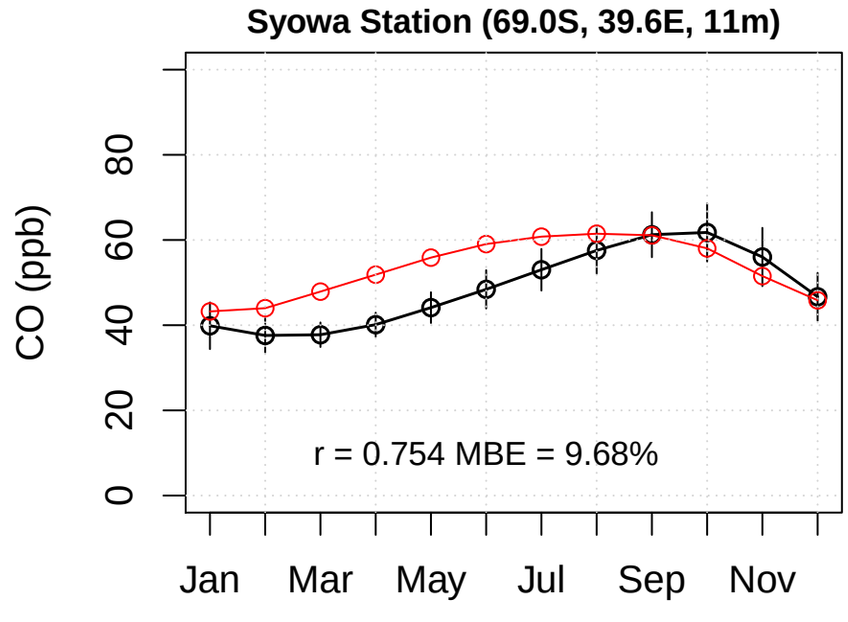

Ascension Island (7.9S, 14.4W, 54m)
CO (ppb)
0
50
100
150
200
r = 0.54 MBE = −1.98%
Jan
Mar
May
Jul
Sep
Nov

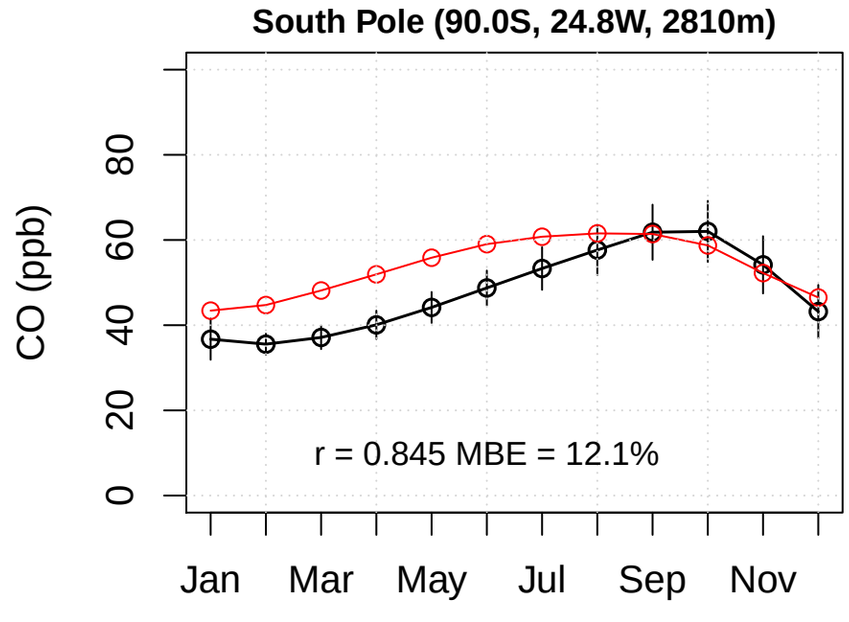

Samoa (14.2S, 170.5W, 42m)
CO (ppb)
0
50
100
150
r = 0.71 MBE = −1.01%
Jan
Mar
May
Jul
Sep
Nov

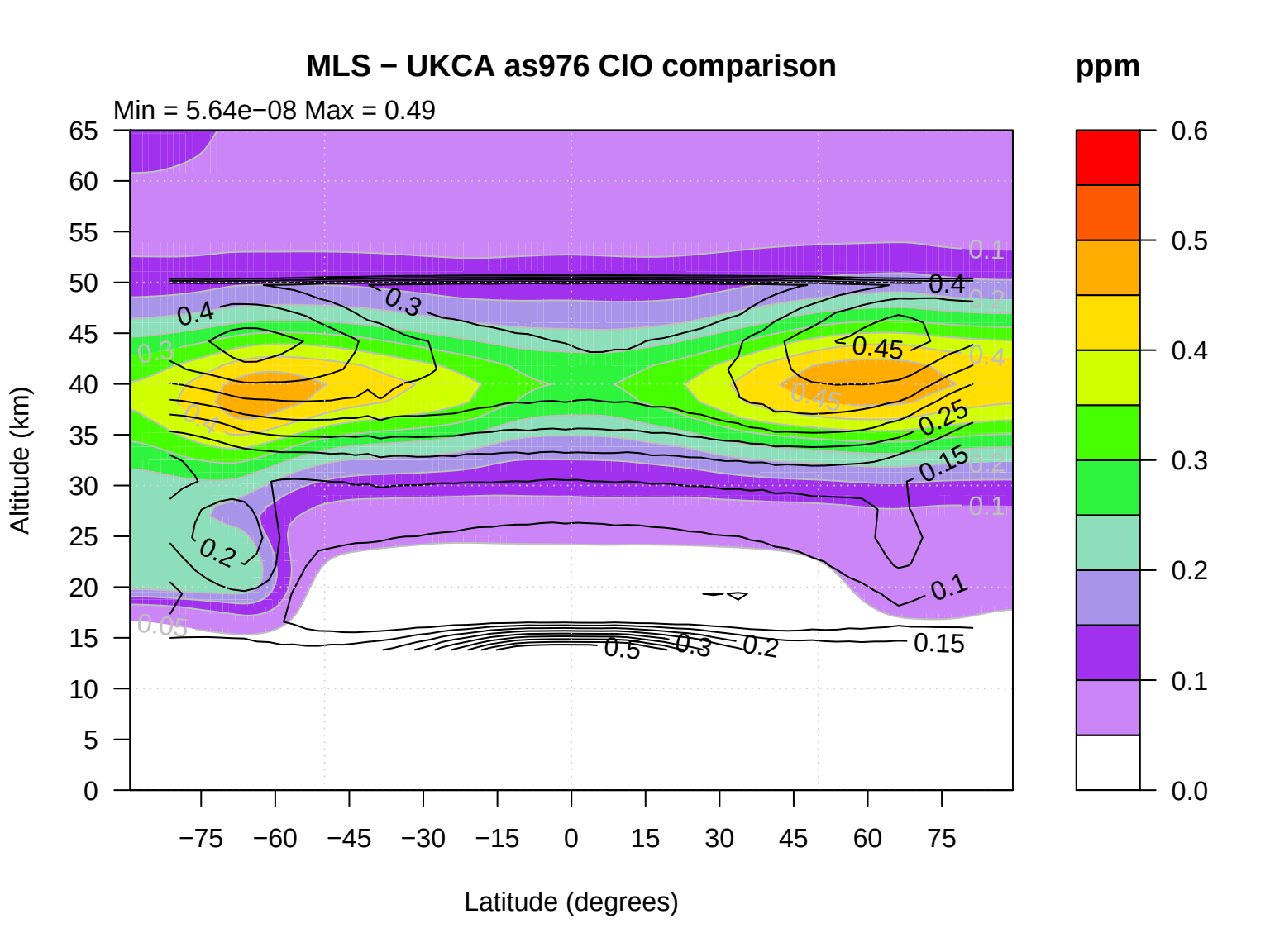

Easter Island (27.1S, 109.4W, 50m)
CO (ppb)
0
50
100
150
r = 0.881 MBE = −2.75%
Jan
Mar
May
Jul
Sep
Nov

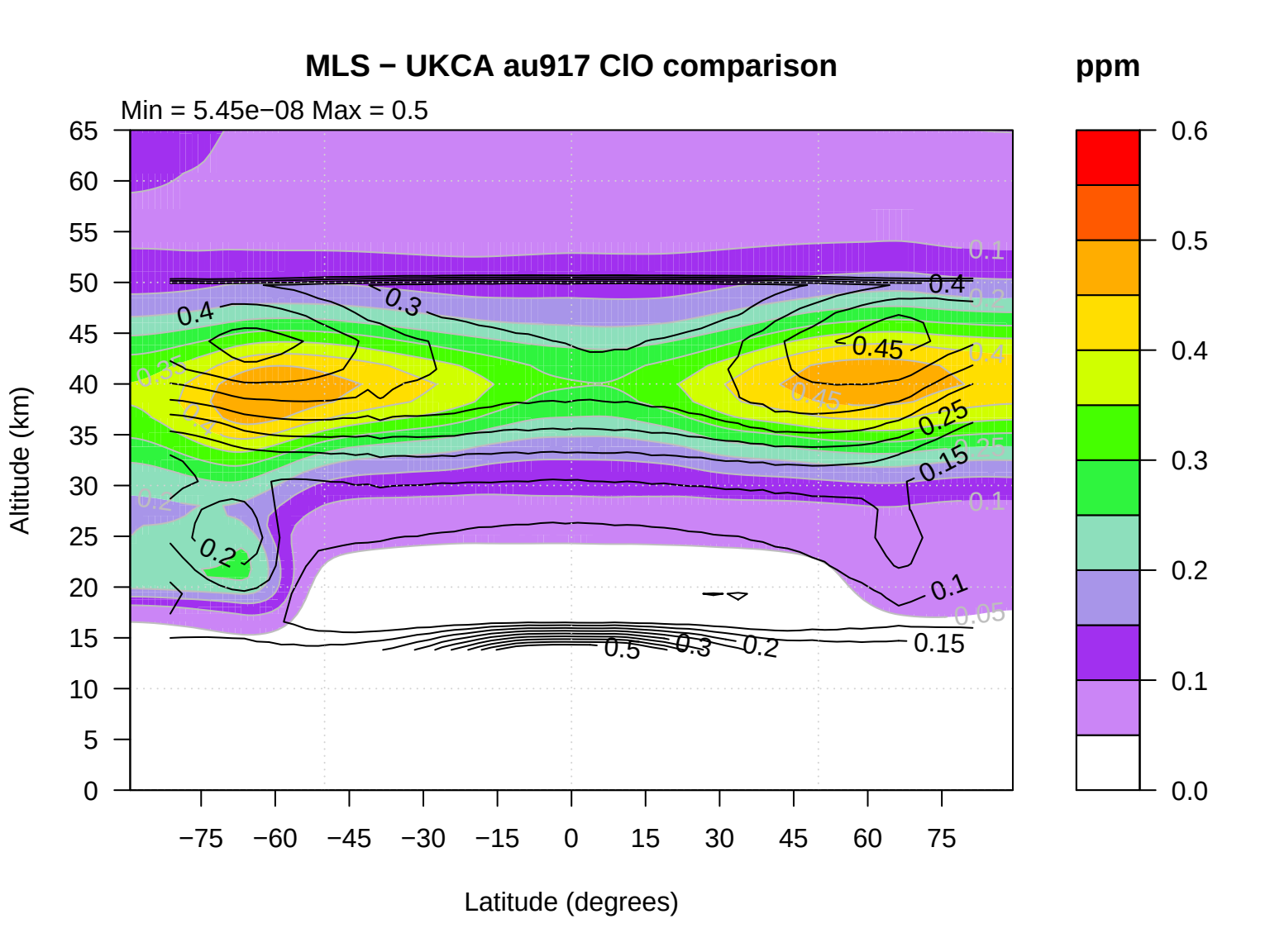

Cape Grim (40.7S, 144.7E, 94m)
CO (ppb)
0
50
100
150
r = −0.0735 MBE = 41%
Jan
Mar
May
Jul
Sep
Nov


Crozet Island (46.5S, 51.8E, 120m)
CO (ppb)
0
20
40
60
80
r = 0.687 MBE = 6.3%
Jan
Mar
May
Jul
Sep
Nov

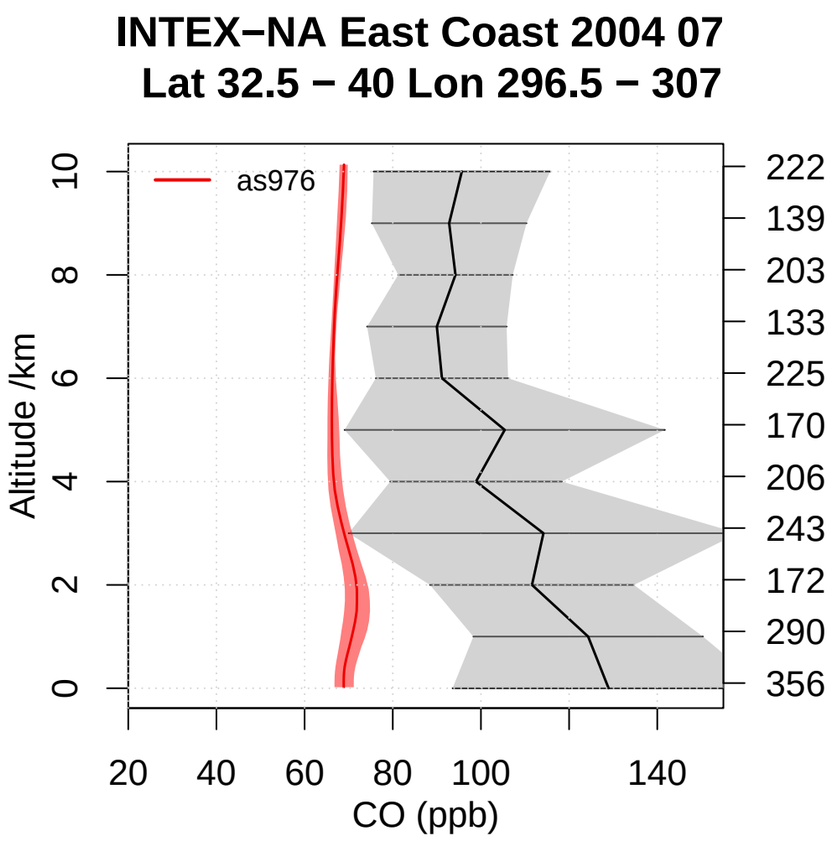

Syowa Station (69.0S, 39.6E, 11m)
CO (ppb)
0
20
40
60
80
r = 0.754 MBE = 9.68%
Jan
Mar
May
Jul
Sep
Nov

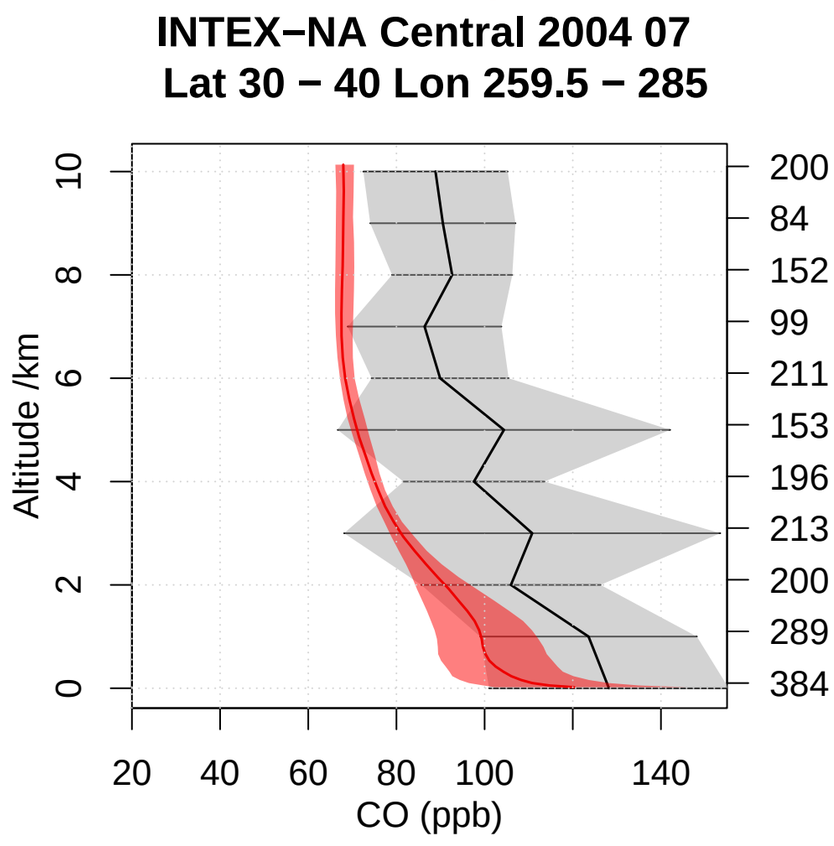

South Pole (90.0S, 24.8W, 2810m)
CO (ppb)
0
20
40
60
80
r = 0.845 MBE = 12.1%
Jan
Mar
May
Jul
Sep
Nov

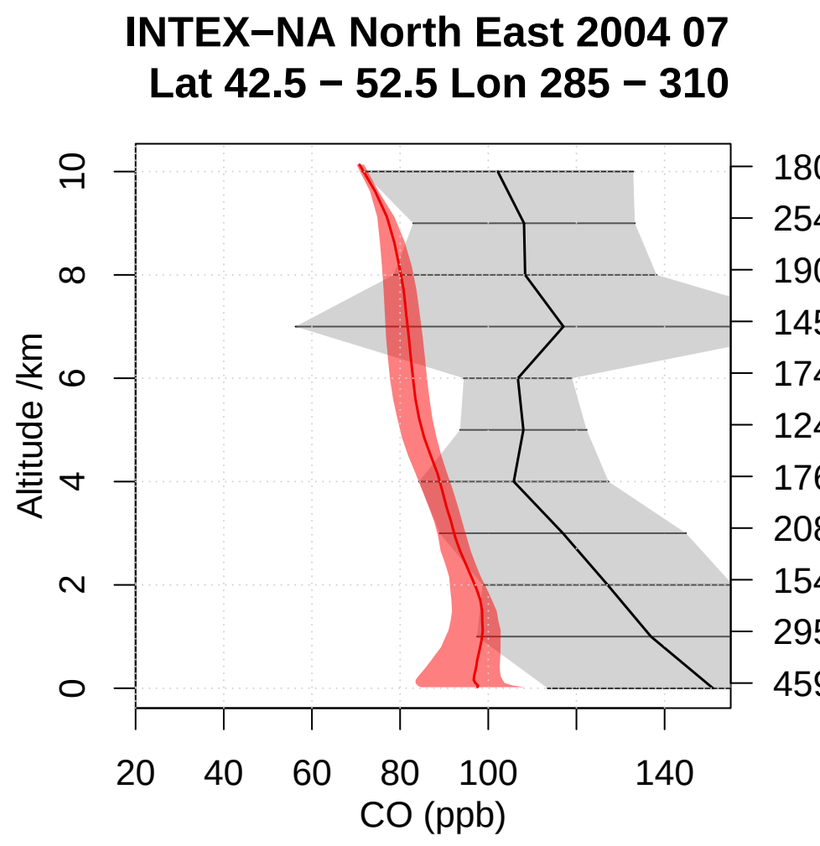

MLS − UKCA as976 ClO comparison
ppm
Min = 5.64e−08 Max = 0.49
Altitude (km)
Latitude (degrees)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
−75
−60
−45
−30
−15
0
15
30
45
60
75
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.4
0.3
0.45
0.25
0.15
0.2
0.1
0.5
0.05

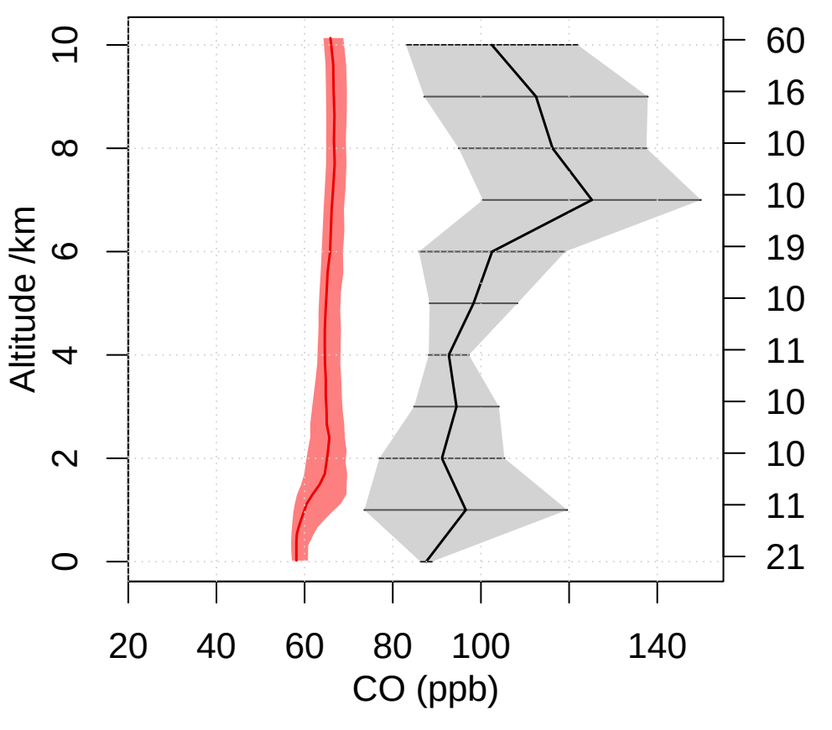

MLS − UKCA au917 ClO comparison
Min = 5.45e−08 Max = 0.5
ppm
Altitude (km)
Latitude (degrees)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
−75
−60
−45
−30
−15
0
15
30
45
60
75
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.4
0.3
0.45
0.25
0.15
0.1
0.2
0.5
0.05

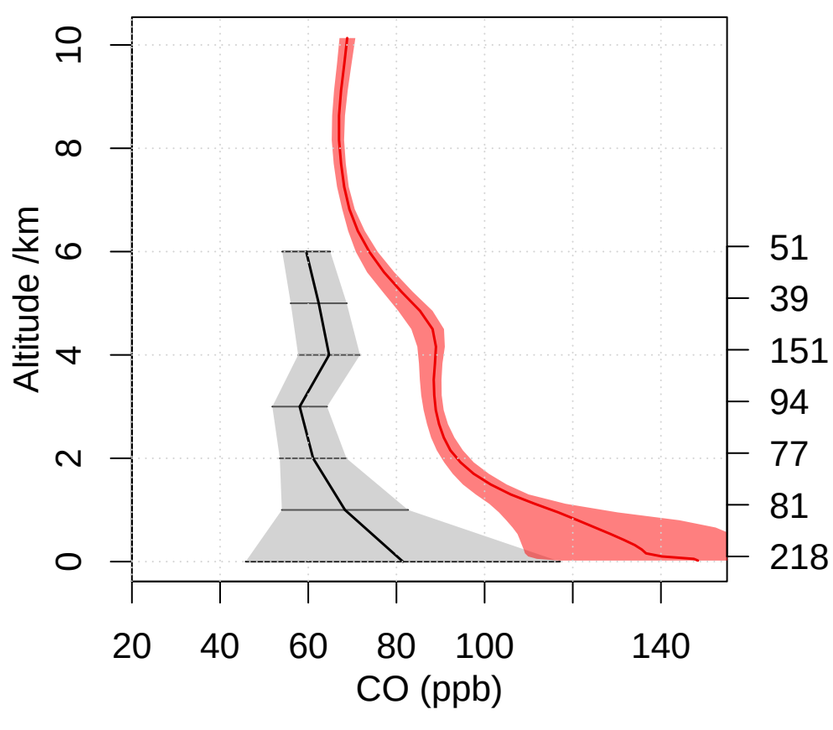
Emmons CO comparison

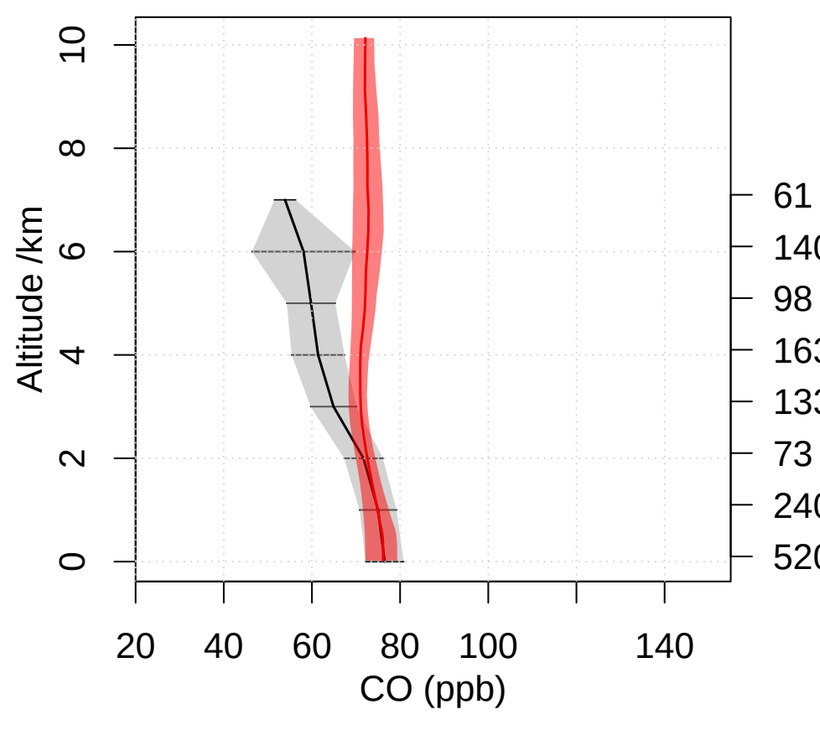


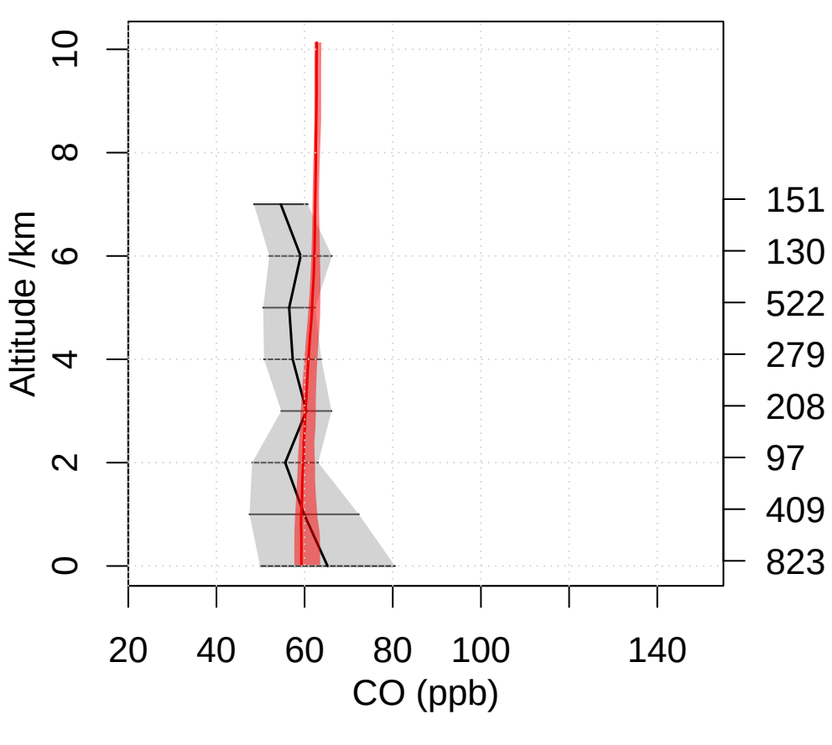


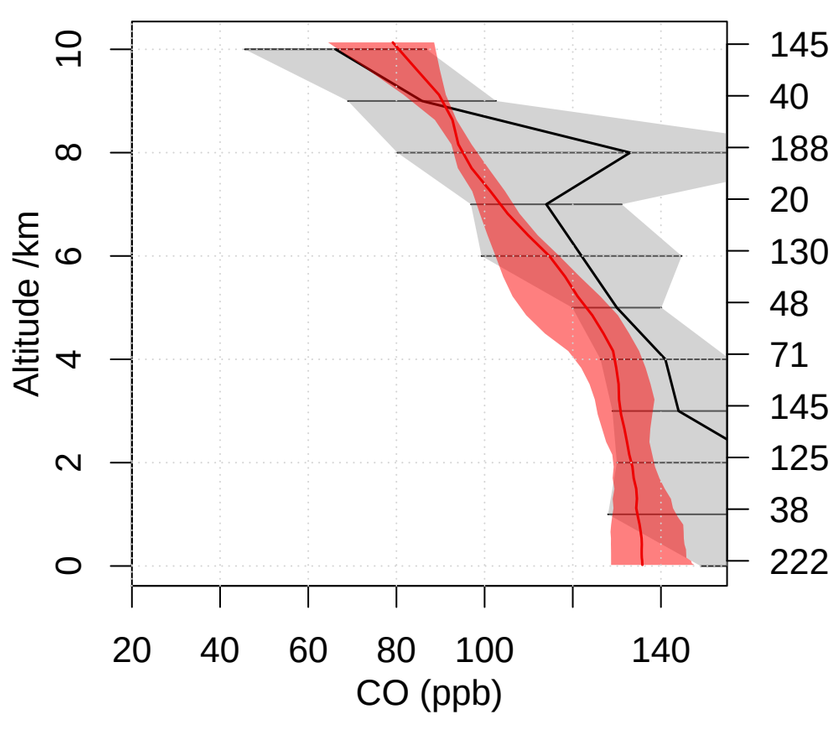


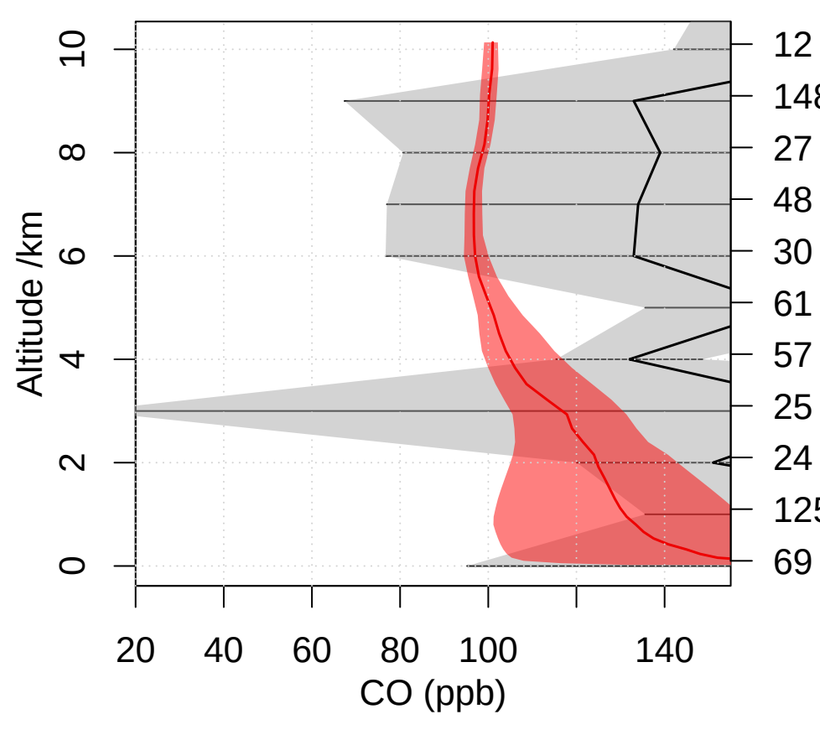


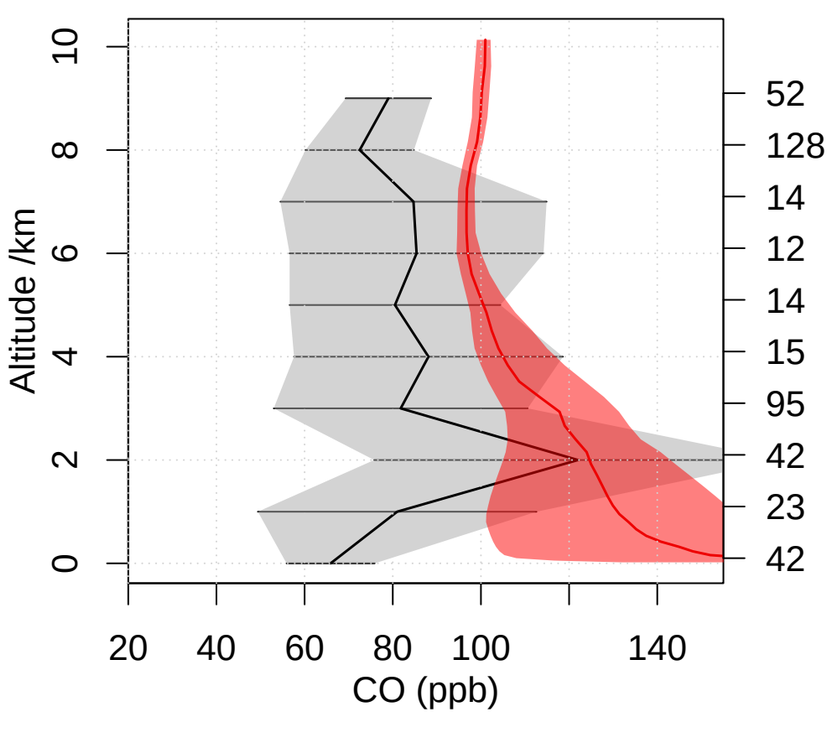


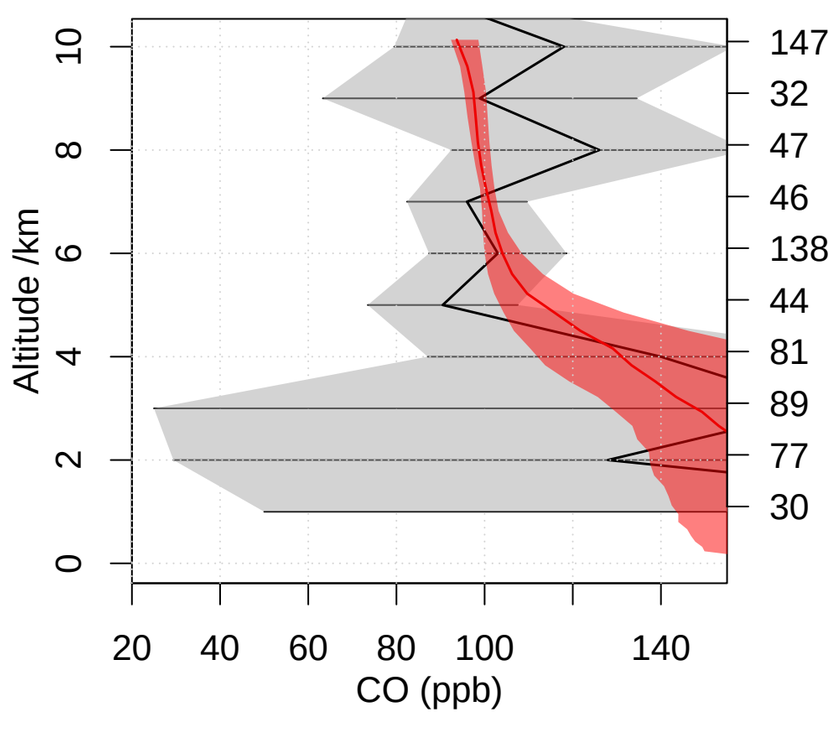


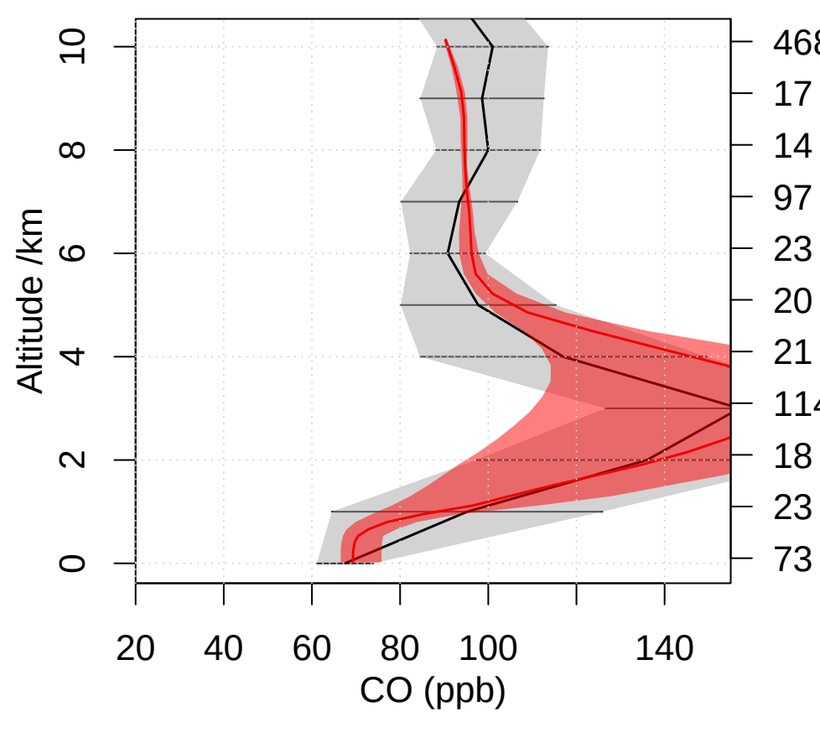




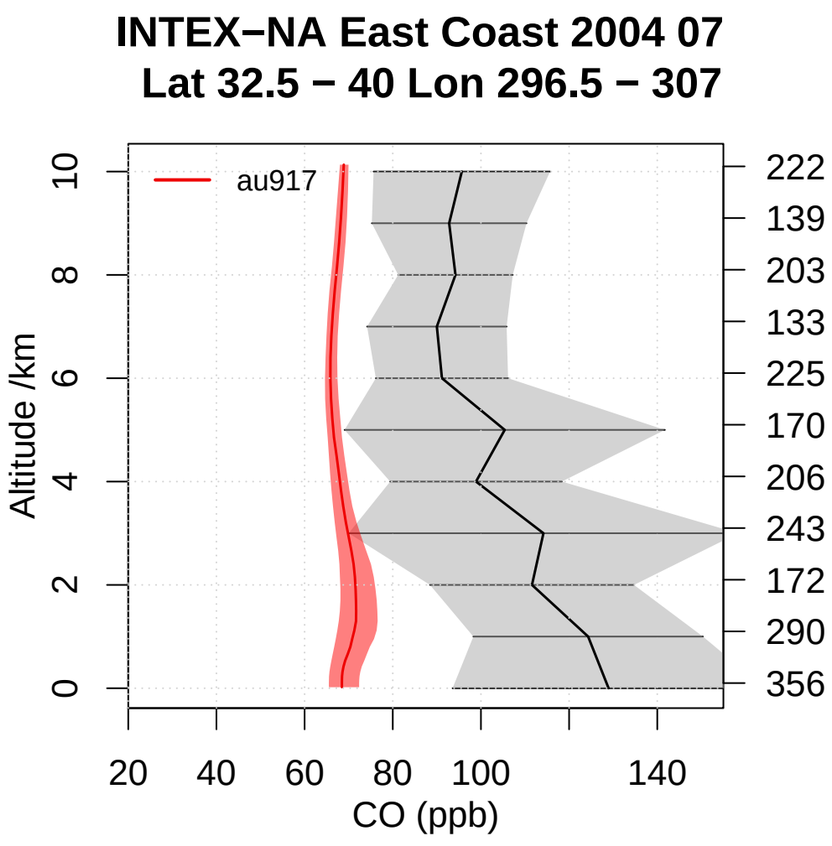


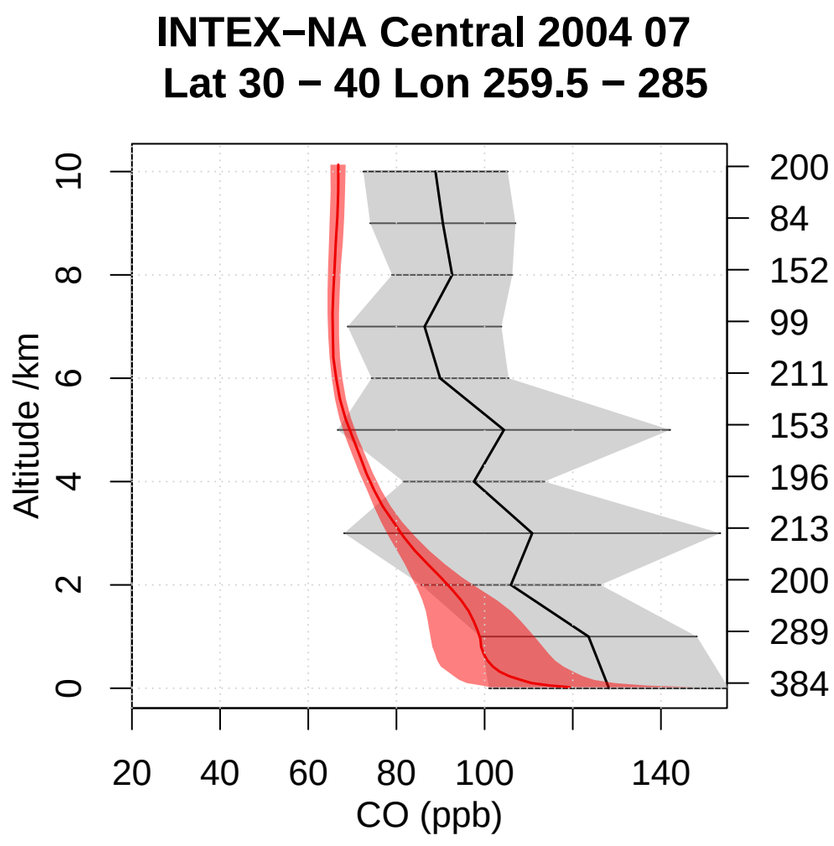


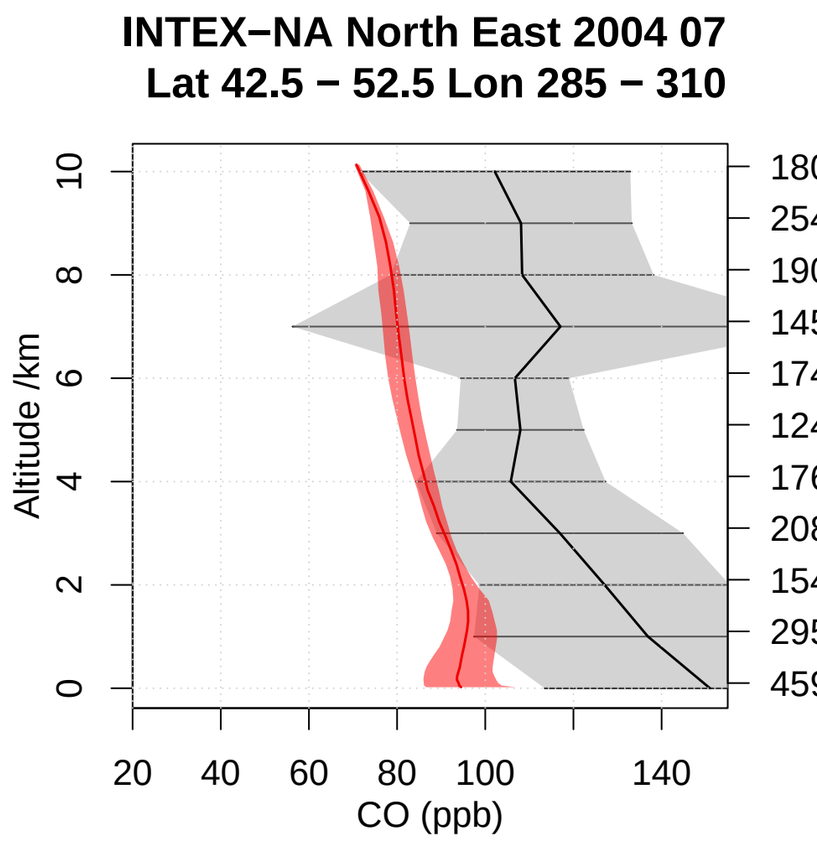


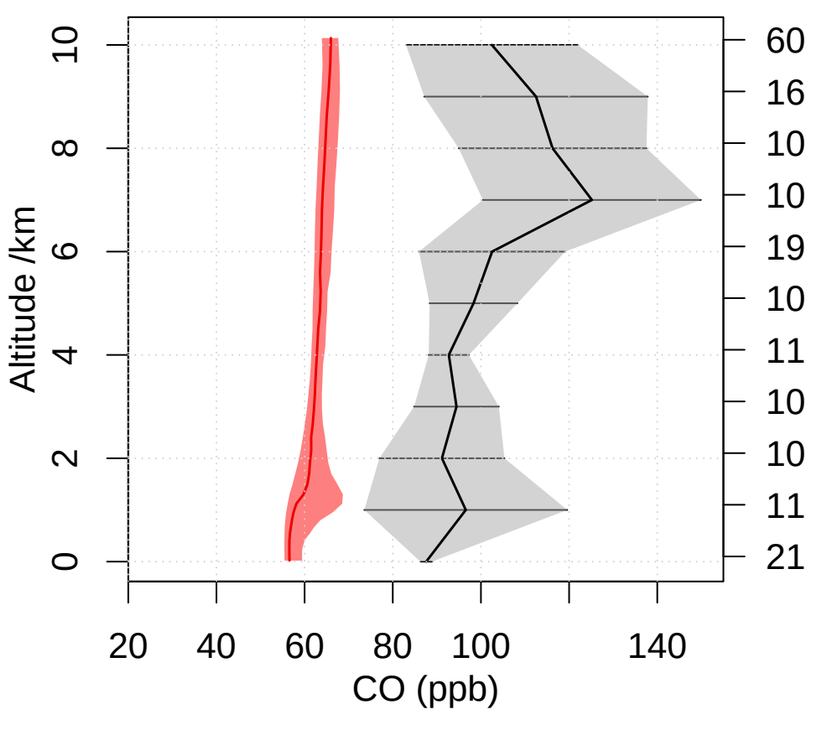


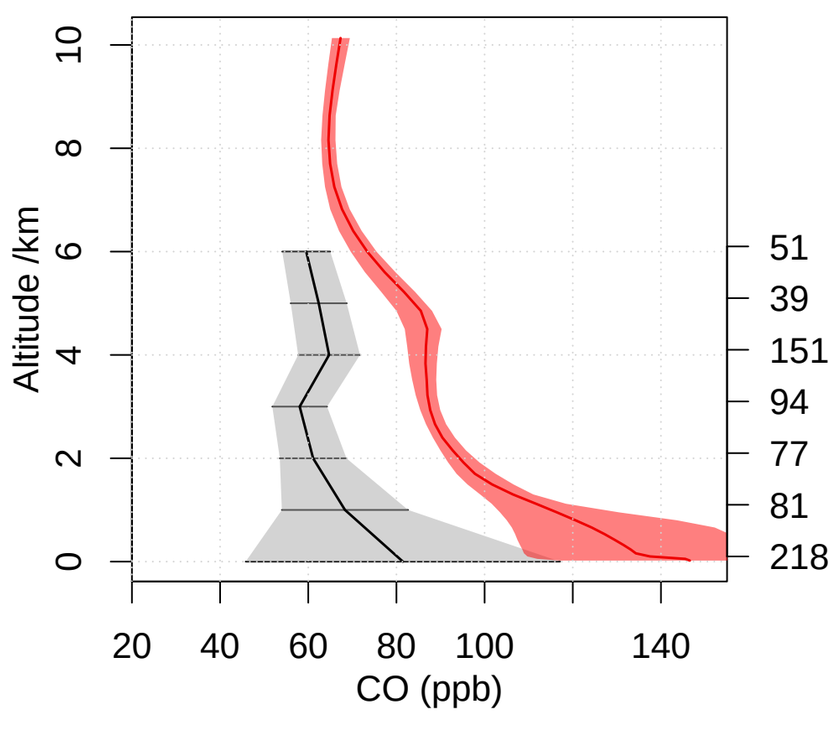
Emmons CO comparison

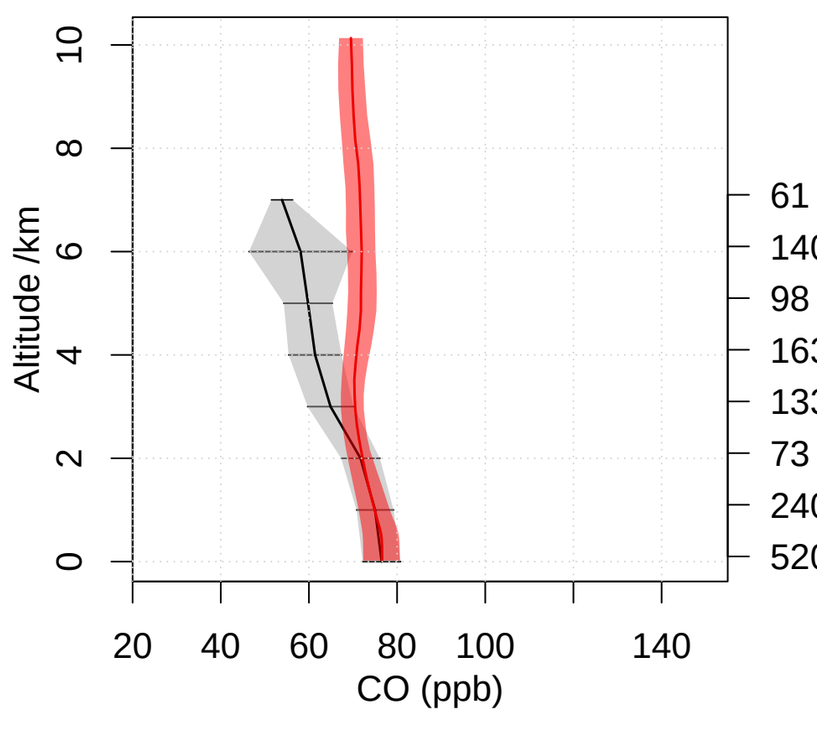


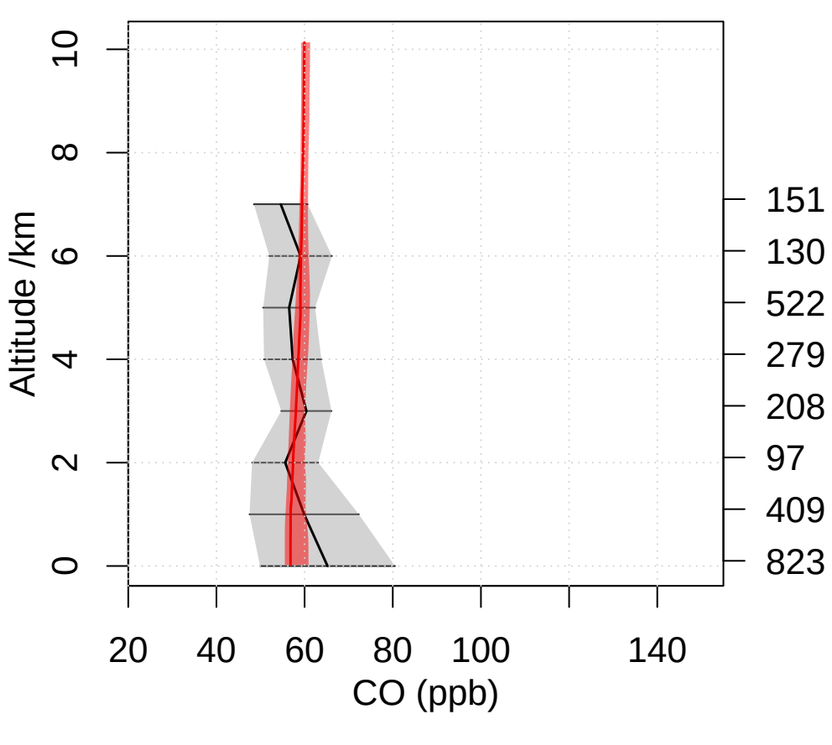


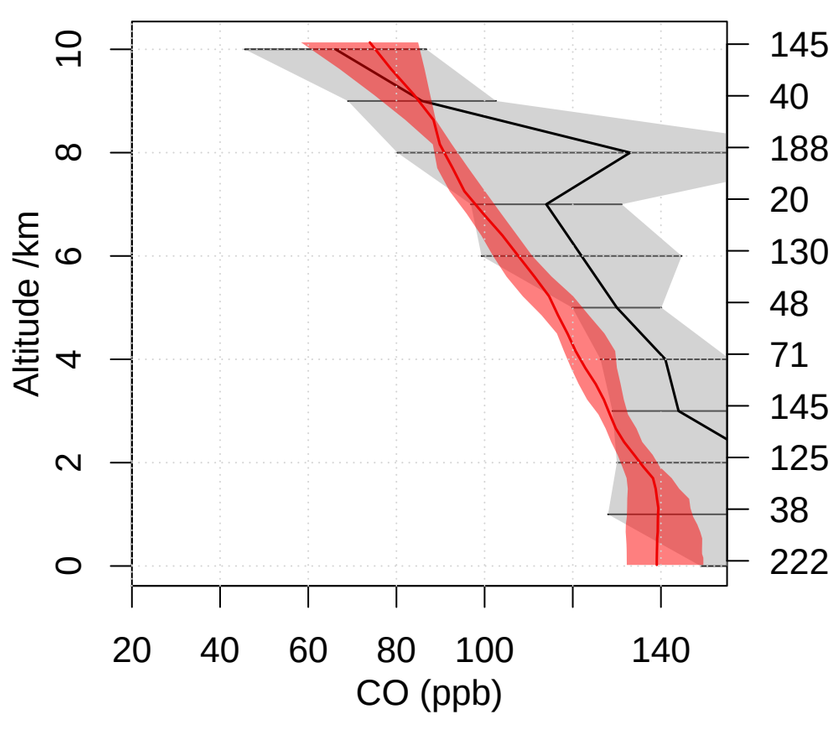


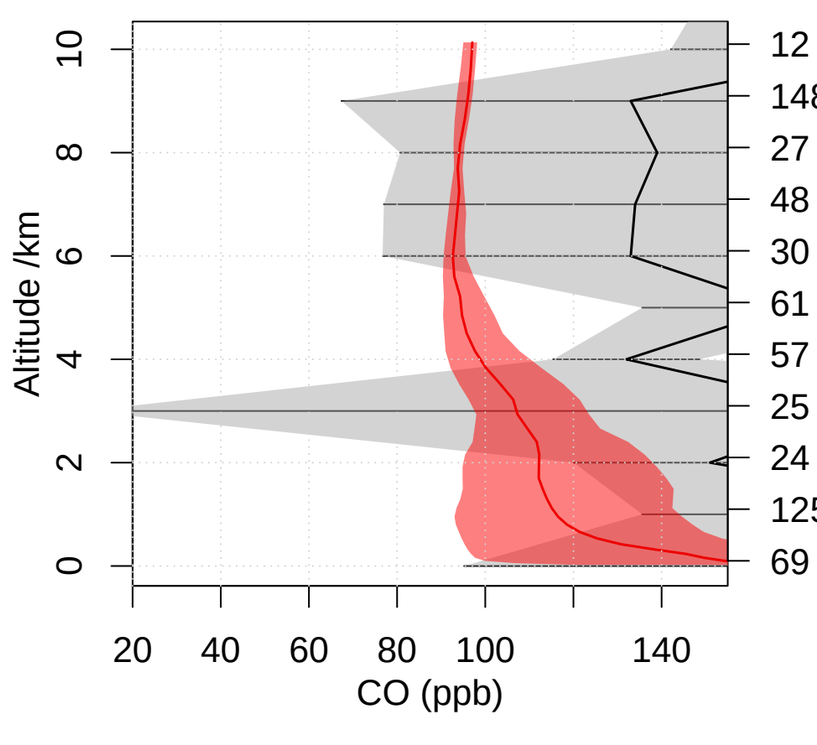


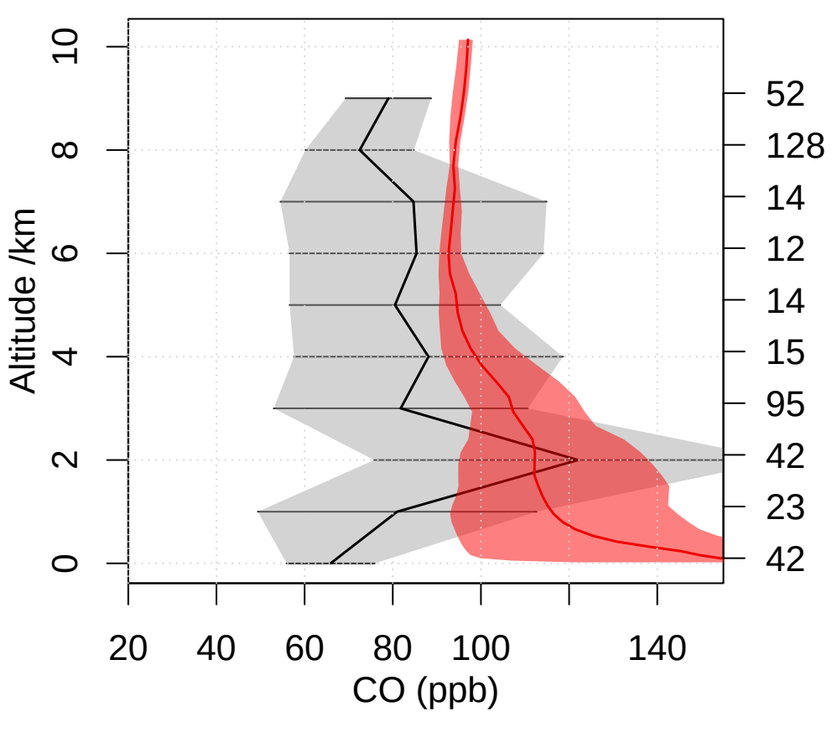


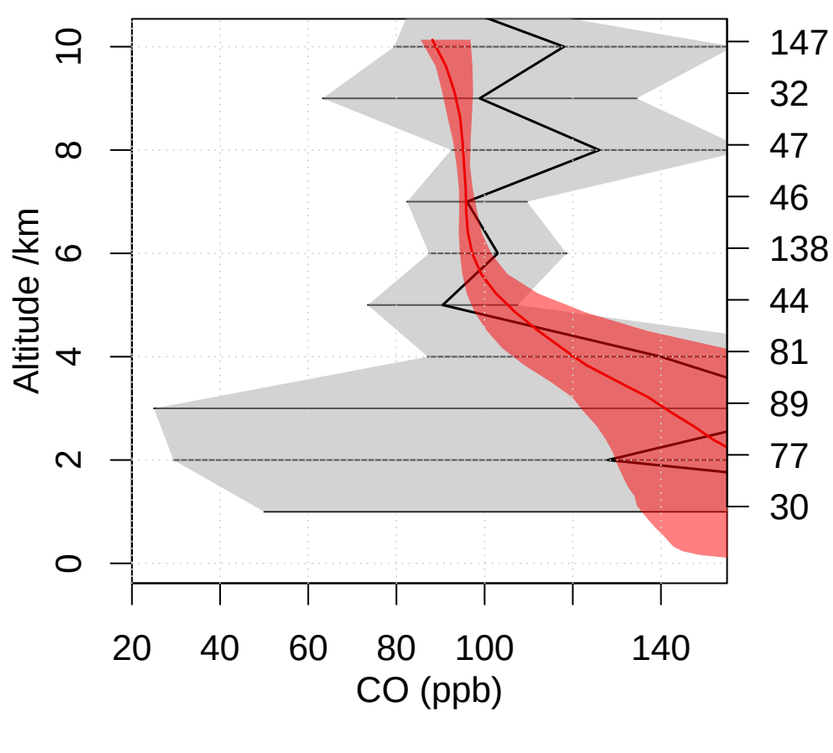


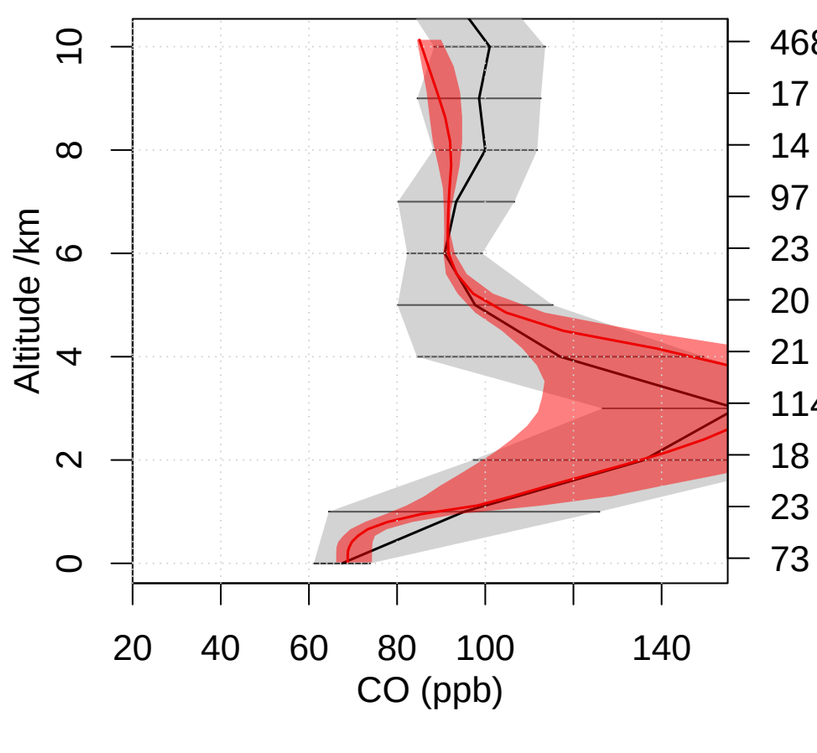




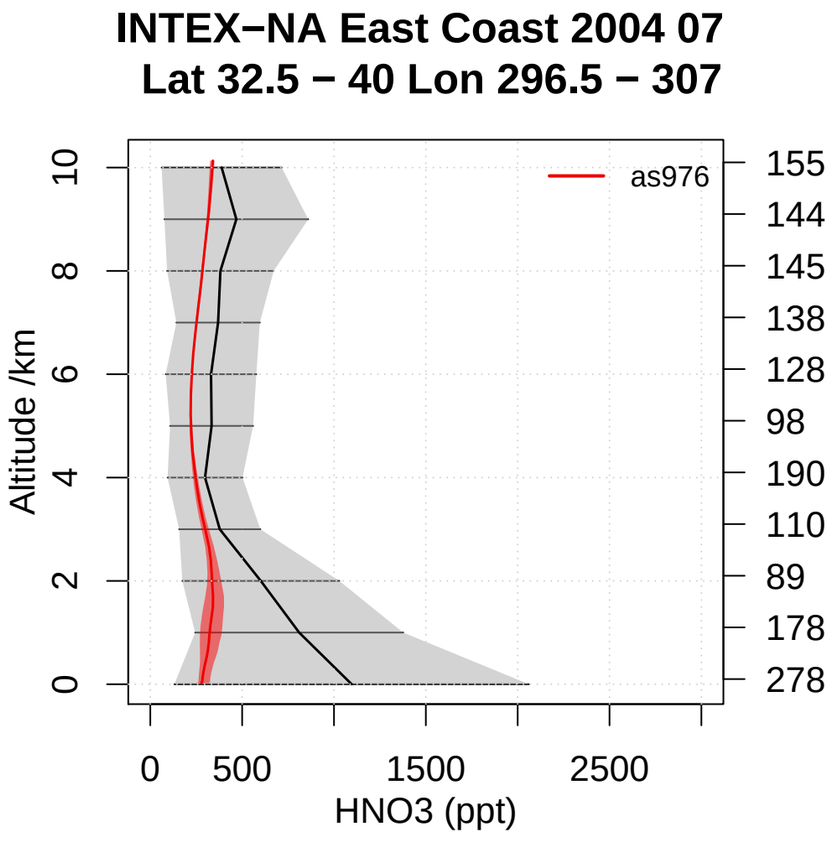


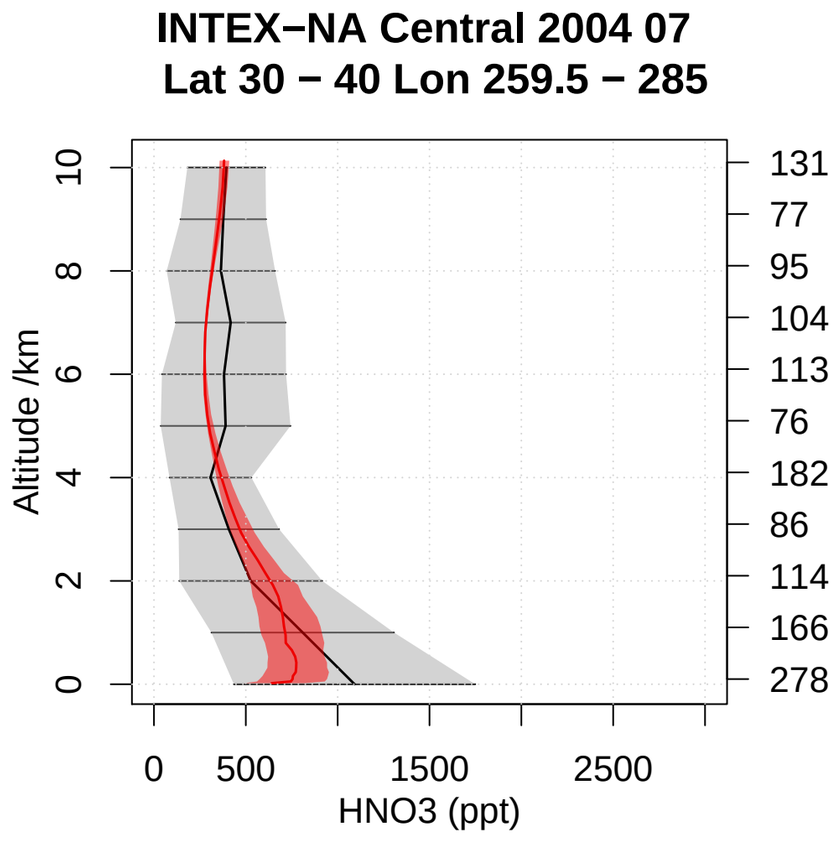


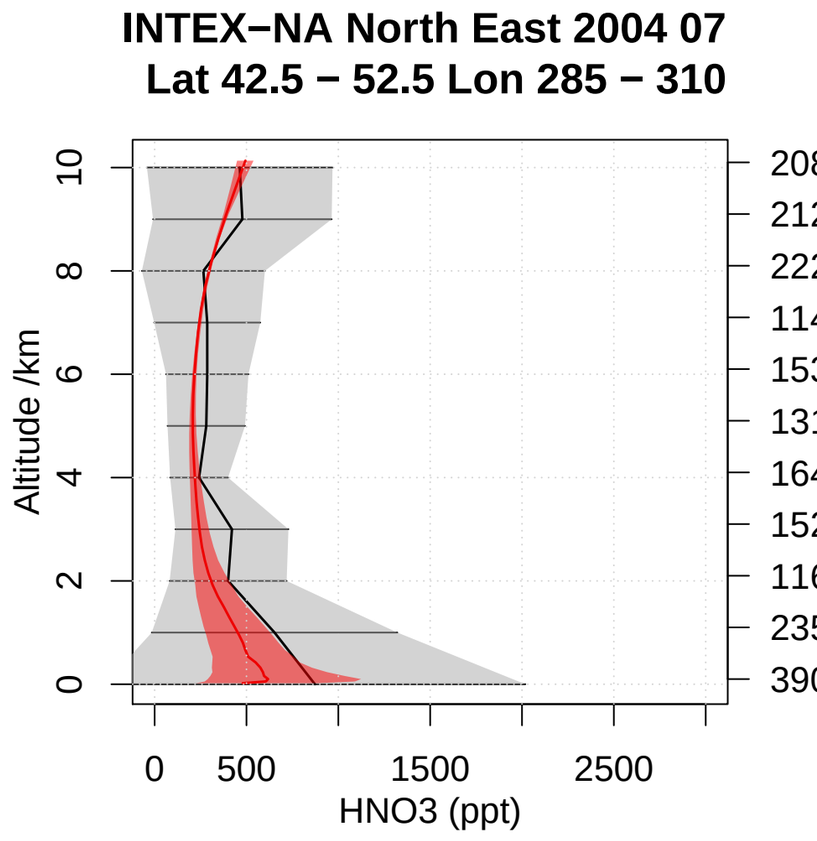


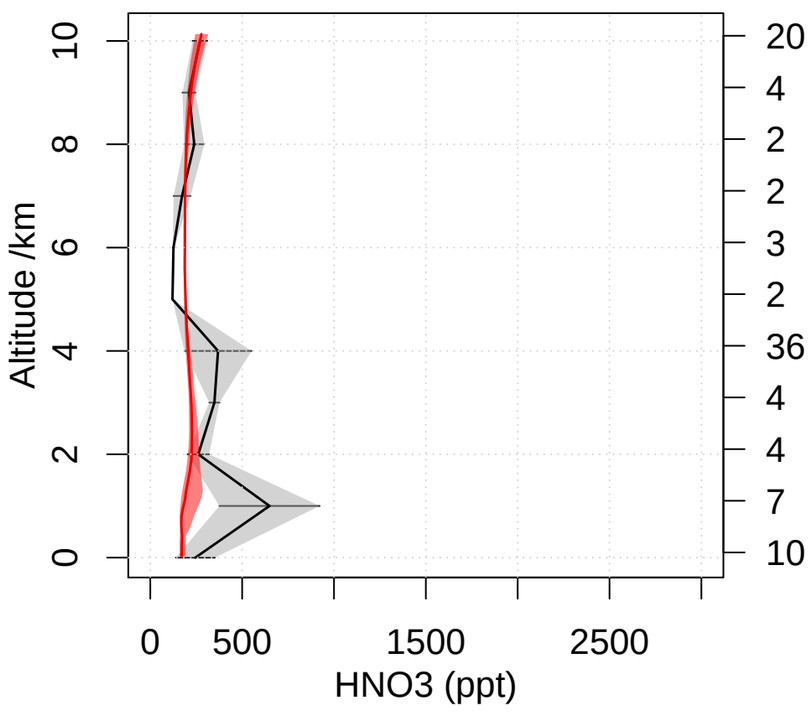


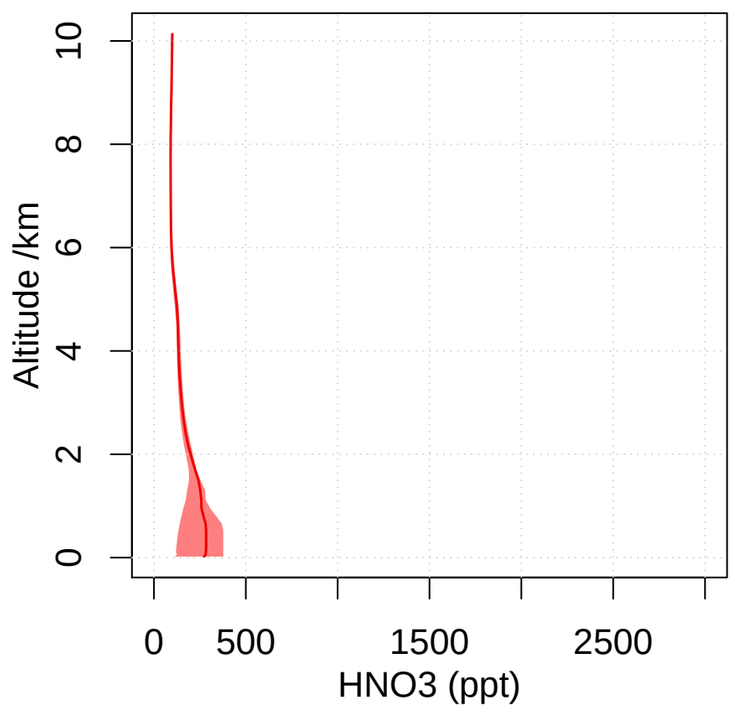
Emmons HNO3 comparison

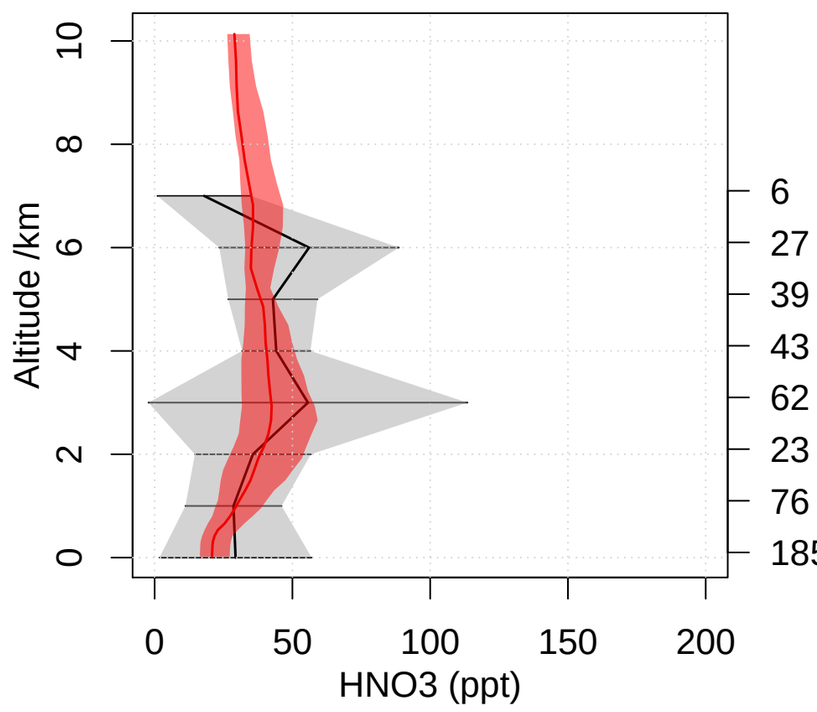


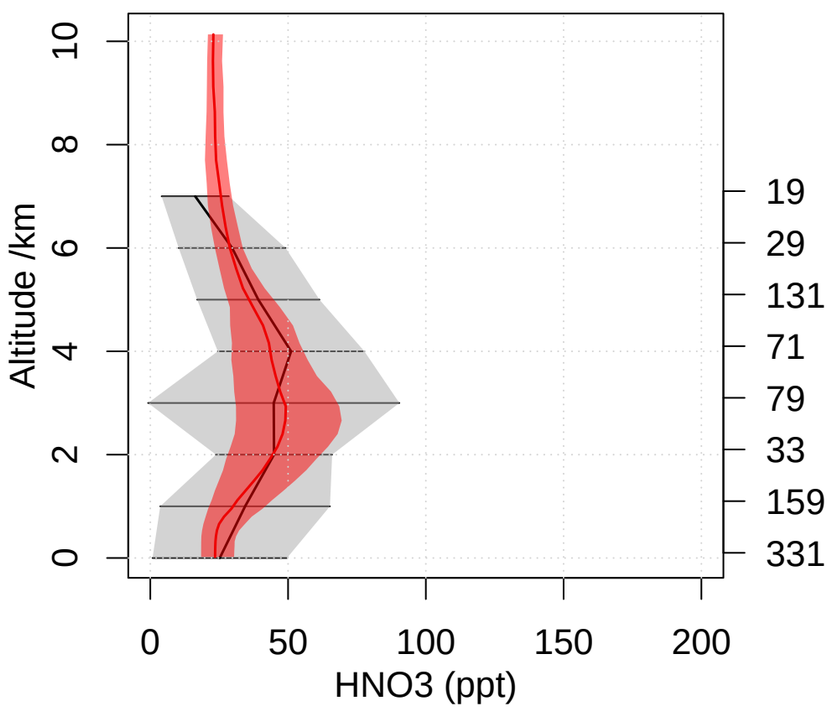


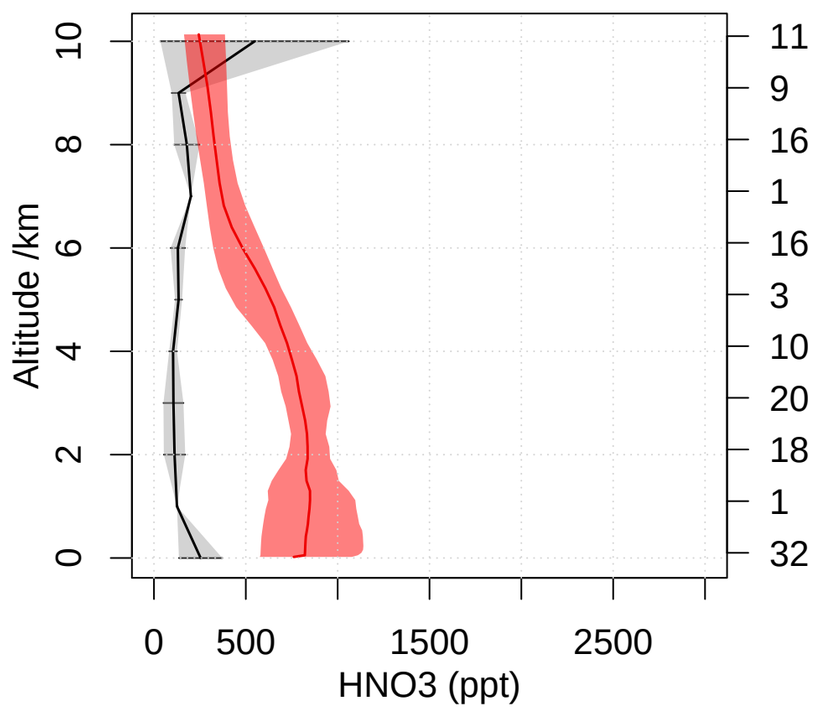


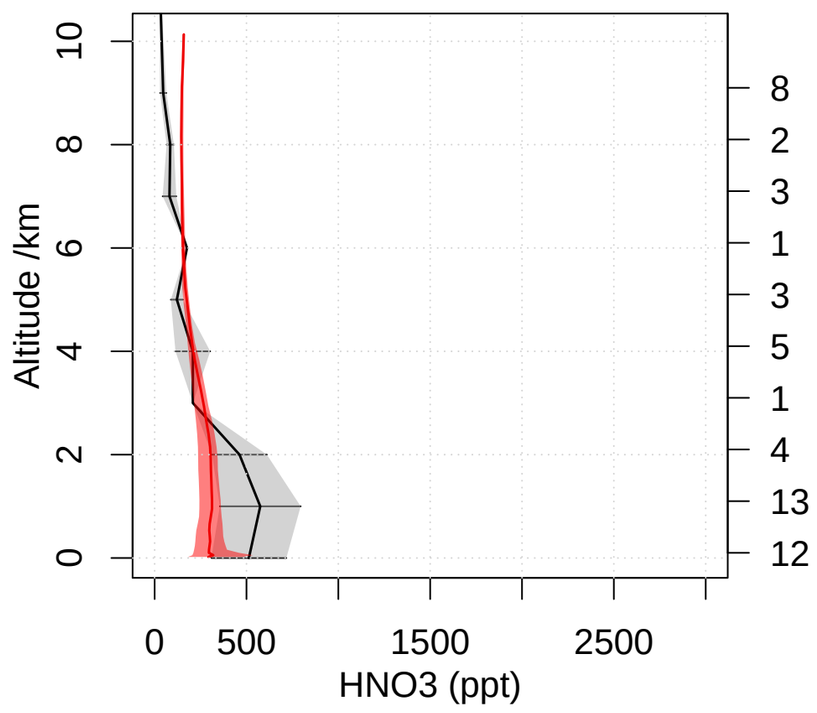


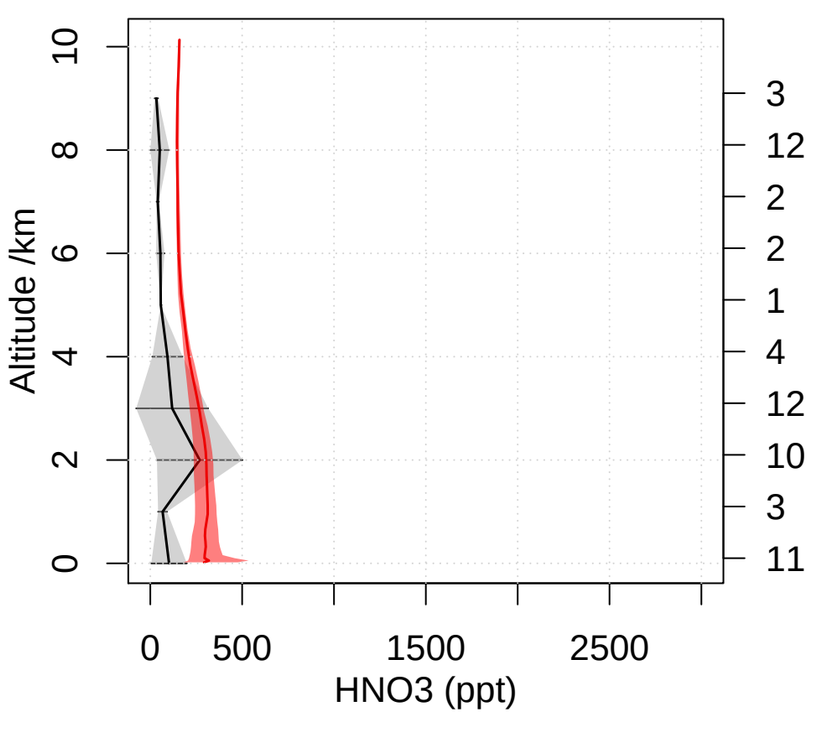


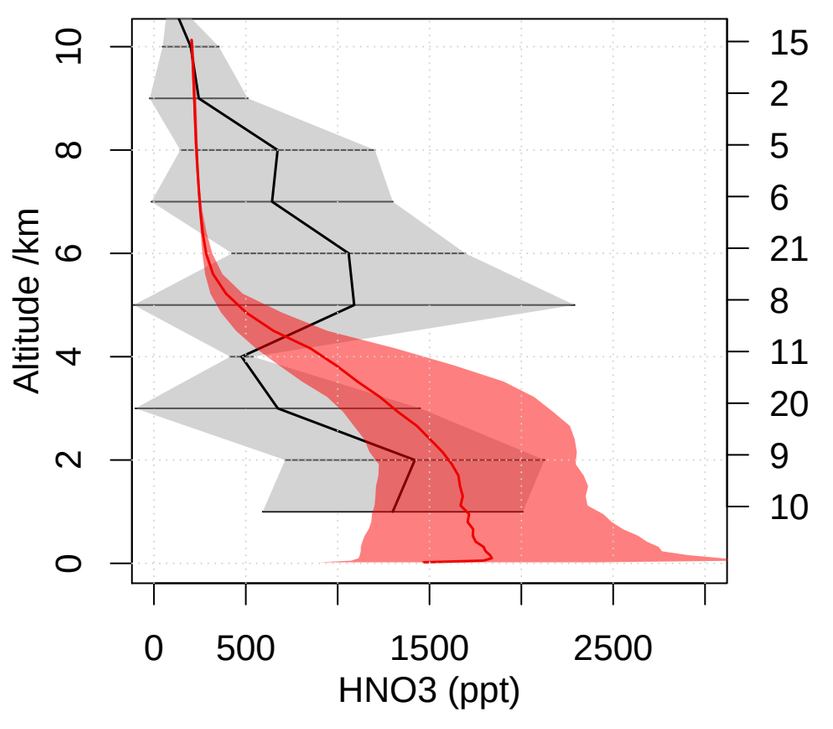


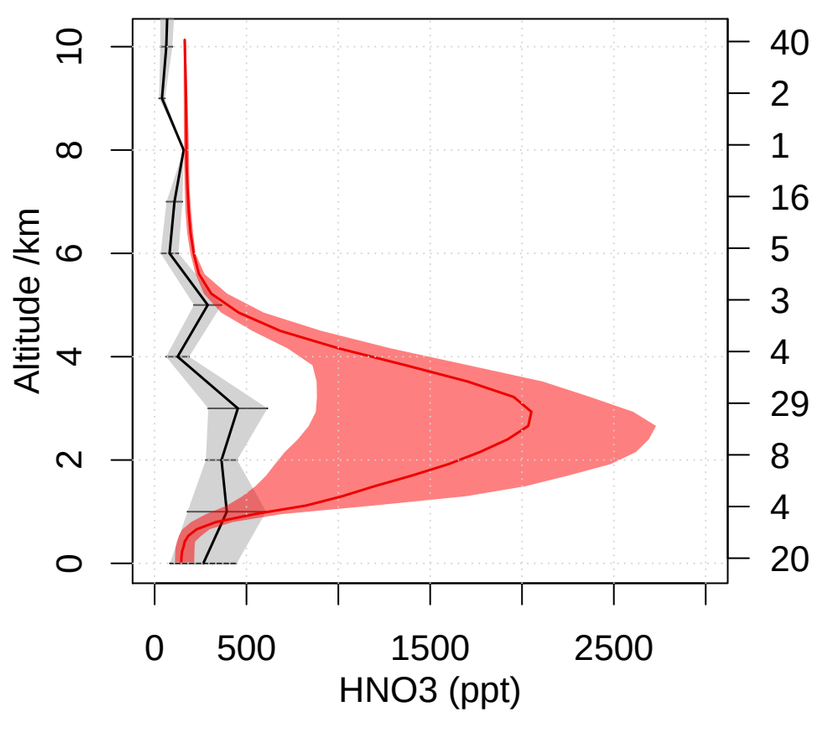




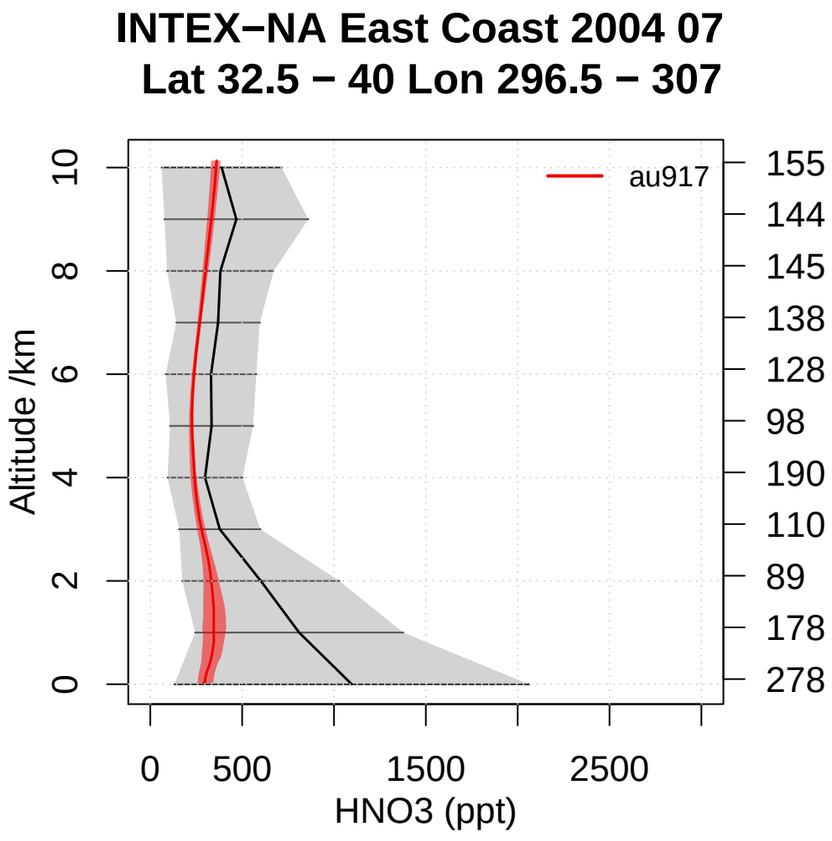


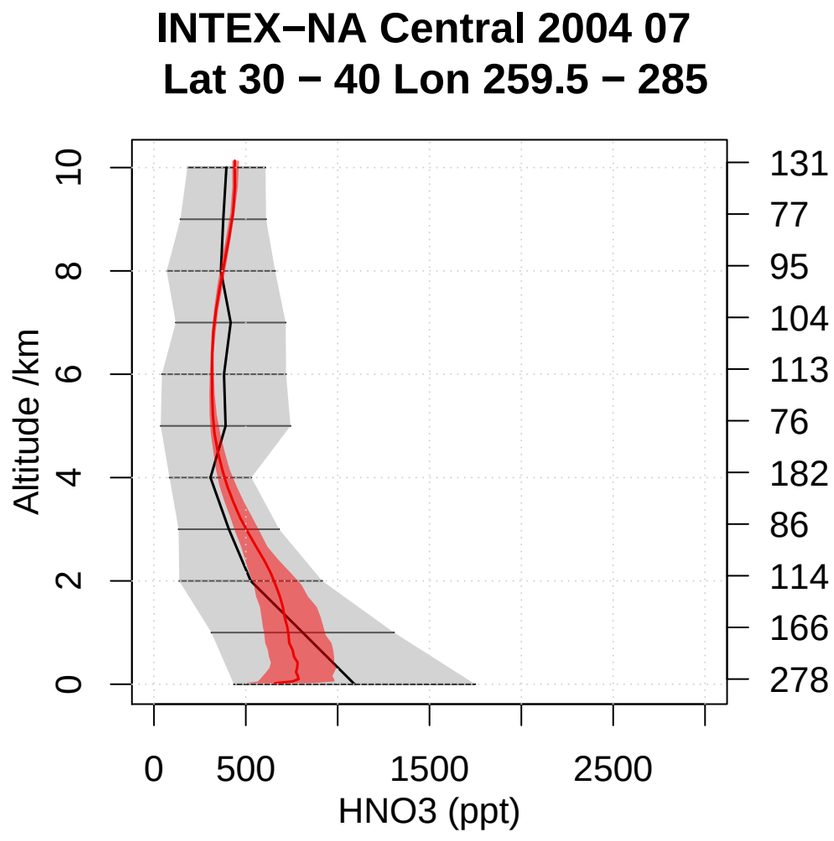


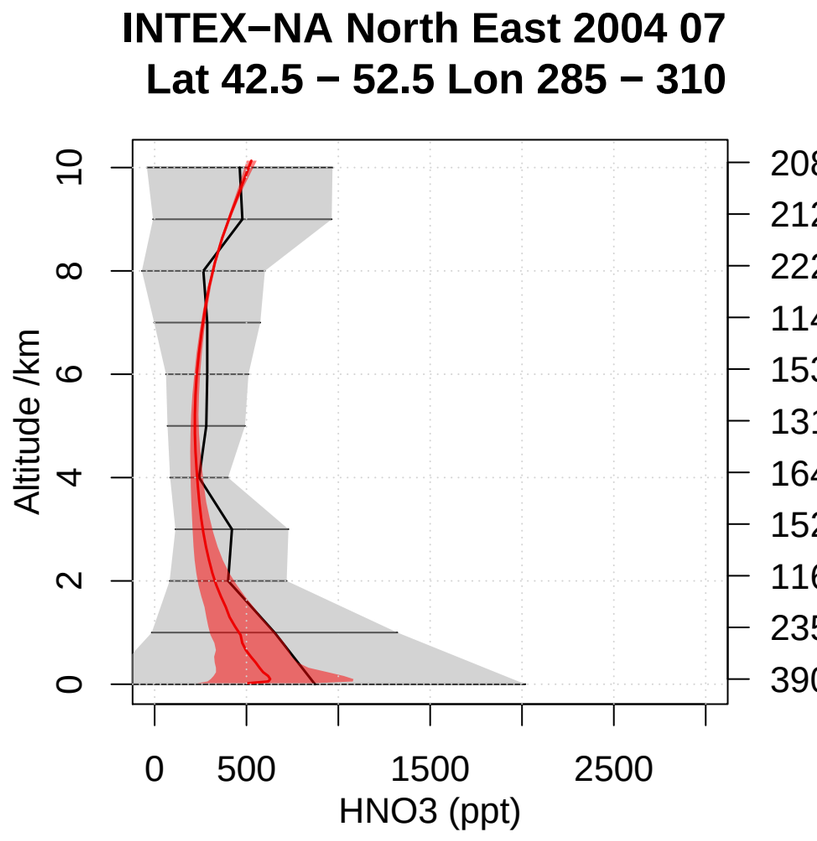


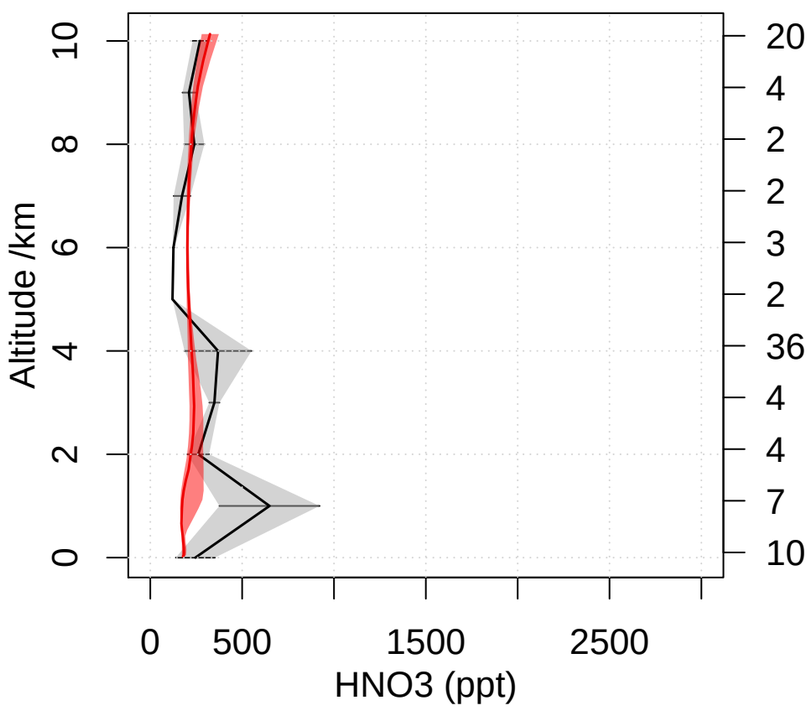


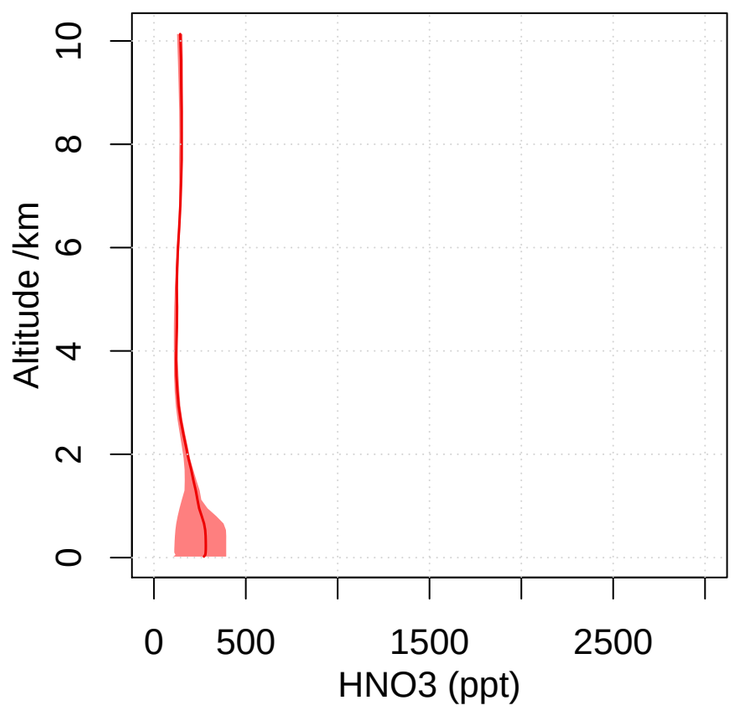
Emmons HNO3 comparison

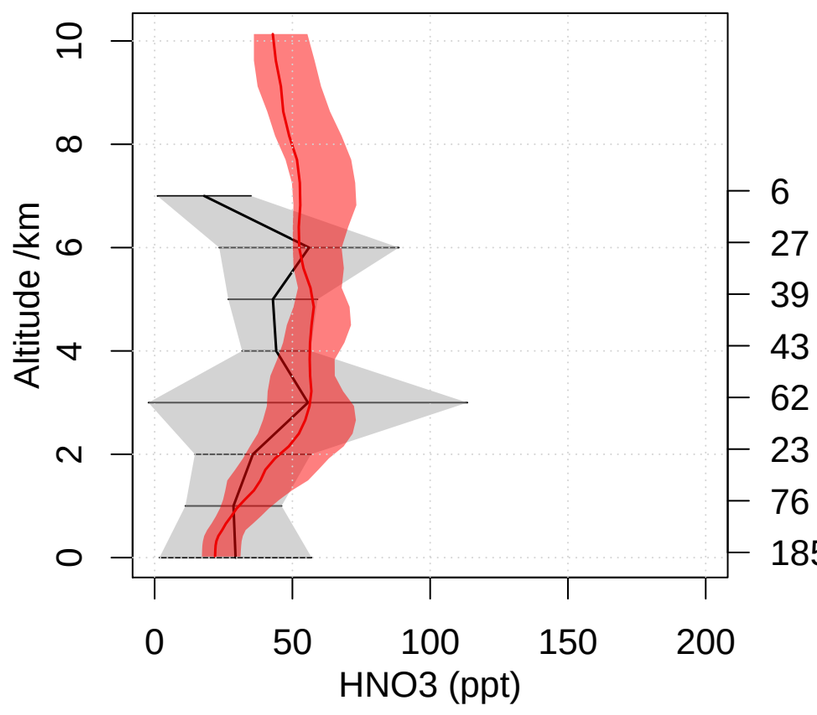


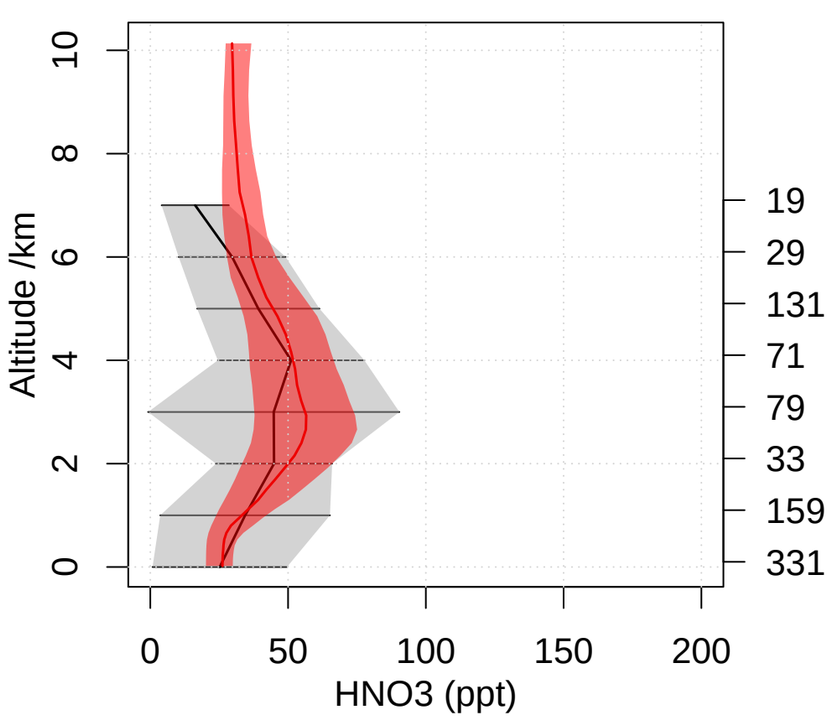


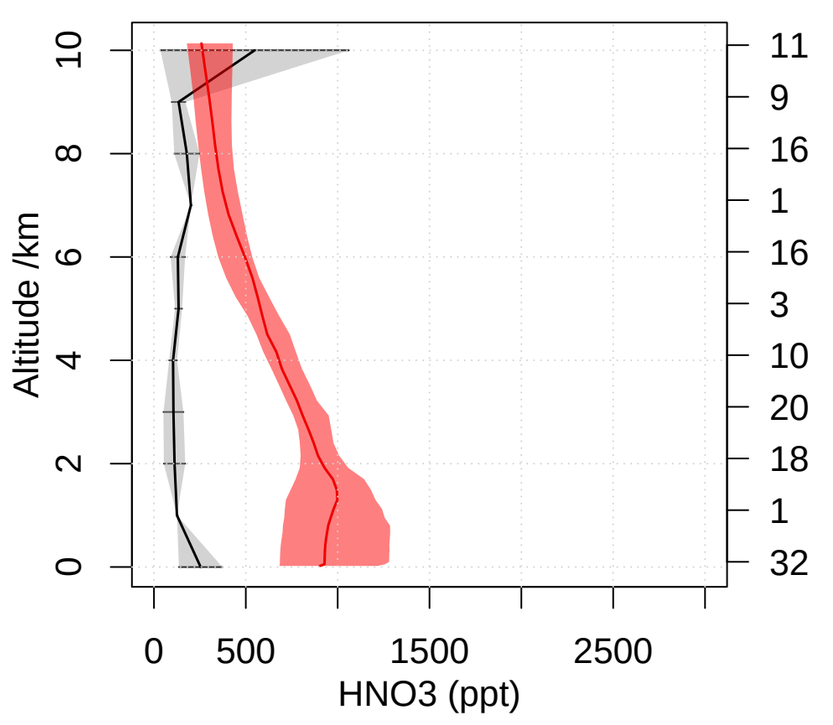


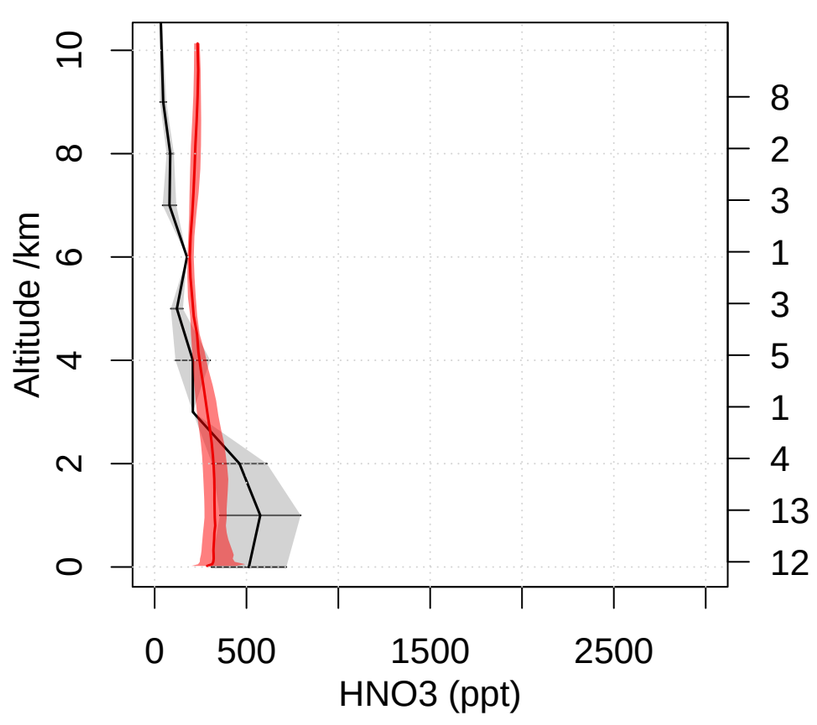


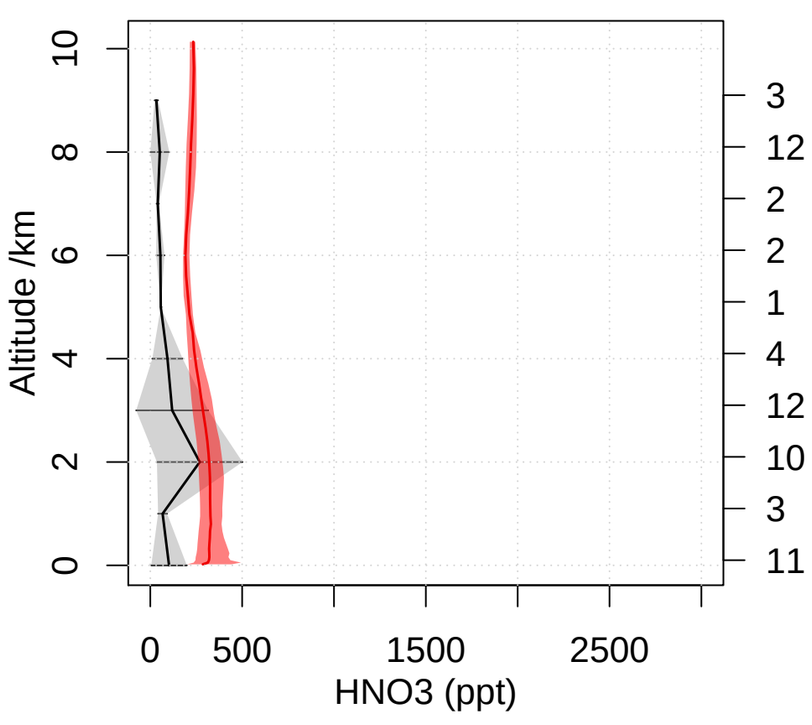


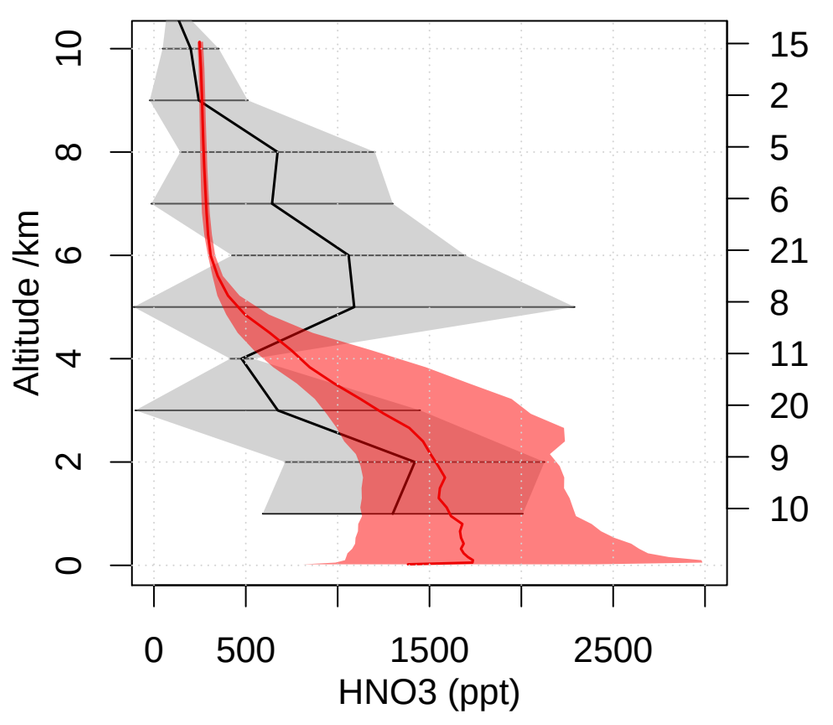


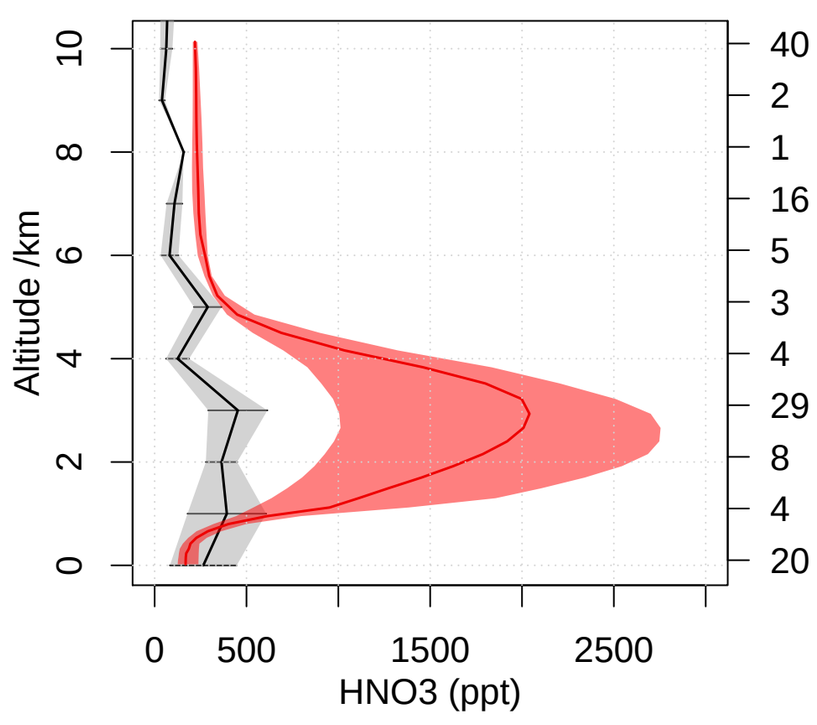






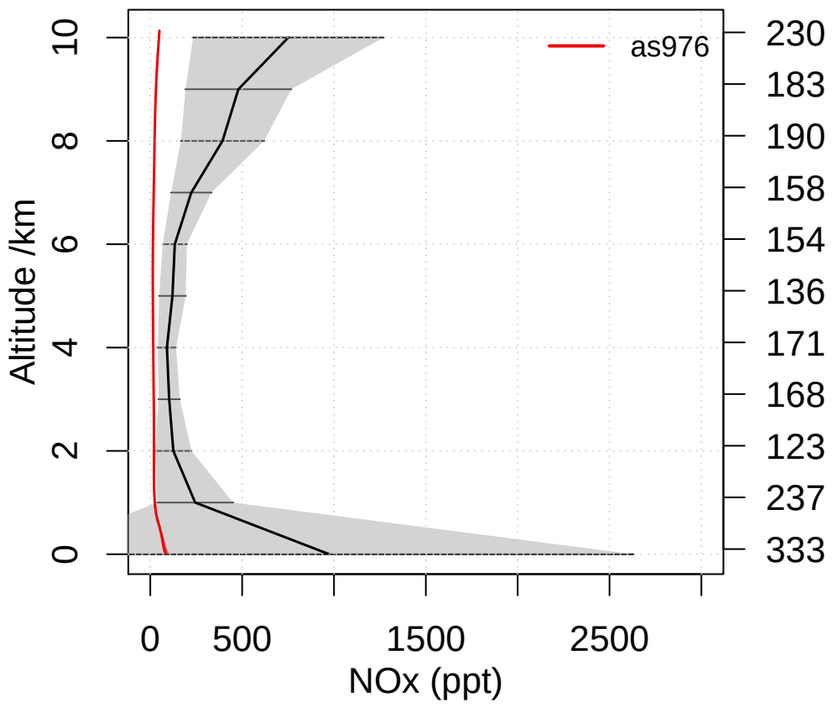




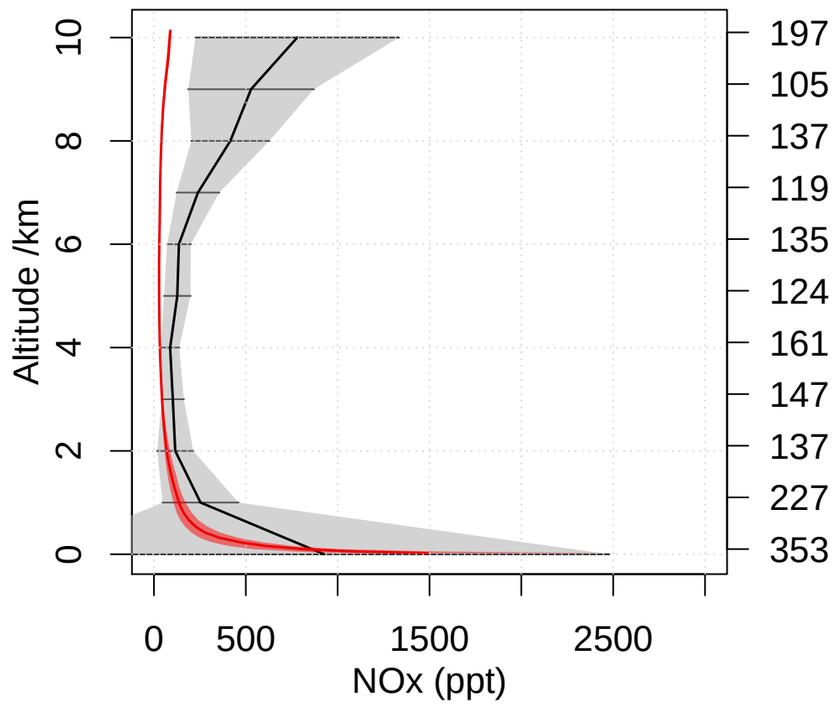


Emmons NOx comparison

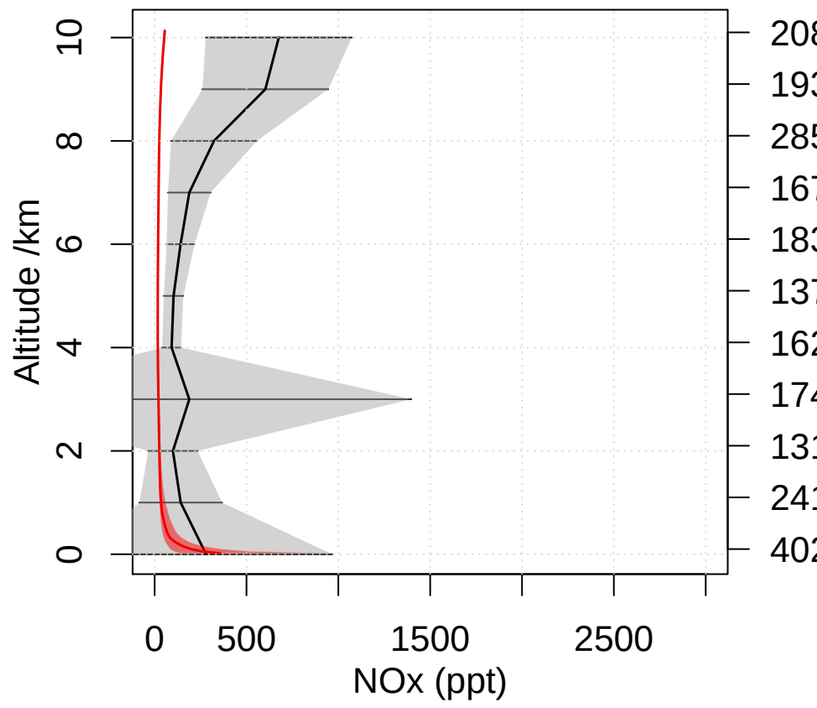
INTEX−NA East Coast 2004 07
Lat 32.5 − 40 Lon 296.5 − 307



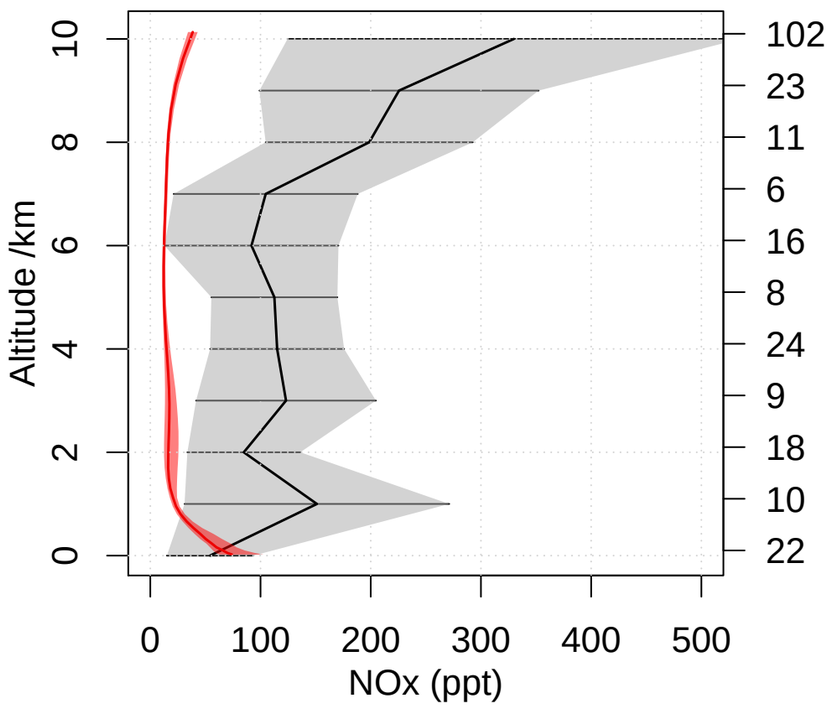
INTEX−NA Central 2004 07
Lat 30 − 40 Lon 259.5 − 285



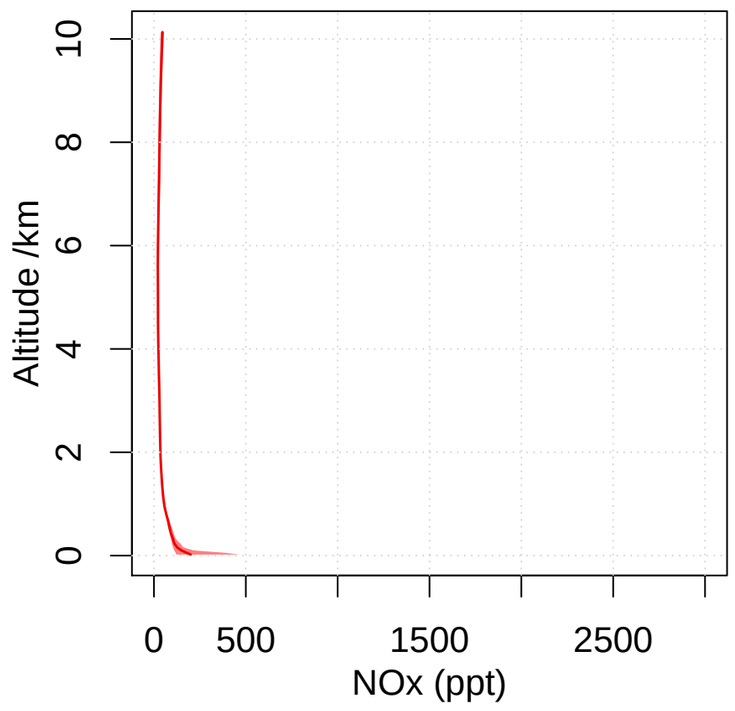
INTEX−NA North East 2004 07
Lat 42.5 − 52.5 Lon 285 − 310



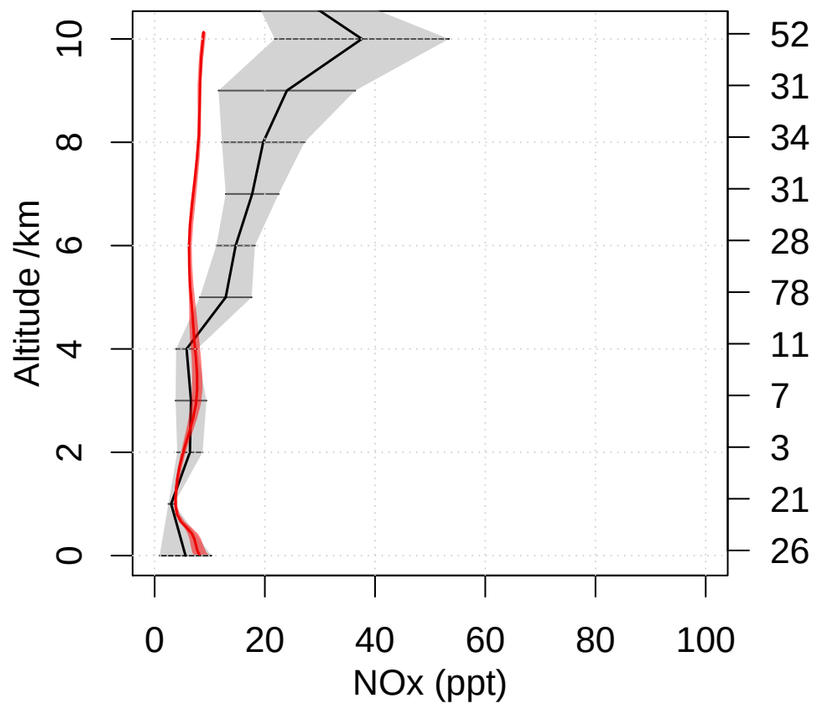
INTEX−NA West Coast 2004 07
Lat 32.5 − 45 Lon 217 − 240



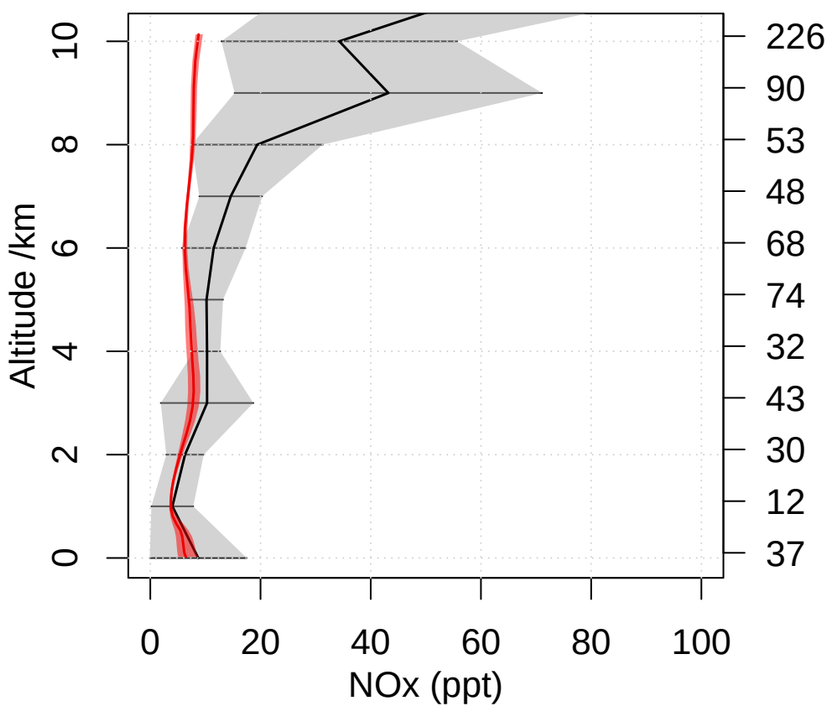
OP3 2008 07
Lat 2.5 − 7.5 Lon 112.5 − 120



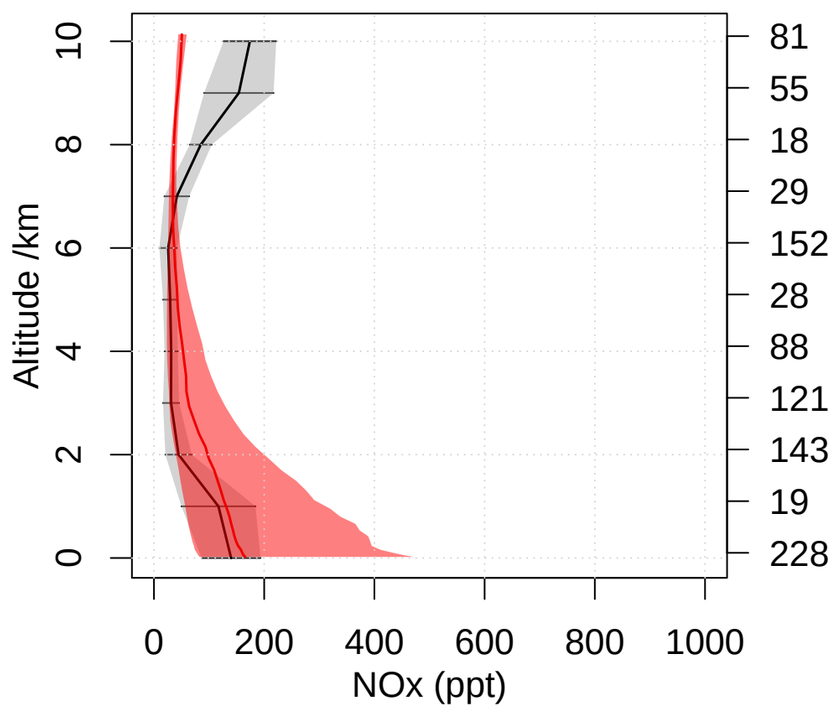
PEM−Tropics−B Christmas−Island 1999 0
Lat 0 − 10 Lon 200 − 220



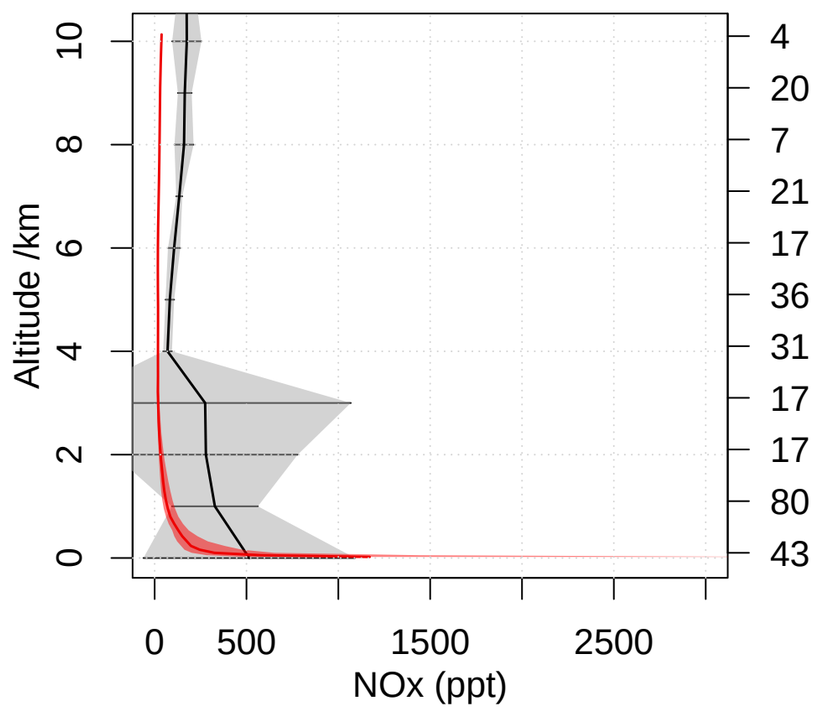
PEM−Tropics−B Tahiti 1999 03
Lat −20 − 0 Lon 200 − 230



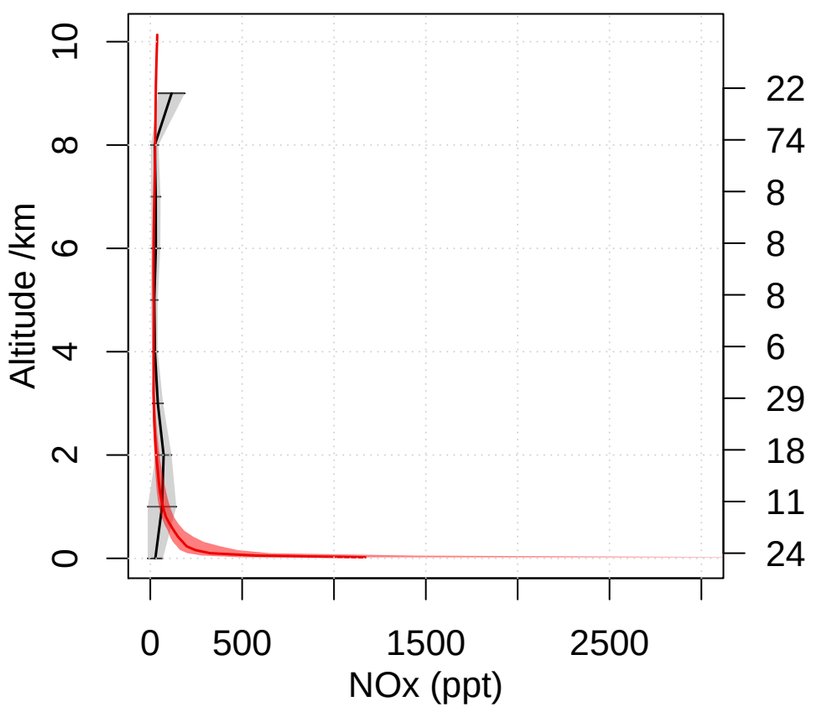
PEM−West−B Japan 1994 02
Lat 25 − 40 Lon 135 − 150



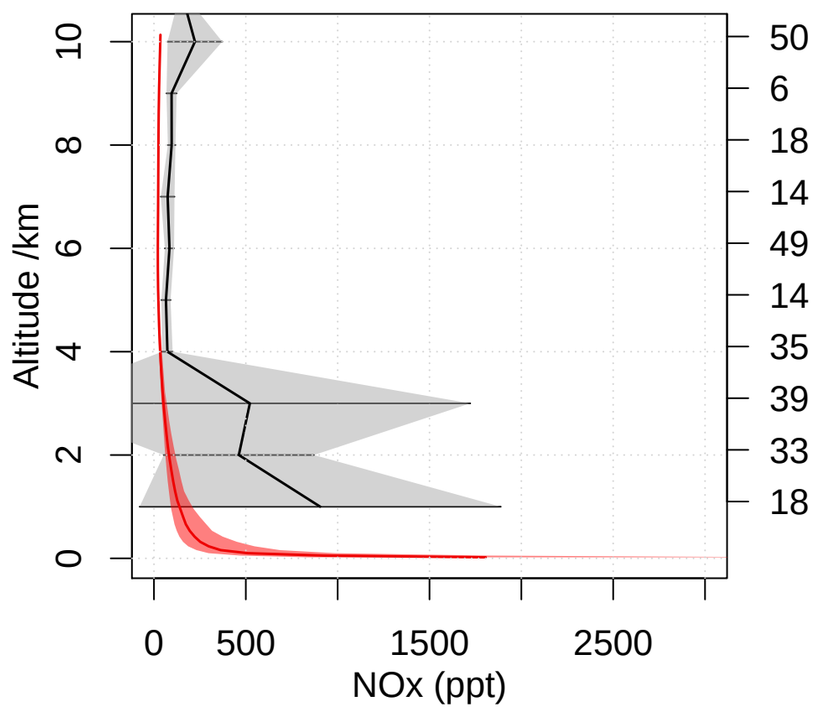
TRACE−A E−Brazil 1992 09
Lat −15 − −5 Lon 310 − 320



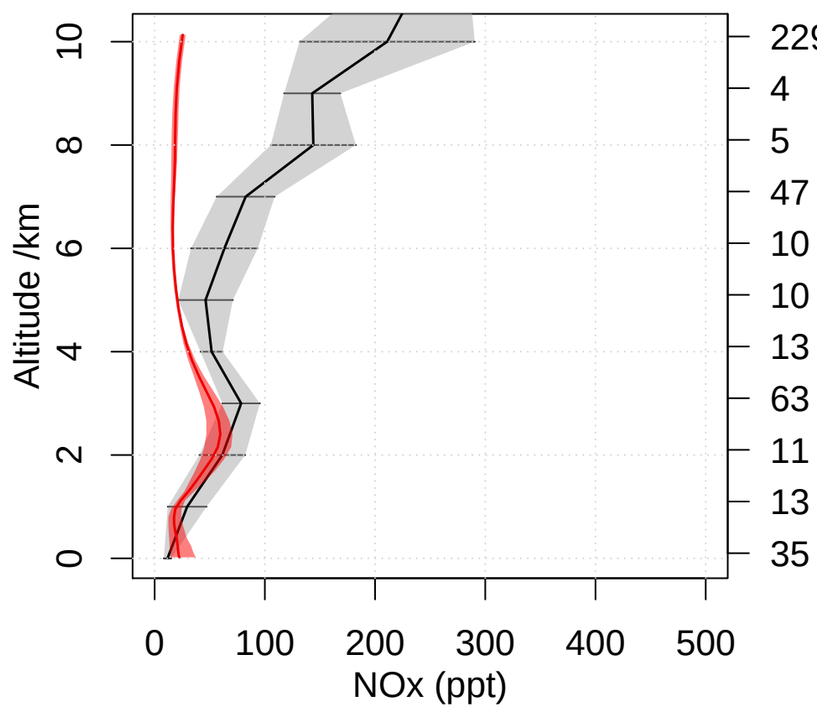
TRACE−A E−Brazil Coast 1992 09
Lat −35 − −25 Lon 310 − 320



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

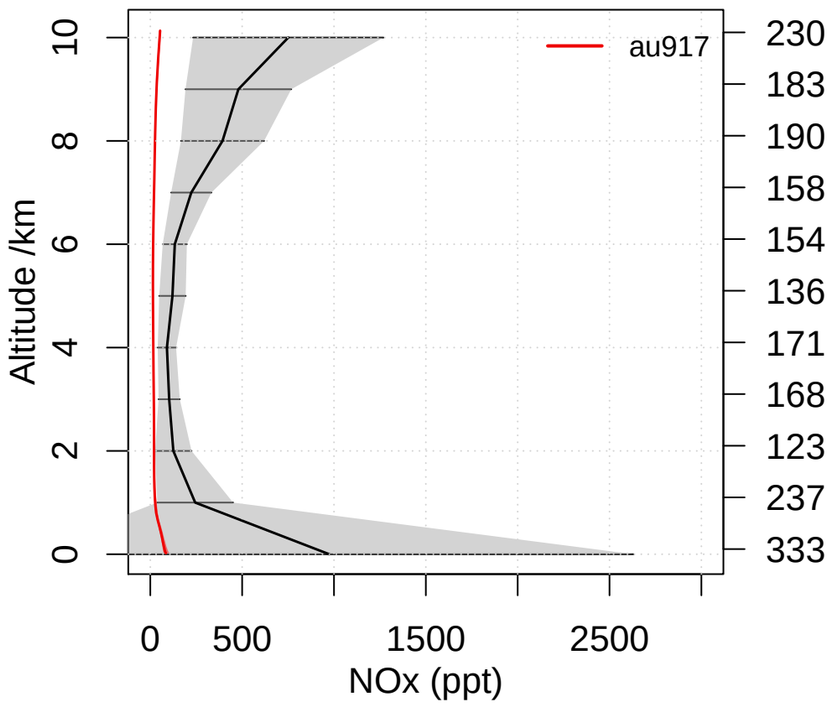


TRACE−A W−Africa Coast 1992 09
Lat −25 − −5 Lon 0 − 10

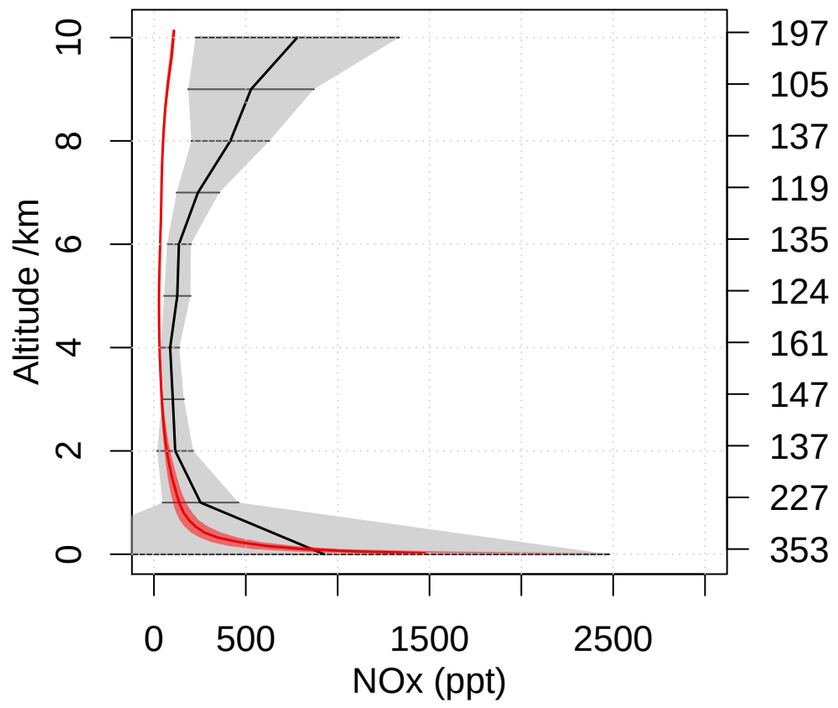


Emmons NOx comparison

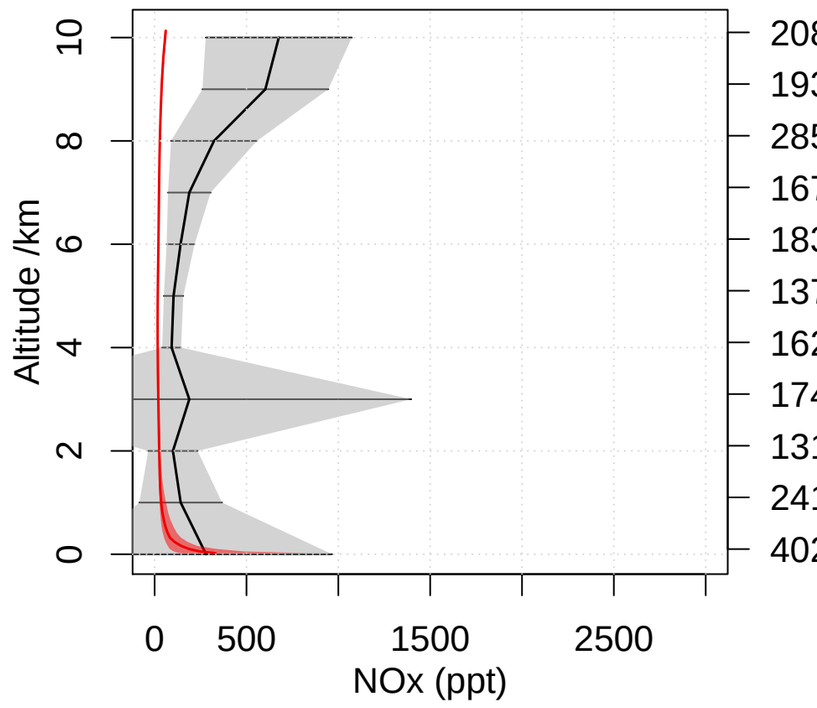
INTEX−NA East Coast 2004 07
Lat 32.5 − 40 Lon 296.5 − 307



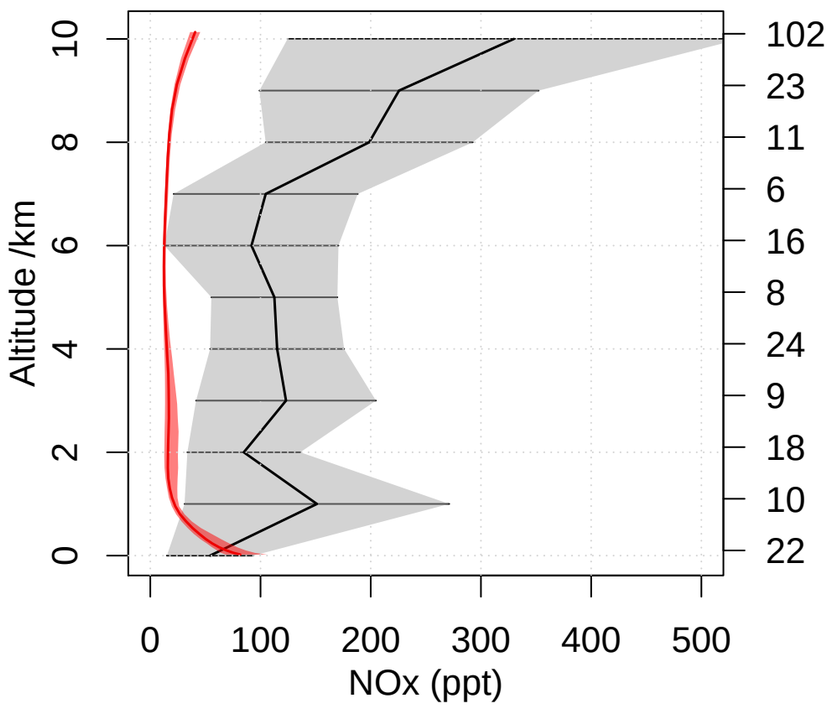
INTEX−NA Central 2004 07
Lat 30 − 40 Lon 259.5 − 285



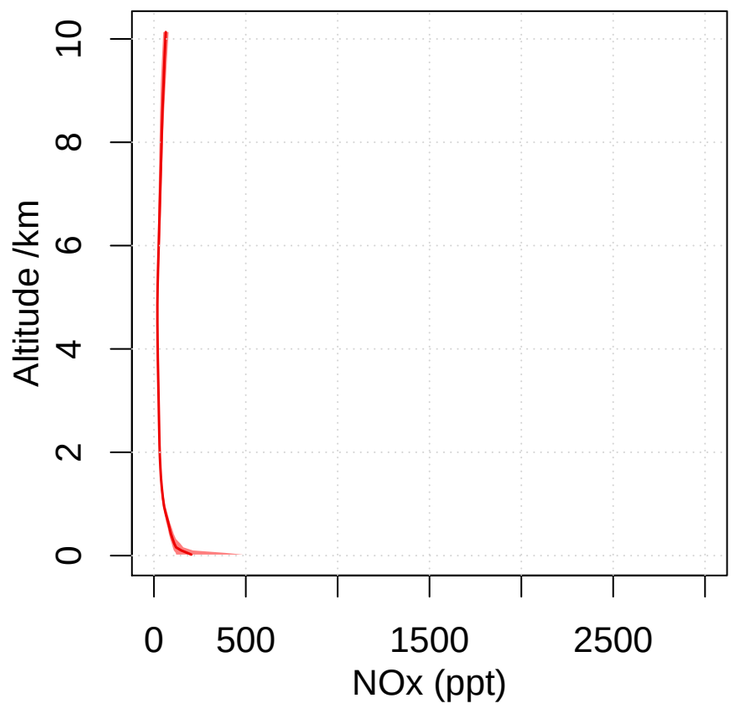
INTEX−NA North East 2004 07
Lat 42.5 − 52.5 Lon 285 − 310



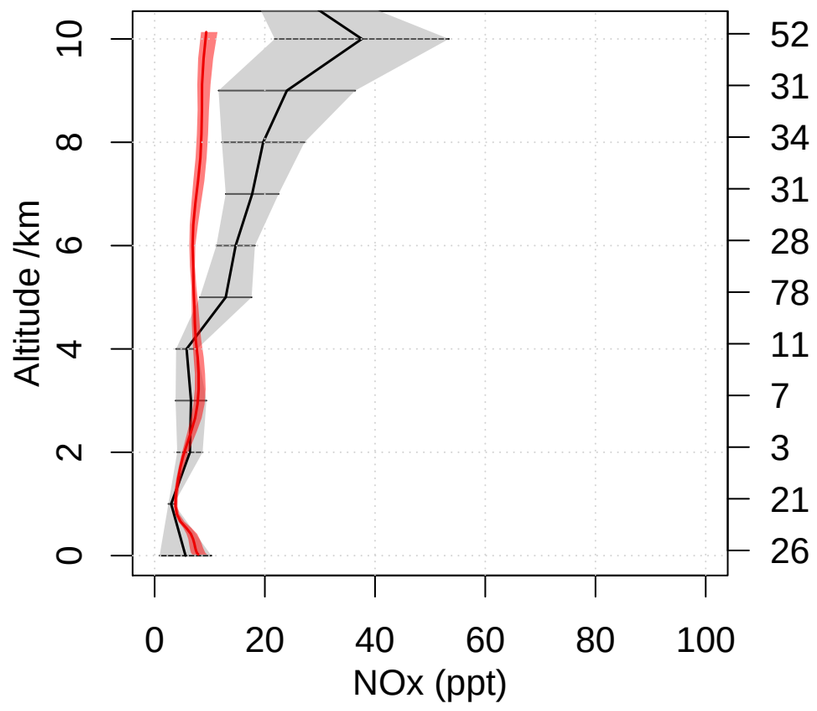
INTEX−NA West Coast 2004 07
Lat 32.5 − 45 Lon 217 − 240



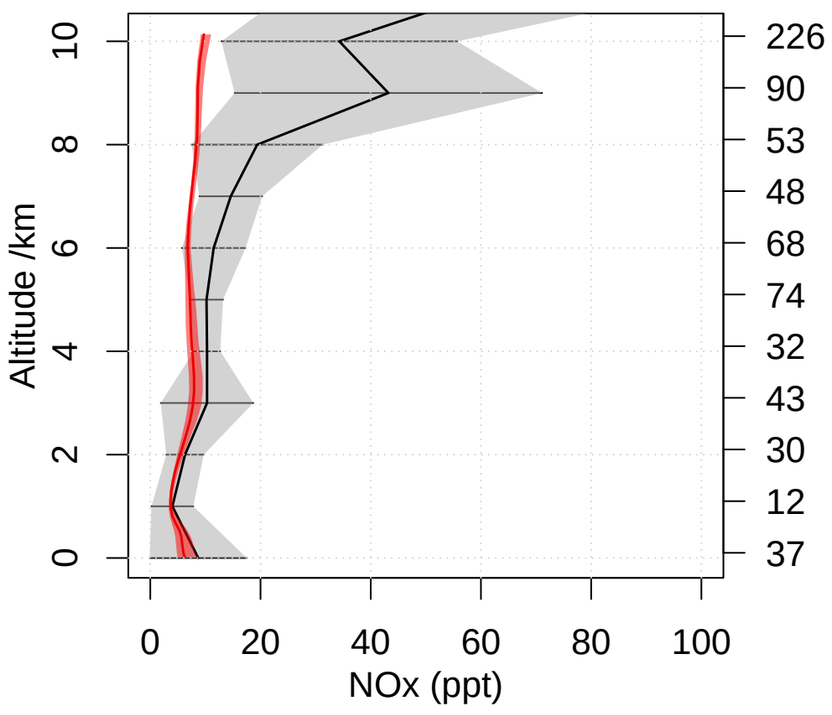
OP3 2008 07
Lat 2.5 − 7.5 Lon 112.5 − 120



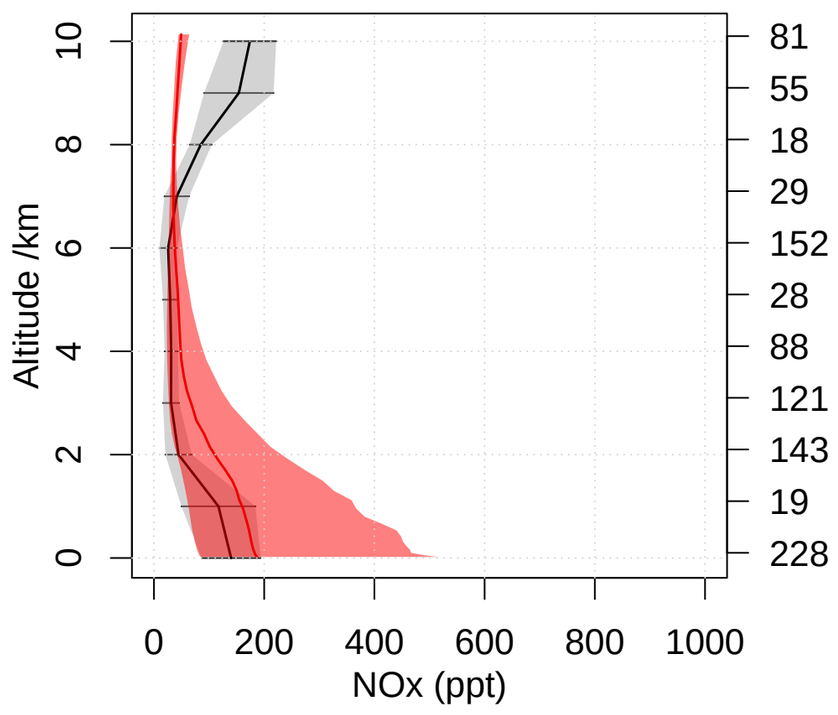
PEM−Tropics−B Christmas−Island 1999 0
Lat 0 − 10 Lon 200 − 220



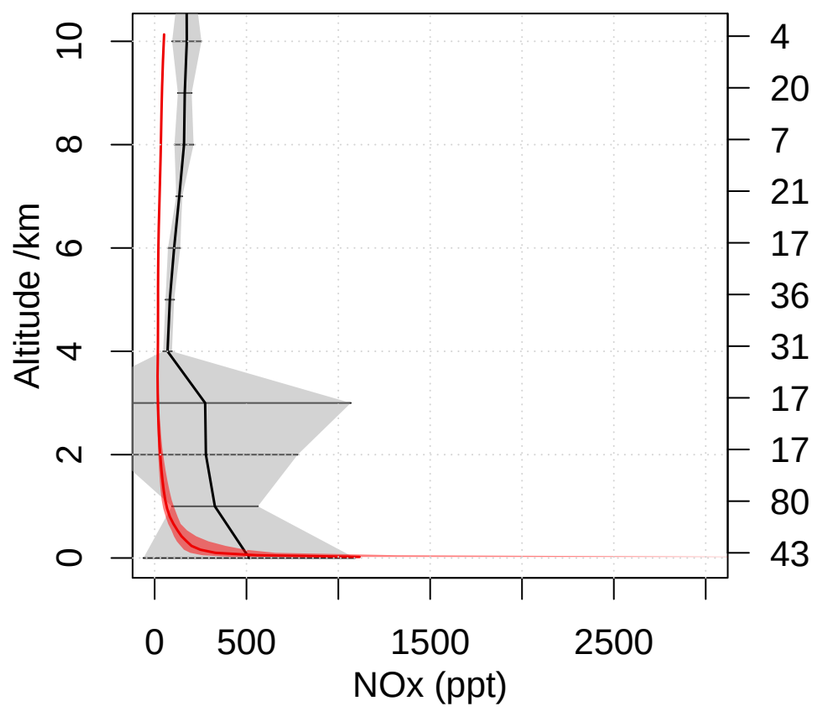
PEM−Tropics−B Tahiti 1999 03
Lat −20 − 0 Lon 200 − 230



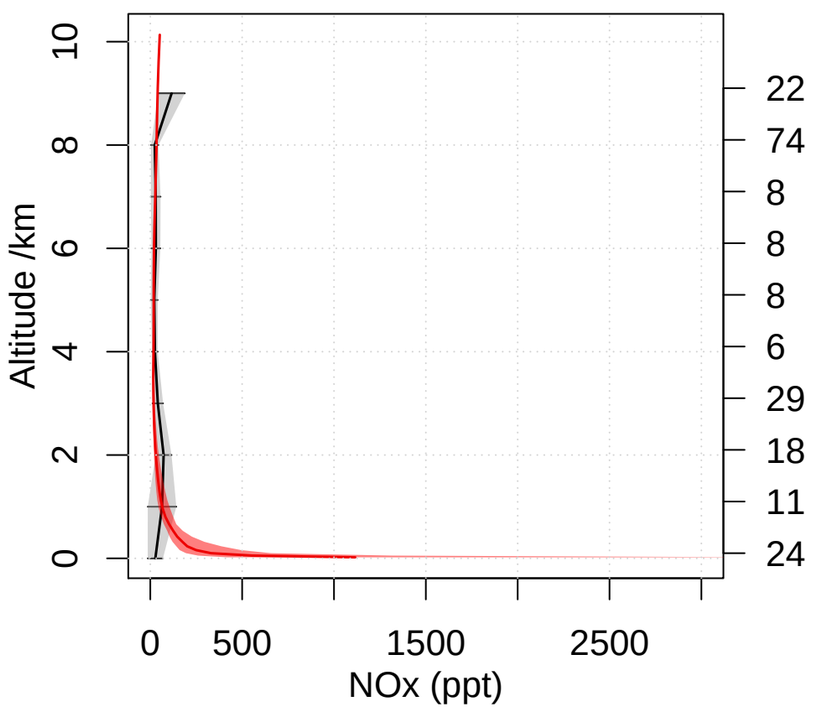
PEM−West−B Japan 1994 02
Lat 25 − 40 Lon 135 − 150



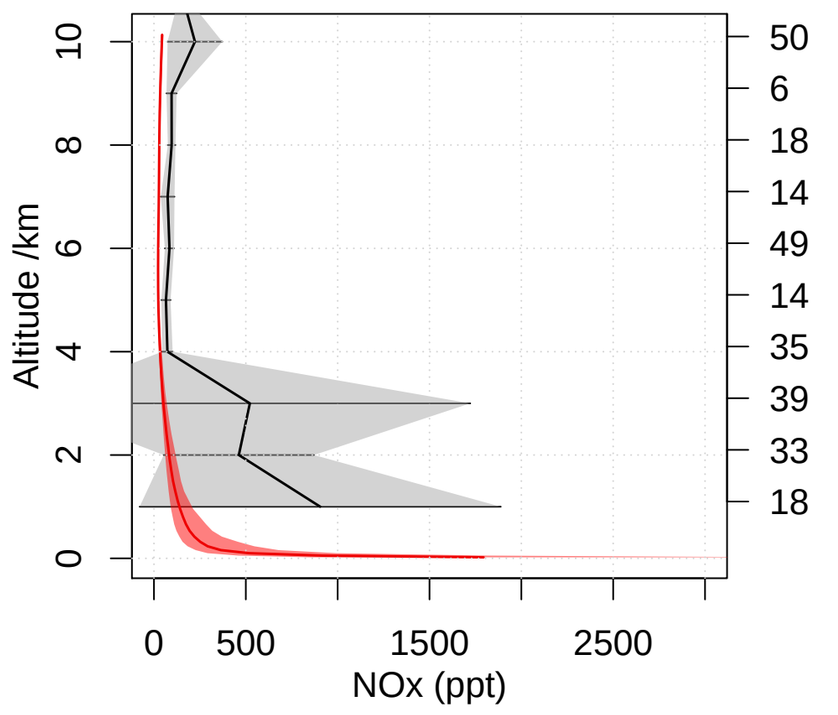
TRACE−A E−Brazil 1992 09
Lat −15 − −5 Lon 310 − 320



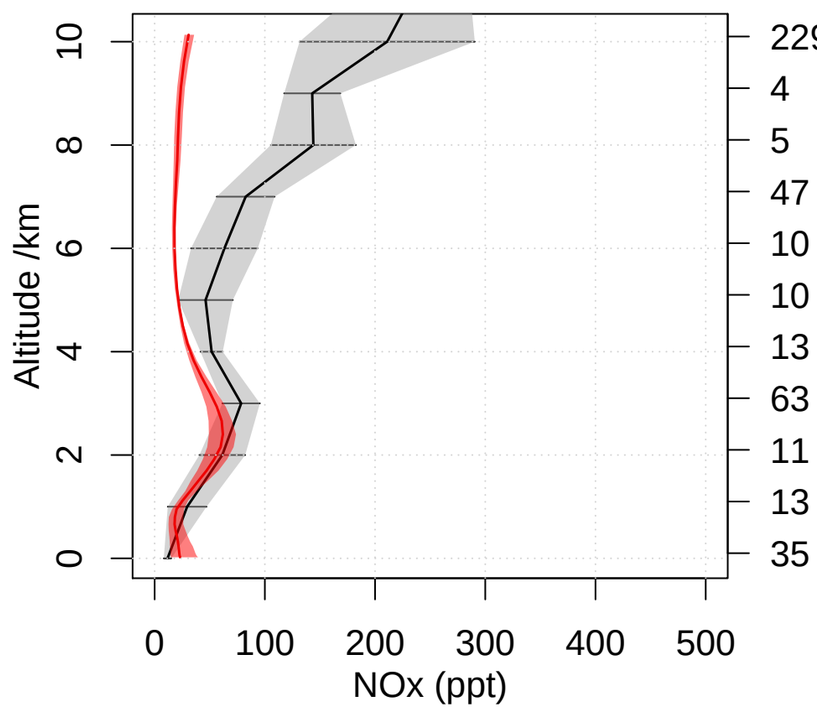
TRACE−A E−Brazil Coast 1992 09
Lat −35 − −25 Lon 310 − 320

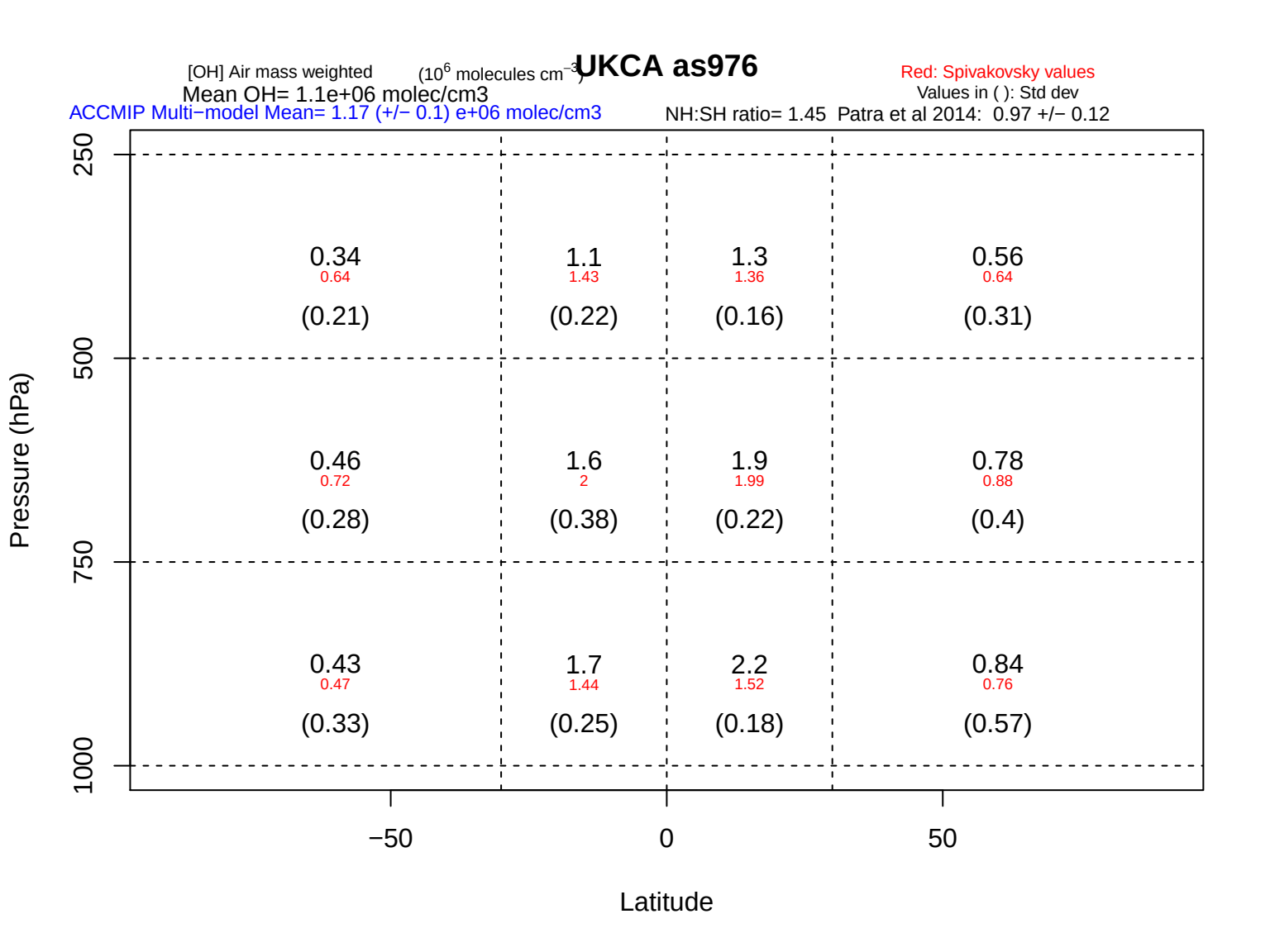


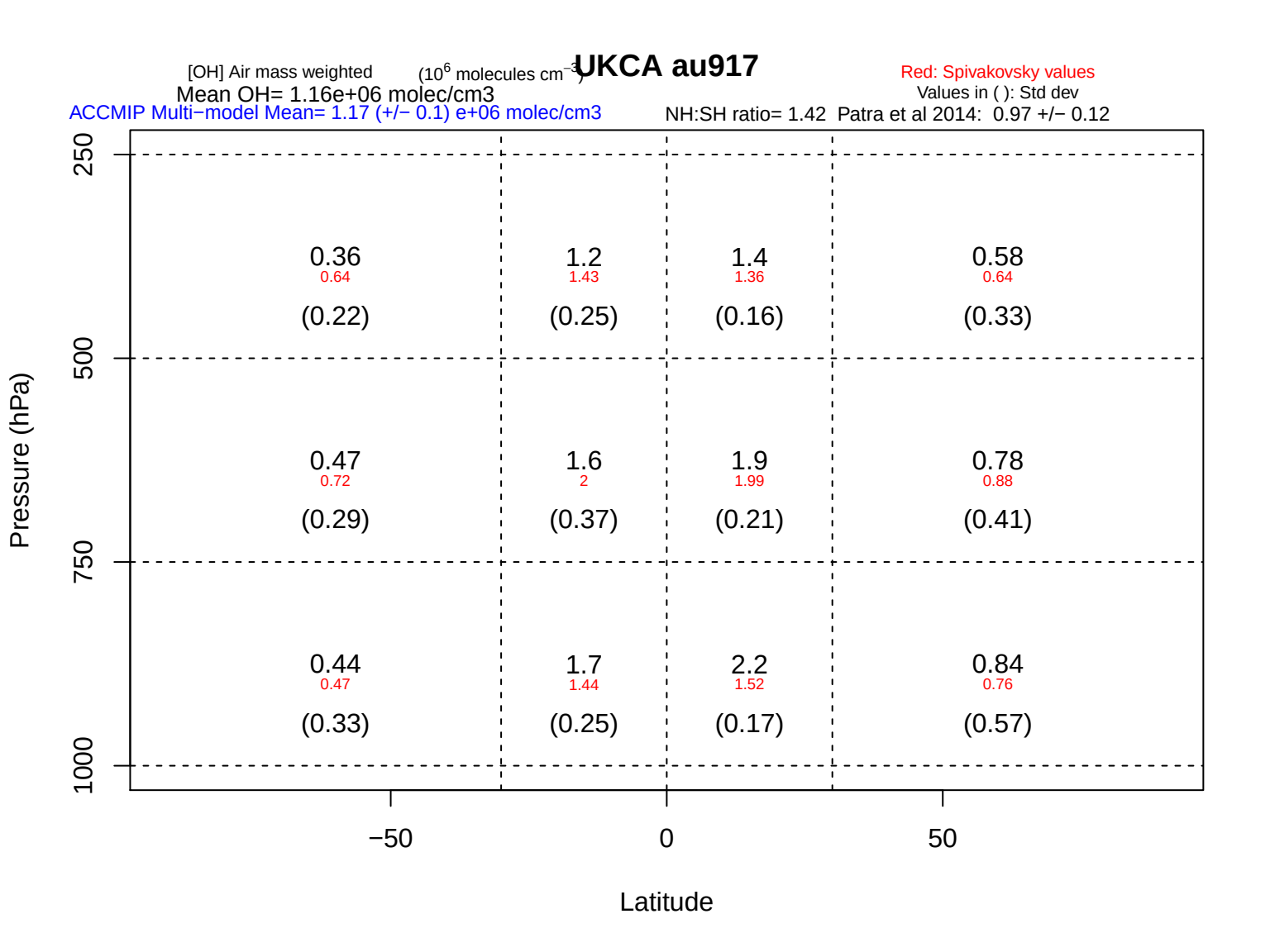
TRACE−A S−Africa 1992 09
Lat −25 − −5 Lon 15 − 35

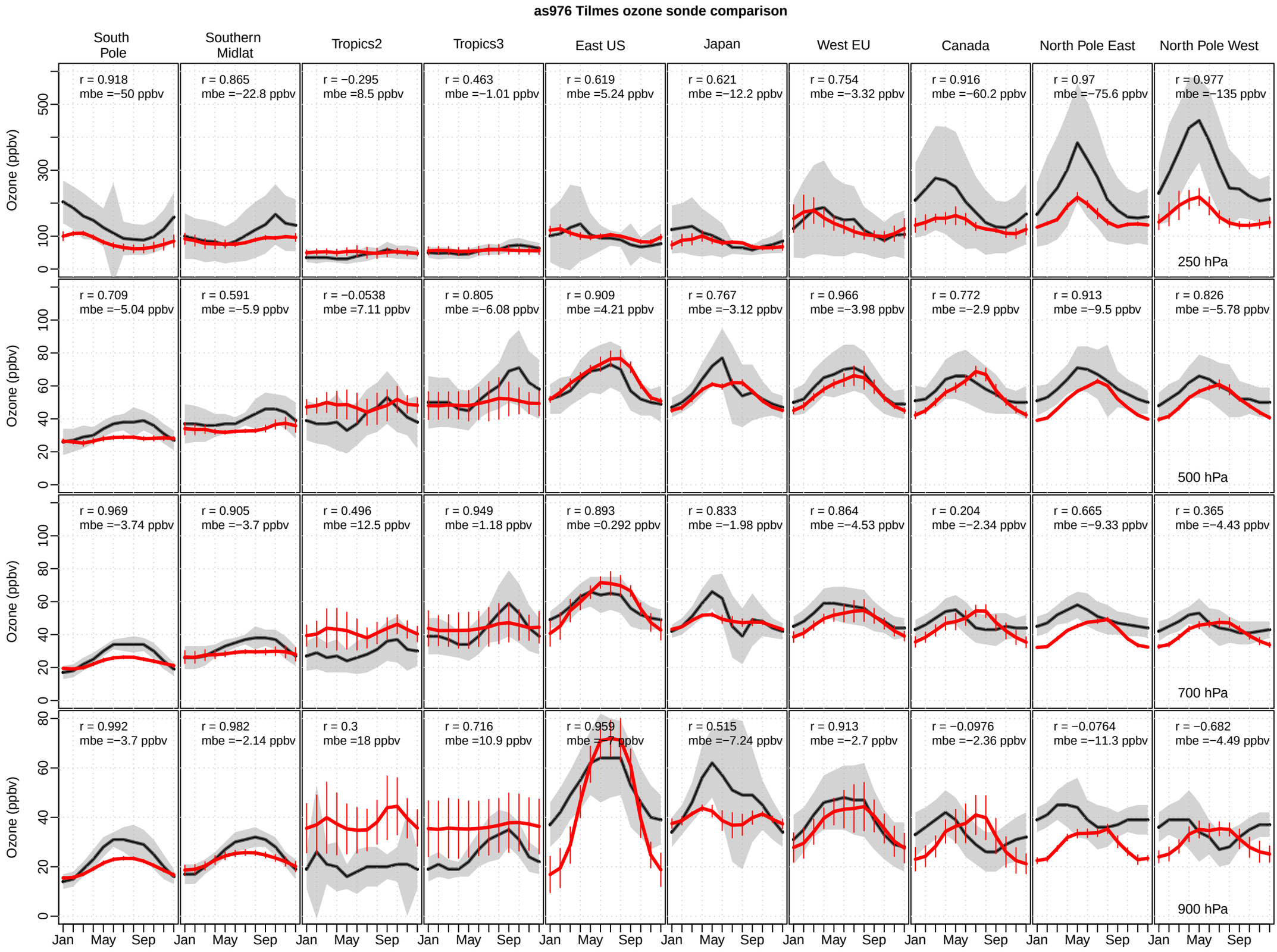


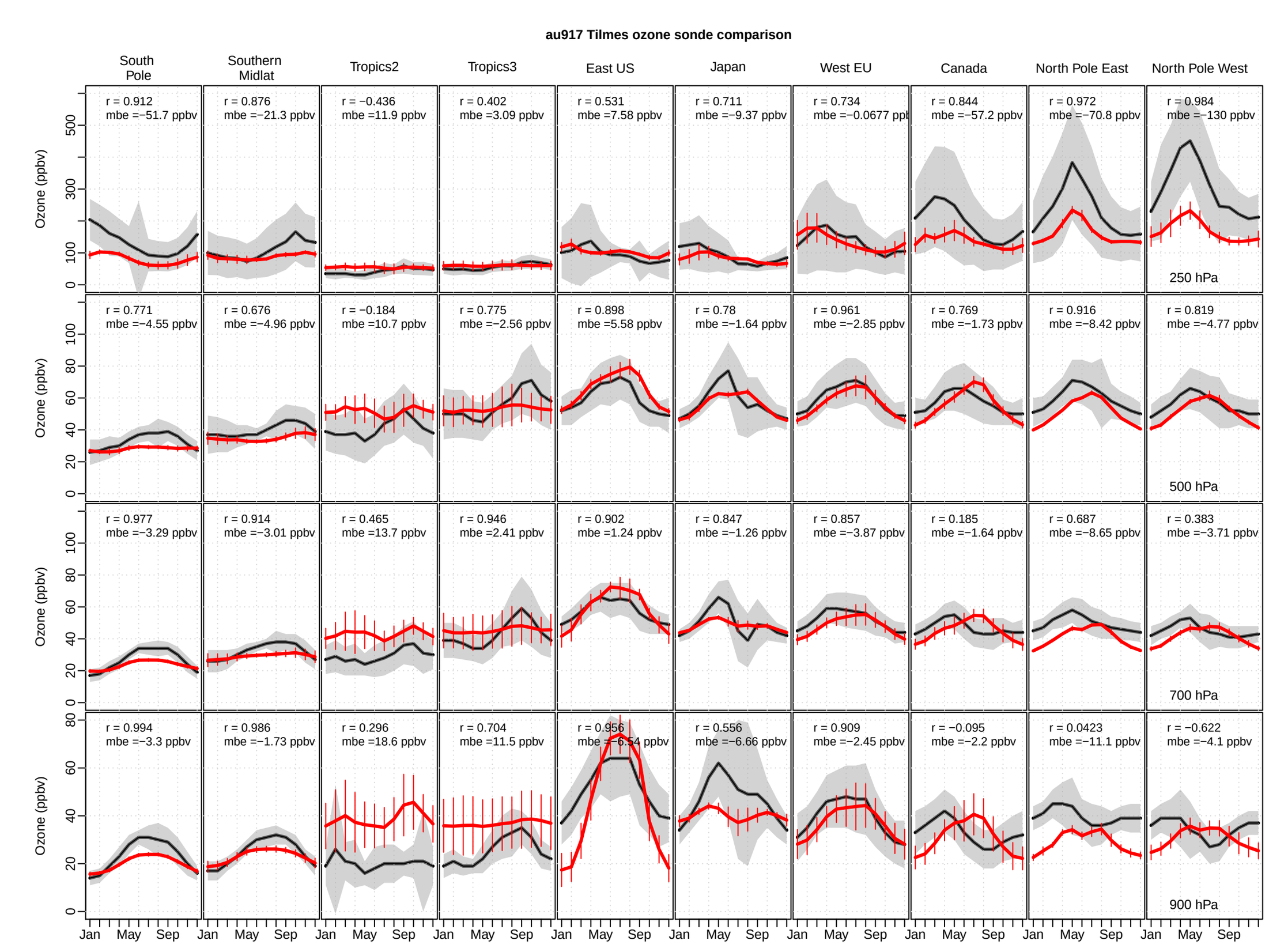
TRACE−A W−Africa Coast 1992 09
Lat −25 − −5 Lon 0 − 10

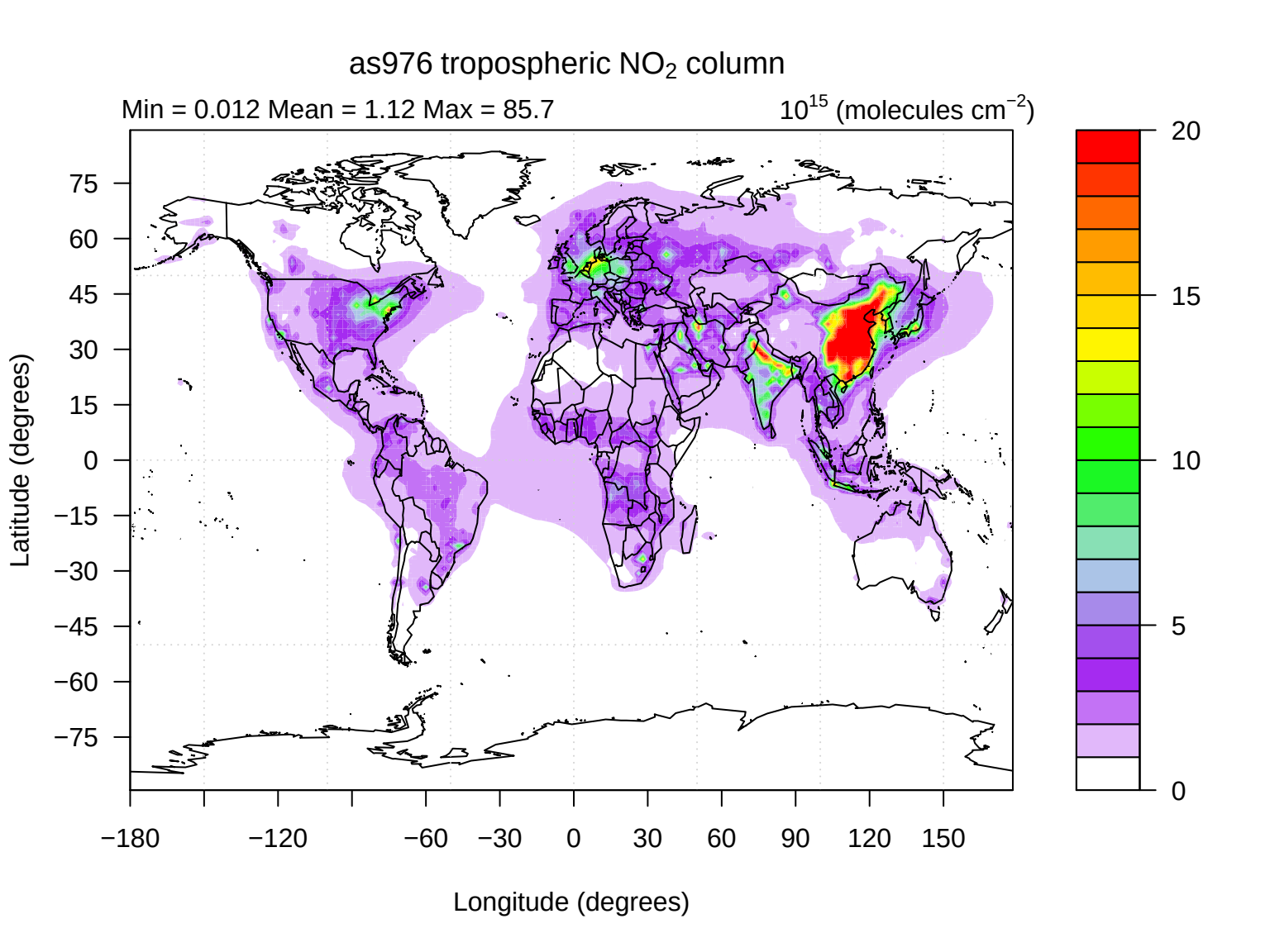


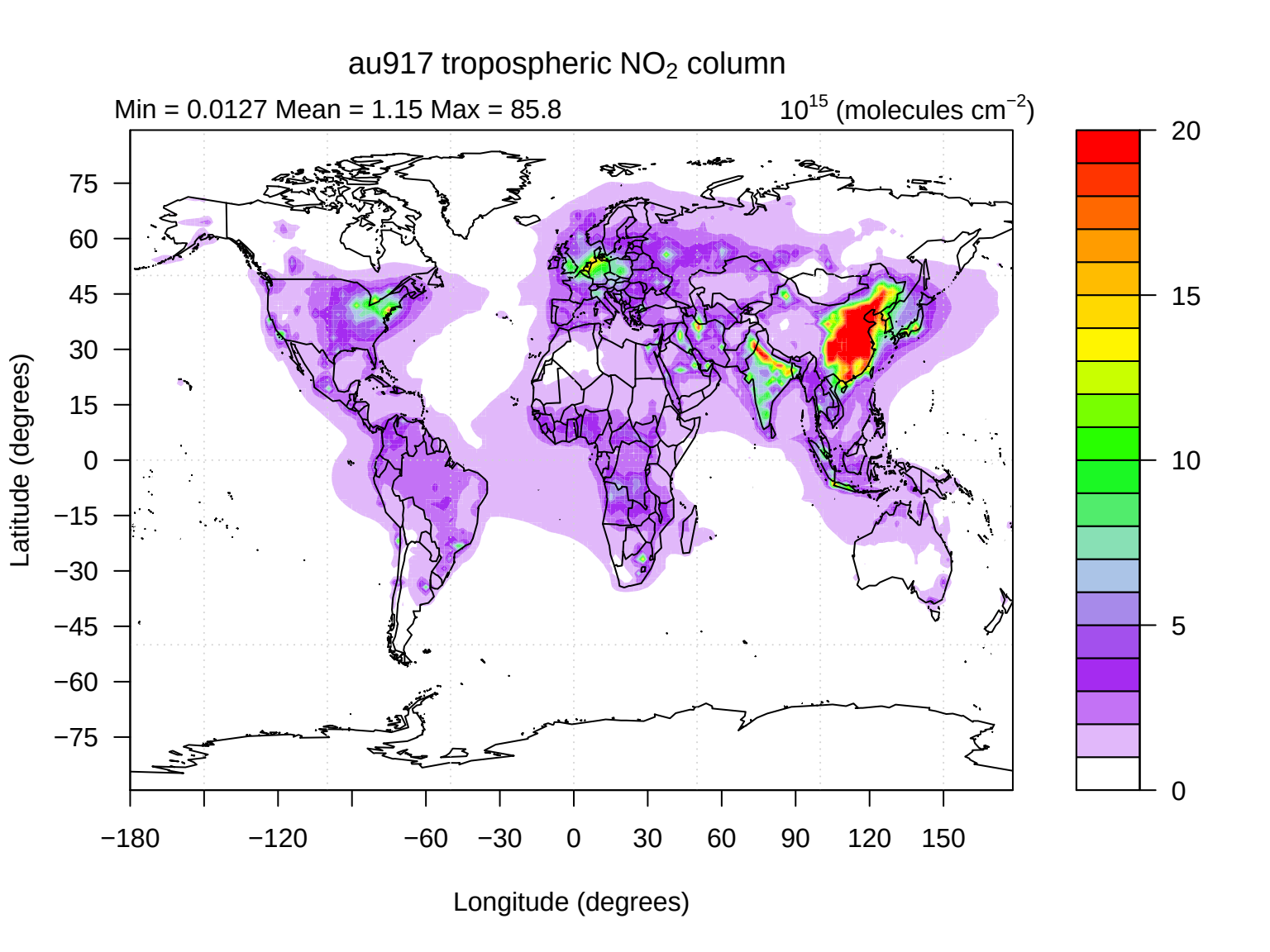

[OH] Air mass weighted (10^6 molecules cm^-3)
UKCA as976
Red: Spivakovsky values
Values in ( ): Std dev
Mean OH= 1.1e+06 molec/cm3
ACCMIP Multi−model Mean= 1.17 (+/− 0.1) e+06 molec/cm3
NH:SH ratio= 1.45 Patra et al 2014: 0.97 +/− 0.12
0.34
0.64
(0.21)
1.1
1.43
(0.22)
1.3
1.36
(0.16)
0.56
0.64
(0.31)
0.46
0.72
(0.28)
1.6
2
(0.38)
1.9
1.99
(0.22)
0.78
0.88
(0.4)
0.43
0.47
(0.33)
1.7
1.44
(0.25)
2.2
1.52
(0.18)
0.84
0.76
(0.57)
250
500
750
1000
Pressure (hPa)
−50
0
50
Latitude

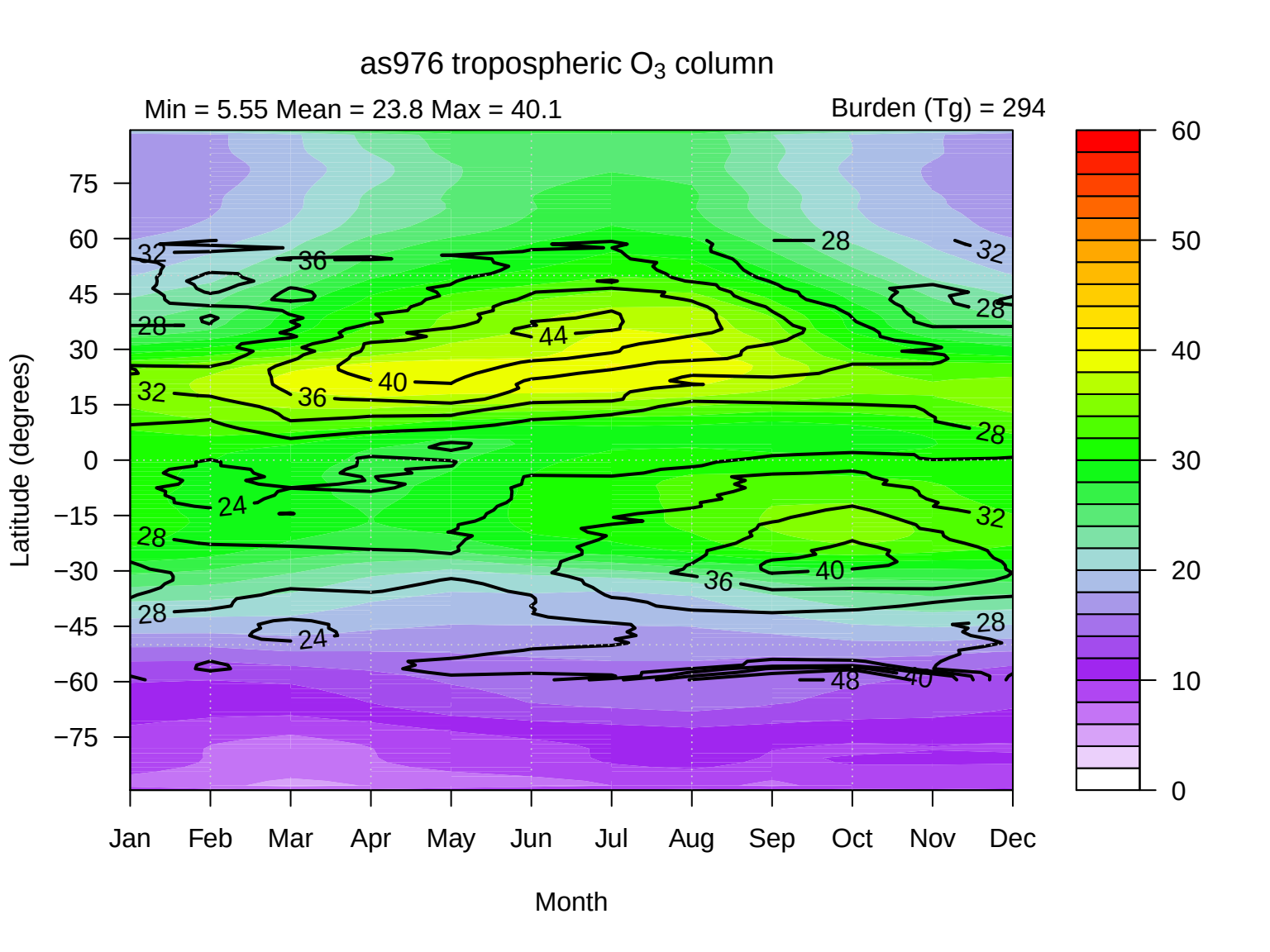

[OH] Air mass weighted (10^6 molecules cm^-3)
UKCA au917
Red: Spivakovsky values
Values in ( ): Std dev
Mean OH= 1.16e+06 molec/cm3
ACCMIP Multi−model Mean= 1.17 (+/− 0.1) e+06 molec/cm3
NH:SH ratio= 1.42 Patra et al 2014: 0.97 +/− 0.12
0.36
0.64
(0.22)
1.2
1.43
(0.25)
1.4
1.36
(0.16)
0.58
0.64
(0.33)
0.47
0.72
(0.29)
1.6
2
(0.37)
1.9
1.99
(0.21)
0.78
0.88
(0.41)
0.44
0.47
(0.33)
1.7
1.44
(0.25)
2.2
1.52
(0.17)
0.84
0.76
(0.57)
250
500
750
1000
Pressure (hPa)
−50
0
50
Latitude

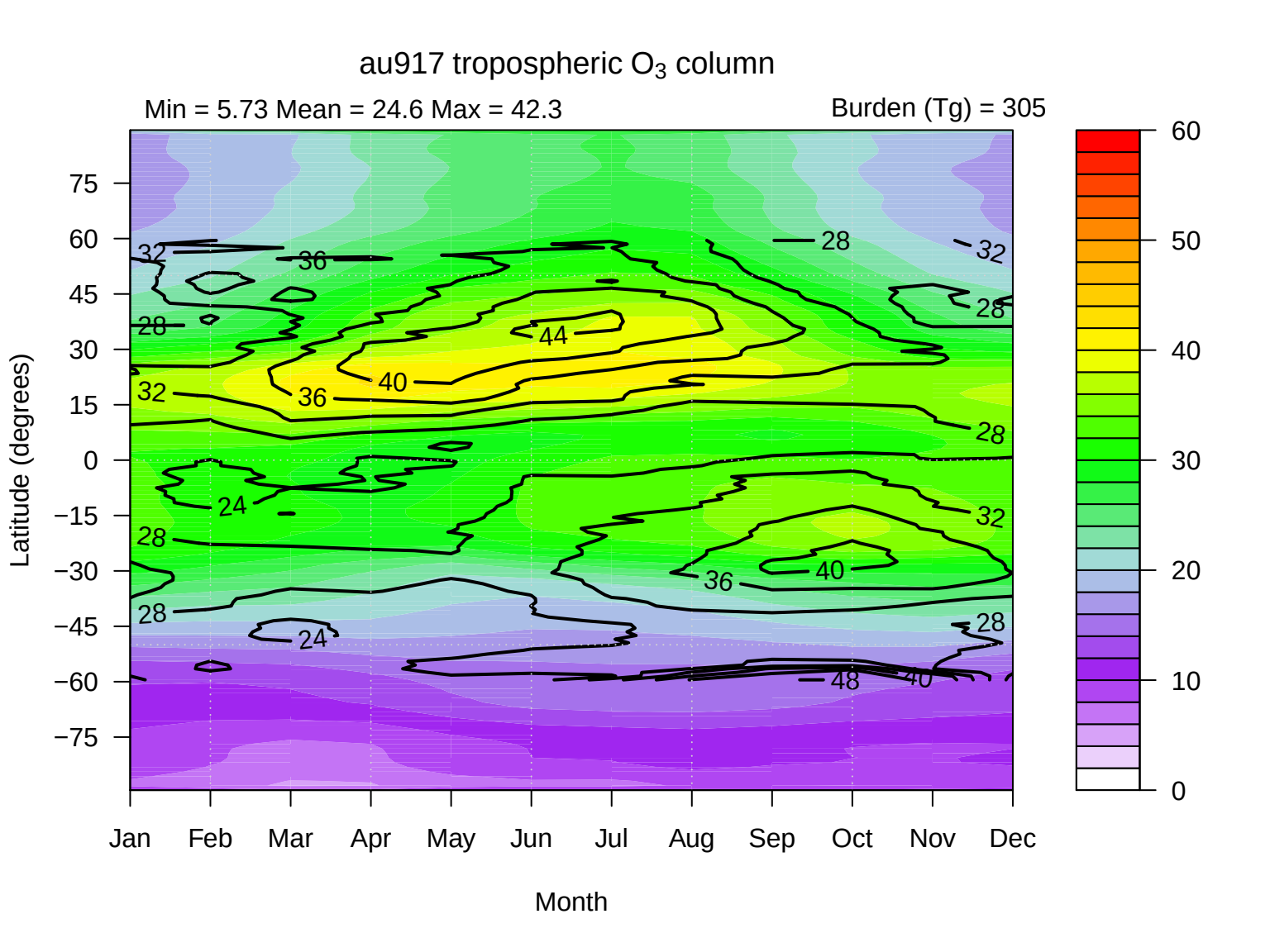

as976 Tilmes ozone sonde comparison
South Pole
Southern Midlat
Tropics2
Tropics3
East US
Japan
West EU
Canada
North Pole East
North Pole West
Ozone (ppbv)
r = 0.918
mbe =−50 ppbv
r = 0.865
mbe =−22.8 ppbv
r = −0.295
mbe =8.5 ppbv
r = 0.463
mbe =−1.01 ppbv
r = 0.619
mbe =5.24 ppbv
r = 0.621
mbe =−12.2 ppbv
r = 0.754
mbe =−3.32 ppbv
r = 0.916
mbe =−60.2 ppbv
r = 0.97
mbe =−75.6 ppbv
r = 0.977
mbe =−135 ppbv
250 hPa
r = 0.709
mbe =−5.04 ppbv
r = 0.591
mbe =−5.9 ppbv
r = −0.0538
mbe =7.11 ppbv
r = 0.805
mbe =−6.08 ppbv
r = 0.909
mbe =4.21 ppbv
r = 0.767
mbe =−3.12 ppbv
r = 0.966
mbe =−3.98 ppbv
r = 0.772
mbe =−2.9 ppbv
r = 0.913
mbe =−9.5 ppbv
r = 0.826
mbe =−5.78 ppbv
500 hPa
r = 0.969
mbe =−3.74 ppbv
r = 0.905
mbe =−3.7 ppbv
r = 0.496
mbe =12.5 ppbv
r = 0.949
mbe =1.18 ppbv
r = 0.893
mbe =0.292 ppbv
r = 0.833
mbe =−1.98 ppbv
r = 0.864
mbe =−4.53 ppbv
r = 0.204
mbe =−2.34 ppbv
r = 0.665
mbe =−9.33 ppbv
r = 0.365
mbe =−4.43 ppbv
700 hPa
r = 0.992
mbe =−3.7 ppbv
r = 0.982
mbe =−2.14 ppbv
r = 0.3
mbe =18 ppbv
r = 0.716
mbe =10.9 ppbv
r = 0.959
mbe =−7 ppbv
r = 0.515
mbe =−7.24 ppbv
r = 0.913
mbe =−2.7 ppbv
r = −0.0976
mbe =−2.36 ppbv
r = −0.0764
mbe =−11.3 ppbv
r = −0.682
mbe =−4.49 ppbv
900 hPa
Jan
May
Sep


au917 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 = 0.912
mbe =−51.7 ppbv
r = 0.876
mbe =−21.3 ppbv
r = −0.436
mbe =11.9 ppbv
r = 0.402
mbe =3.09 ppbv
r = 0.531
mbe =7.58 ppbv
r = 0.711
mbe =−9.37 ppbv
r = 0.734
mbe =−0.0677 ppb
r = 0.844
mbe =−57.2 ppbv
r = 0.972
mbe =−70.8 ppbv
r = 0.984
mbe =−130 ppbv
250 hPa
r = 0.771
mbe =−4.55 ppbv
r = 0.676
mbe =−4.96 ppbv
r = −0.184
mbe =10.7 ppbv
r = 0.775
mbe =−2.56 ppbv
r = 0.898
mbe =5.58 ppbv
r = 0.78
mbe =−1.64 ppbv
r = 0.961
mbe =−2.85 ppbv
r = 0.769
mbe =−1.73 ppbv
r = 0.916
mbe =−8.42 ppbv
r = 0.819
mbe =−4.77 ppbv
500 hPa
r = 0.977
mbe =−3.29 ppbv
r = 0.914
mbe =−3.01 ppbv
r = 0.465
mbe =13.7 ppbv
r = 0.946
mbe =2.41 ppbv
r = 0.902
mbe =1.24 ppbv
r = 0.847
mbe =−1.26 ppbv
r = 0.857
mbe =−3.87 ppbv
r = 0.185
mbe =−1.64 ppbv
r = 0.687
mbe =−8.65 ppbv
r = 0.383
mbe =−3.71 ppbv
700 hPa
r = 0.994
mbe =−3.3 ppbv
r = 0.986
mbe =−1.73 ppbv
r = 0.296
mbe =18.6 ppbv
r = 0.704
mbe =11.5 ppbv
r = 0.956
mbe =−6.54 ppbv
r = 0.556
mbe =−6.66 ppbv
r = 0.909
mbe =−2.45 ppbv
r = −0.095
mbe =−2.2 ppbv
r = 0.0423
mbe =−11.1 ppbv
r = −0.622
mbe =−4.1 ppbv
900 hPa
Jan
May
Sep


as976 tropospheric NO2 column
Min = 0.012 Mean = 1.12 Max = 85.7
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

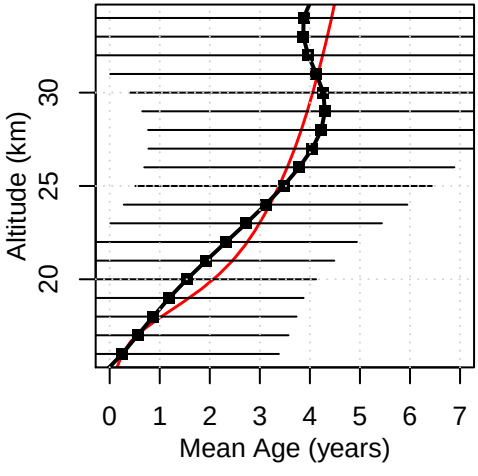

au917 tropospheric NO2 column
Min = 0.0127 Mean = 1.15 Max = 85.8
10^15 (molecules cm^-2)
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
−180
−120
−60
−30
0
30
60
90
120
150
Longitude (degrees)
20
15
10
5
0


as976 tropospheric O_3 column
Min = 5.55 Mean = 23.8 Max = 40.1
Burden (Tg) = 294
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

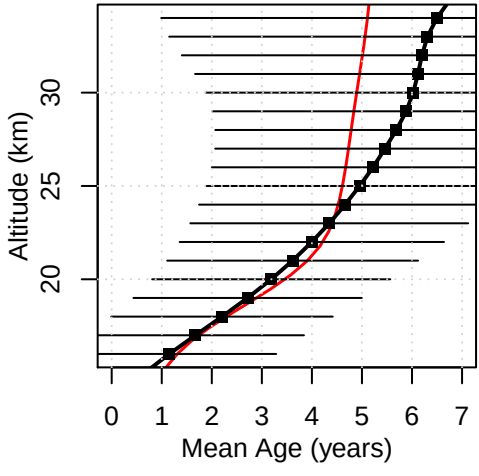

au917 tropospheric O3 column
Min = 5.73 Mean = 24.6 Max = 42.3
Burden (Tg) = 305
Latitude (degrees)
75
60
45
30
15
0
−15
−30
−45
−60
−75
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
60
50
40
30
20
10
0
32
36
28
44
40
24
48

UKCA as976 Mean Age of Air

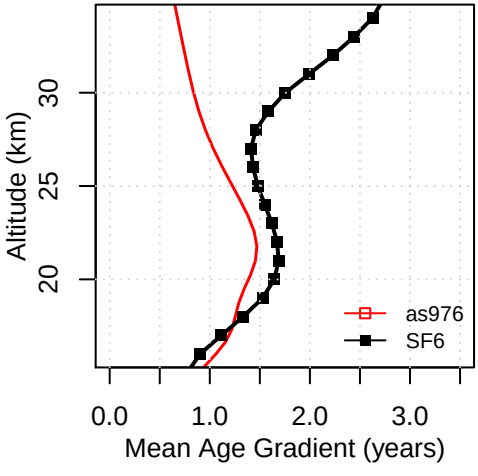
Tropical Mean Age Profile



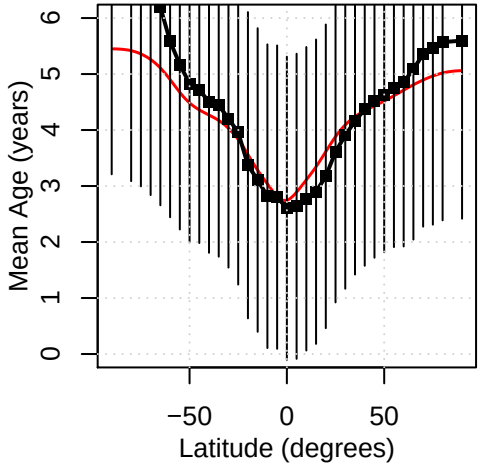
Midlatitude Mean Age Profile



Trop−Midlat Mean Age Gradient Prof

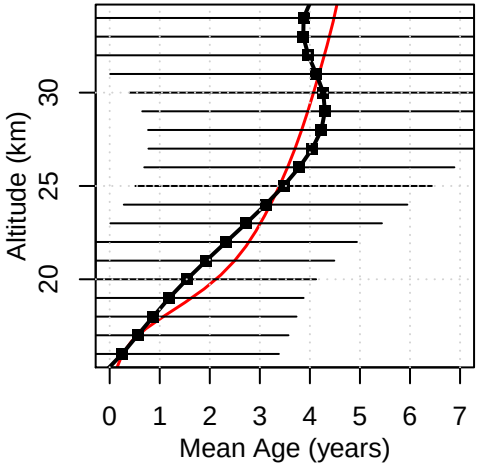


Mean Age, 23km (~50hPa)

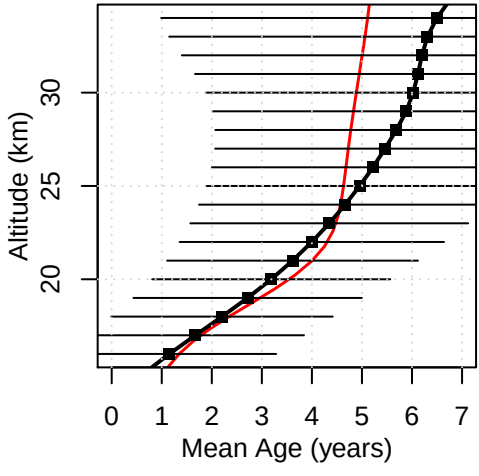


UKCA au917 Mean Age of Air

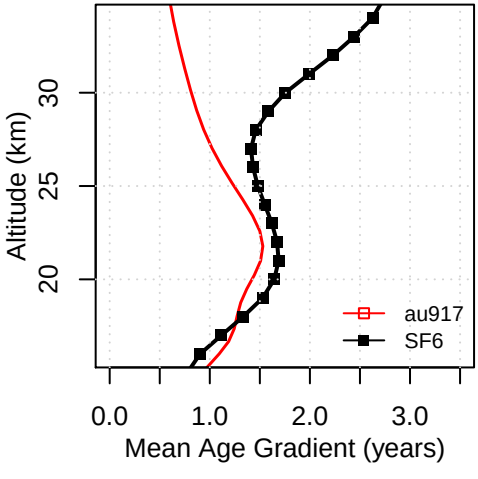
Tropical Mean Age Profile



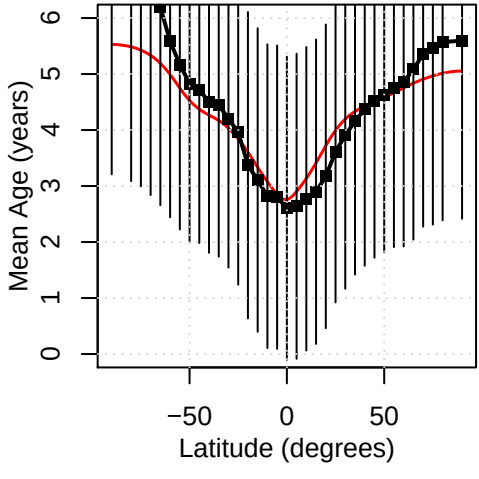
Midlatitude Mean Age Profile

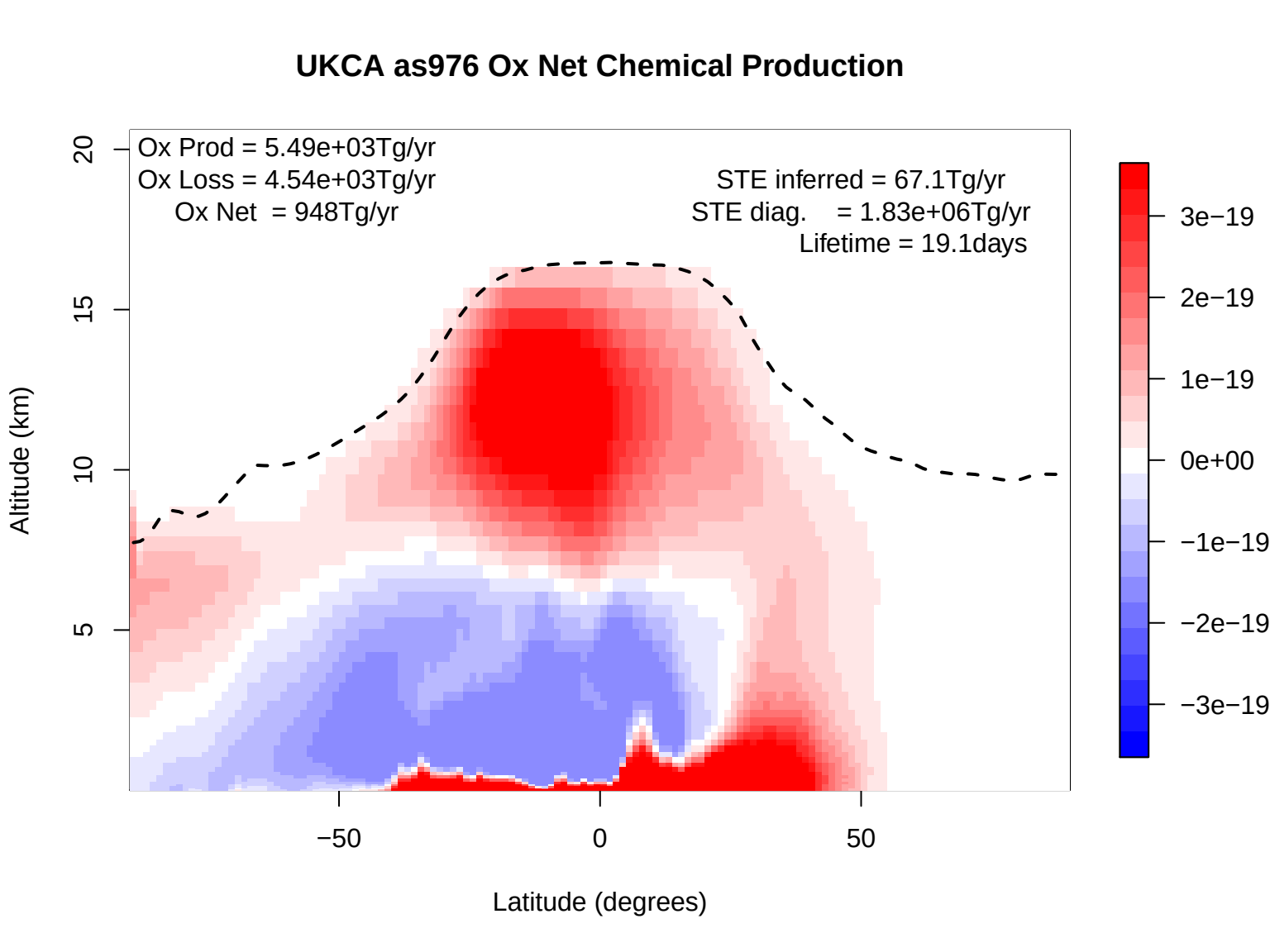


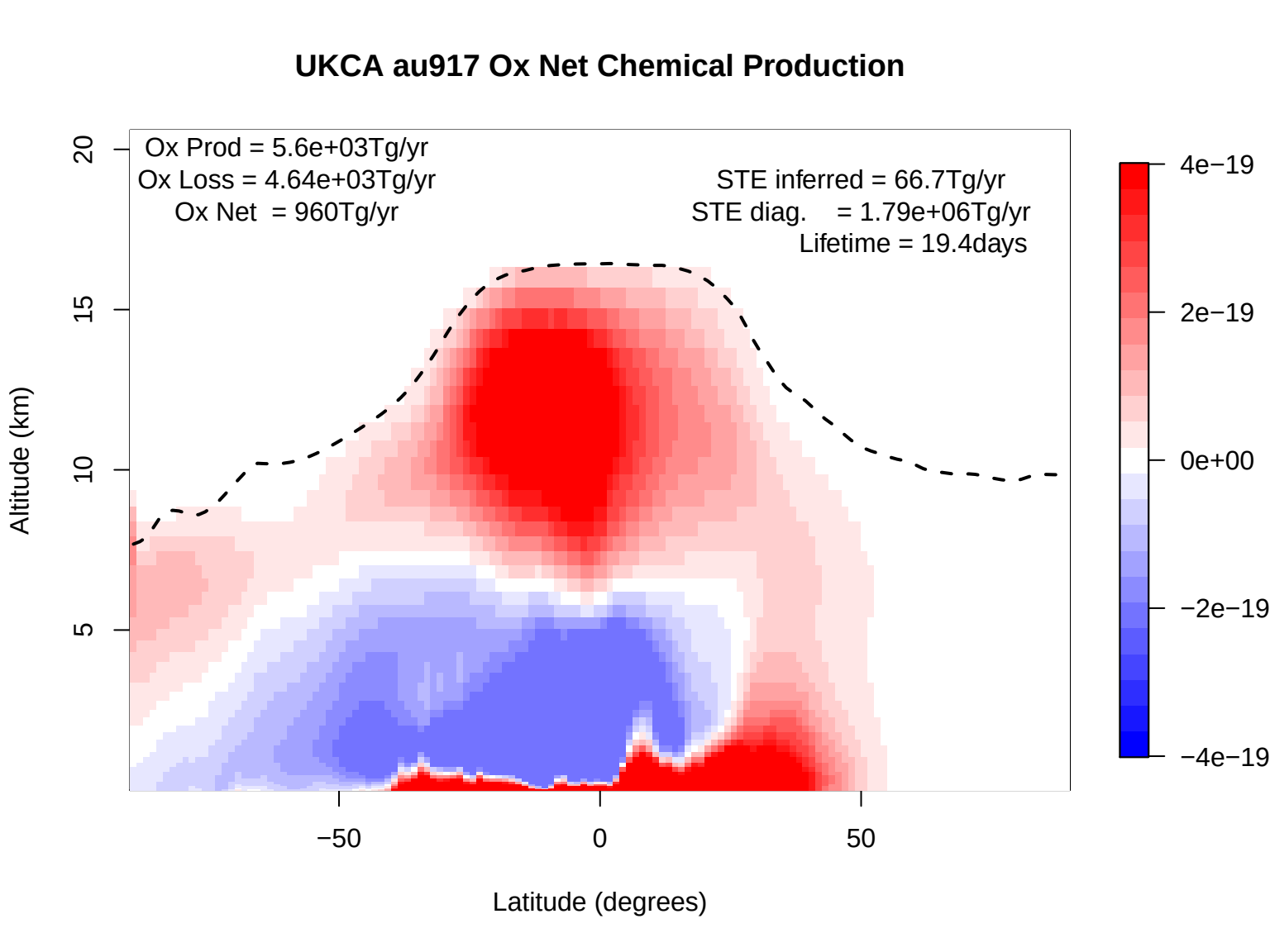
Trop−Midlat Mean Age Gradient Prof

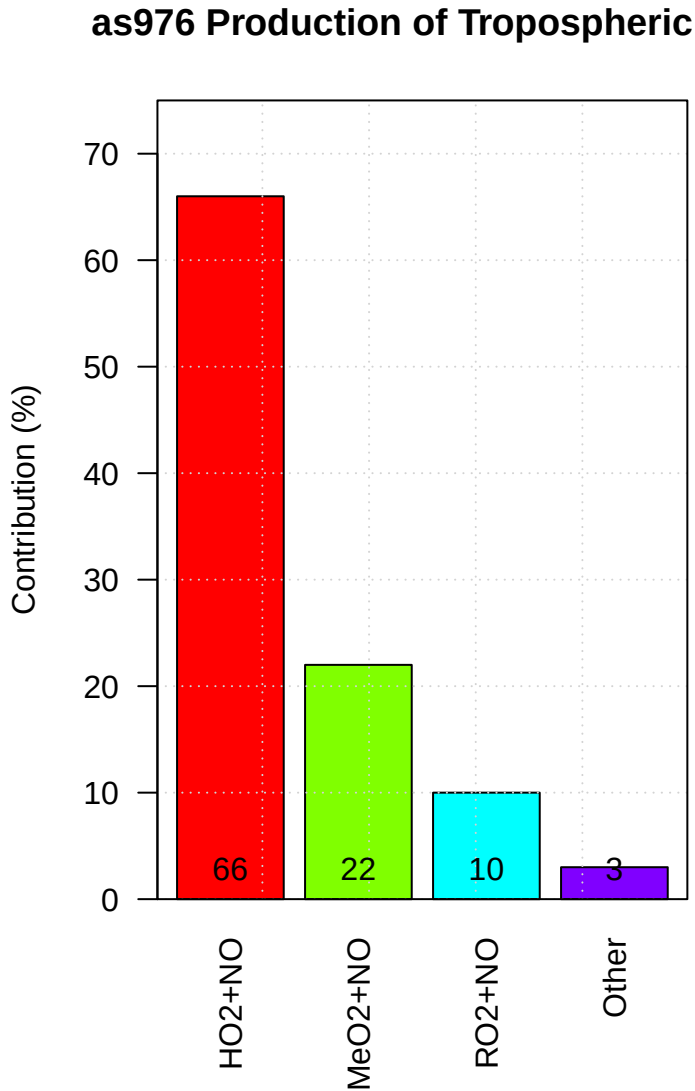


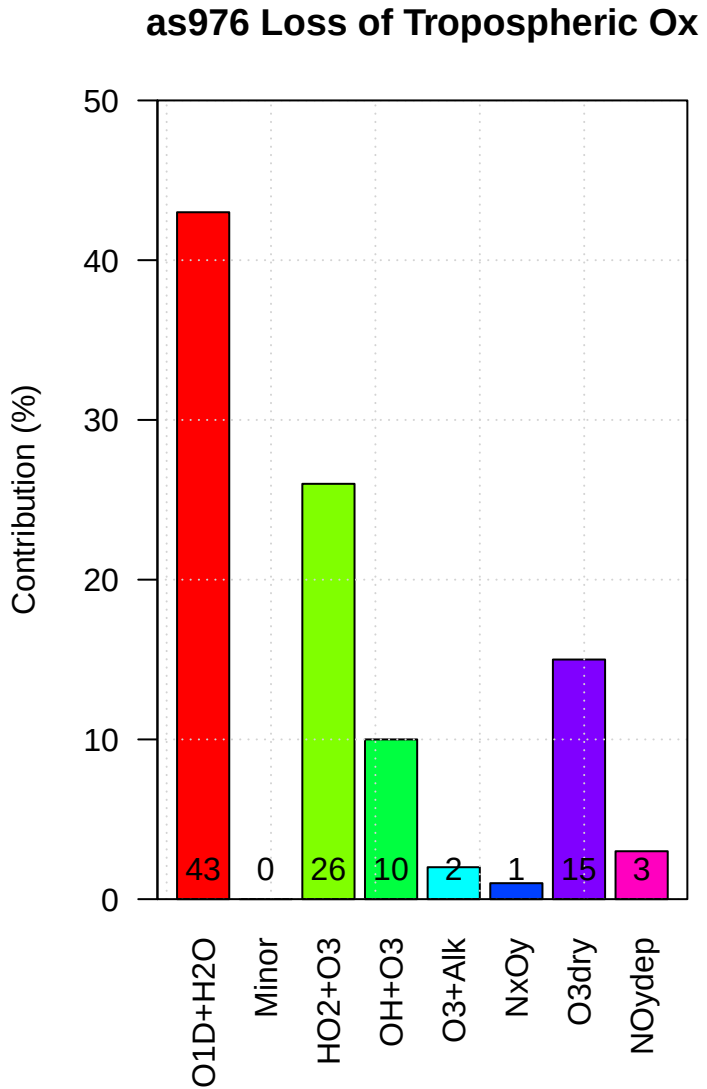
Mean Age, 23km (~50hPa)

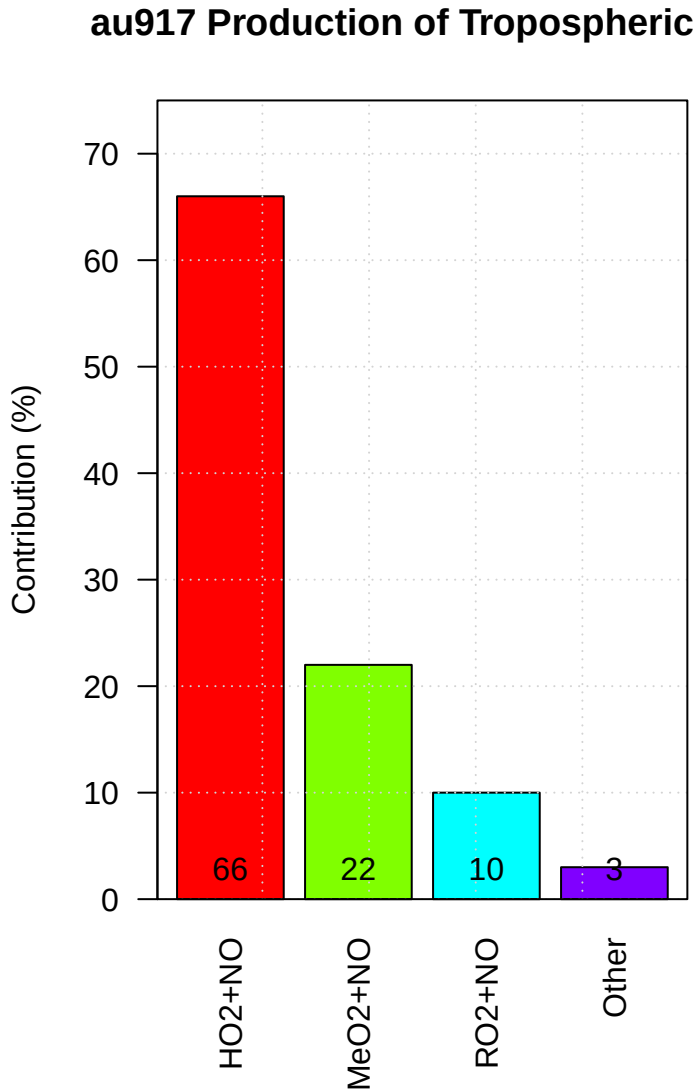


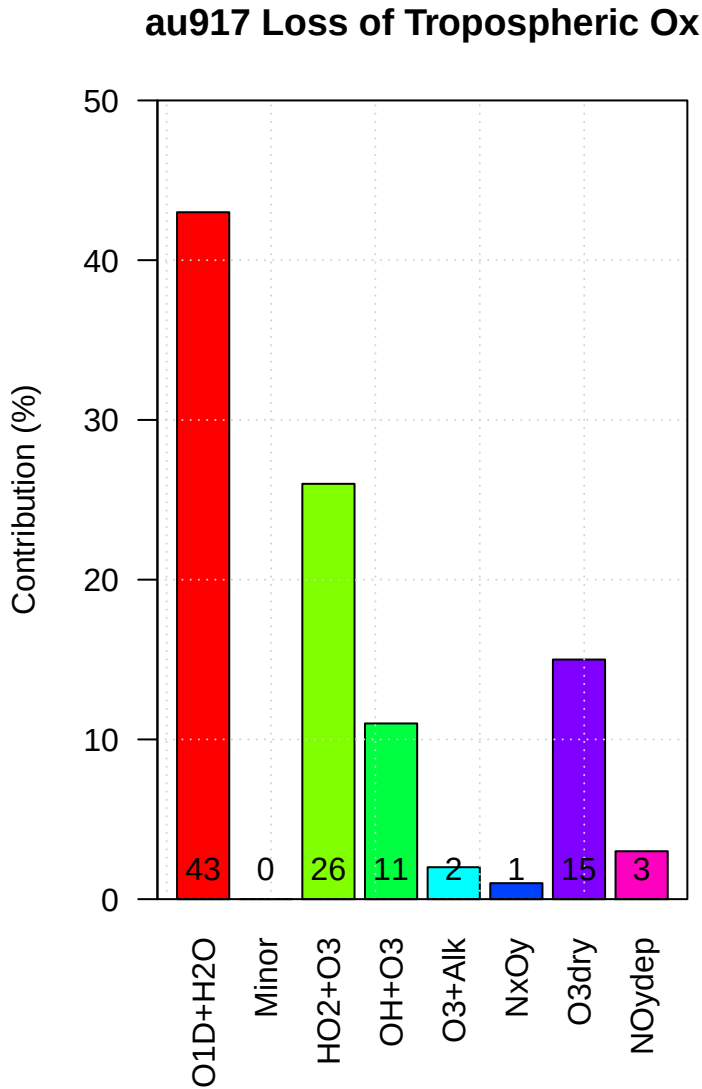

UKCA as976 Ox Net Chemical Production
Ox Prod = 5.49e+03Tg/yr
Ox Loss = 4.54e+03Tg/yr
Ox Net = 948Tg/yr
STE inferred = 67.1Tg/yr
STE diag. = 1.83e+06Tg/yr
Lifetime = 19.1days
Altitude (km)
20
15
10
5
−50
0
50
Latitude (degrees)
3e−19
2e−19
1e−19
0e+00
−1e−19
−2e−19
−3e−19

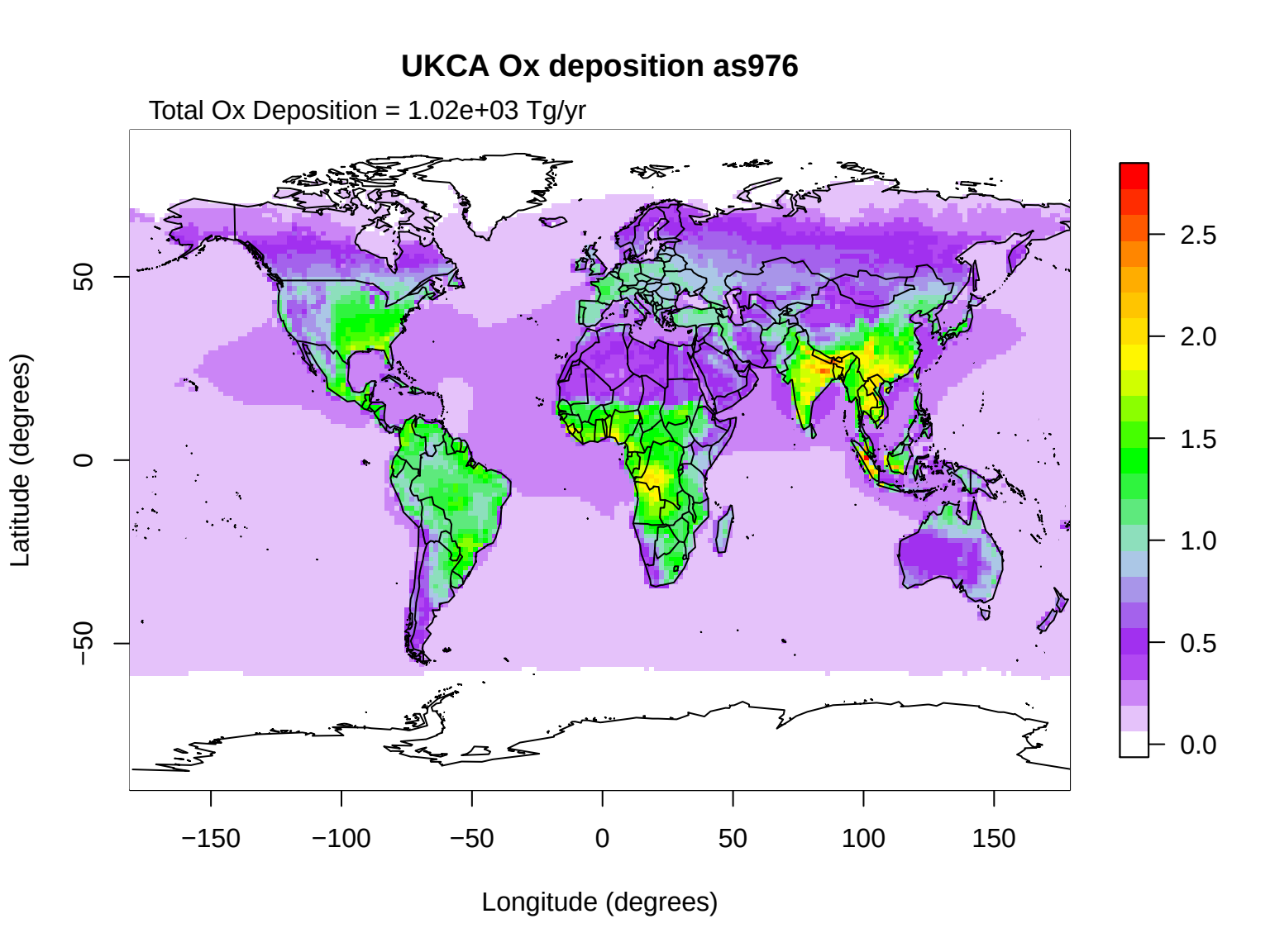

UKCA au917 Ox Net Chemical Production
Ox Prod = 5.6e+03Tg/yr
Ox Loss = 4.64e+03Tg/yr
Ox Net = 960Tg/yr
STE inferred = 66.7Tg/yr
STE diag. = 1.79e+06Tg/yr
Lifetime = 19.4days
Altitude (km)
20
15
10
5
−50
0
50
Latitude (degrees)
4e−19
2e−19
0e+00
−2e−19
−4e−19

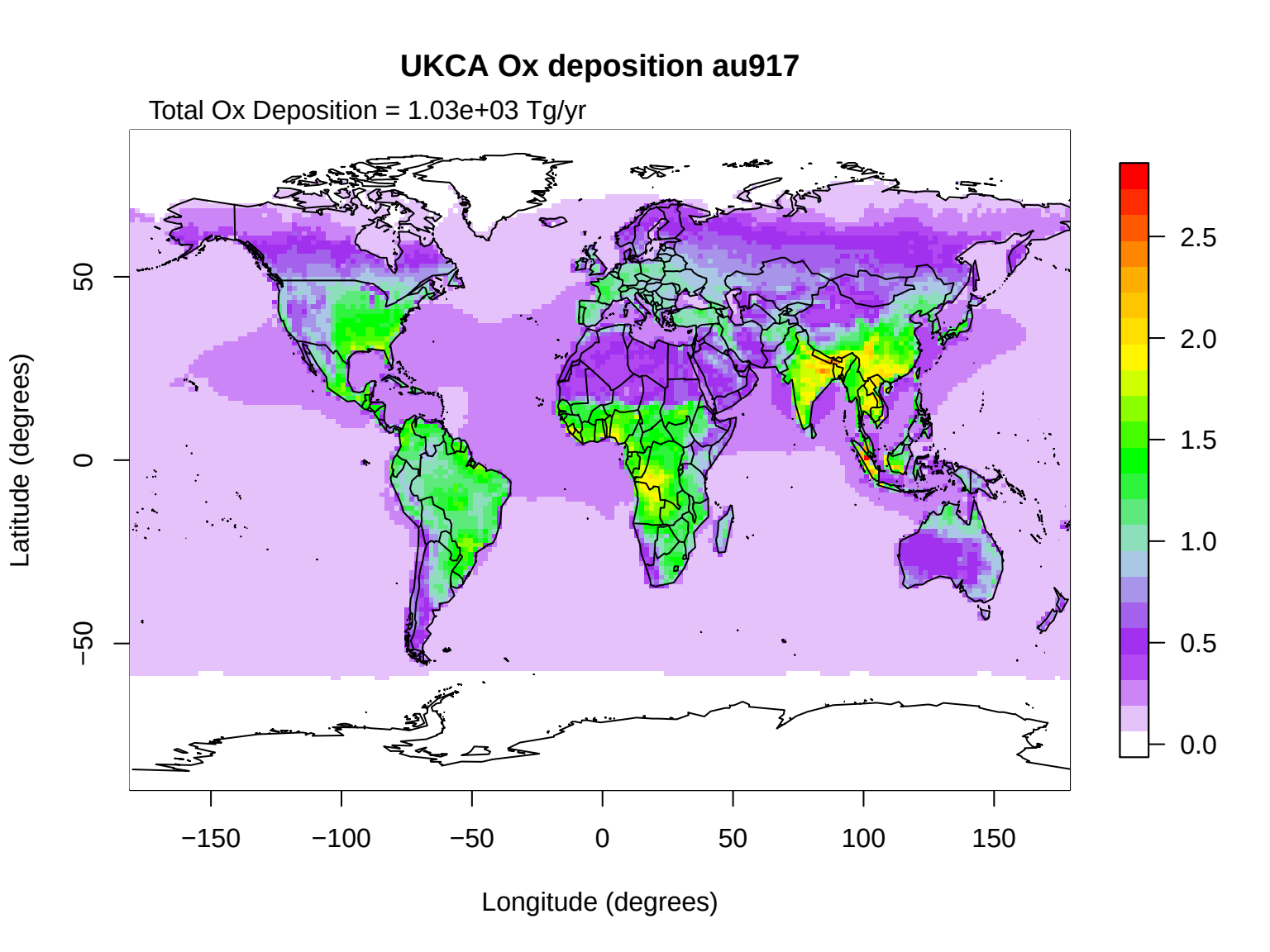

as976 Production of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
60
70
66
22
10
3
HO2+NO
MeO2+NO
RO2+NO
Other

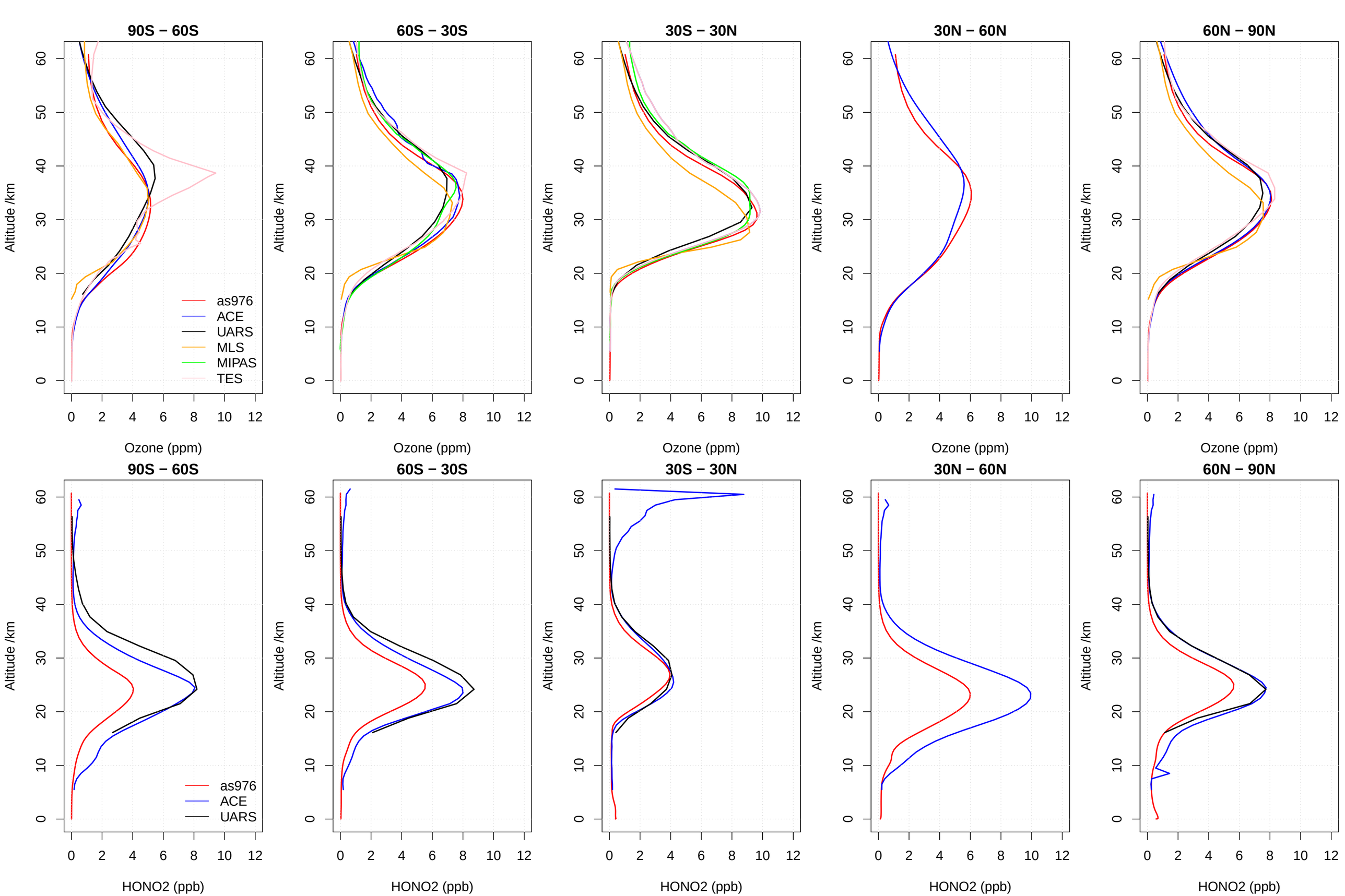

as976 Loss of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
43
0
26
10
2
1
15
3
O1D+H2O
Minor
HO2+O3
OH+O3
O3+Alk
NxOy
O3dry
NOydep

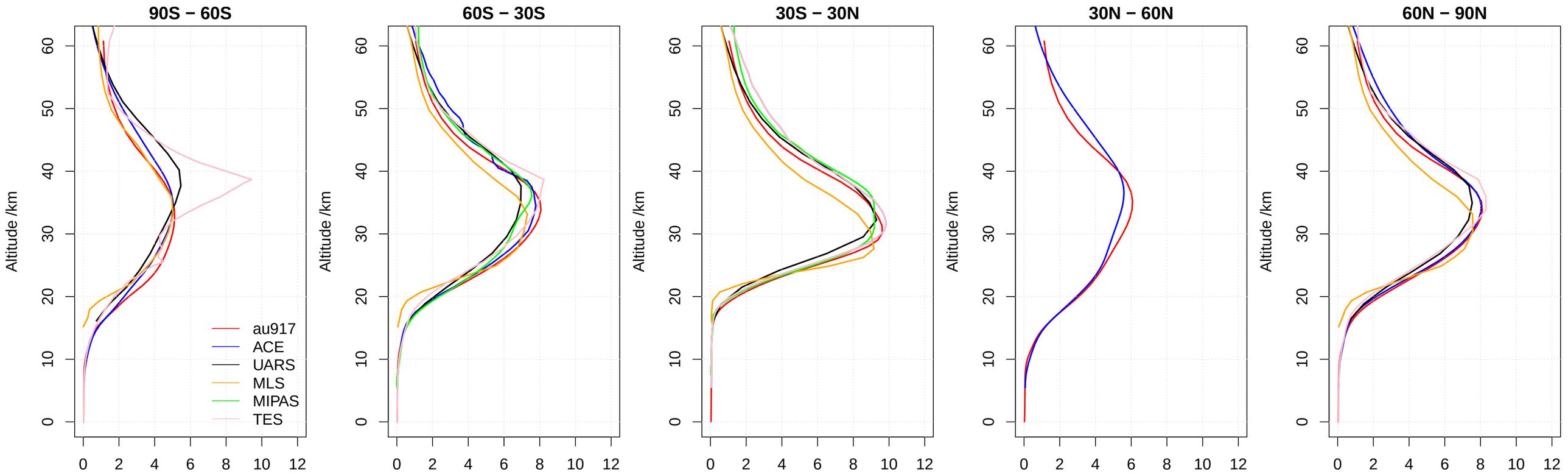

au917 Production of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
60
70
66
22
10
3
HO2+NO
MeO2+NO
RO2+NO
Other


au917 Loss of Tropospheric Ox
Contribution (%)
0
10
20
30
40
50
43
0
26
11
2
1
15
3
O1D+H2O
Minor
HO2+O3
OH+O3
O3+Alk
NxOy
O3dry
NOydep

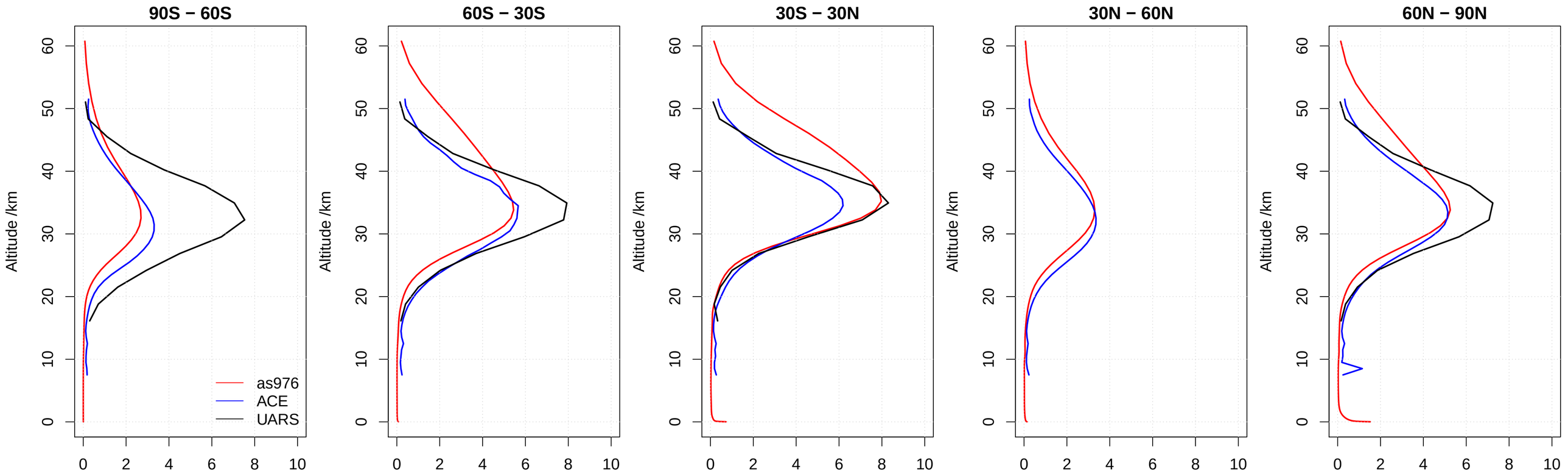

UKCA Ox deposition as976
Total Ox Deposition = 1.02e+03 Tg/yr
Latitude (degrees)
50
0
−50
−150
−100
−50
0
50
100
150
Longitude (degrees)
2.5
2.0
1.5
1.0
0.5
0.0

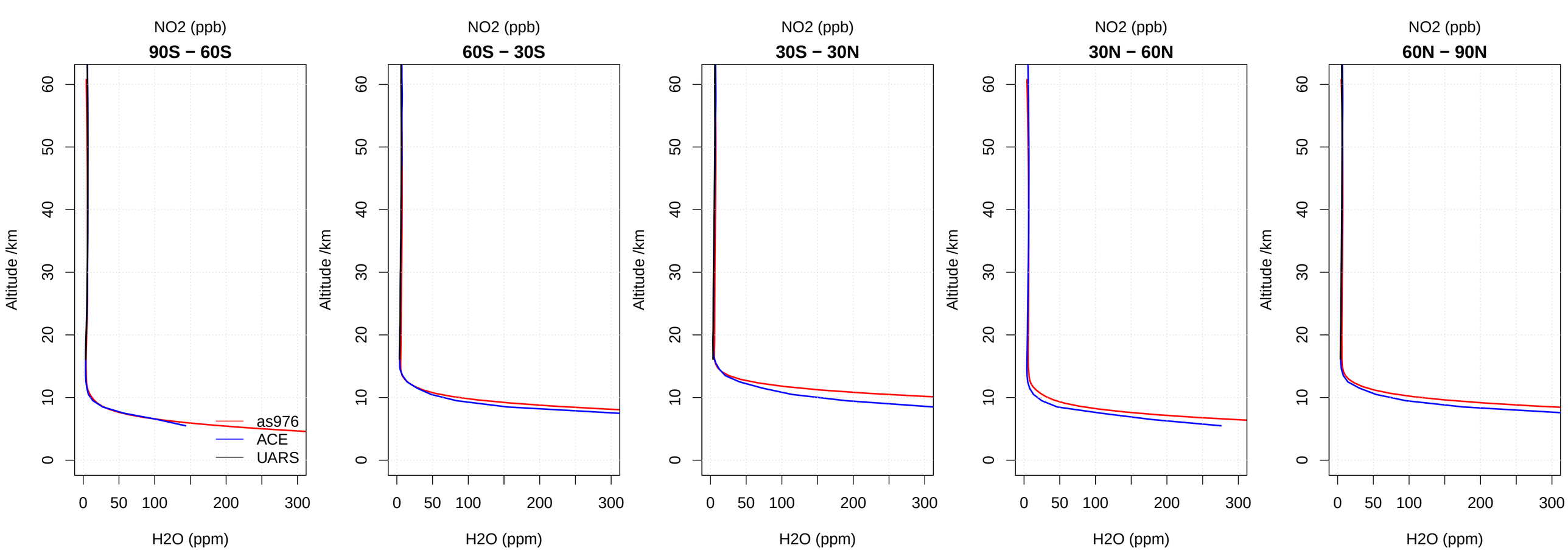

UKCA Ox deposition au917
Total Ox Deposition = 1.03e+03 Tg/yr
Latitude (degrees)
50
0
−50
−150
−100
−50
0
50
100
150
Longitude (degrees)
2.5
2.0
1.5
1.0
0.5
0.0


90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
Ozone (ppm)
HONO2 (ppb)
as976
ACE
UARS
MLS
MIPAS
TES


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
au917
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
au917
ACE
UARS
HONO2 (ppb)


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
as976
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)
as976
ACE
UARS

90S − 60S

60S − 30S

30S − 30N

30N − 60N

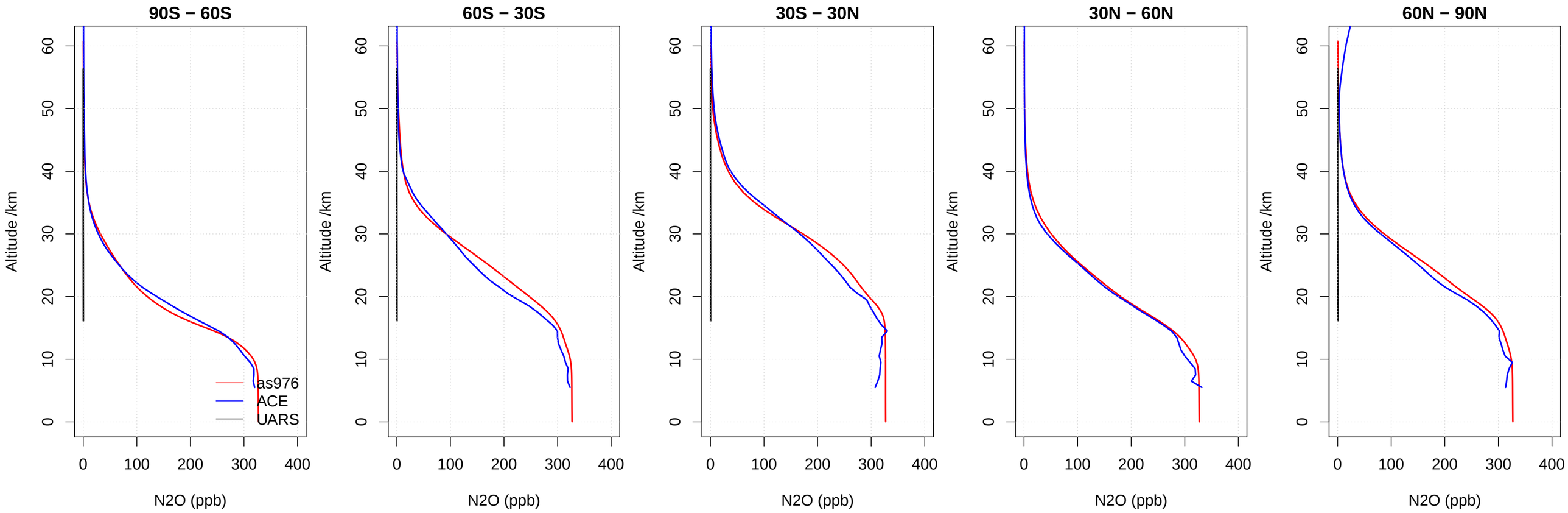
60N − 90N

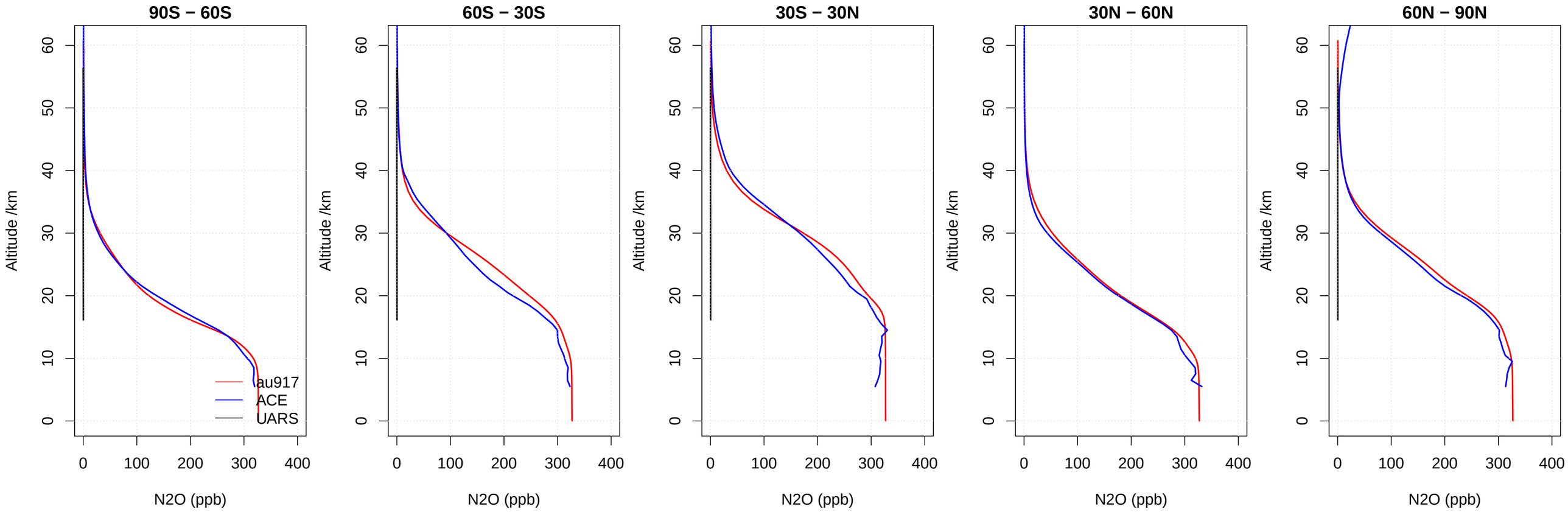
Altitude /km

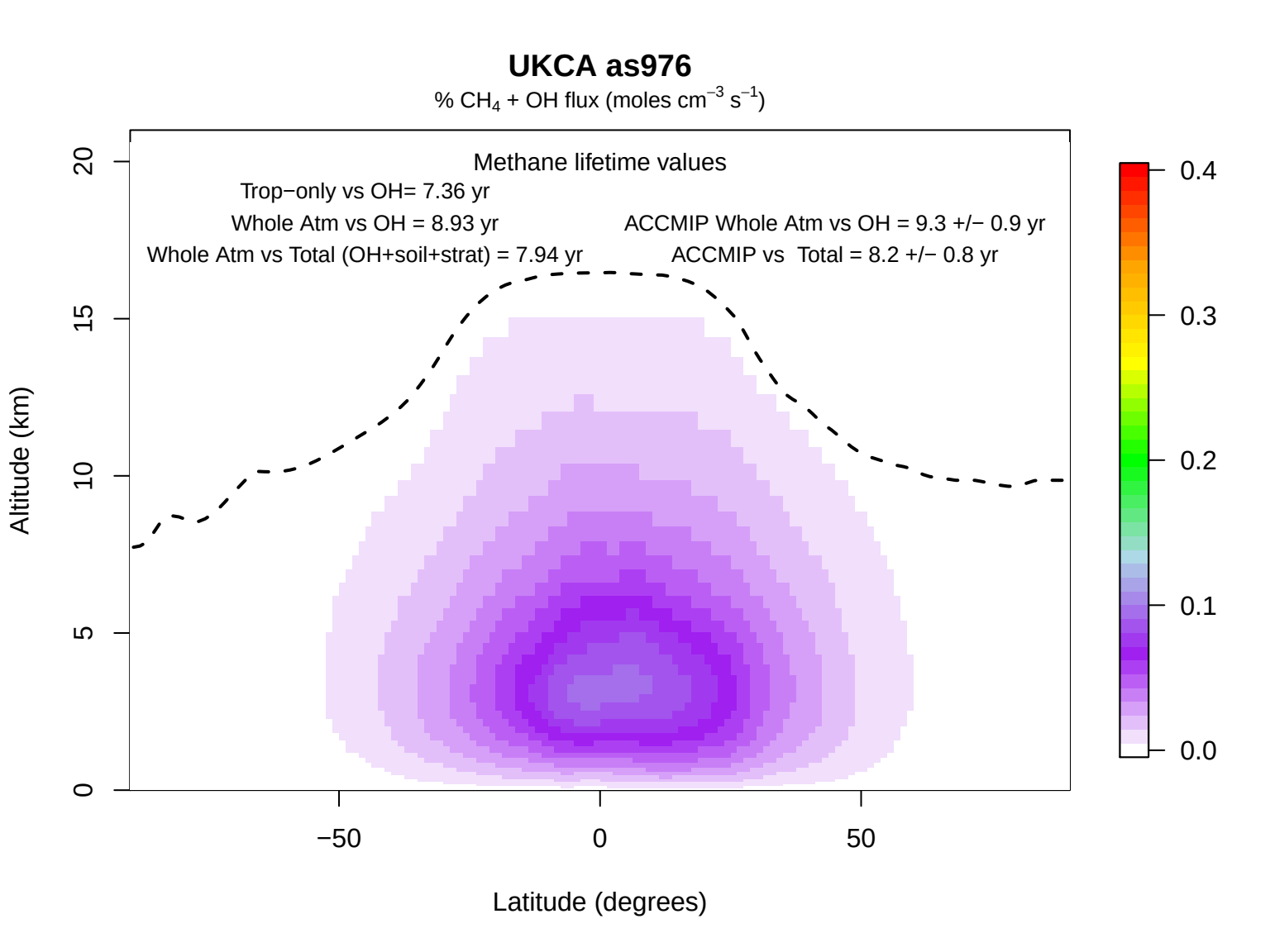
au917
ACE
UARS

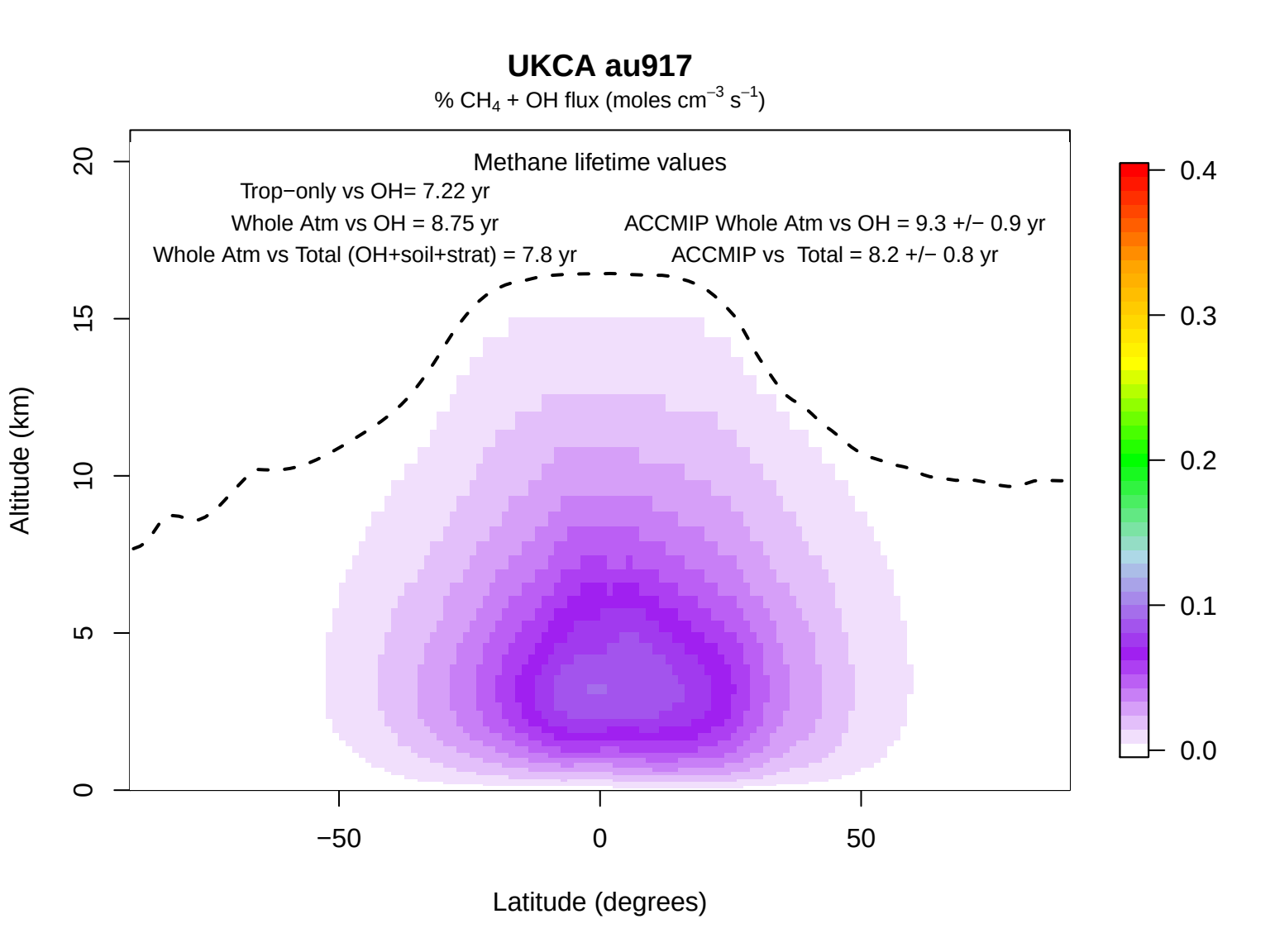
NO2 (ppb)

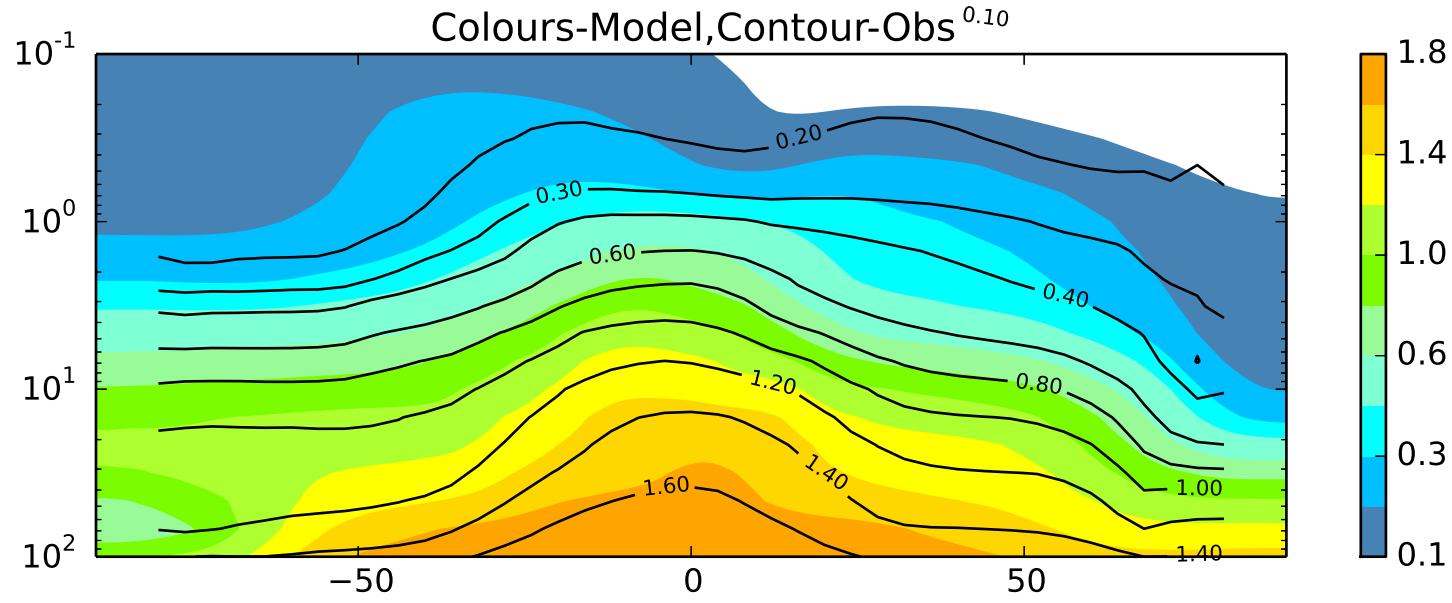
H2O (ppm)

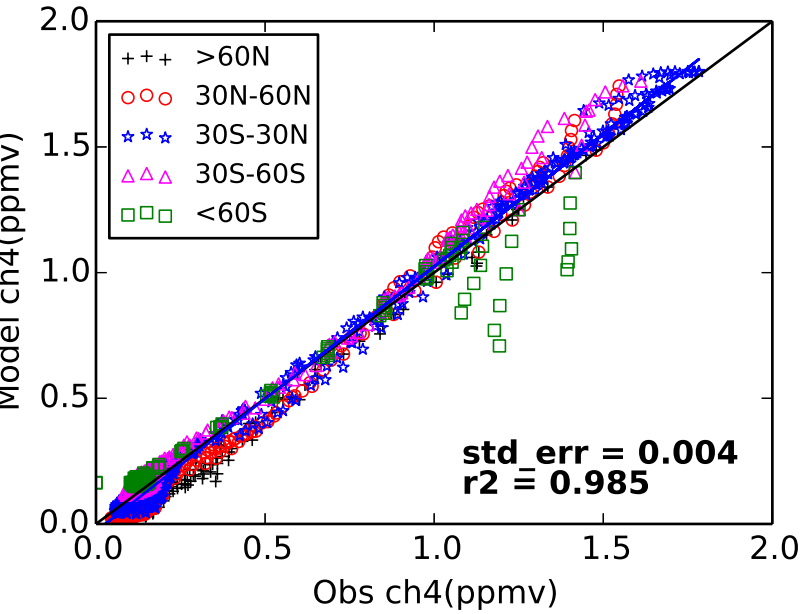

90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
N2O (ppb)
as976
ACE
UARS
0
10
20
30
40
50
60
0
100
200
300
400


90S − 60S
60S − 30S
30S − 30N
30N − 60N
60N − 90N
Altitude /km
N2O (ppb)
au917
ACE
UARS
0
10
20
30
40
50
60
0
100
200
300
400

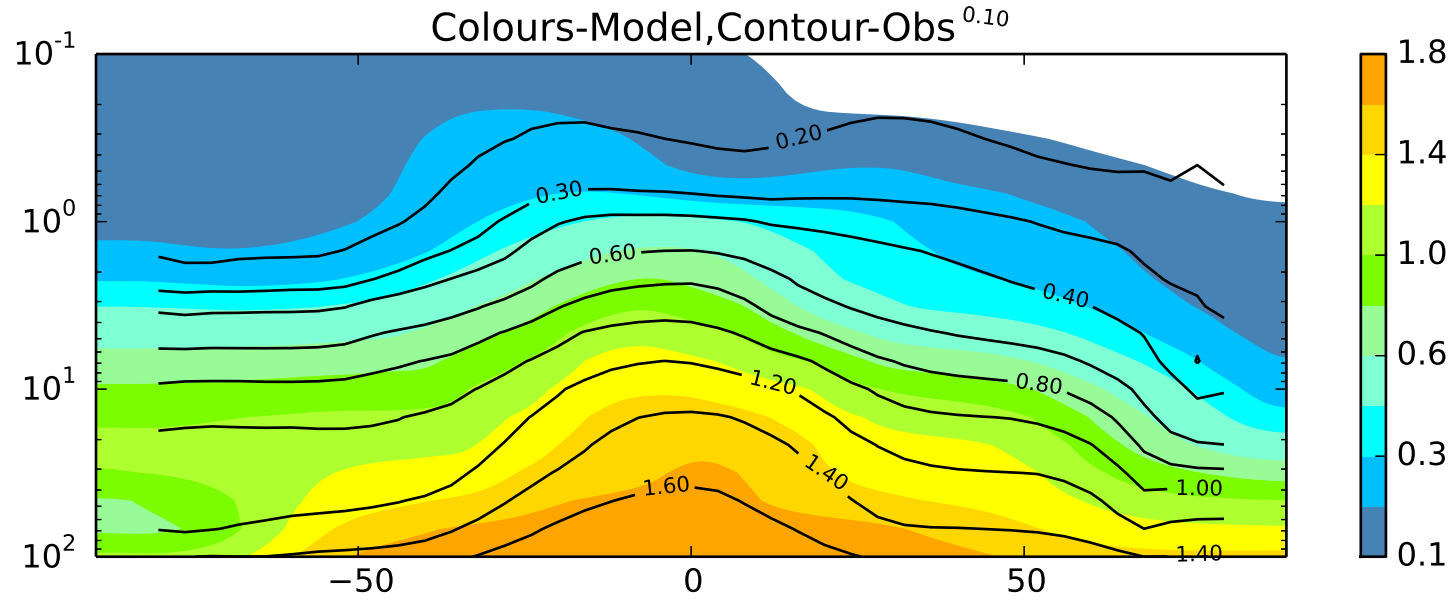

UKCA as976
% CH4 + OH flux (moles cm−3 s−1)
Methane lifetime values
Trop−only vs OH= 7.36 yr
Whole Atm vs OH = 8.93 yr
Whole Atm vs Total (OH+soil+strat) = 7.94 yr
ACCMIP Whole Atm vs OH = 9.3 +/− 0.9 yr
ACCMIP vs Total = 8.2 +/− 0.8 yr
Altitude (km)
0
5
10
15
20
−50
0
50
Latitude (degrees)
0.4
0.3
0.2
0.1
0.0

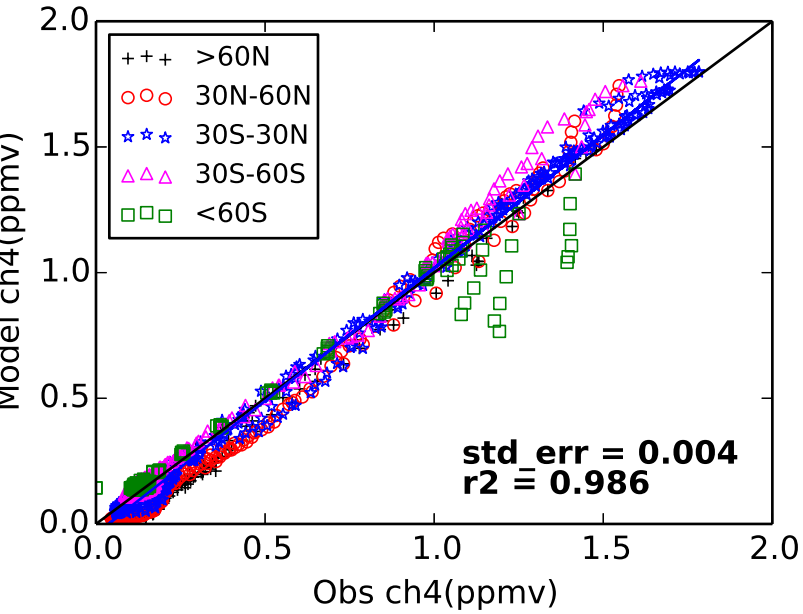

UKCA au917
% CH4 + OH flux (moles cm−3 s−1)
Methane lifetime values
Trop−only vs OH= 7.22 yr
Whole Atm vs OH = 8.75 yr
Whole Atm vs Total (OH+soil+strat) = 7.8 yr
ACCMIP Whole Atm vs OH = 9.3 +/− 0.9 yr
ACCMIP vs Total = 8.2 +/− 0.8 yr
Altitude (km)
0
5
10
15
20
−50
0
50
Latitude (degrees)
0.4
0.3
0.2
0.1
0.0



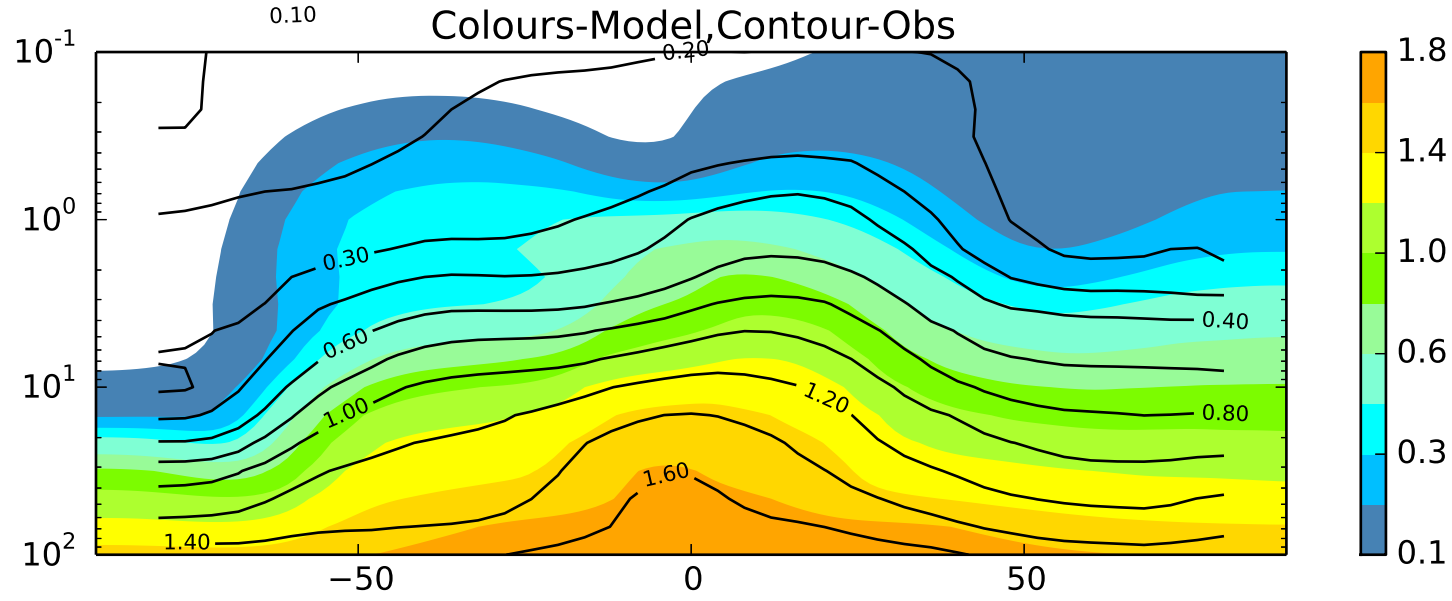


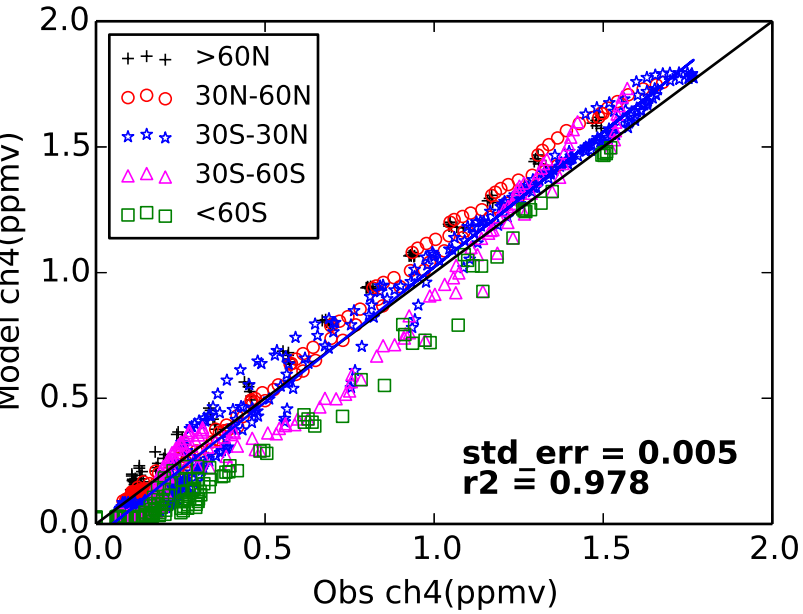
UKCA as976 vs HALOE:
CH4 (ppmv) Jan



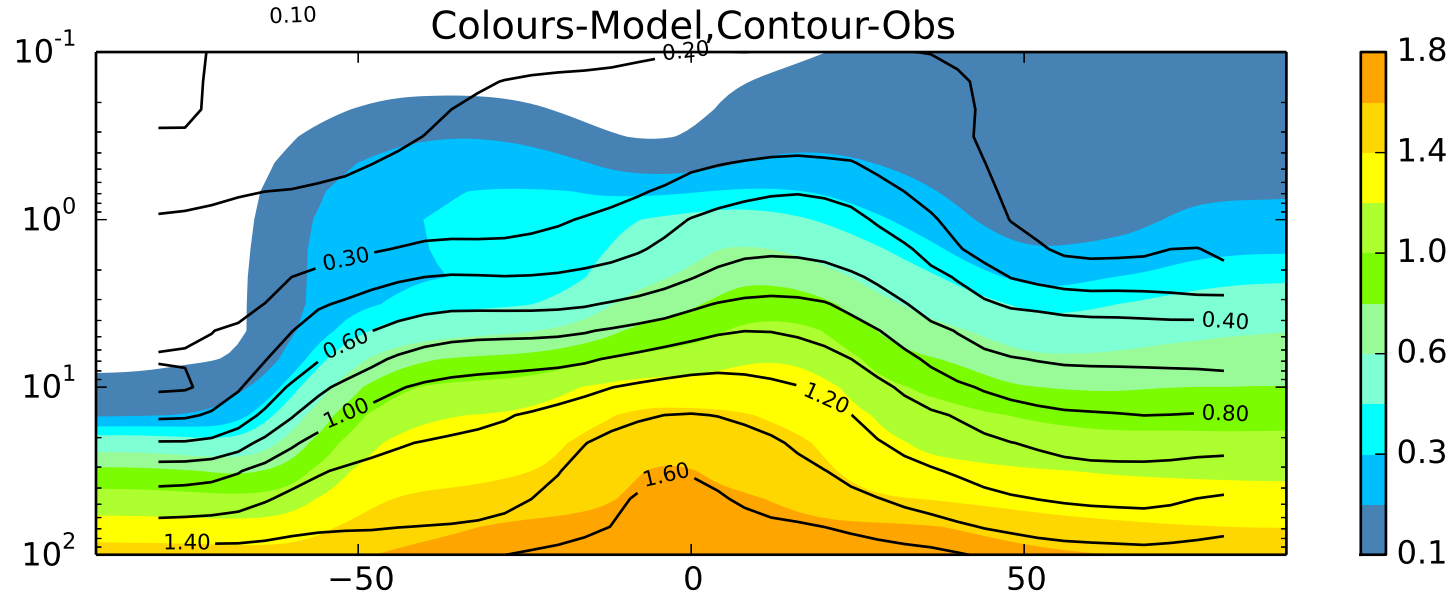


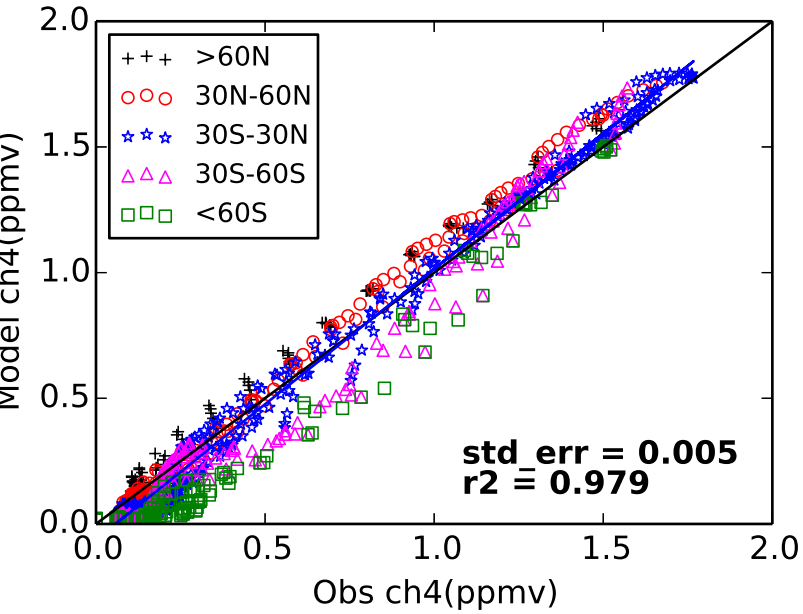
UKCA au917 vs HALOE:
CH4 (ppmv) Jan



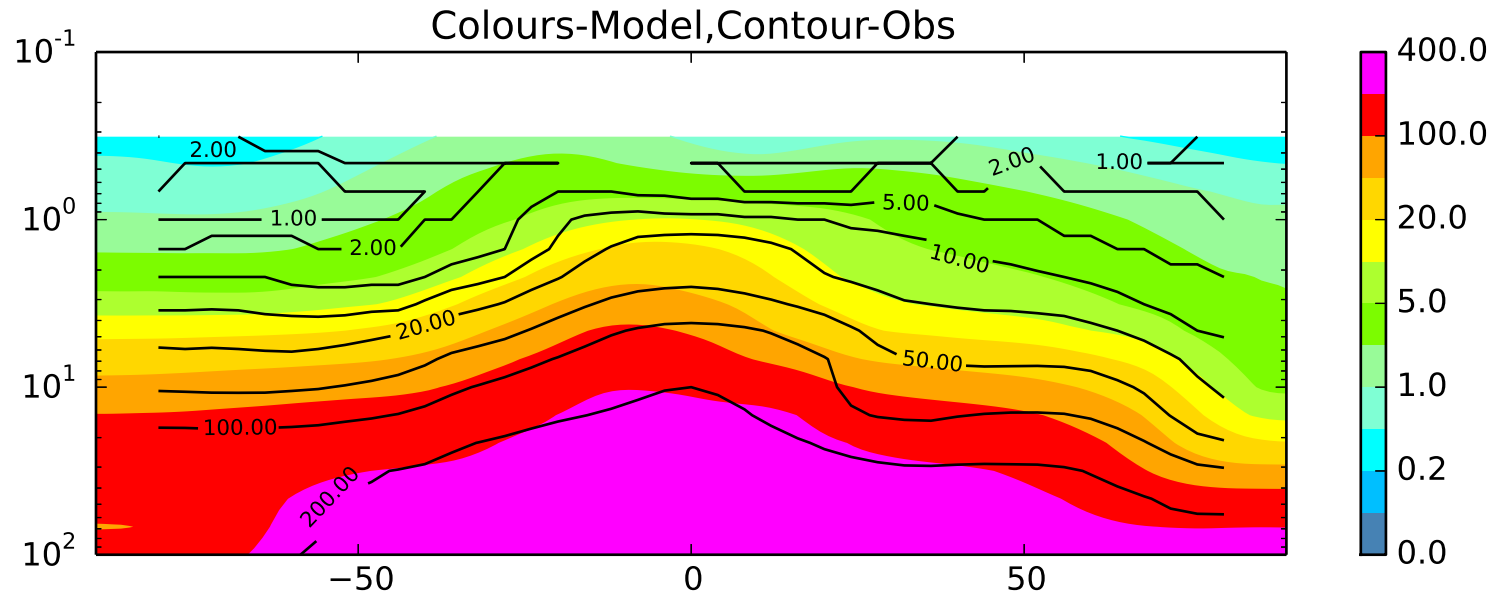


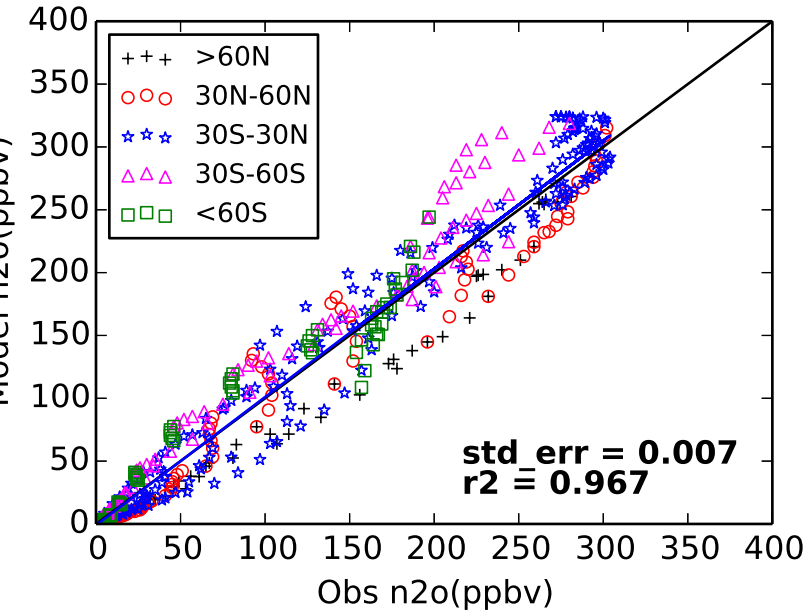
UKCA as976 vs HALOE:
CH4 (ppmv) Jul



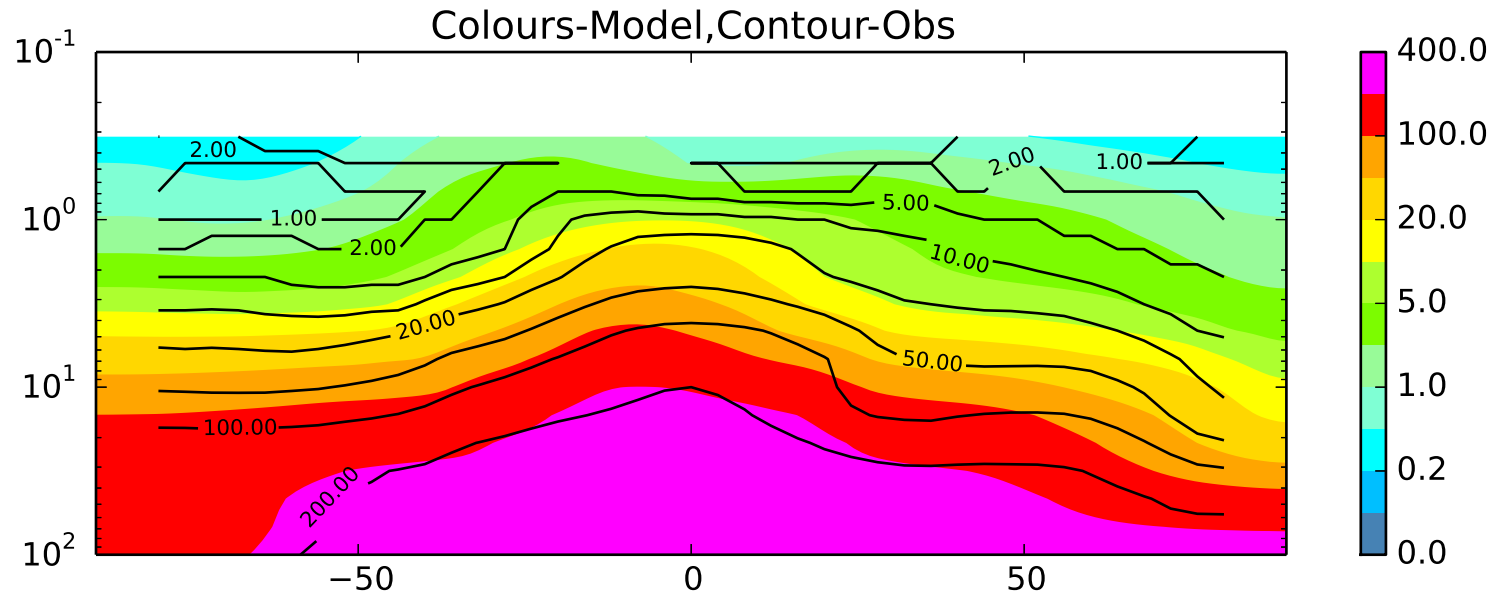


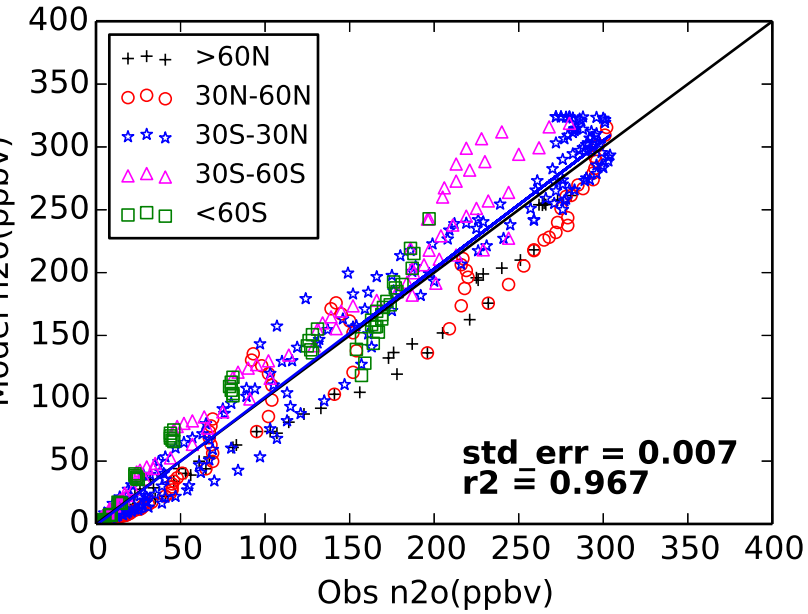
UKCA au917 vs HALOE:
CH4 (ppmv) Jul



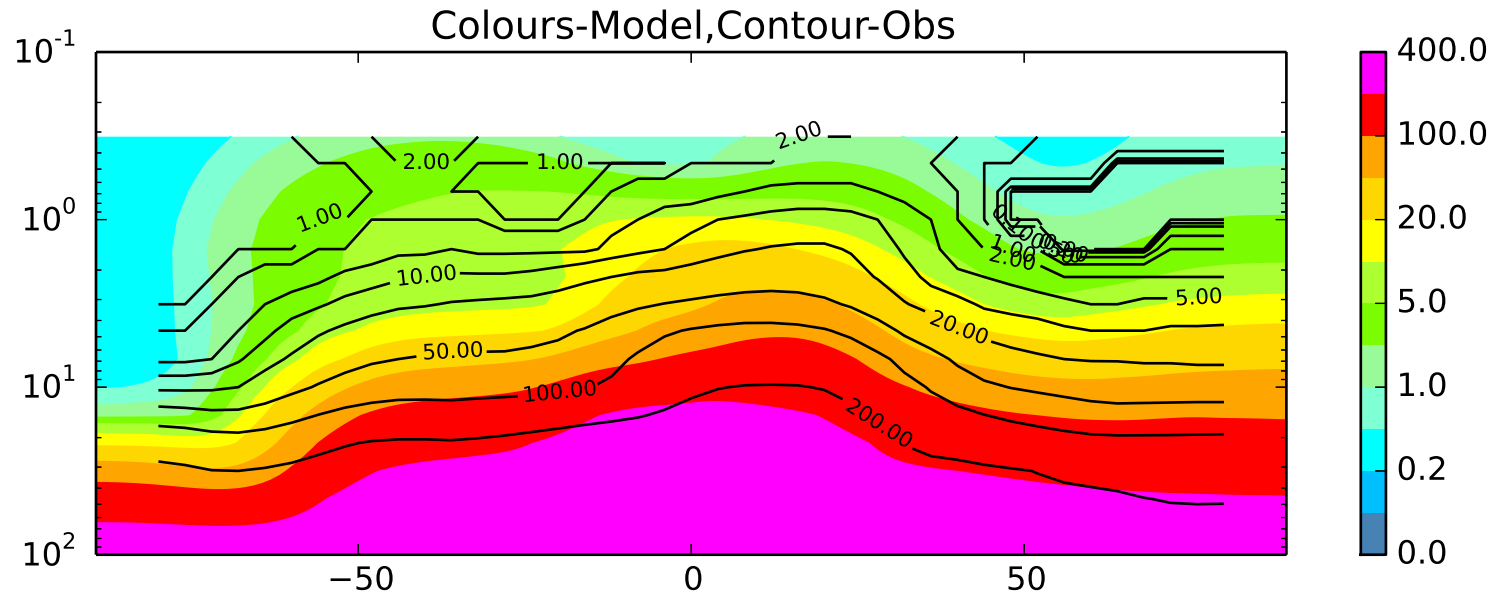


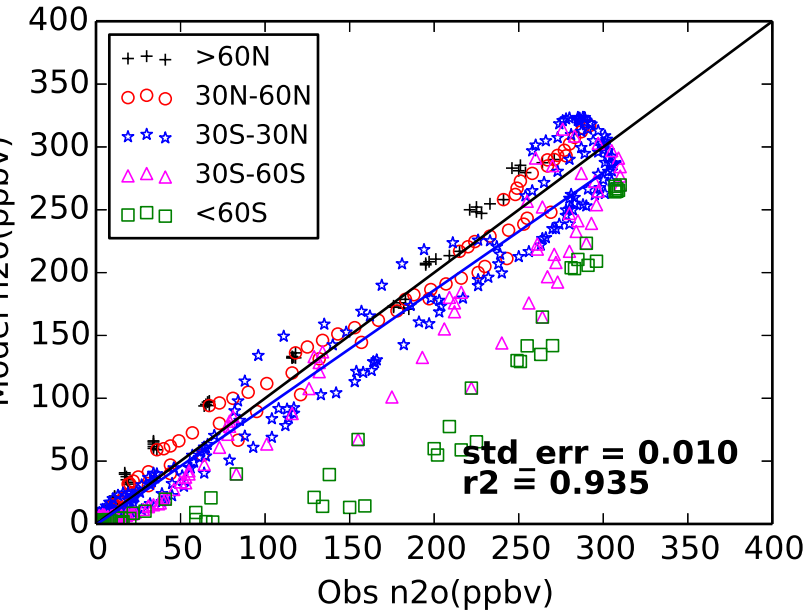
UKCA as976 vs HALOE:
N2O (ppmv) Jan



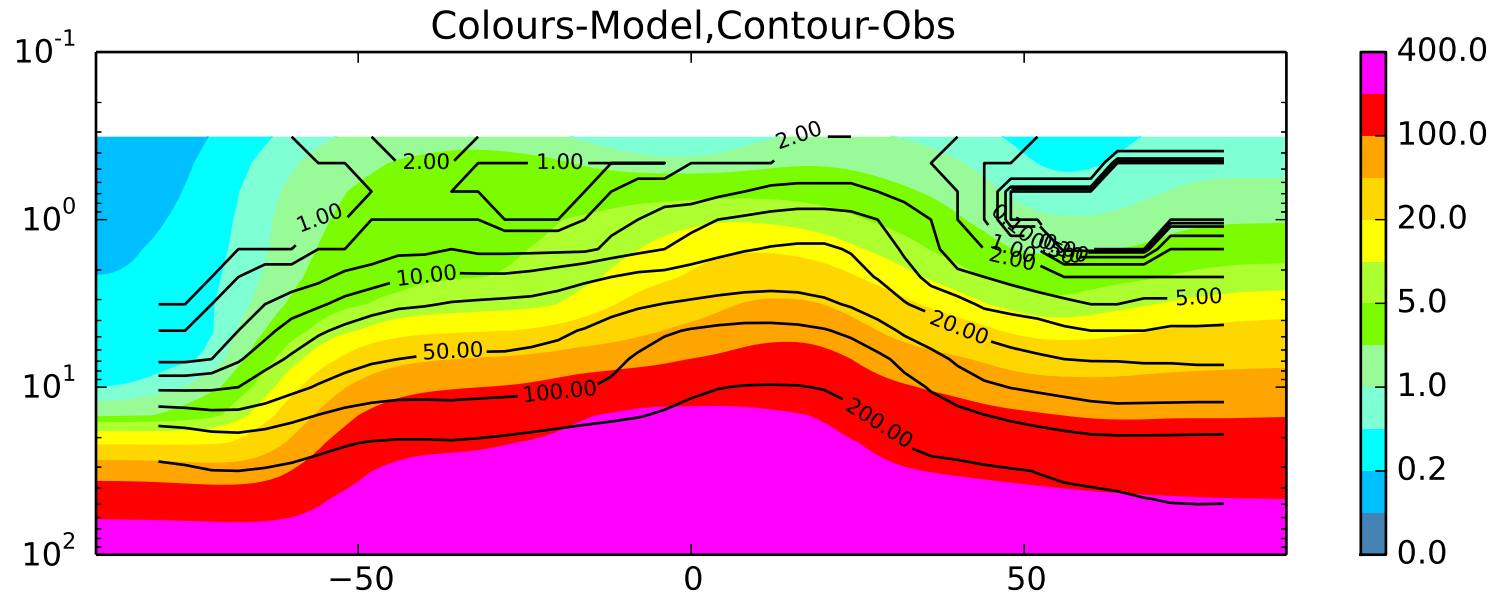


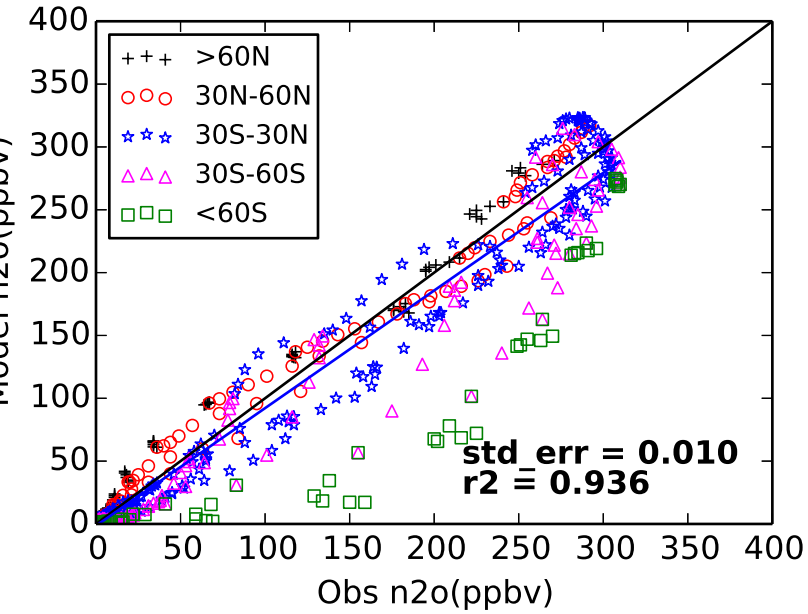
UKCA au917 vs HALOE:
N2O (ppmv) Jan



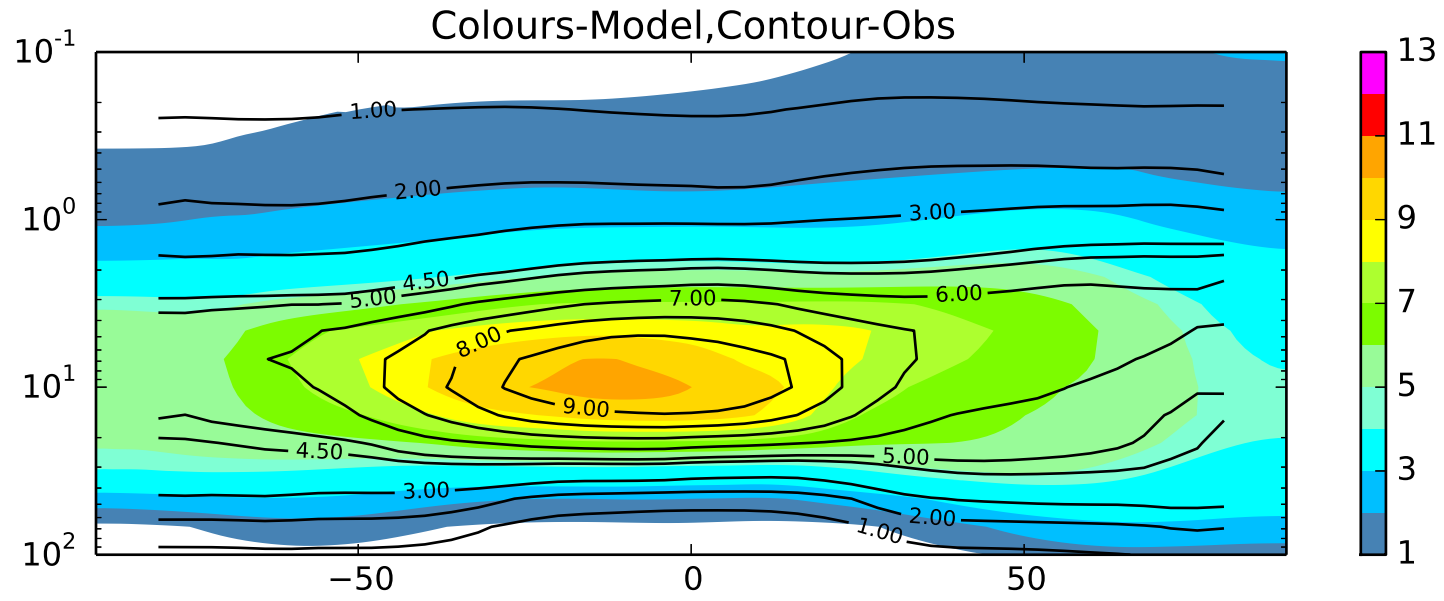


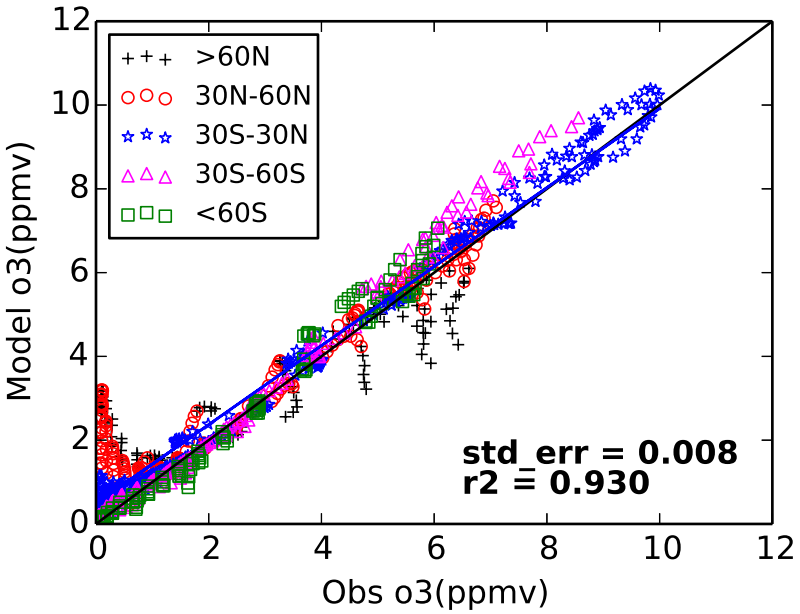
UKCA as976 vs HALOE:
N2O (ppmv) Jul



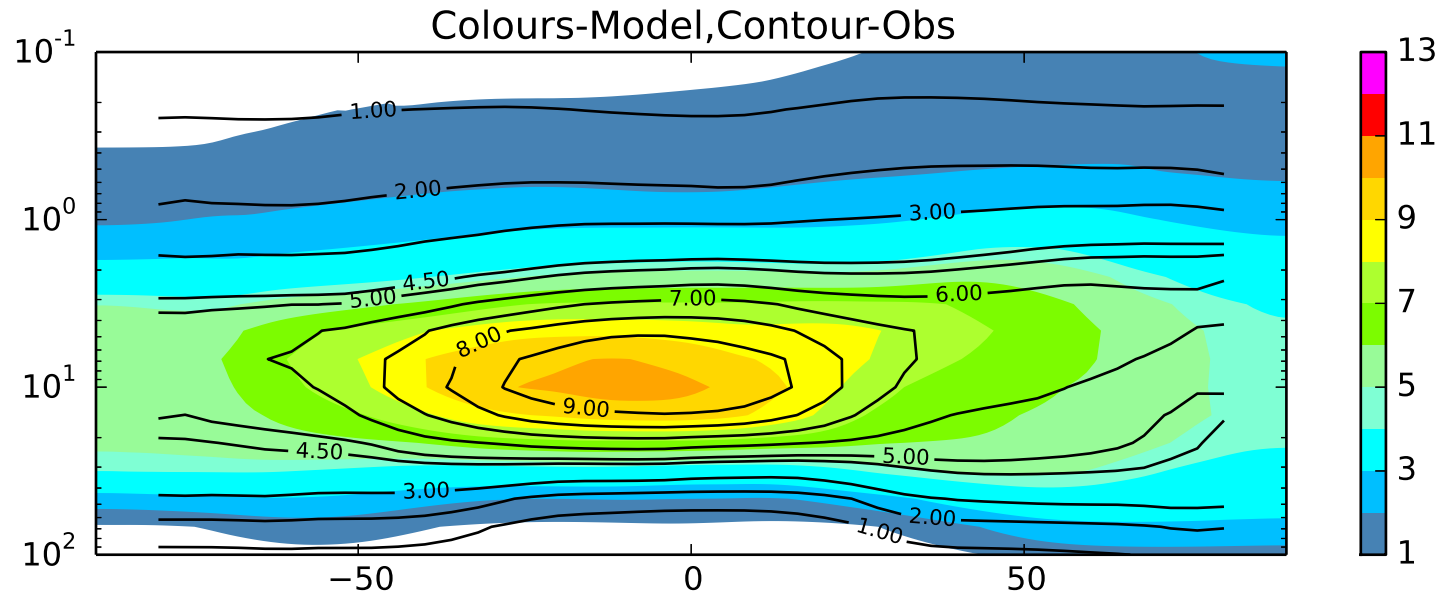


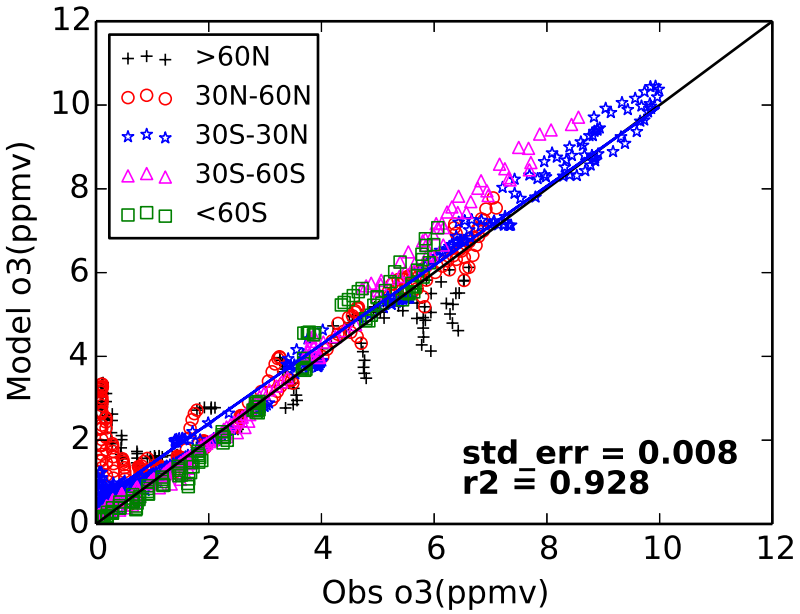
UKCA au917 vs HALOE:
N2O (ppmv) Jul



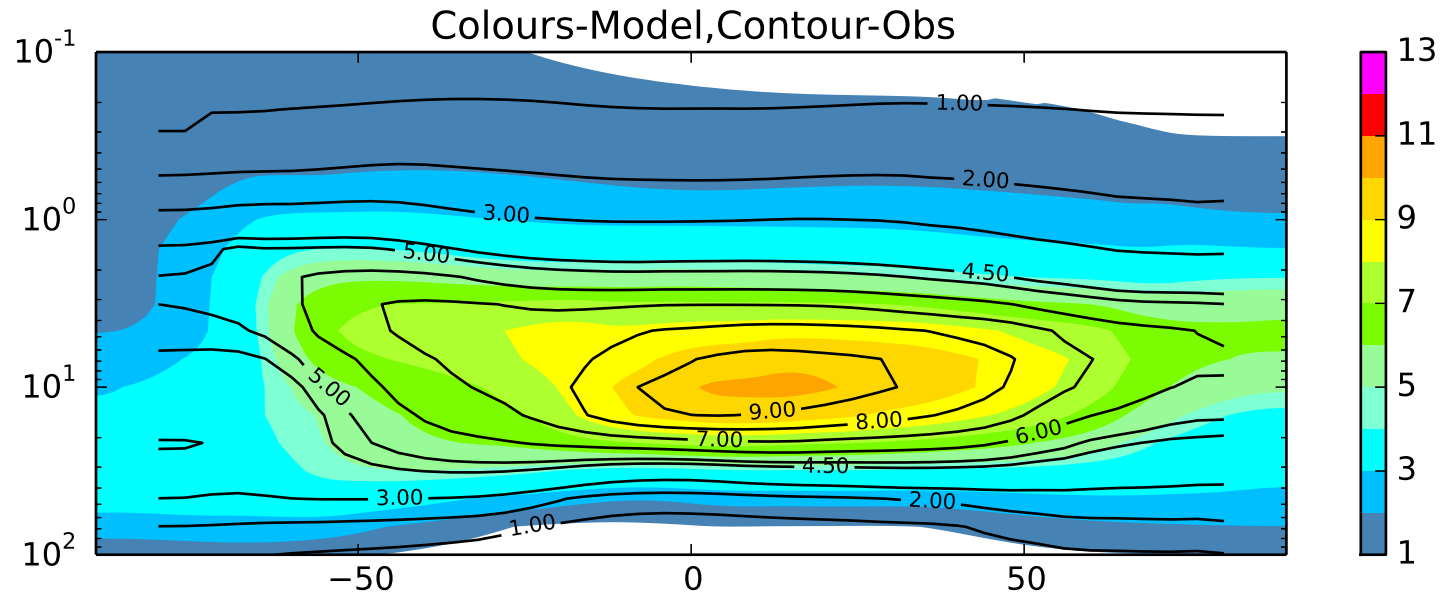


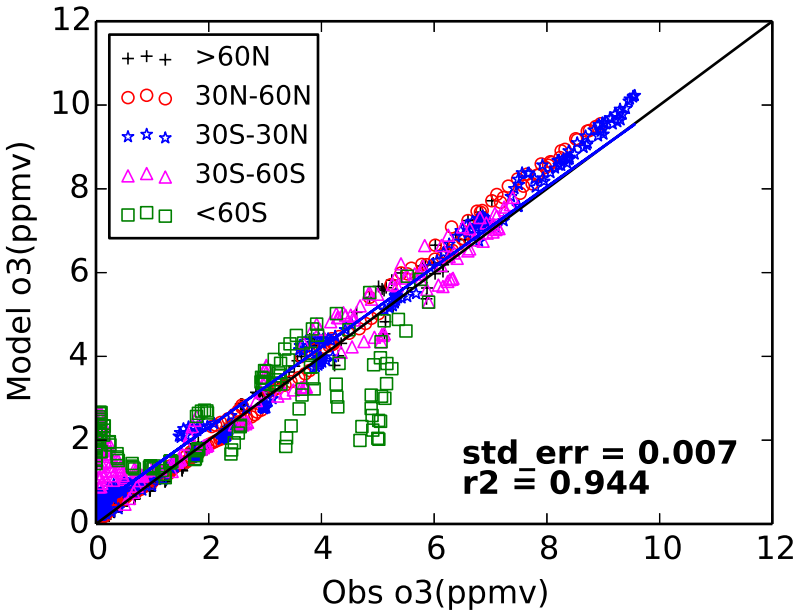
UKCA as976 vs HALOE:
O3 (ppmv) Jan



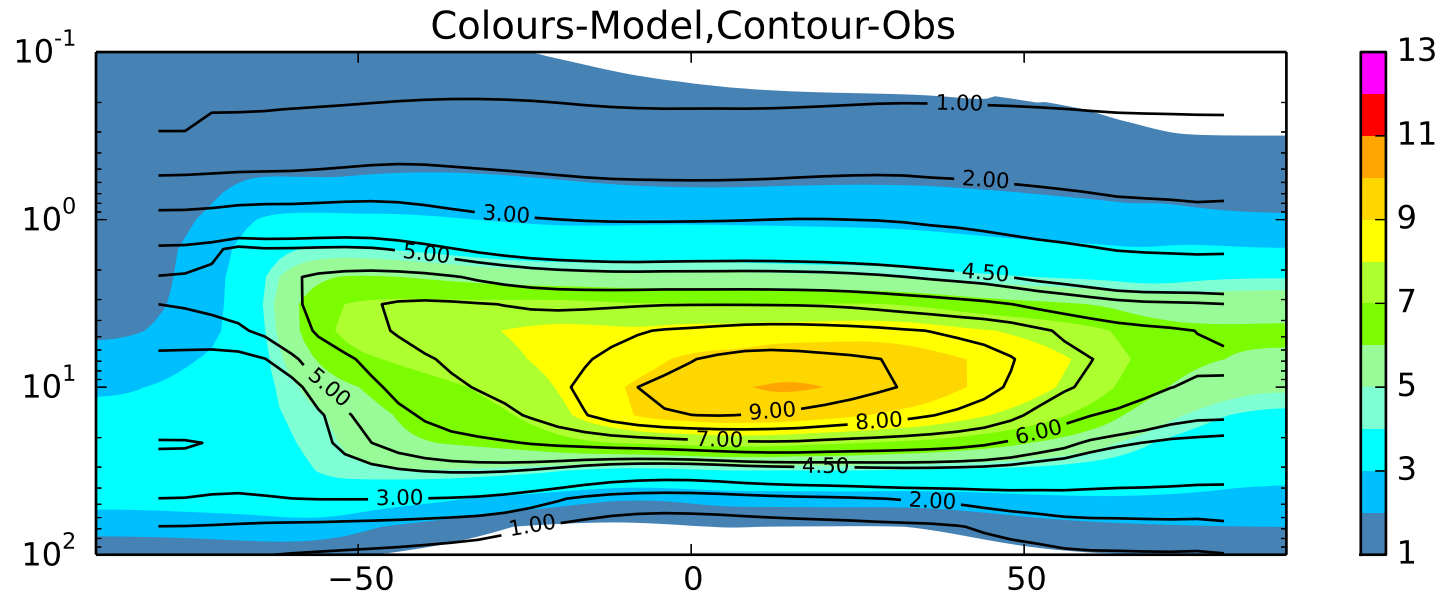


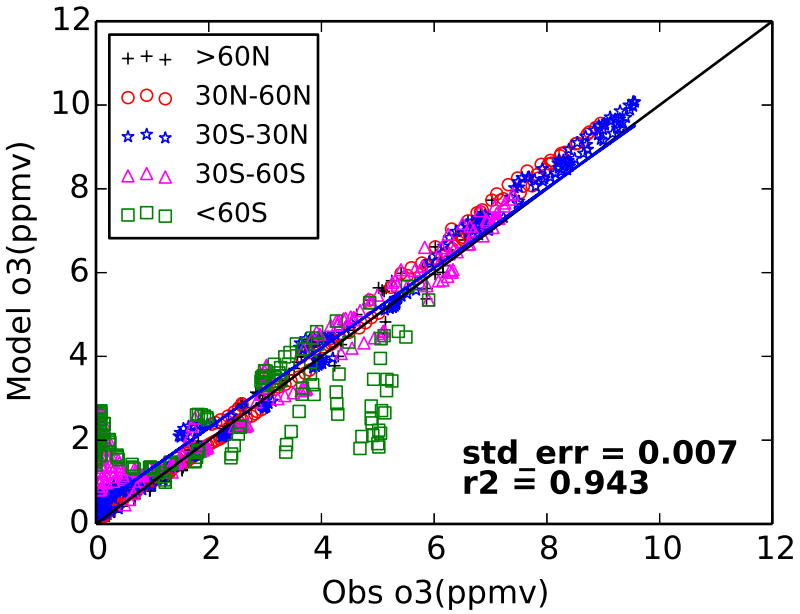
UKCA au917 vs HALOE:
O3 (ppmv) Jan



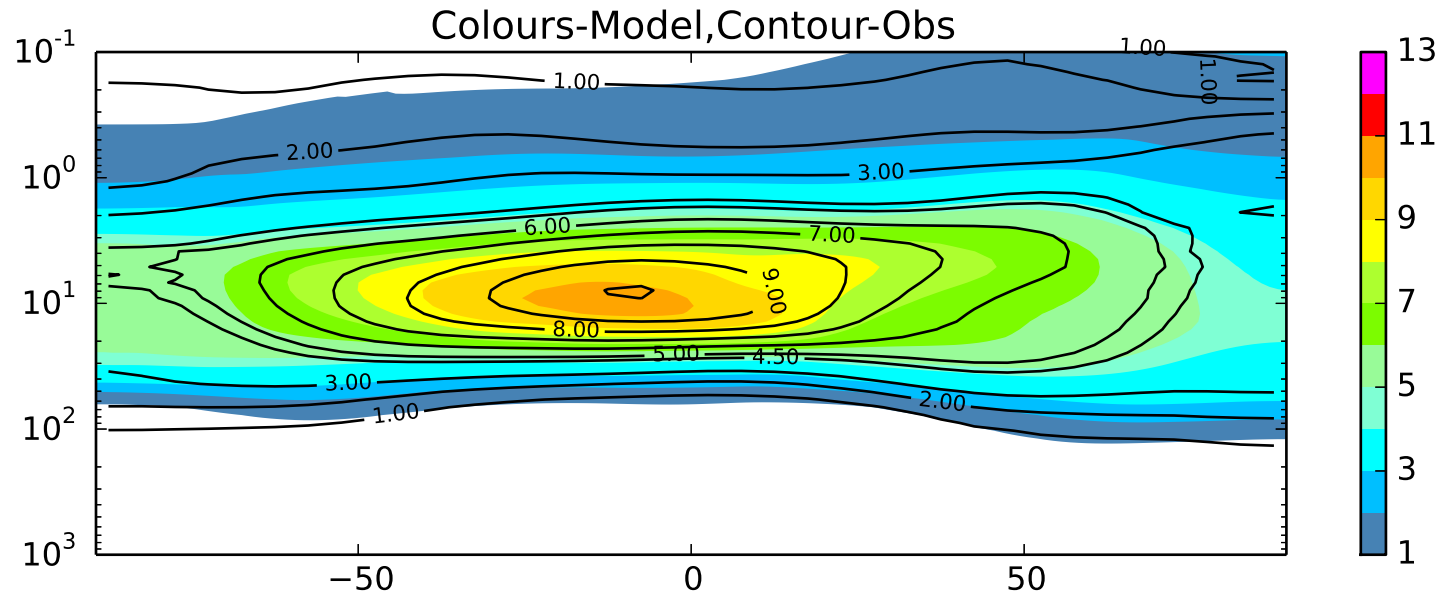


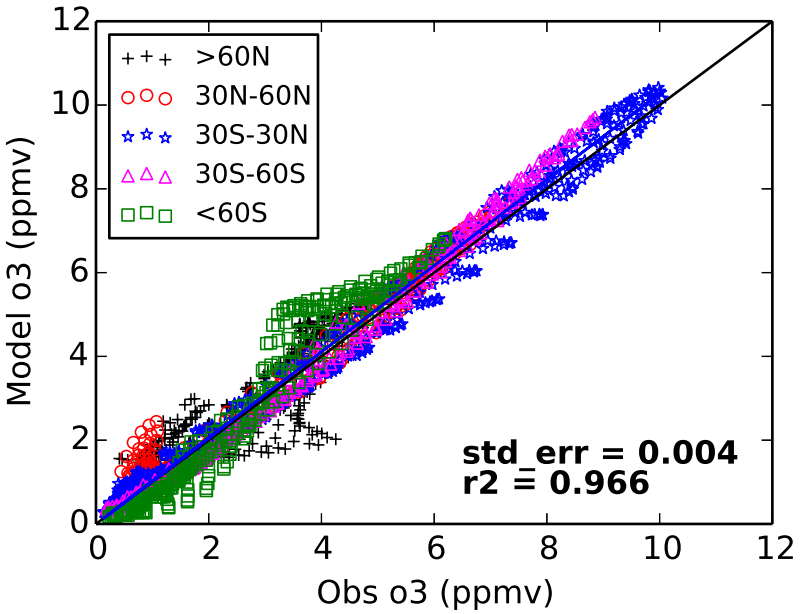
UKCA as976 vs HALOE:
O3 (ppmv) Jul



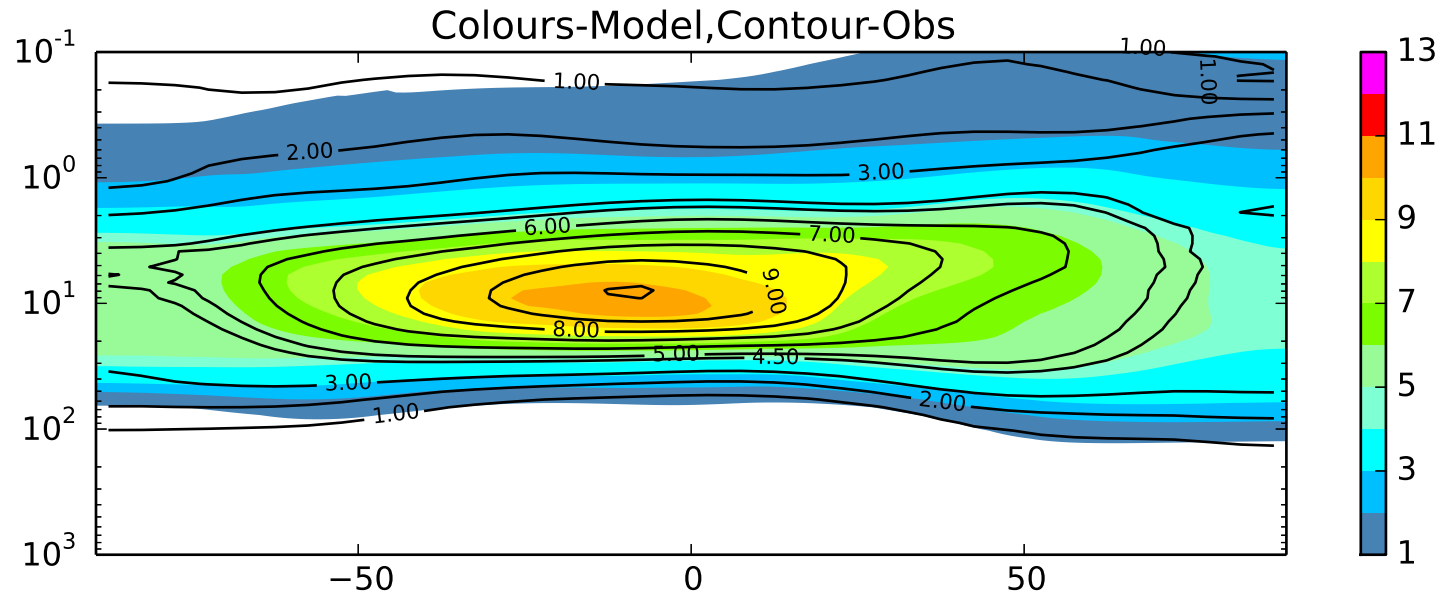


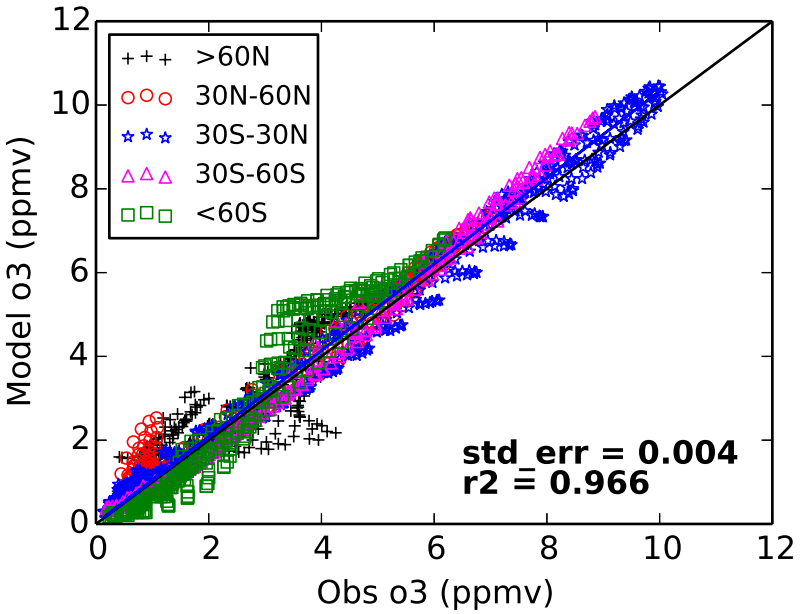
UKCA au917 vs HALOE:
O3 (ppmv) Jul



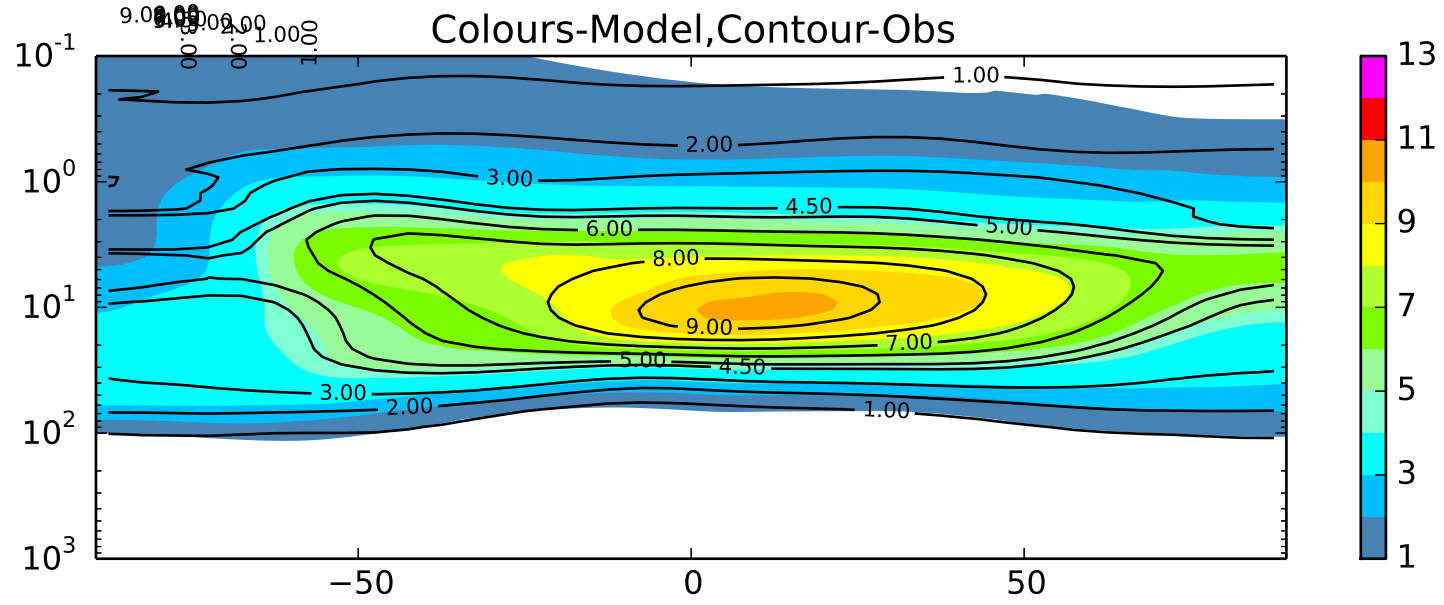


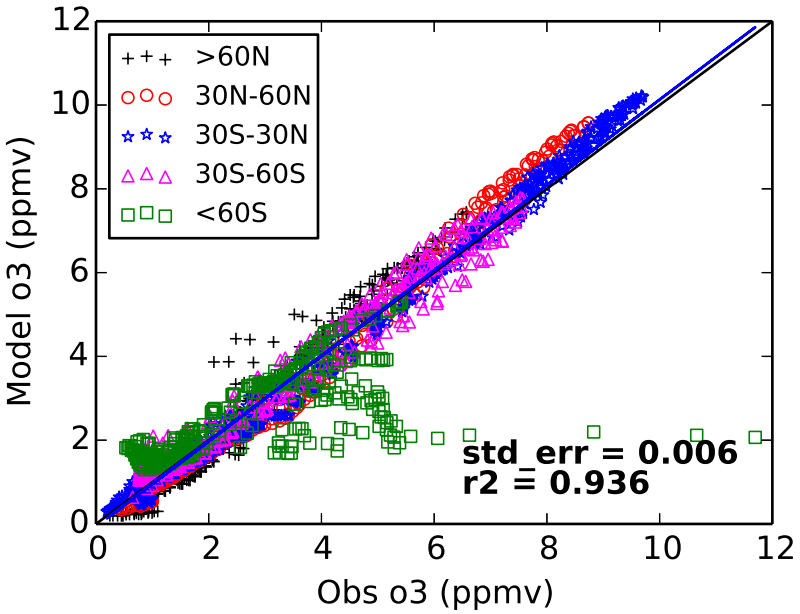
UKCA as976 vs NIWA-CCMVal:
O3 (ppmv) Jan



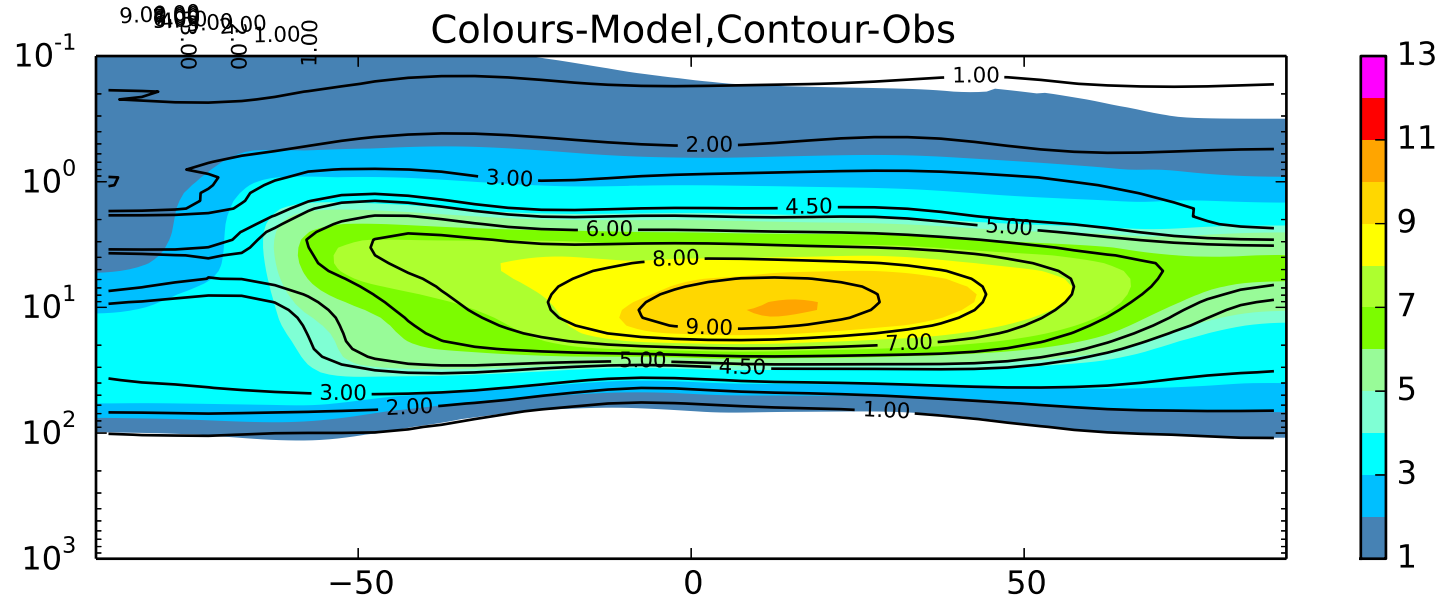


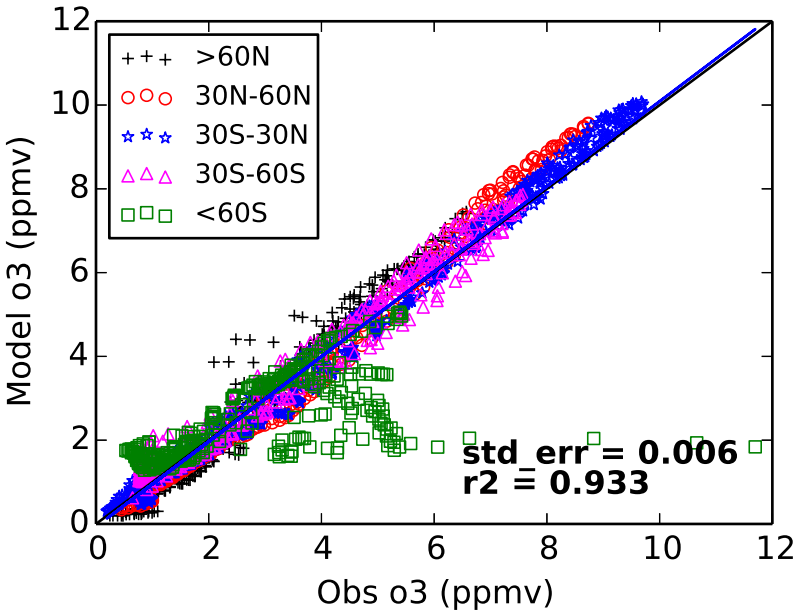
UKCA au917 vs NIWA-CCMVal:
O3 (ppmv) Jan



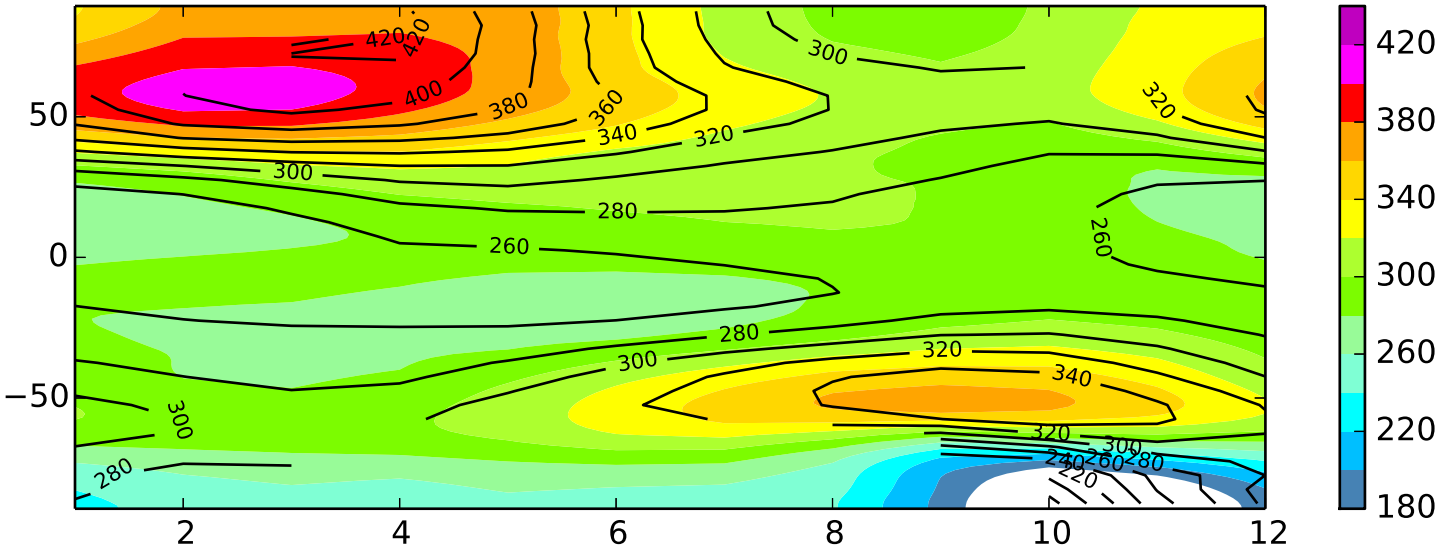


UKCA as976 vs NIWA-CCMVal:
O3 (ppmv) Jul

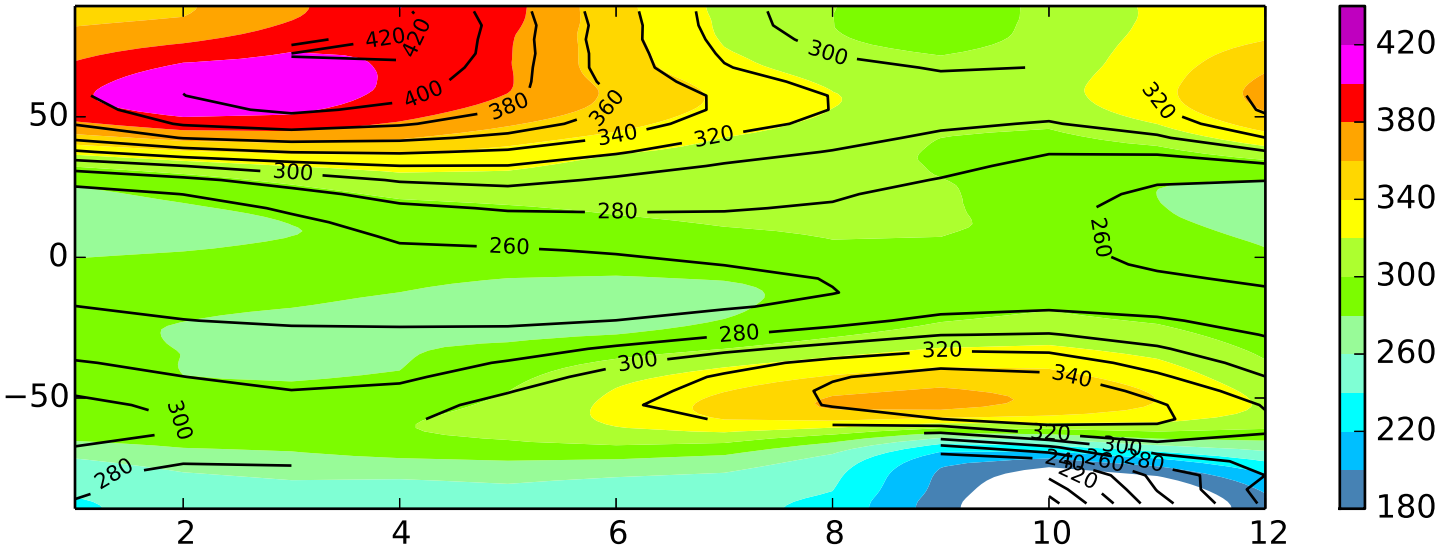




UKCA au917 vs NIWA-CCMVal:
O3 (ppmv) Jul



UKCA as976 vs TOMS:
Column_Ozone (DU)



UKCA au917 vs TOMS:
Column_Ozone (DU)