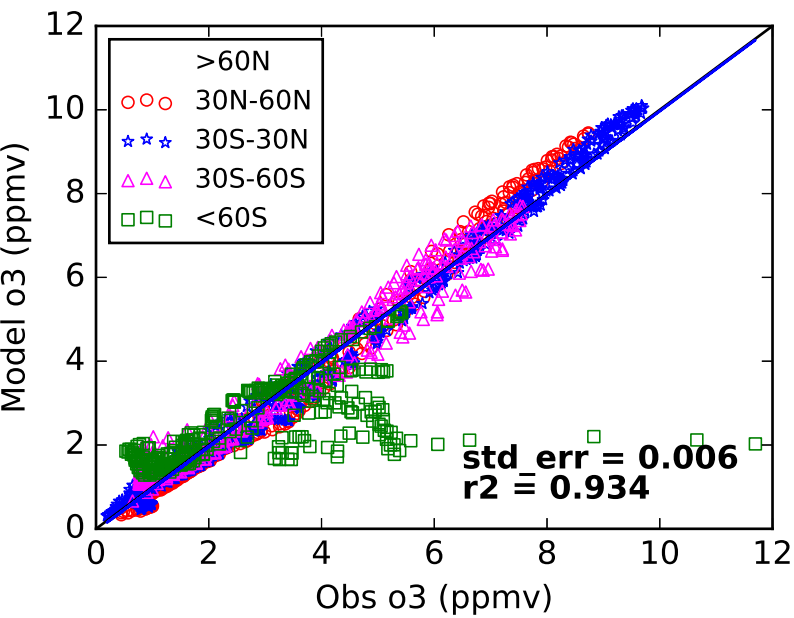
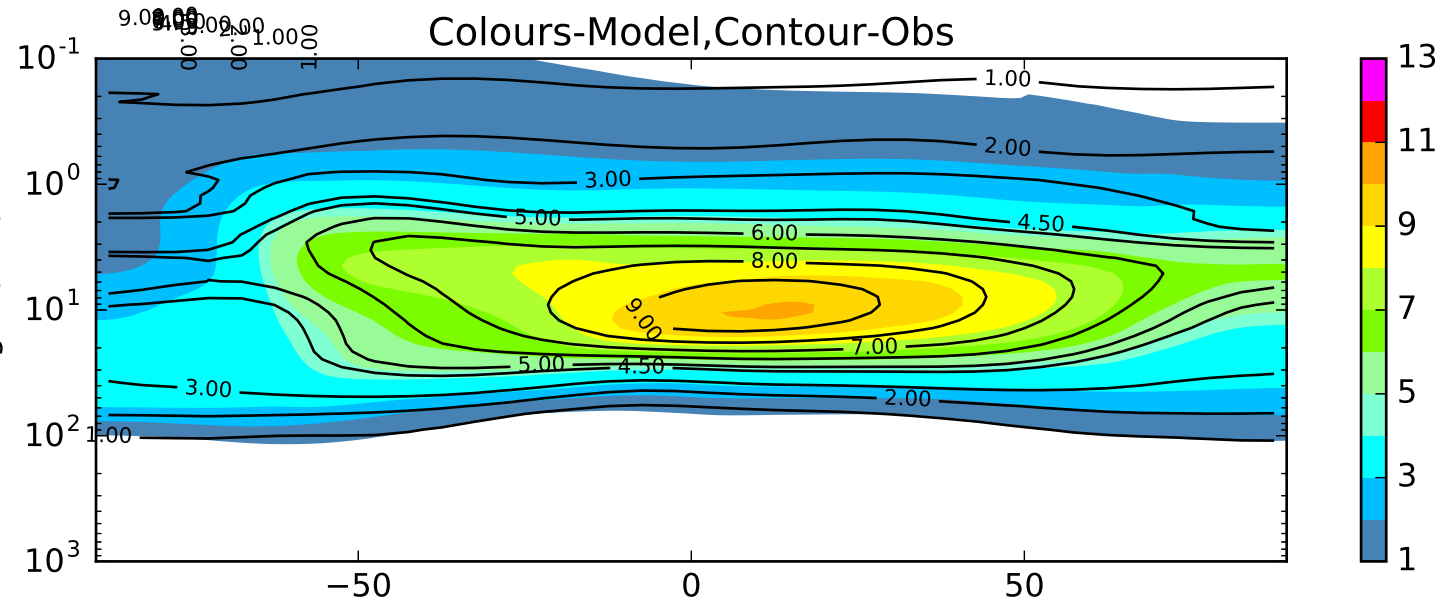
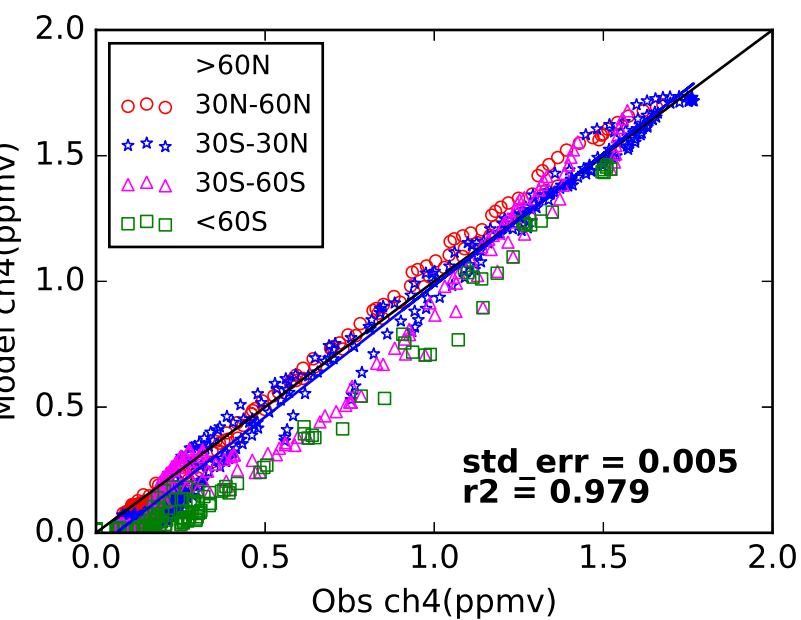
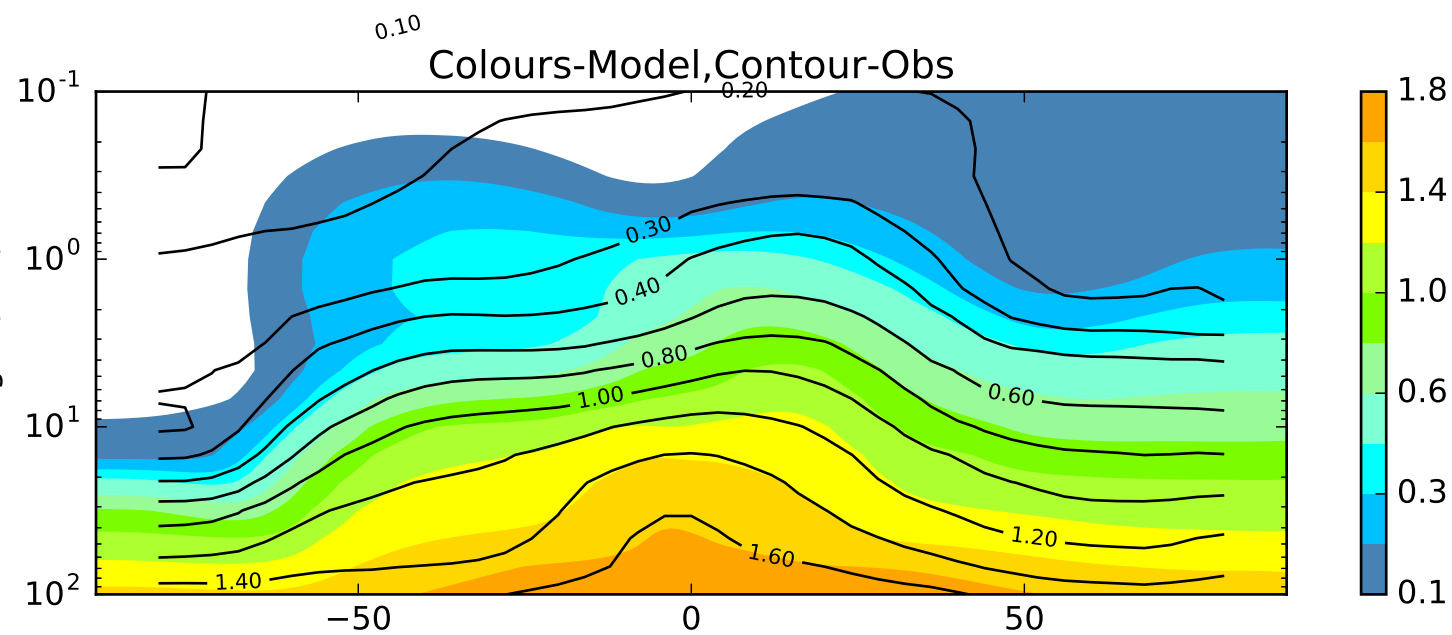


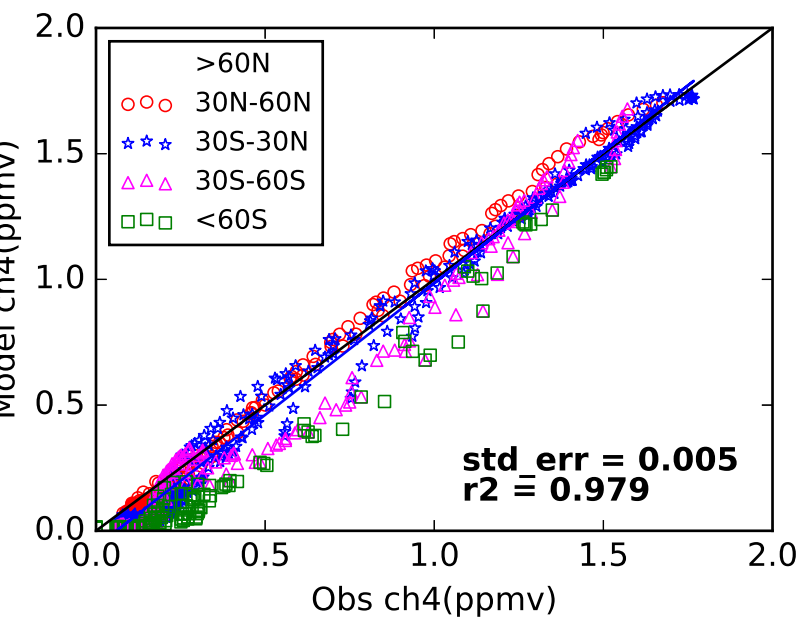
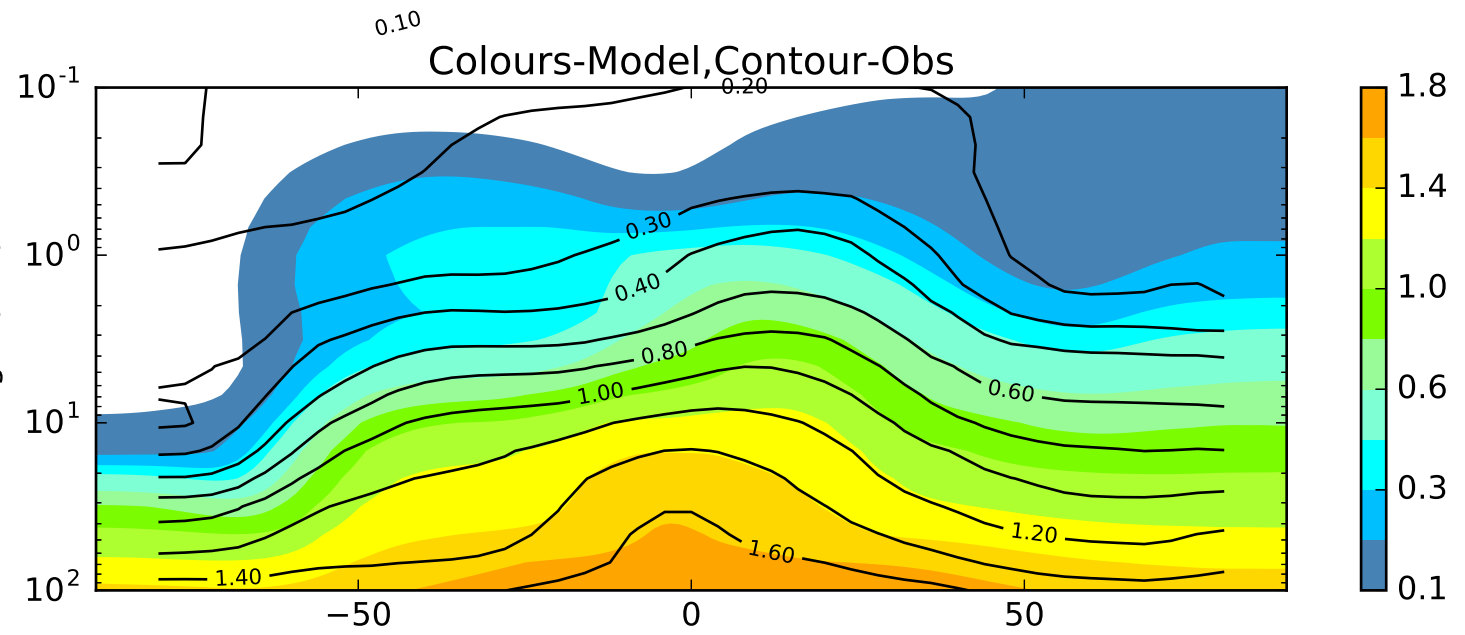
UKCA bk249 vs NIWA-CCMVal:
O₃ (ppmv) Jul



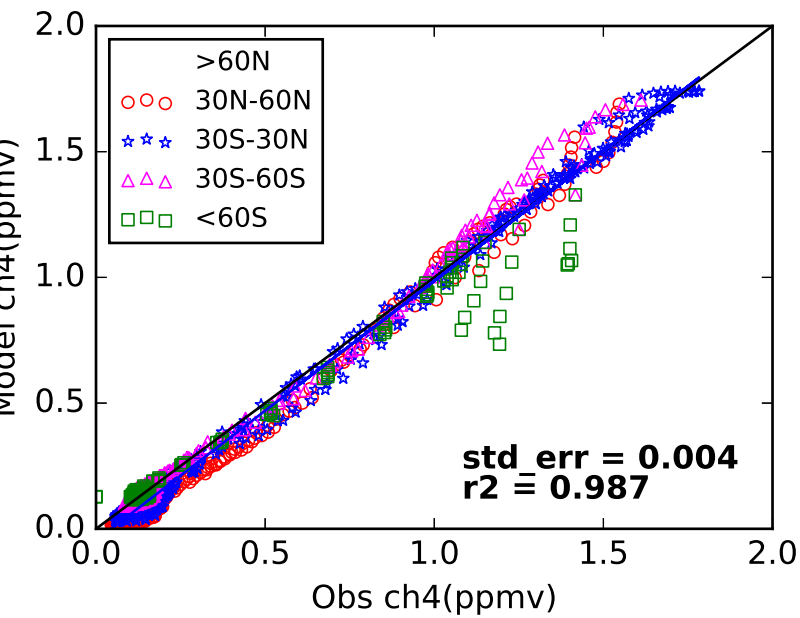
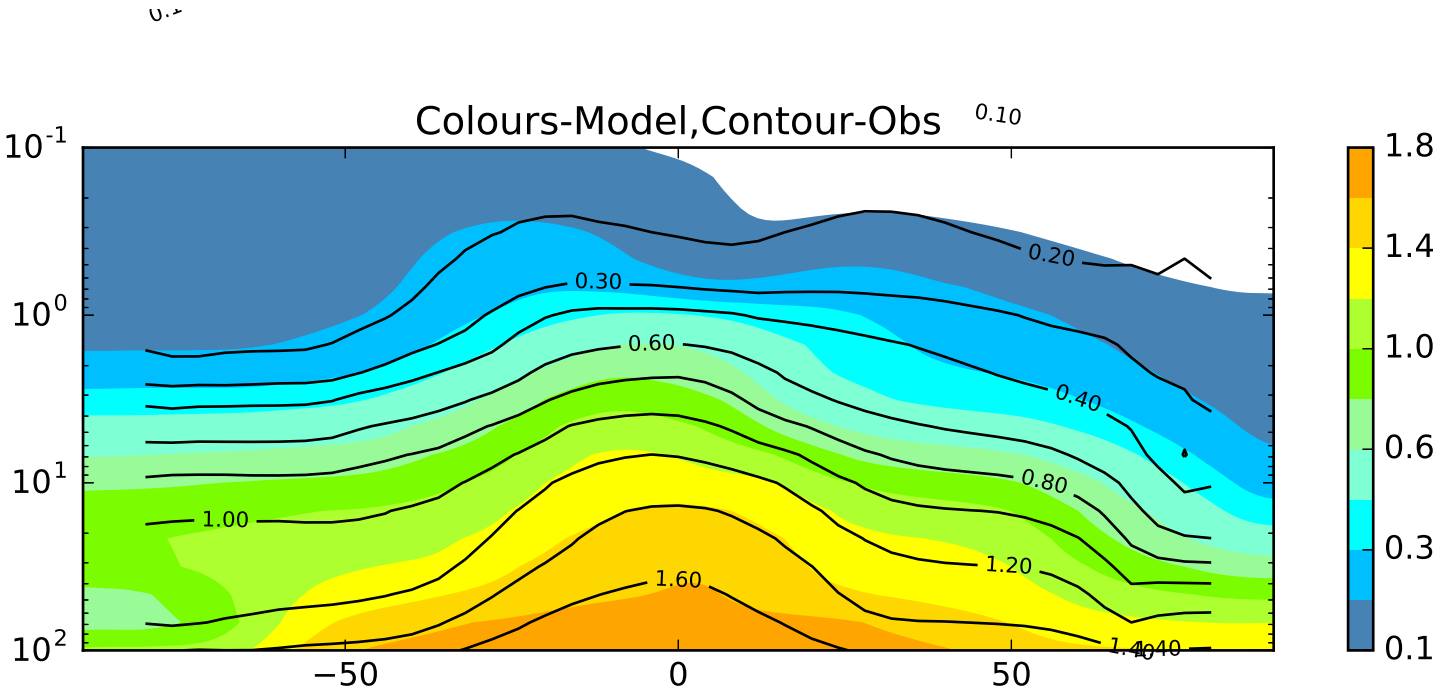
UKCA bo717 vs NIWA-CCMVal:
O3 (ppmv) Jul



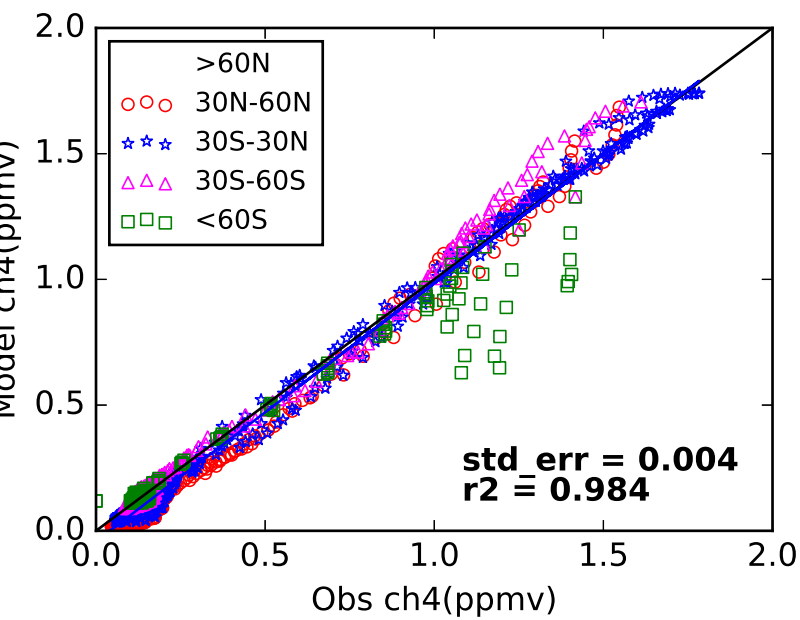
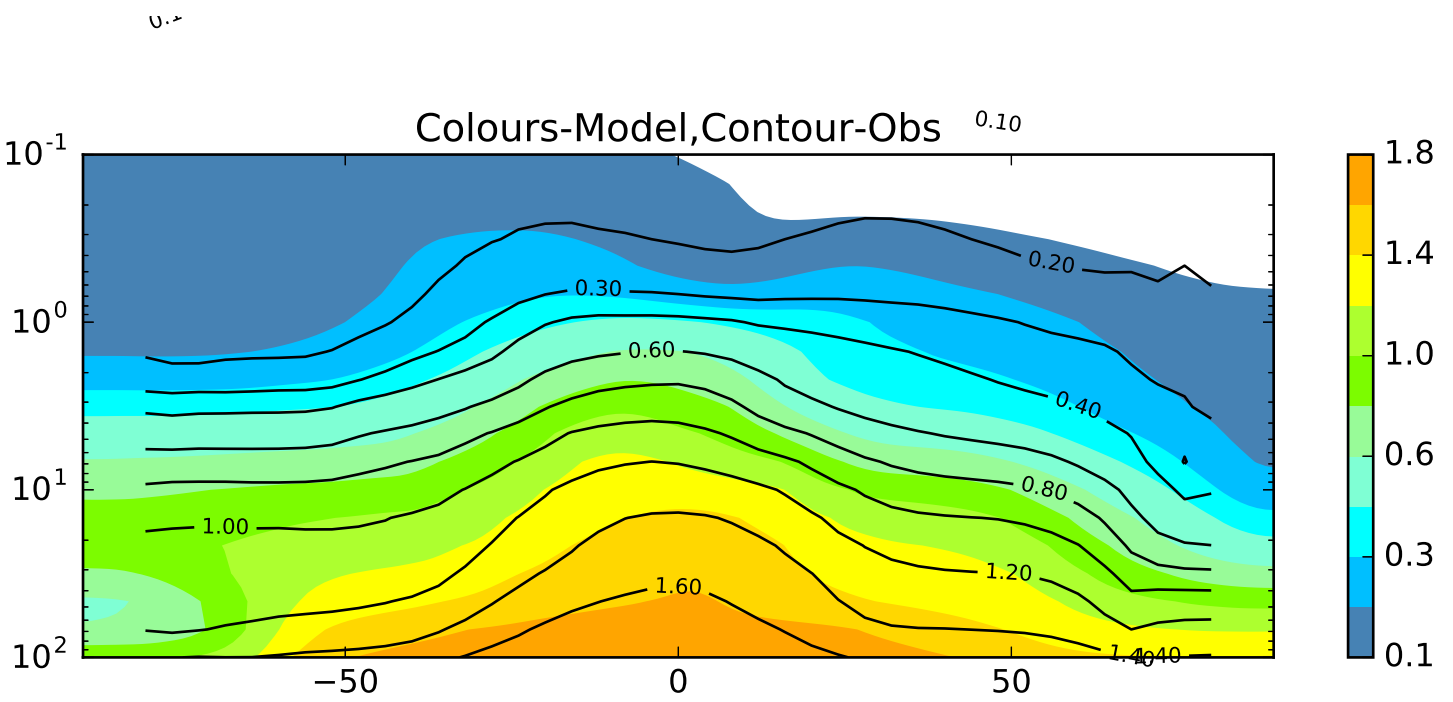
UKCA bk249 vs HALOE:
CH4 (ppmv) Jul



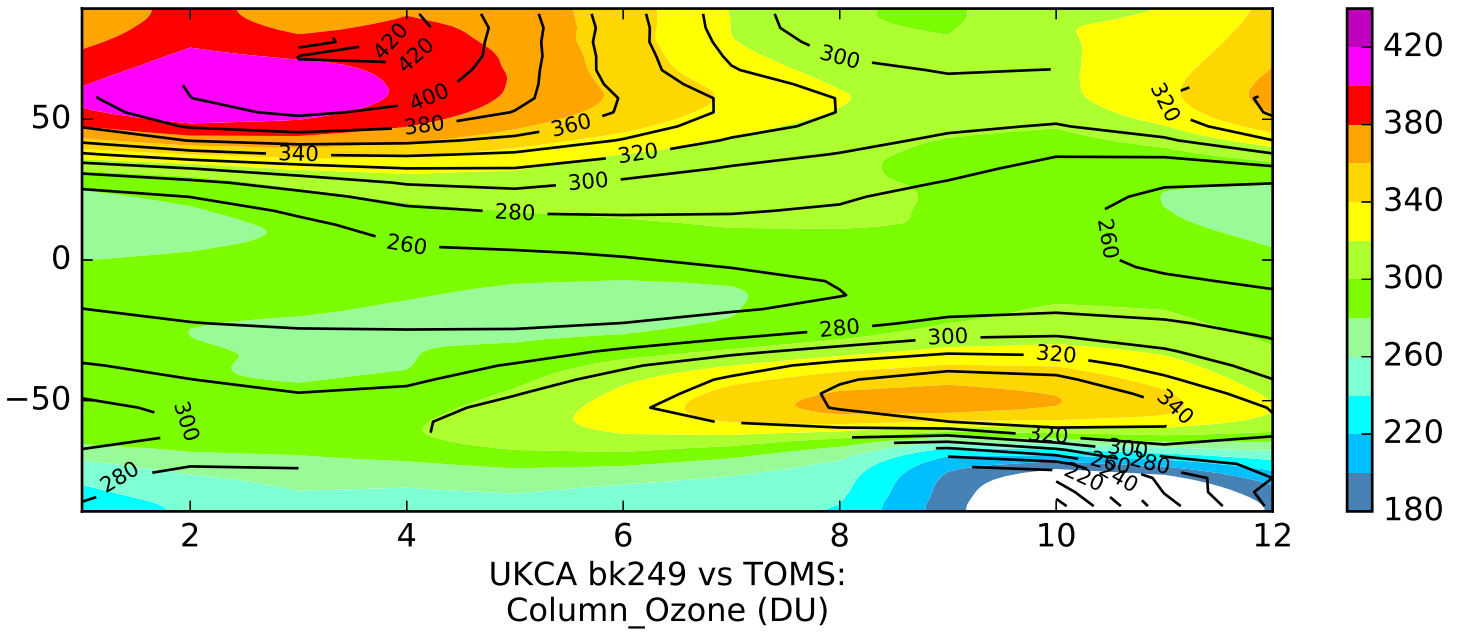
UKCA bo717 vs HALOE:
CH₄ (ppmv) Jul

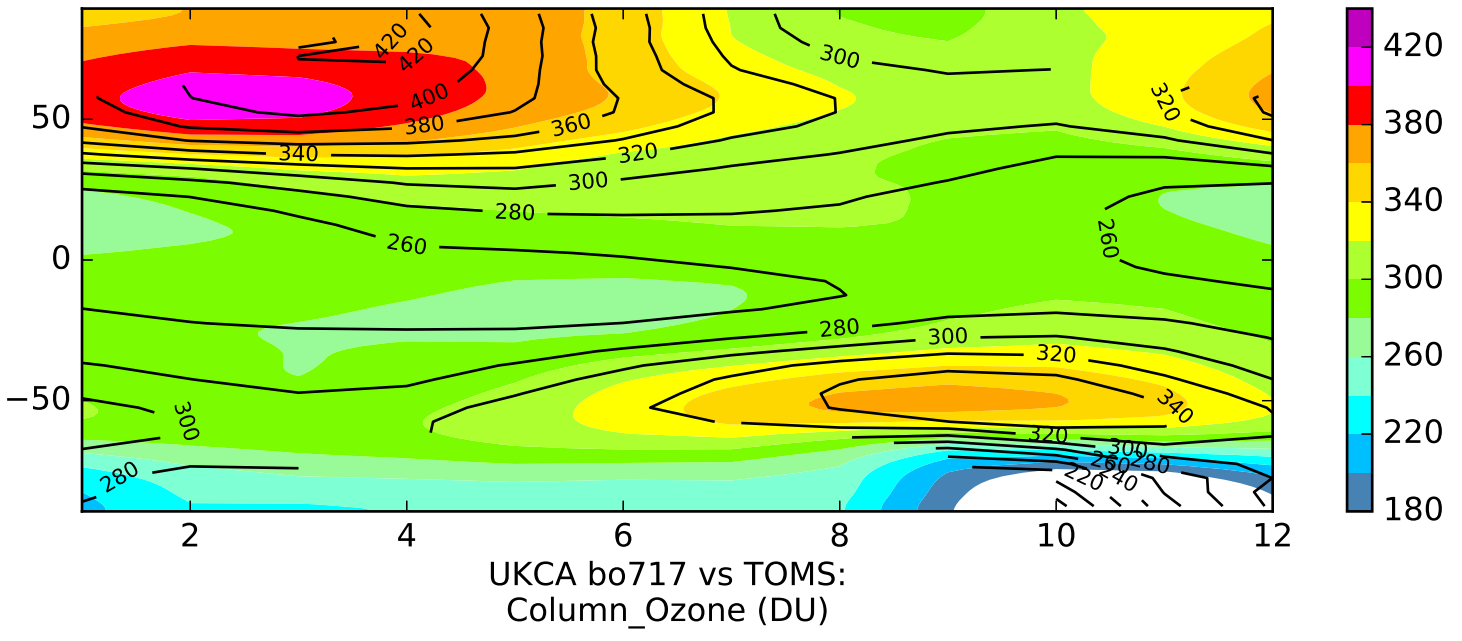


UKCA bk249 vs HALOE:
CH4 (ppmv) Jan

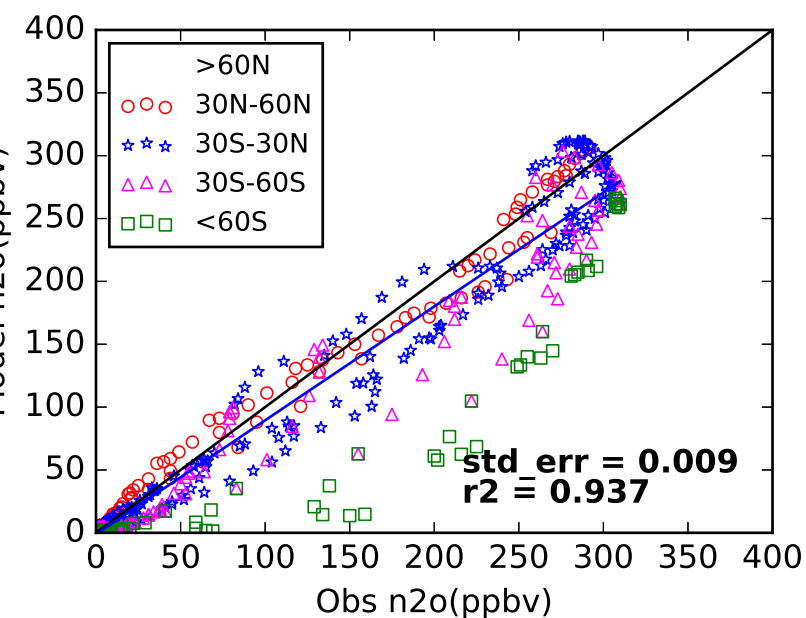
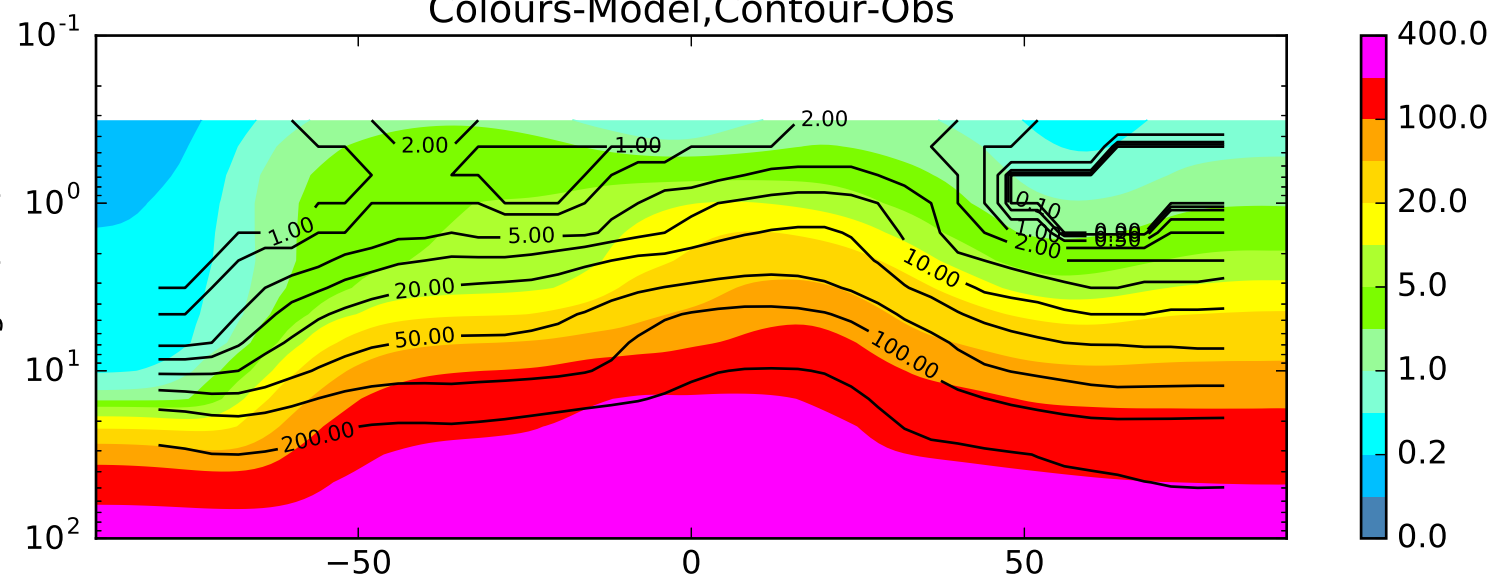


UKCA bo717 vs HALOE:
CH4 (ppmv) Jan



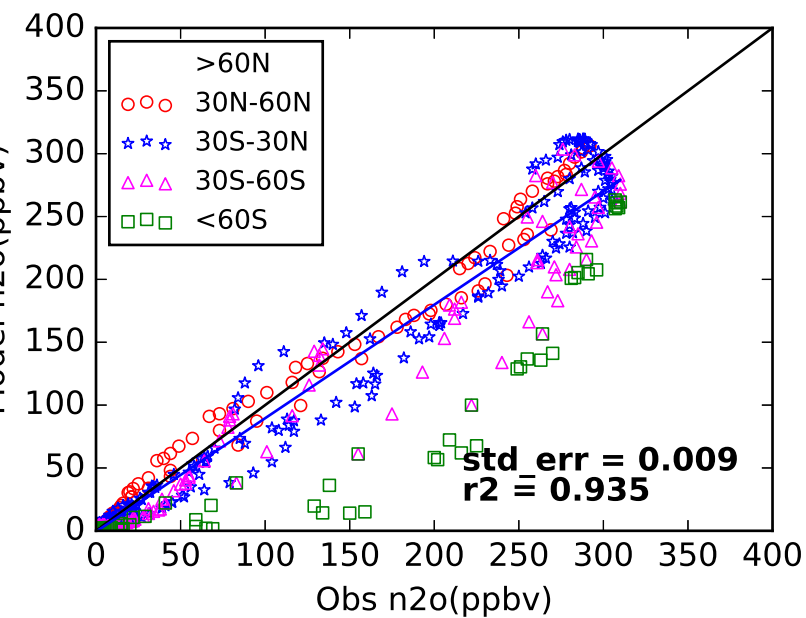
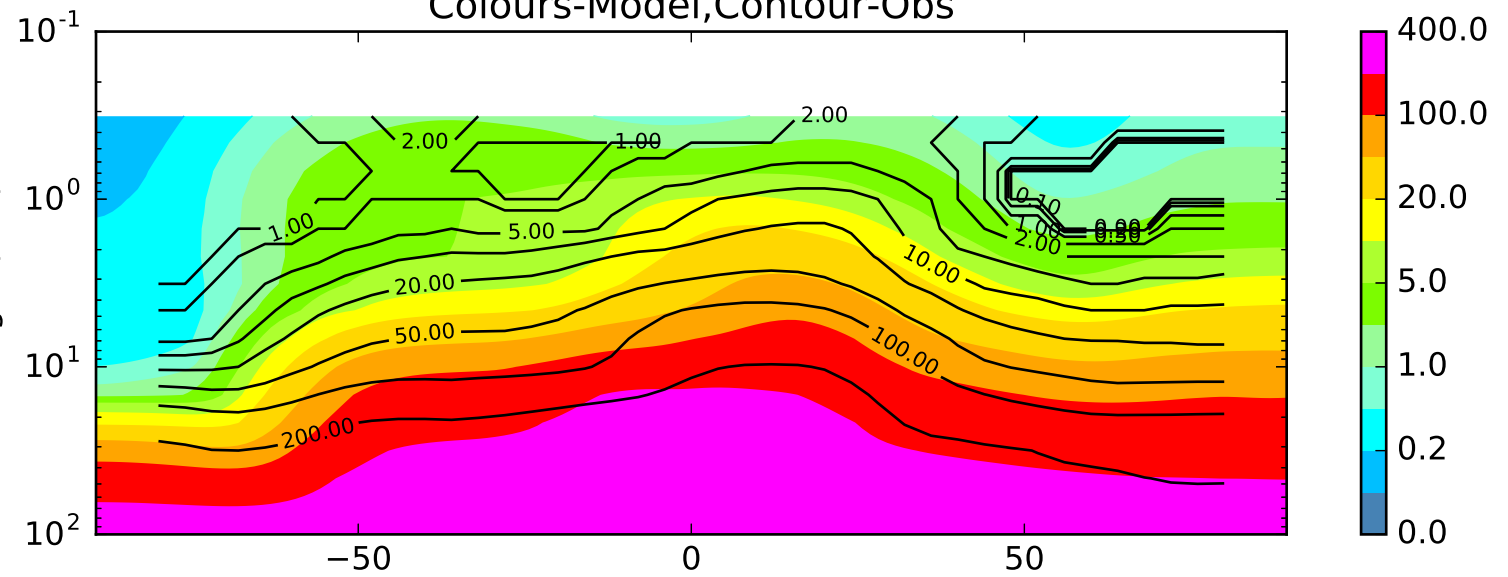


Colours-Model,Contour-Obs

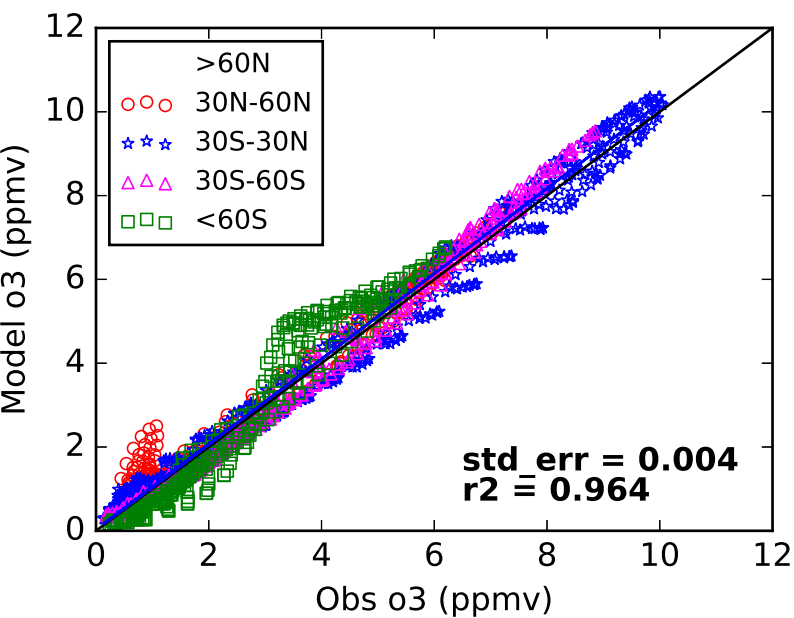
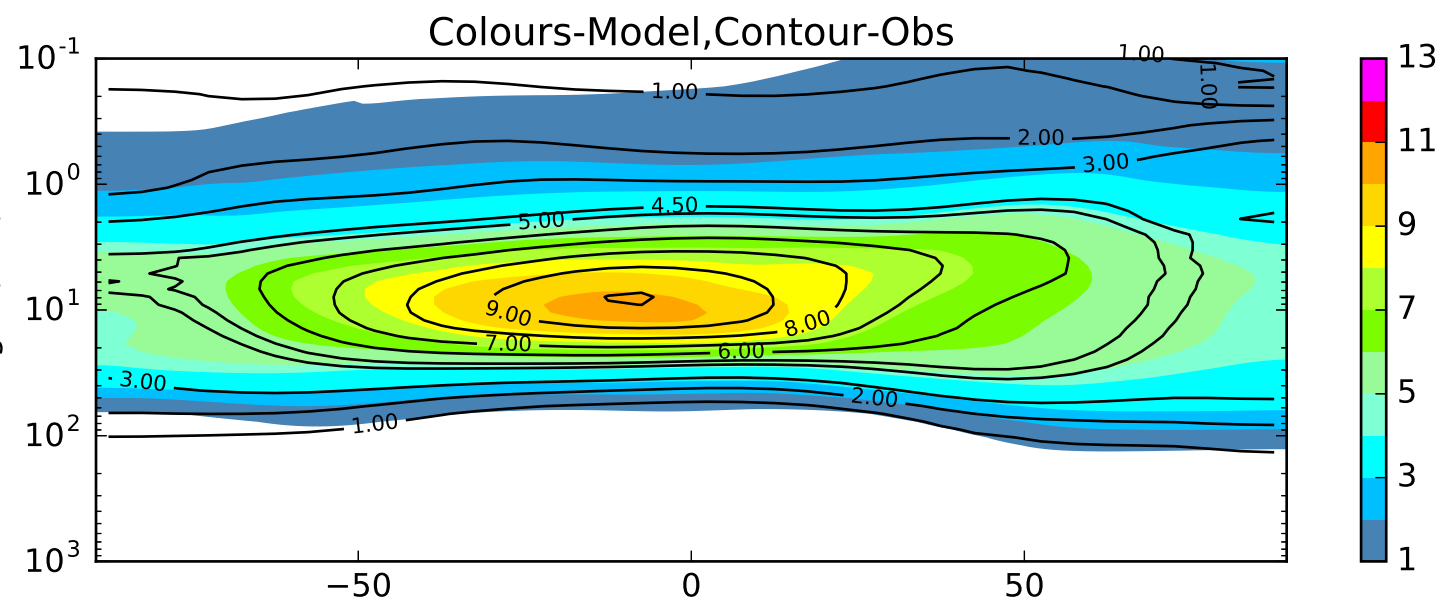


UKCA bk249 vs HALOE:
N₂O (ppmv) Jul

Colours-Model,Contour-Obs

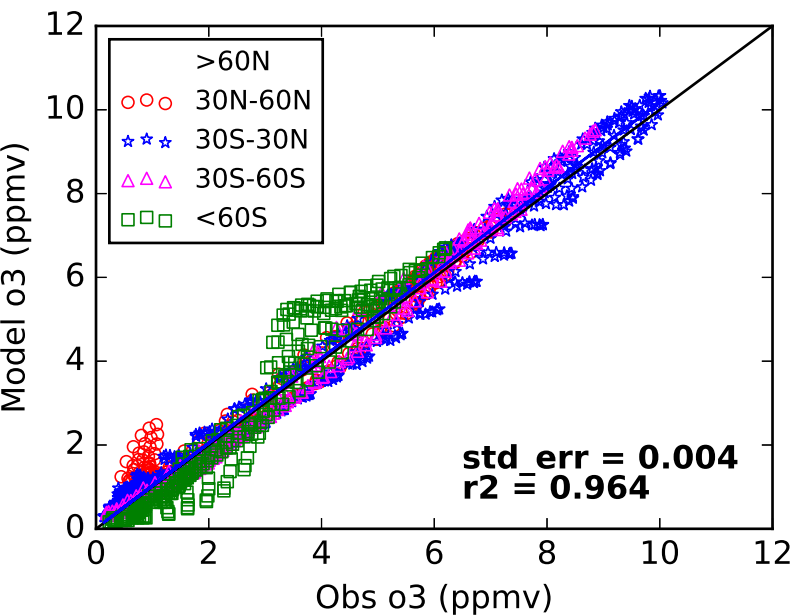
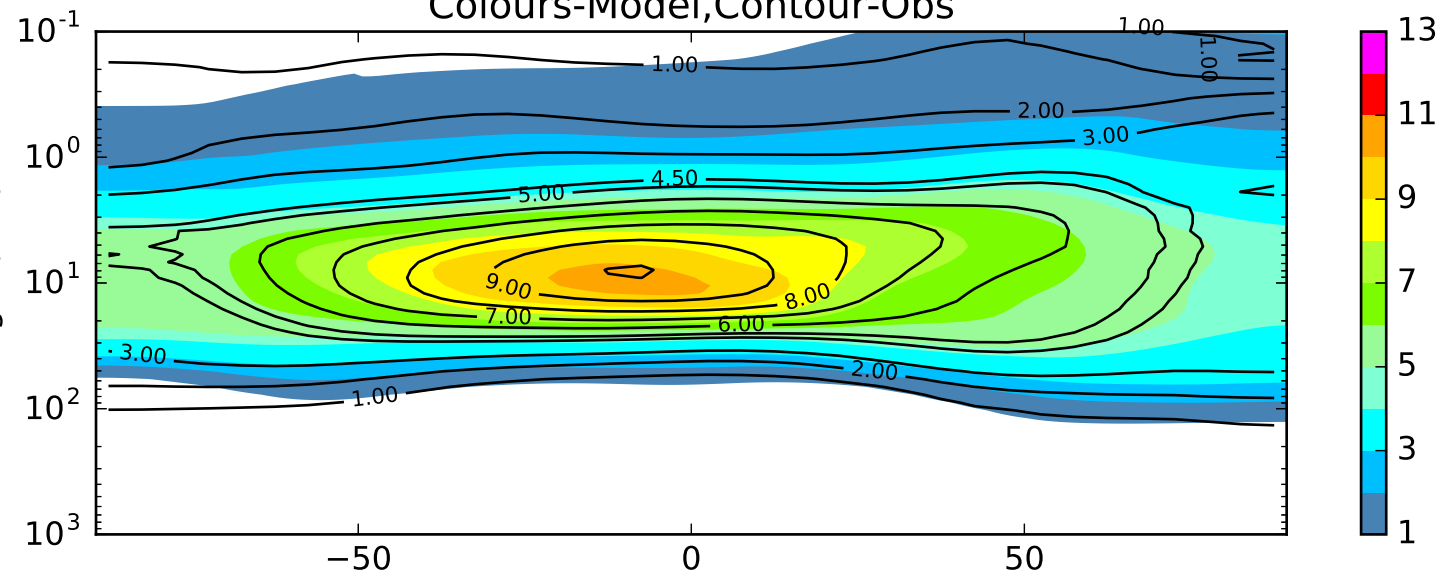


UKCA bo717 vs HALOE:
N₂O (ppmv) Jul



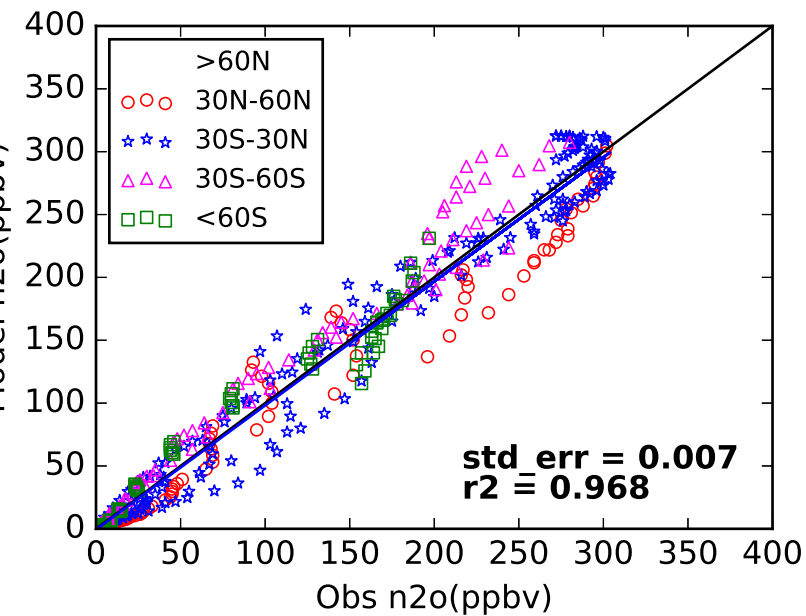
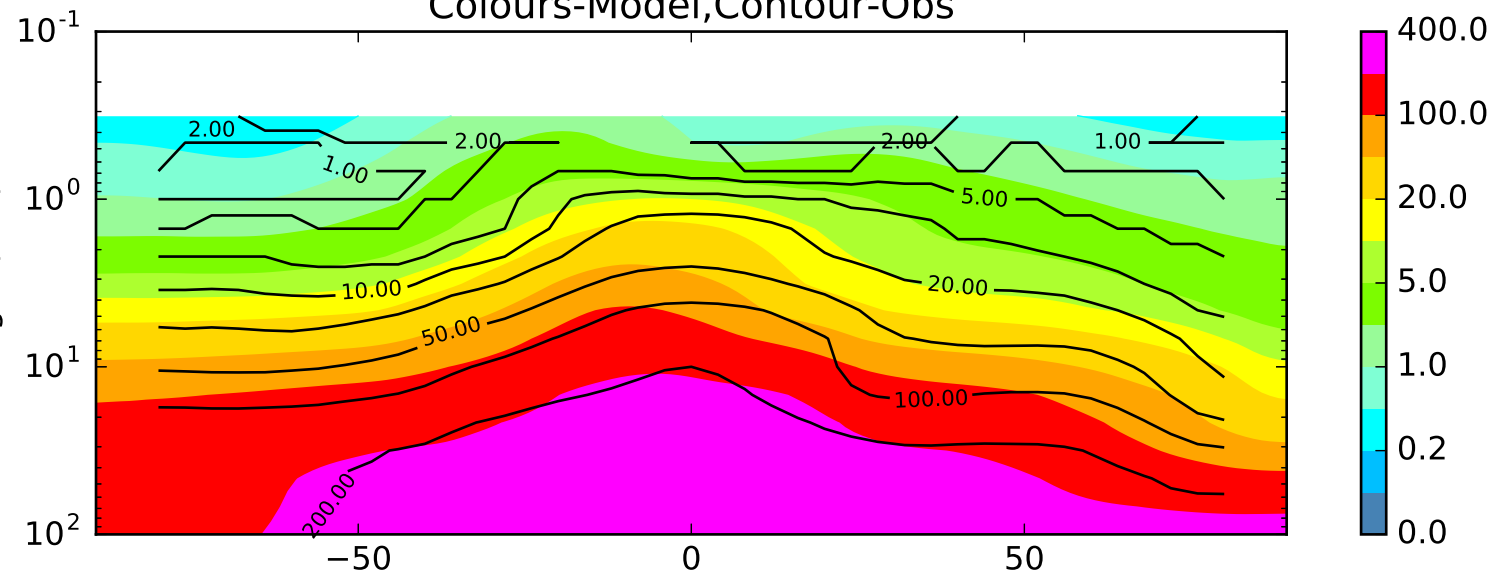
UKCA bk249 vs NIWA-CCMVal:
O3 (ppmv) Jan

Colours-Model,Contour-Obs

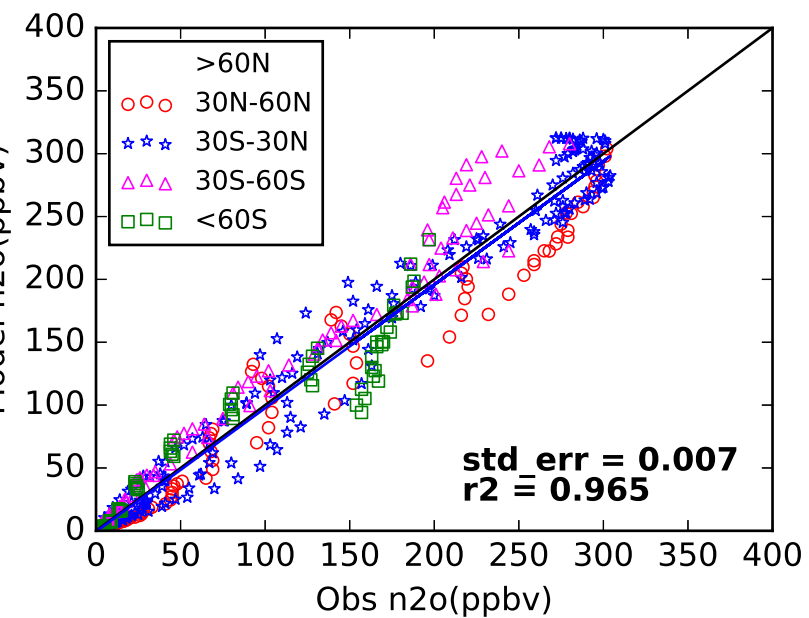
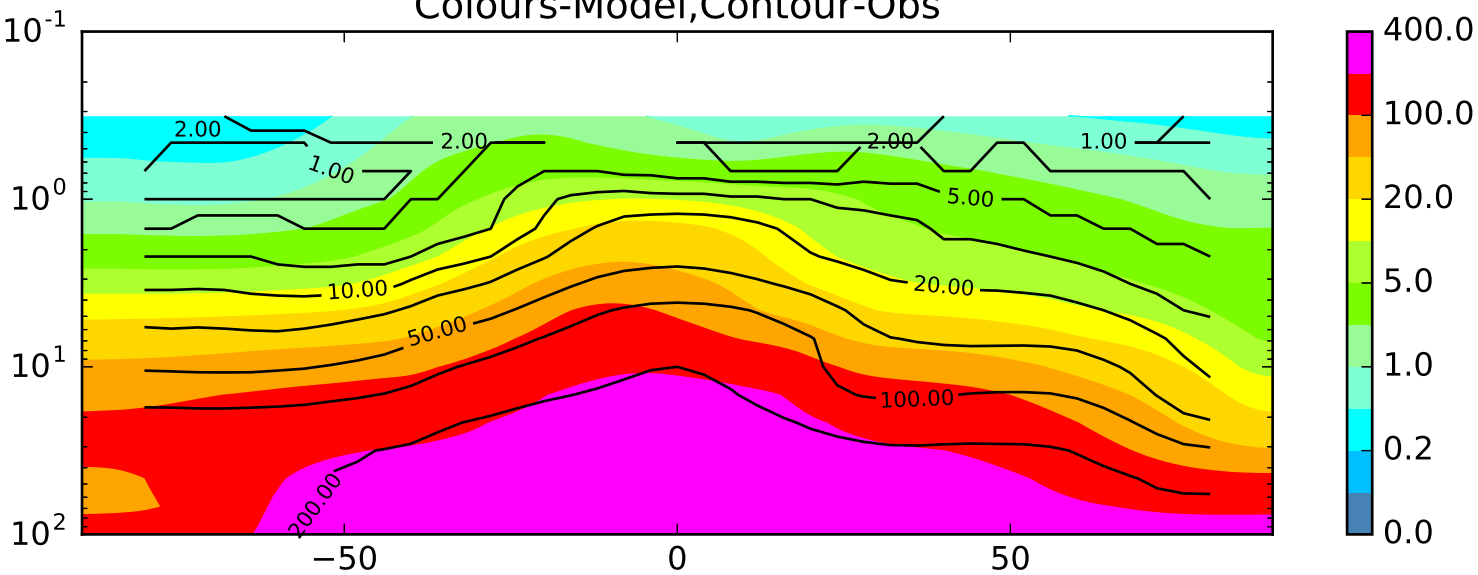


UKCA bo717 vs NIWA-CCMVal:
O₃ (ppmv) Jan

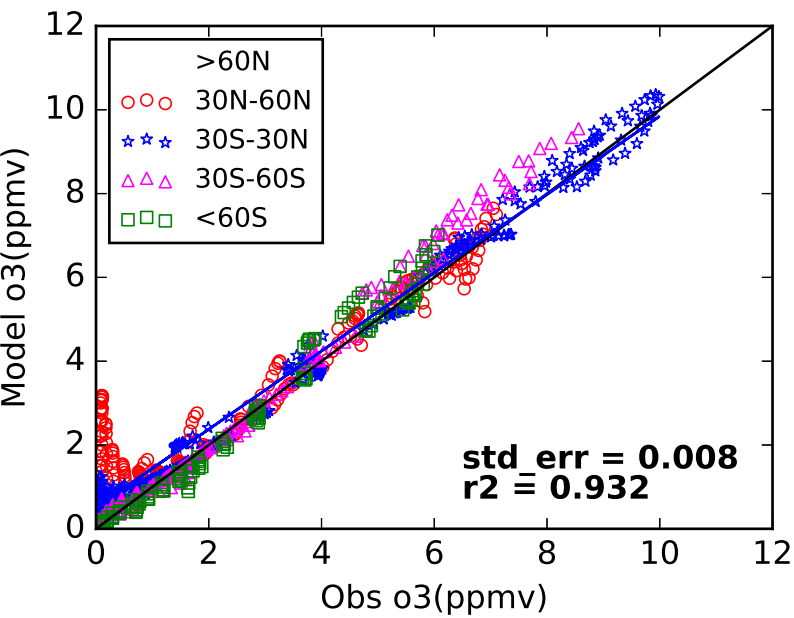
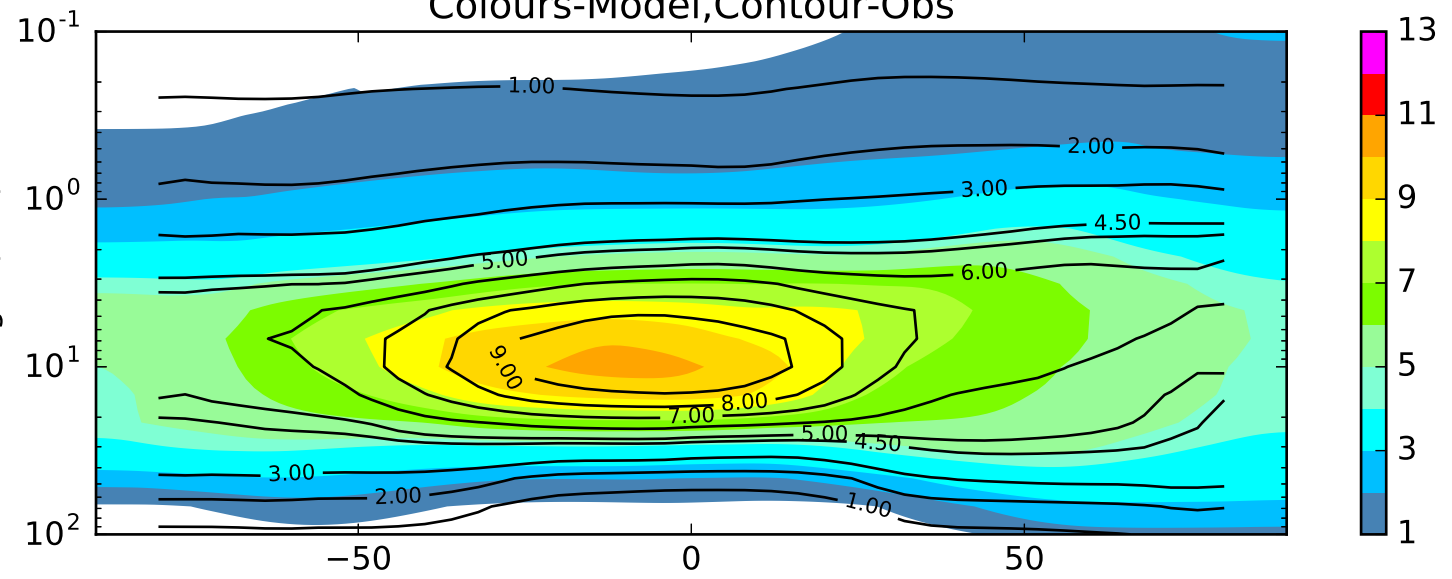
Colours-Model,Contour-Obs



Colours-Model,Contour-Obs

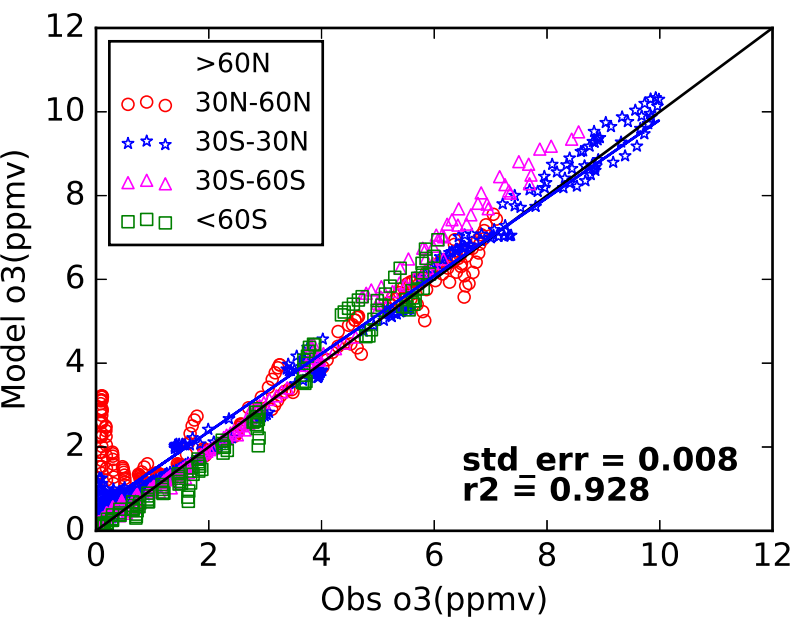
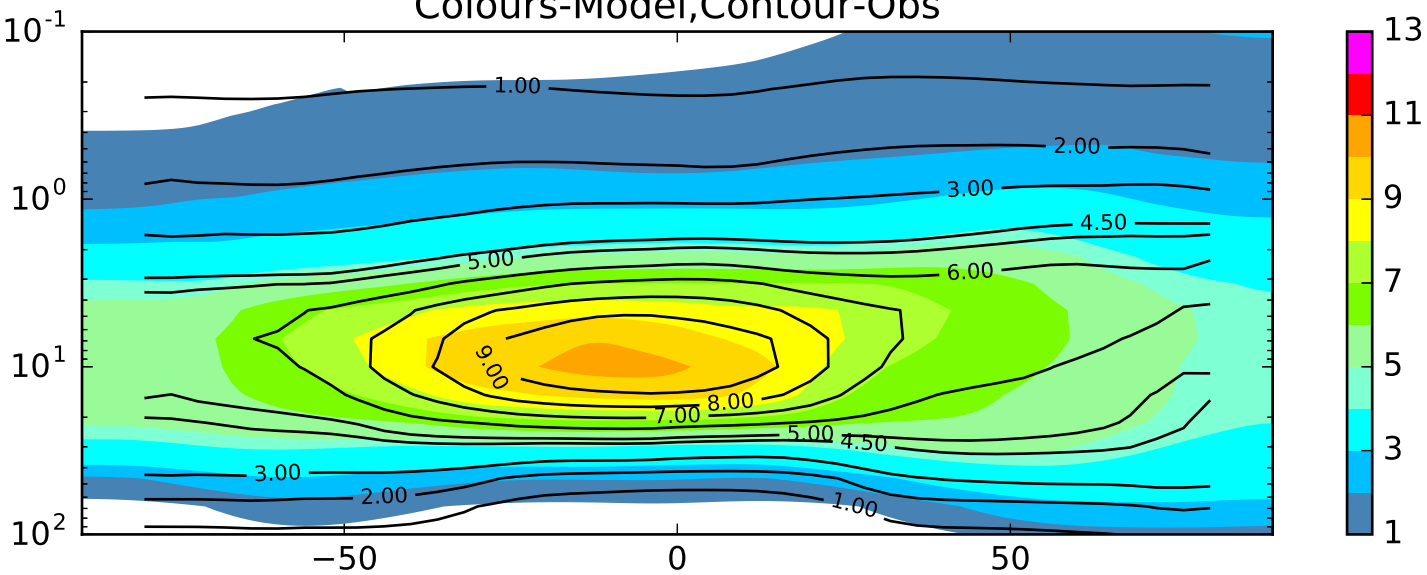


Colours-Model,Contour-Obs



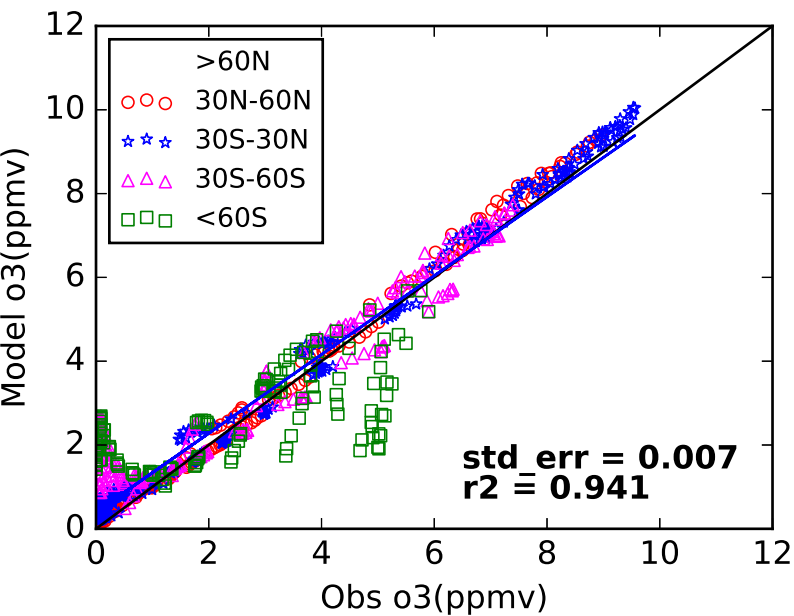
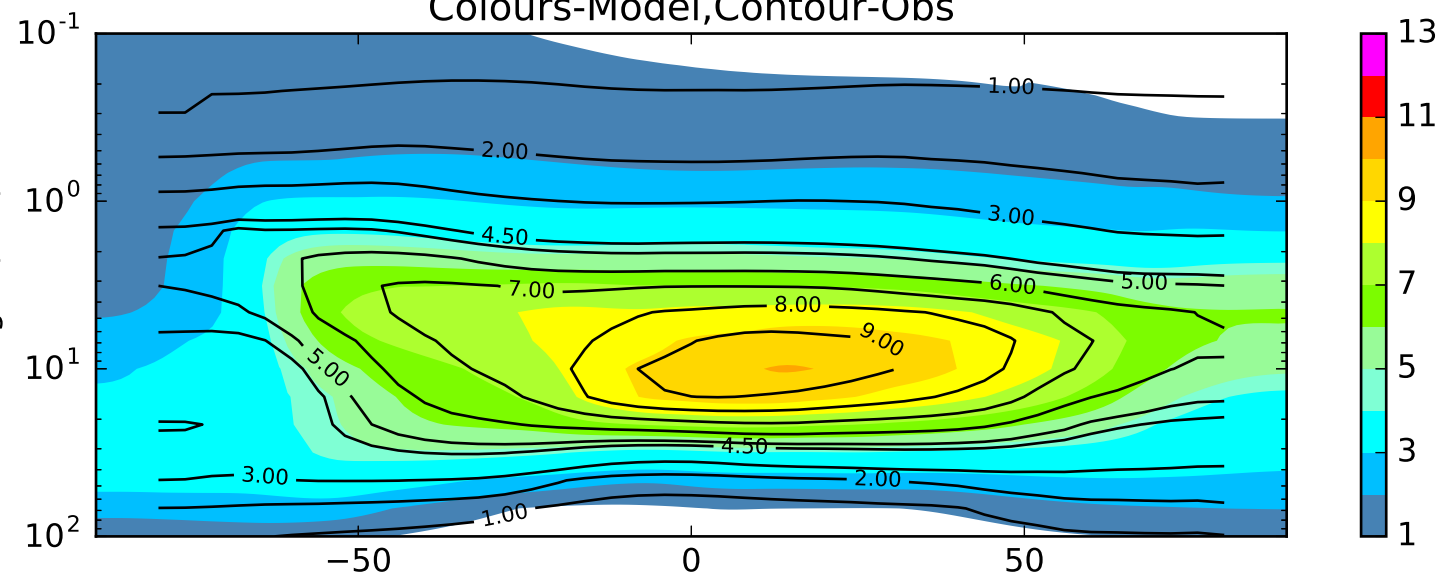
UKCA bk249 vs HALOE:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



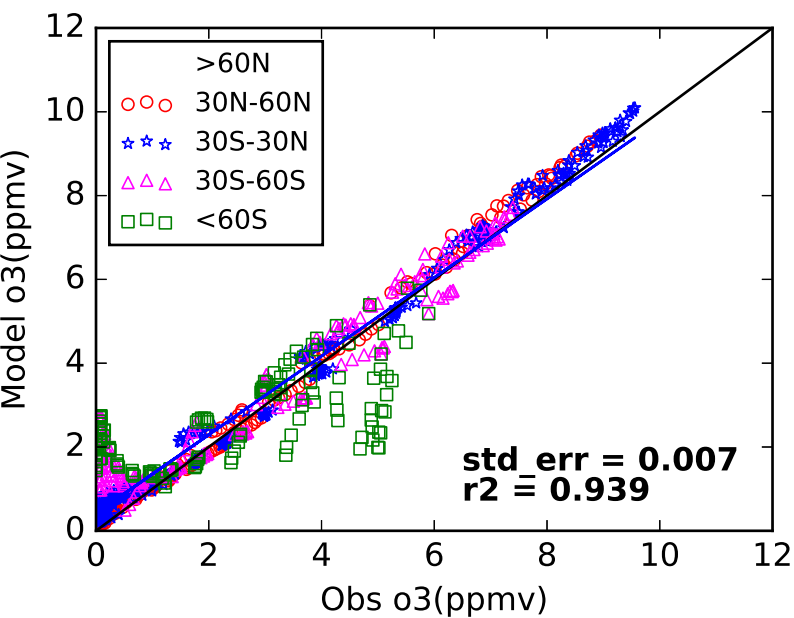
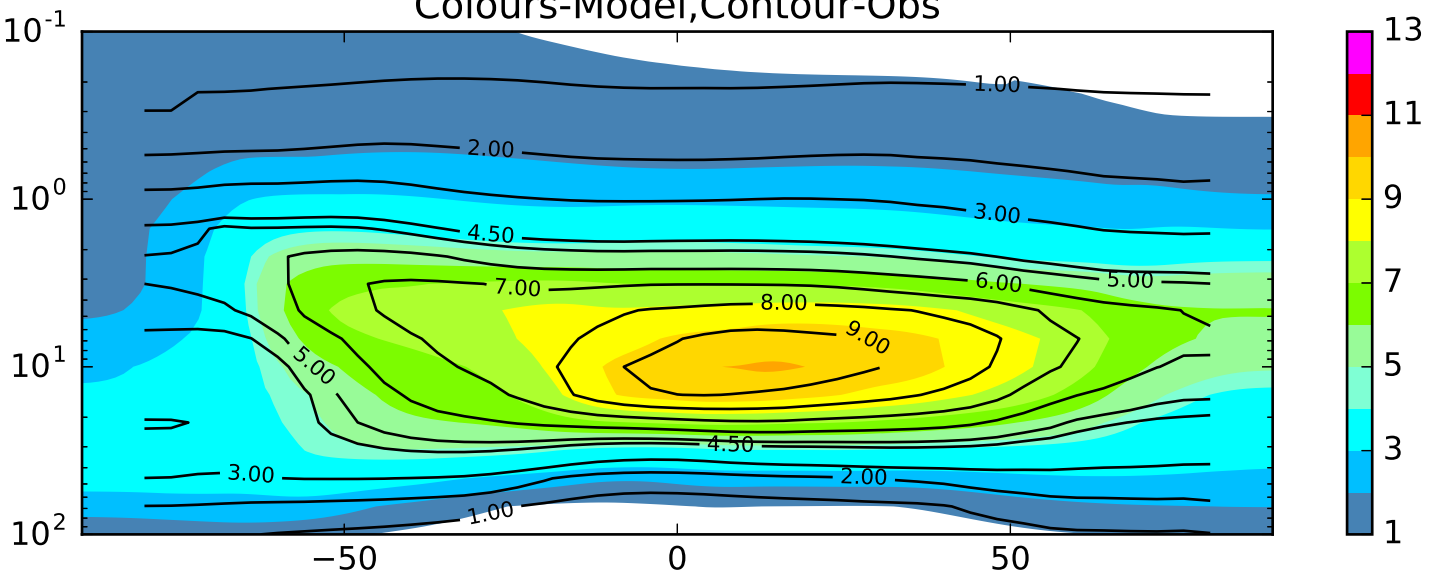
UKCA bo717 vs HALOE:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



UKCA bk249 vs HALOE:
O3 (ppmv) Jul

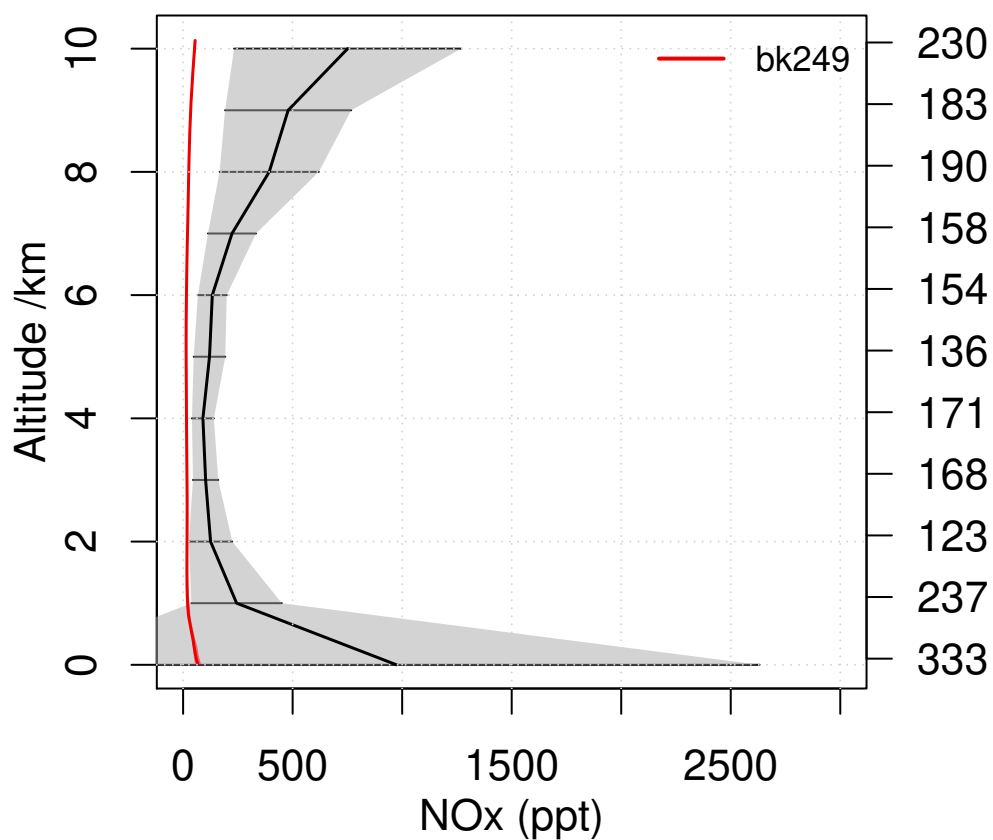
Colours-Model,Contour-Obs



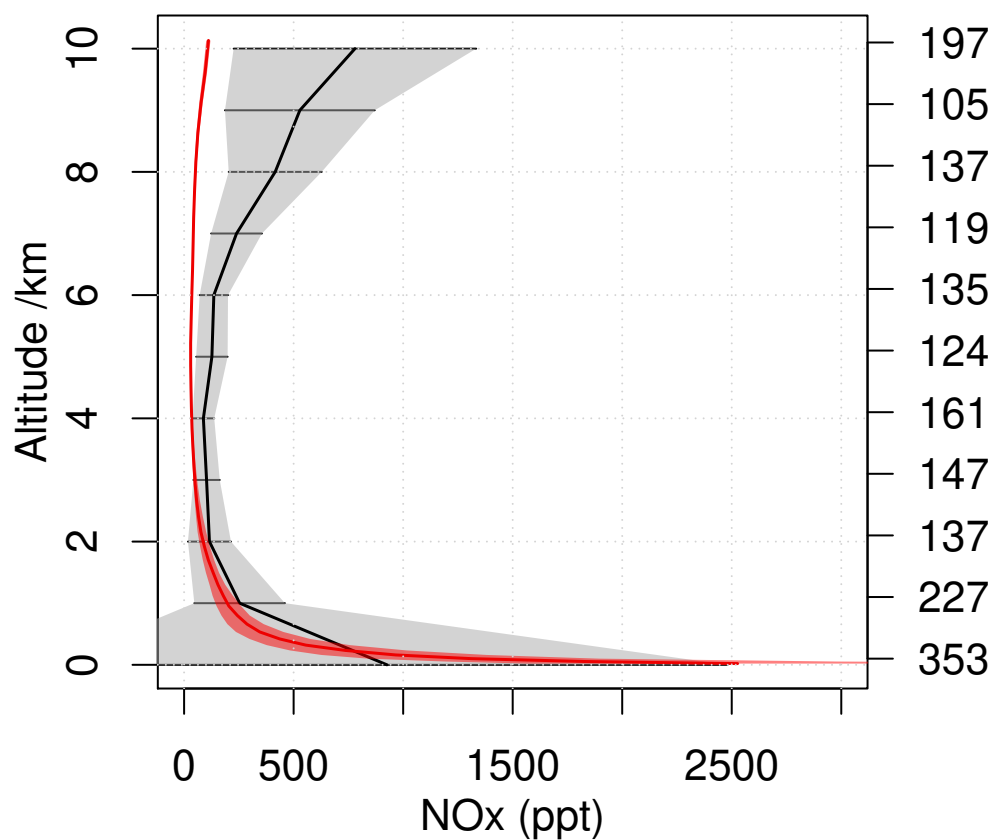
UKCA bo717 vs HALOE:
O₃ (ppmv) Jul

Emmons NOx comparison

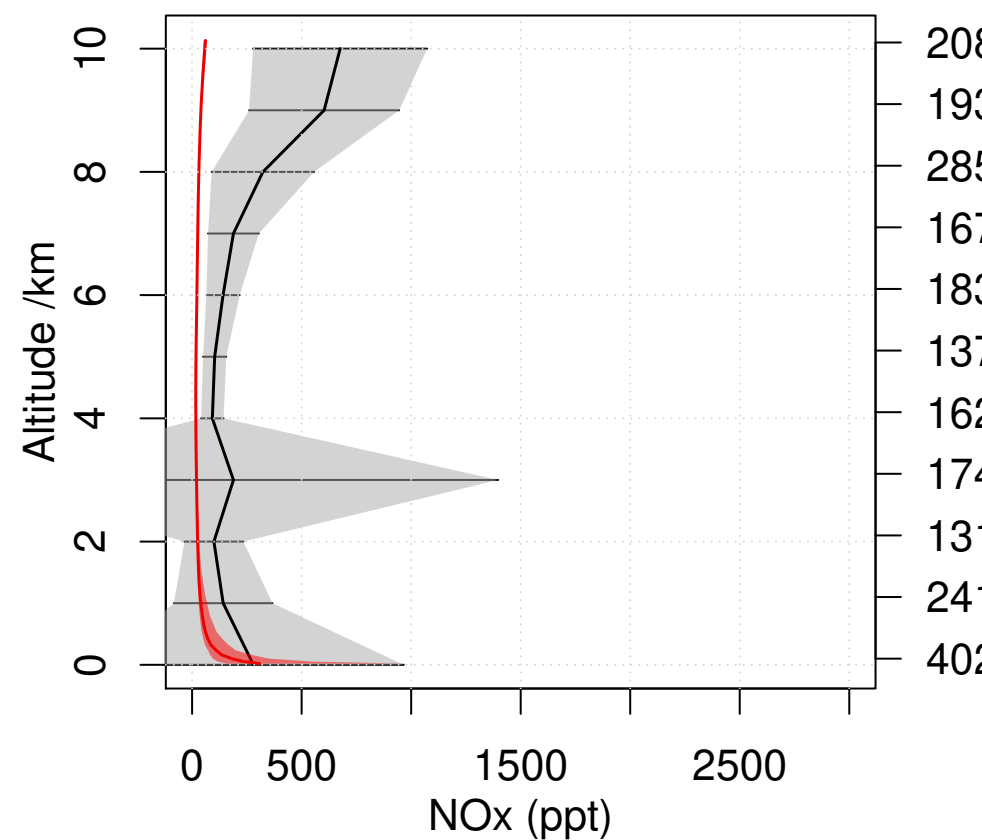
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



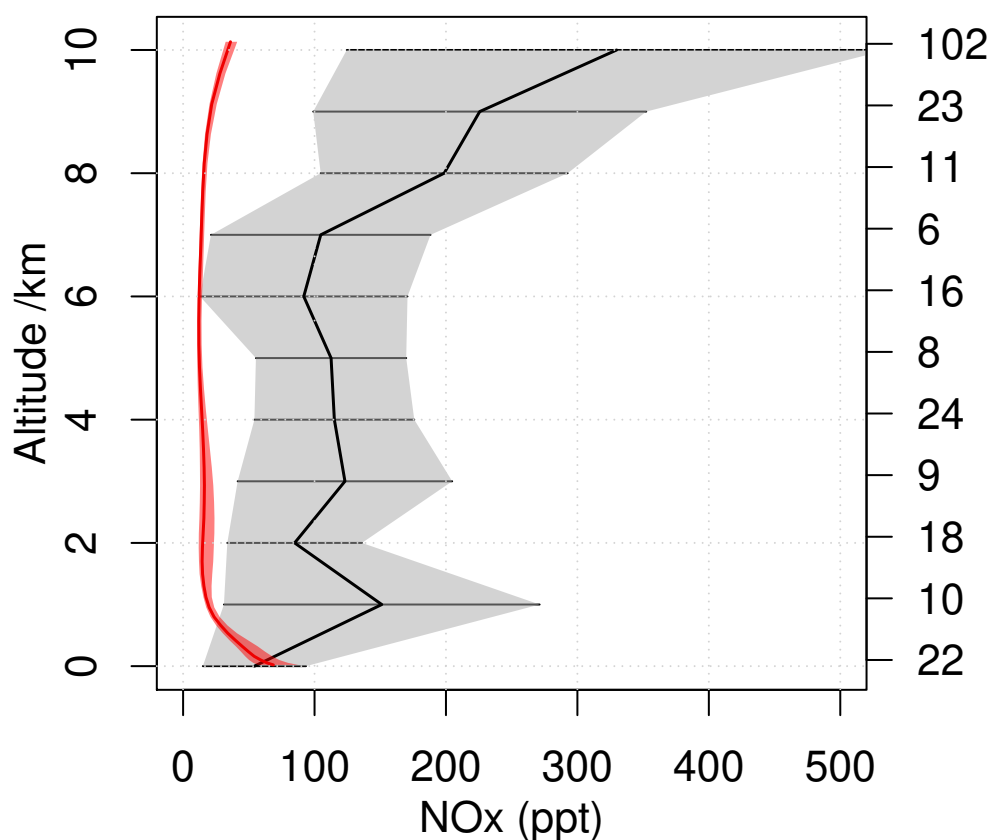
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



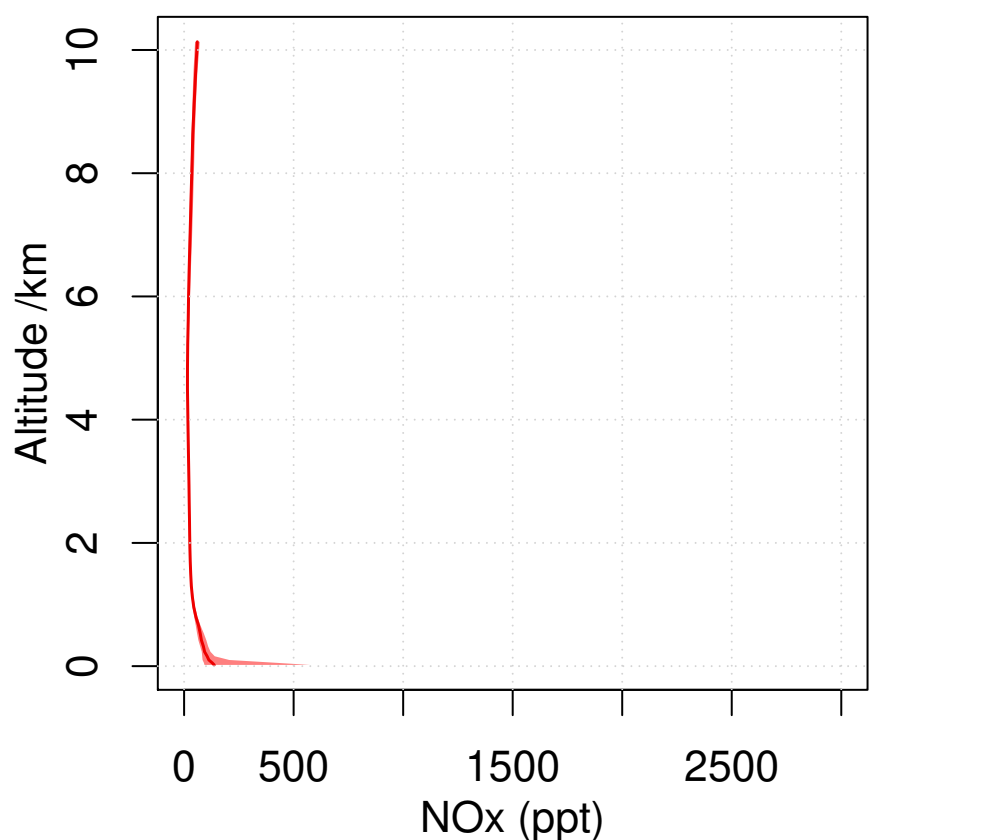
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



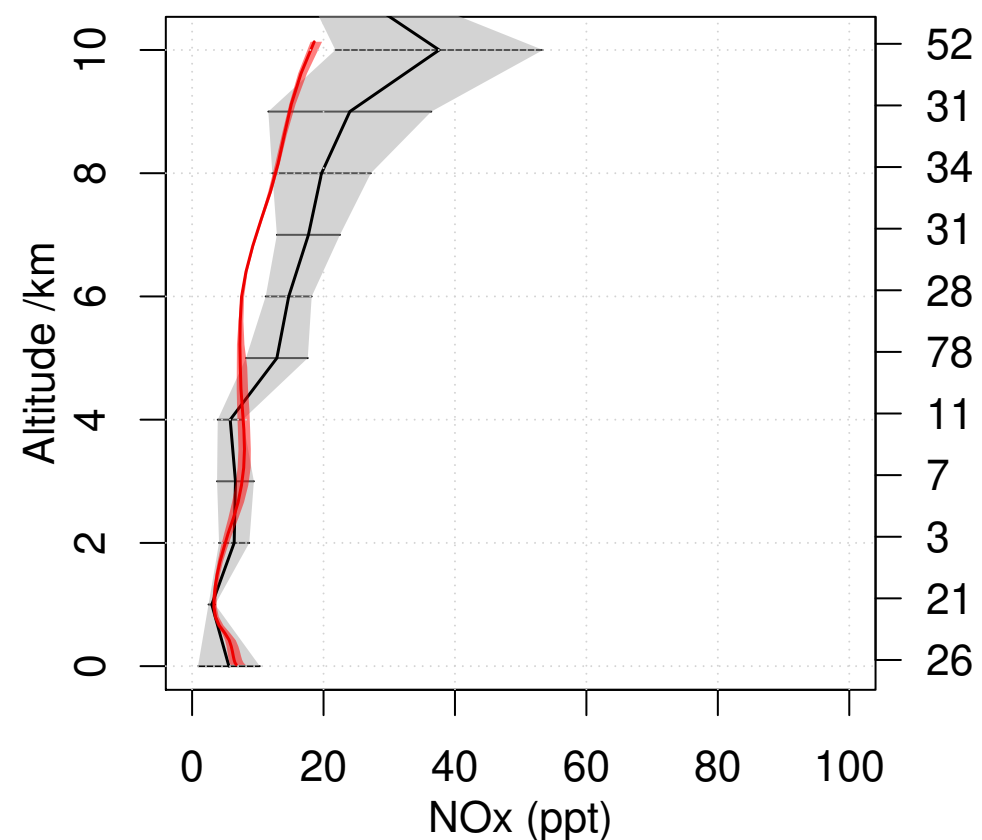
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



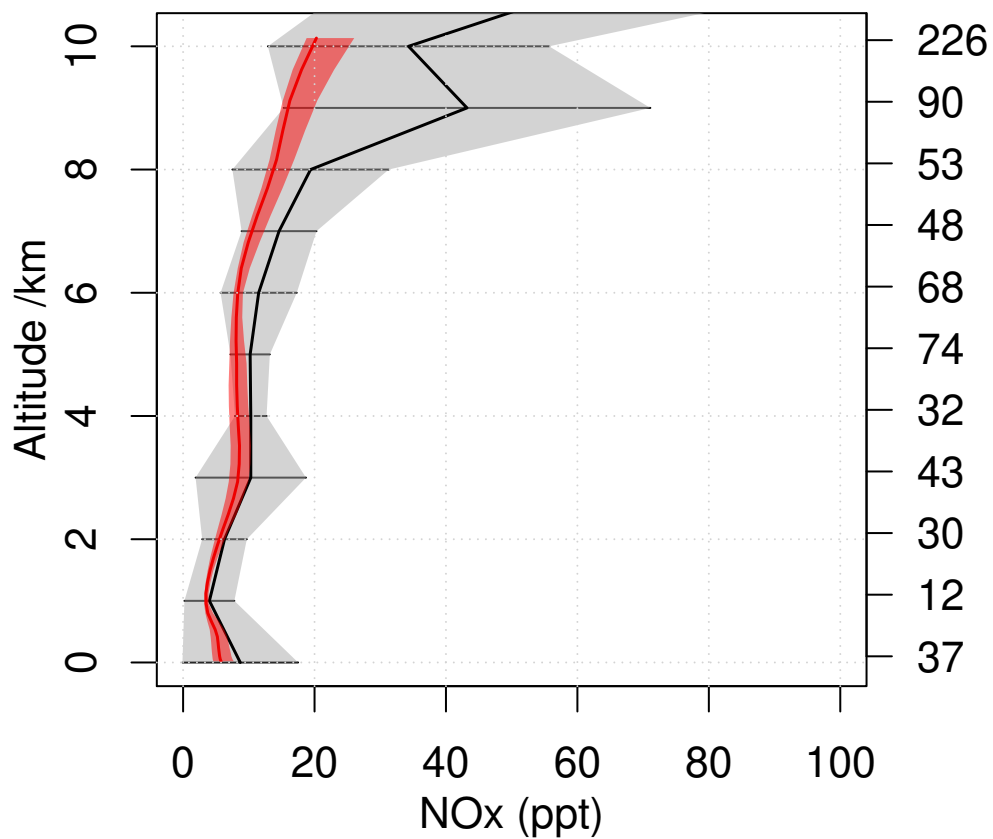
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



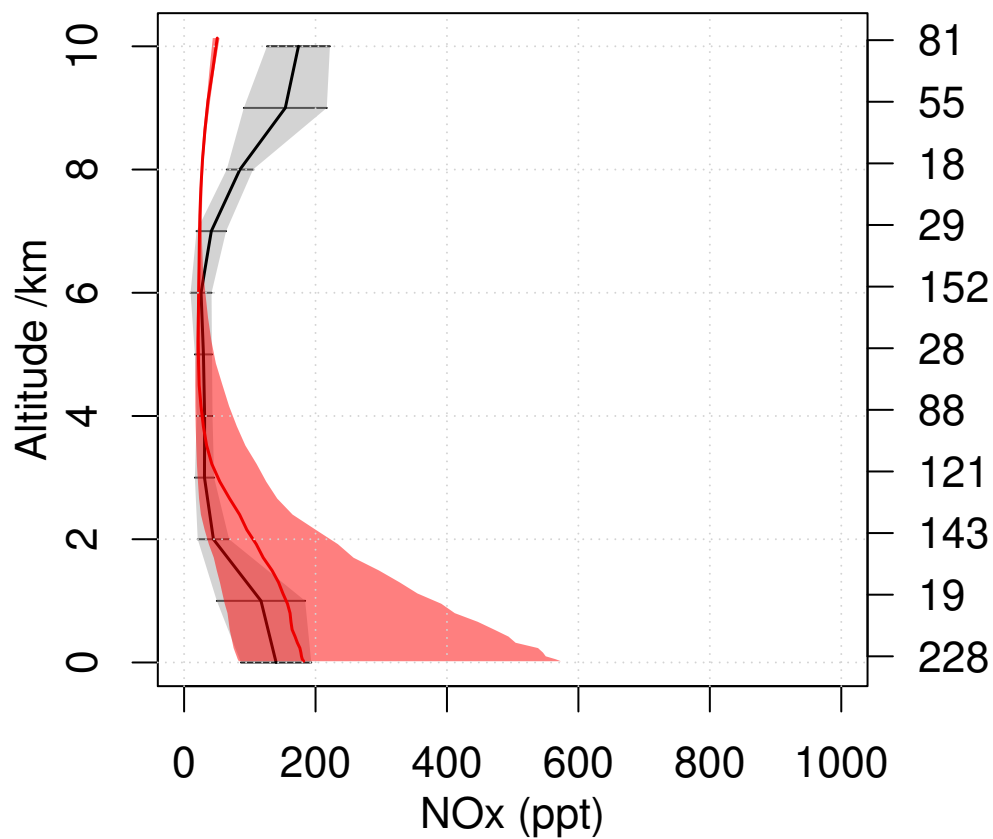
PEM-Tropics-B Christmas-Island 1999 0
Lat 0 – 10 Lon 200 – 220



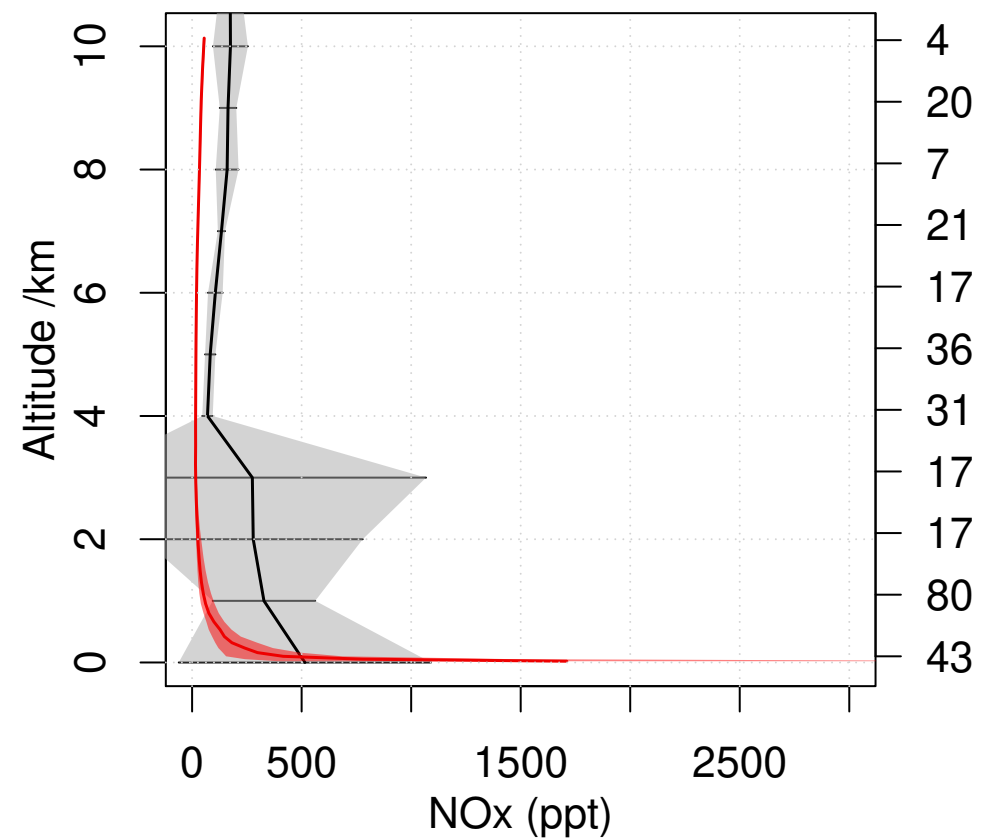
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



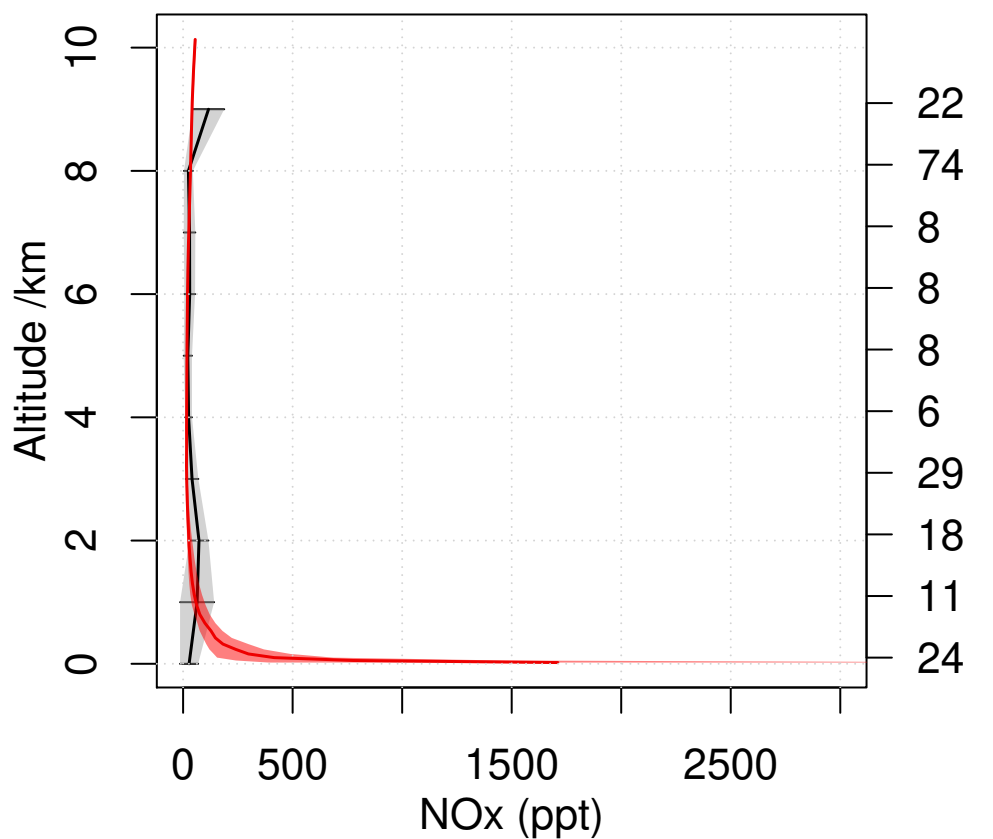
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



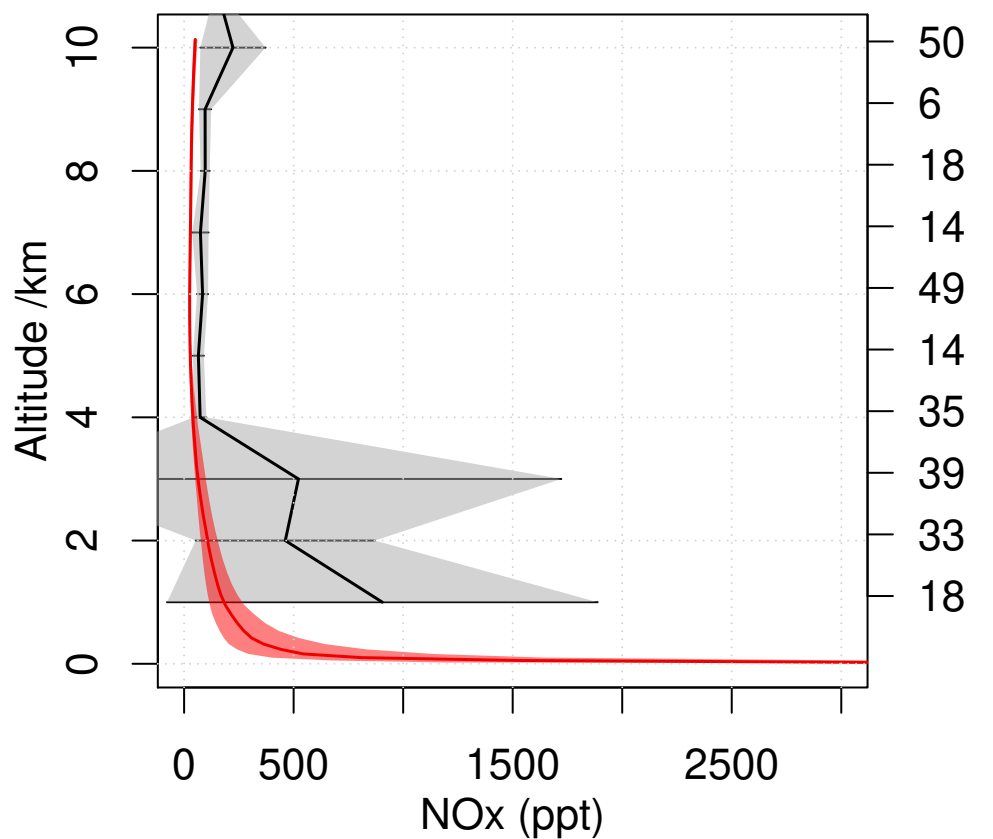
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



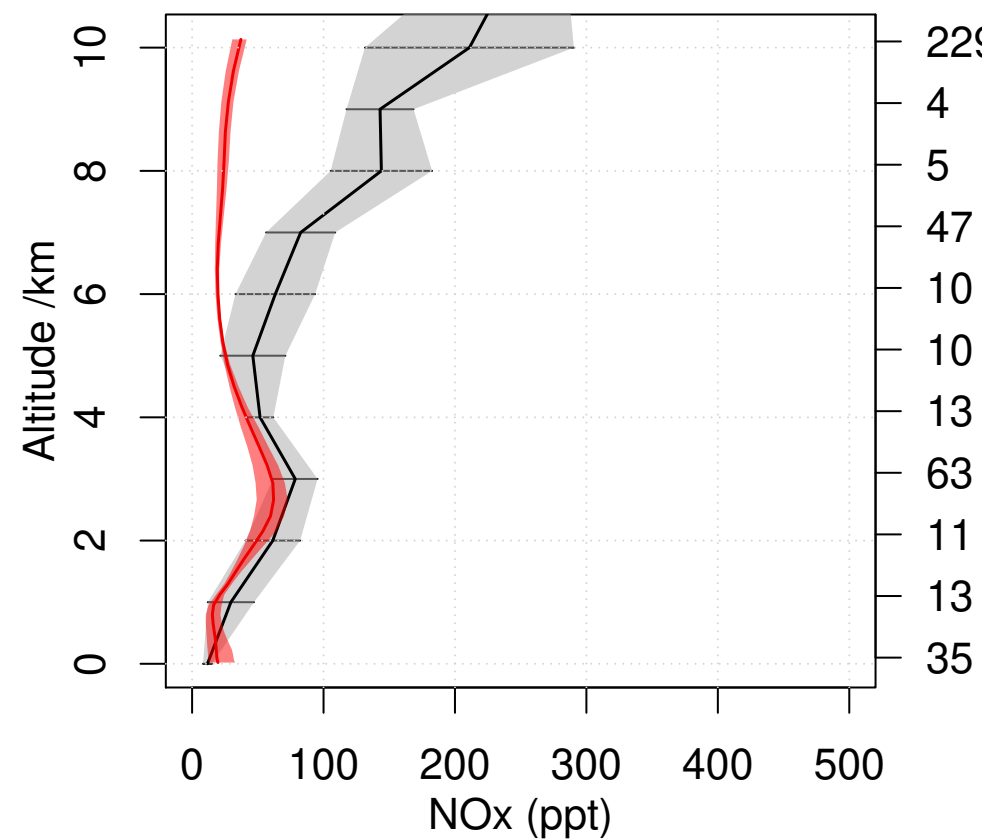
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

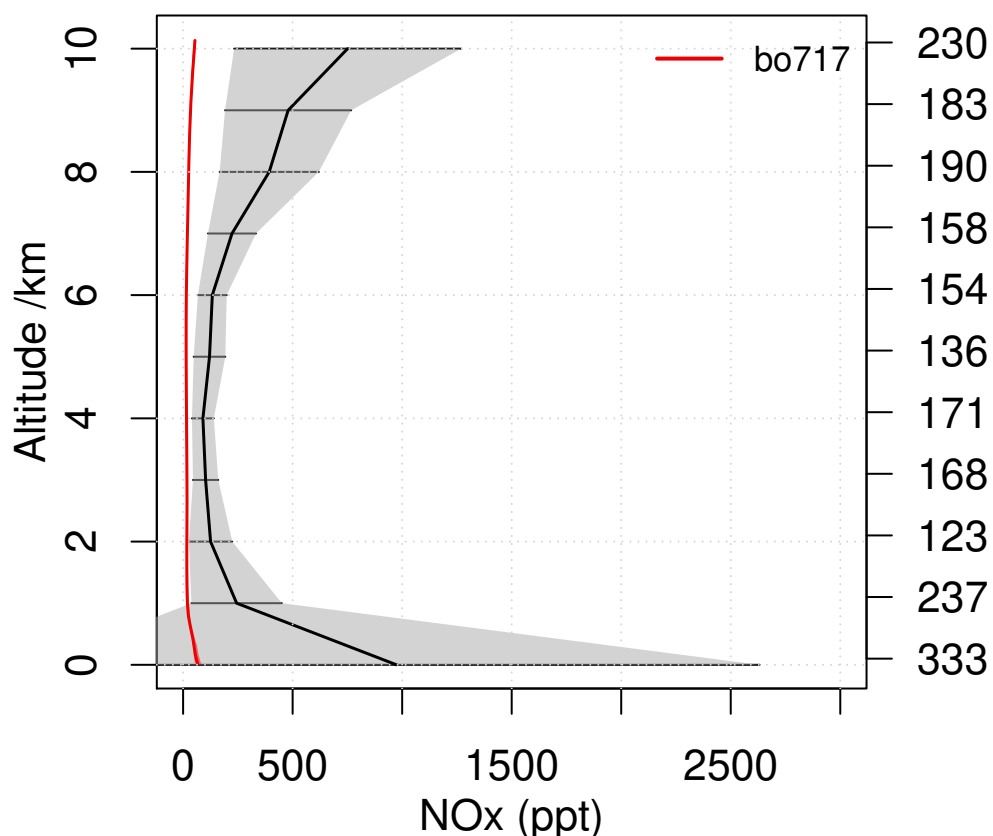


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

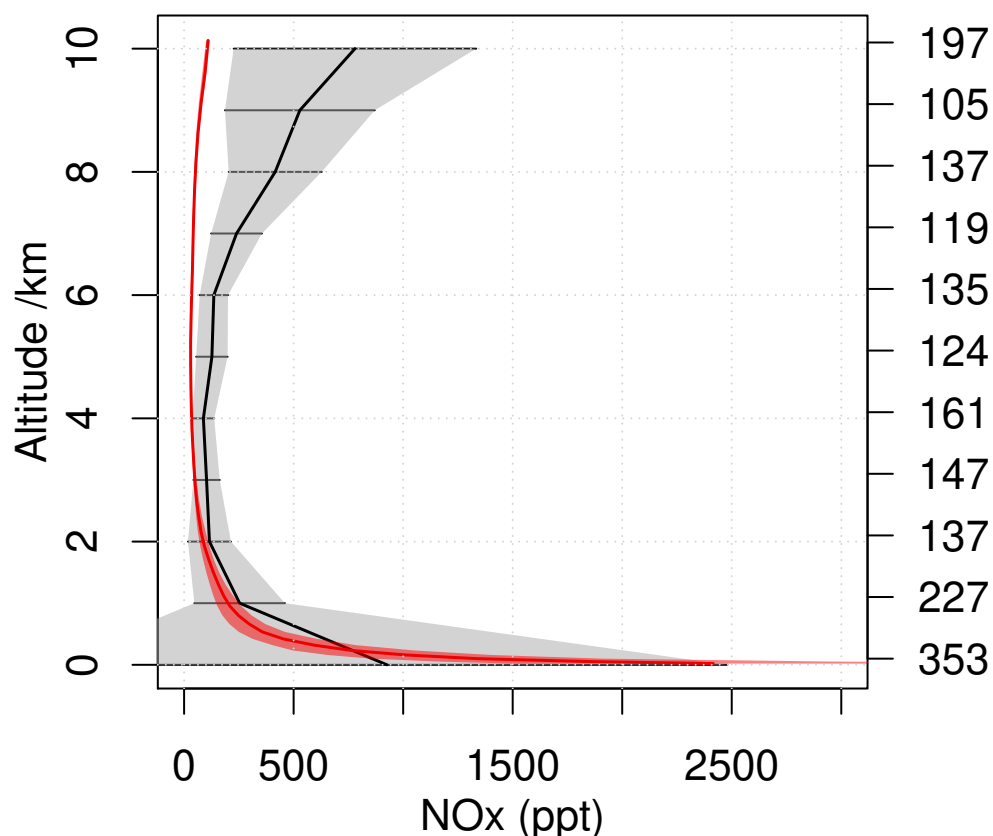


Emmons NOx comparison

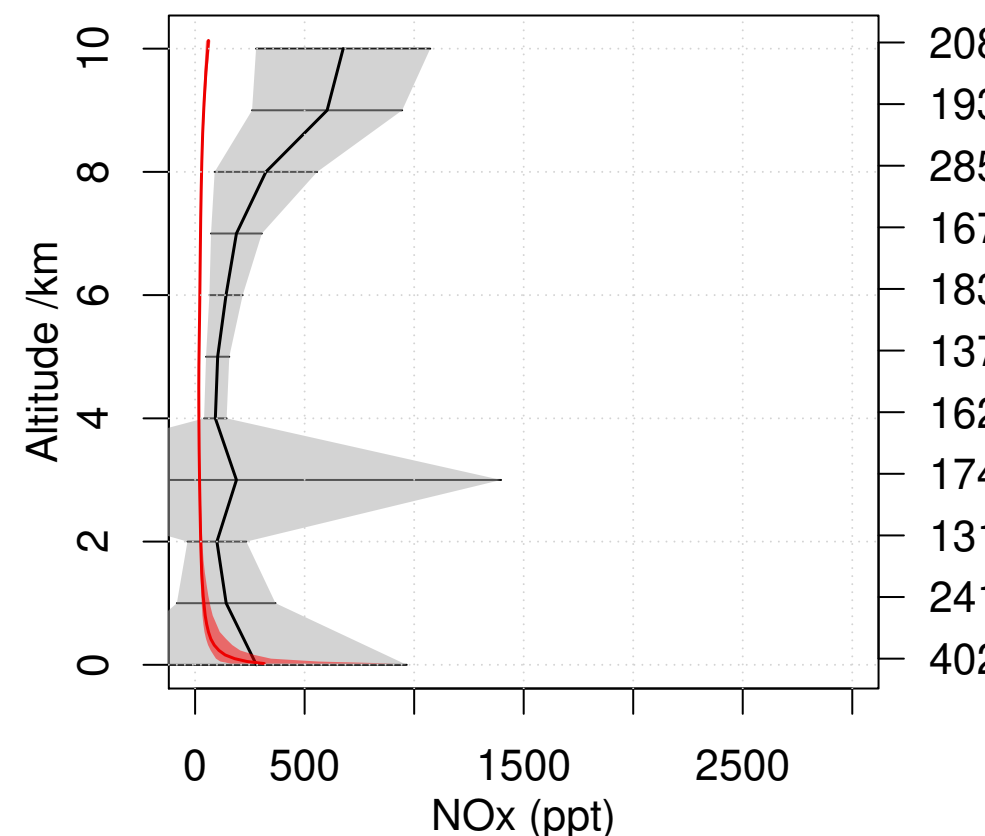
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



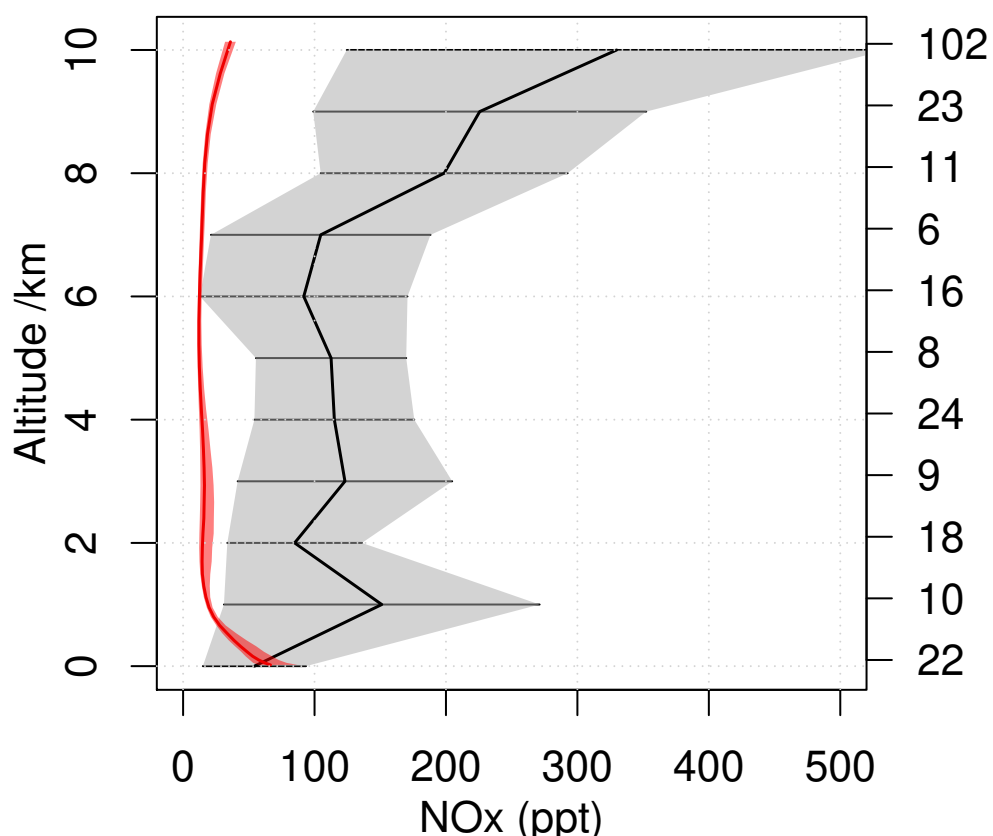
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



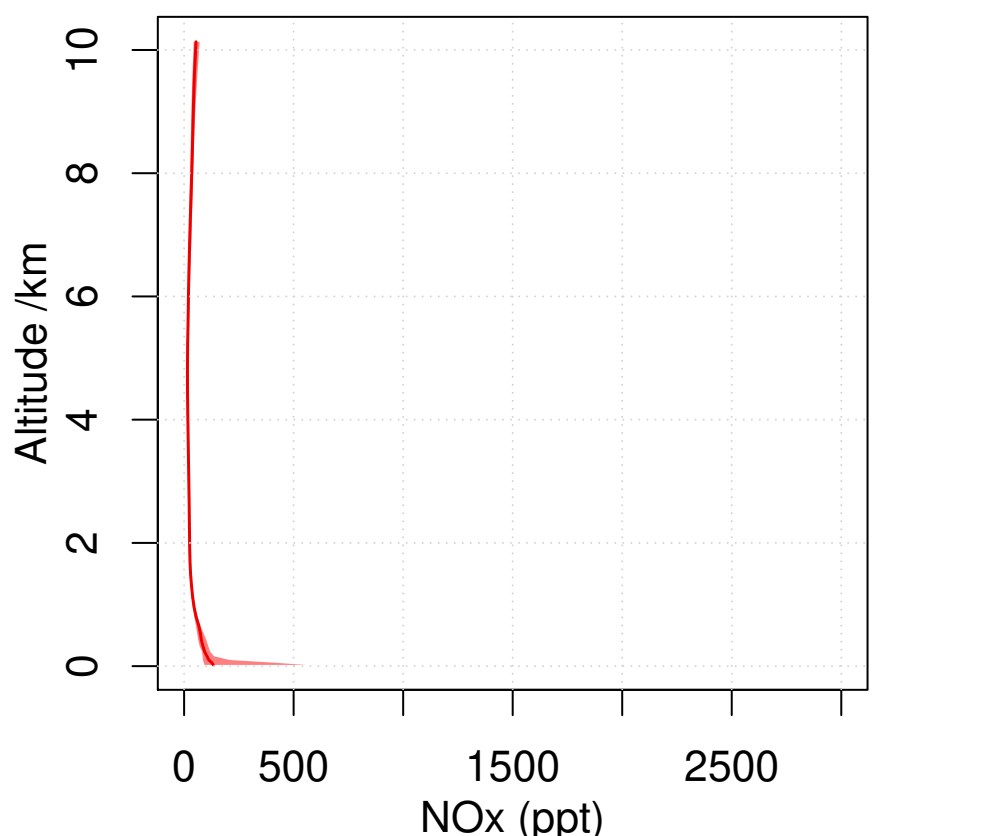
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



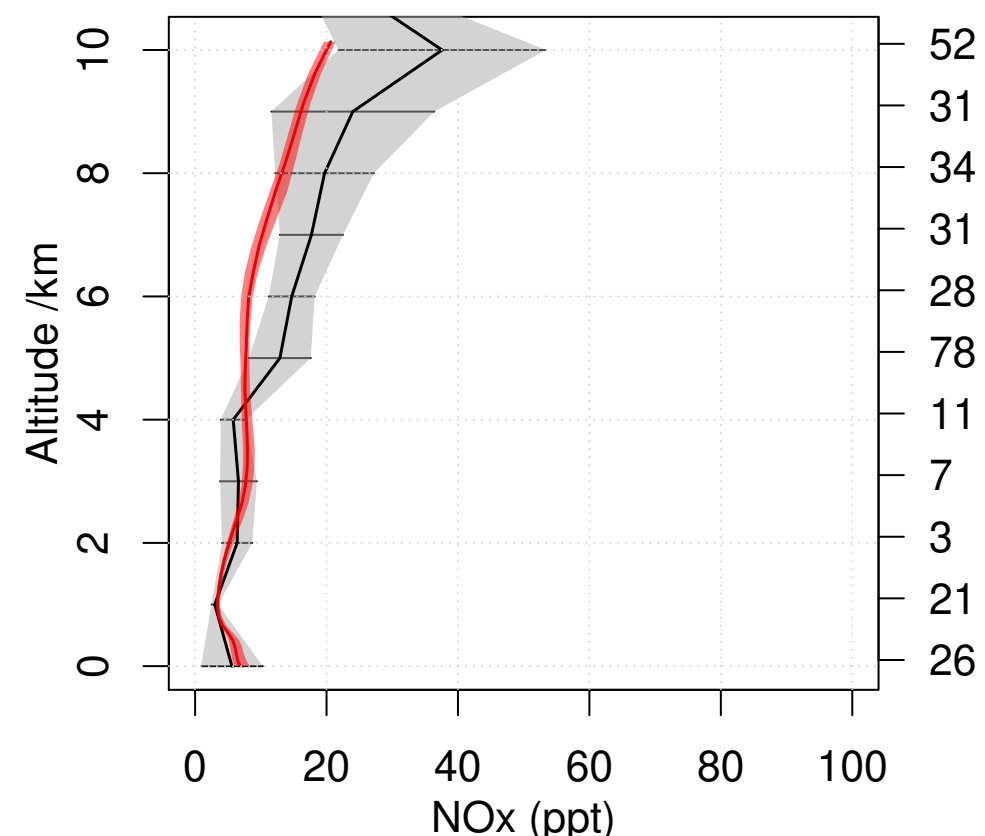
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



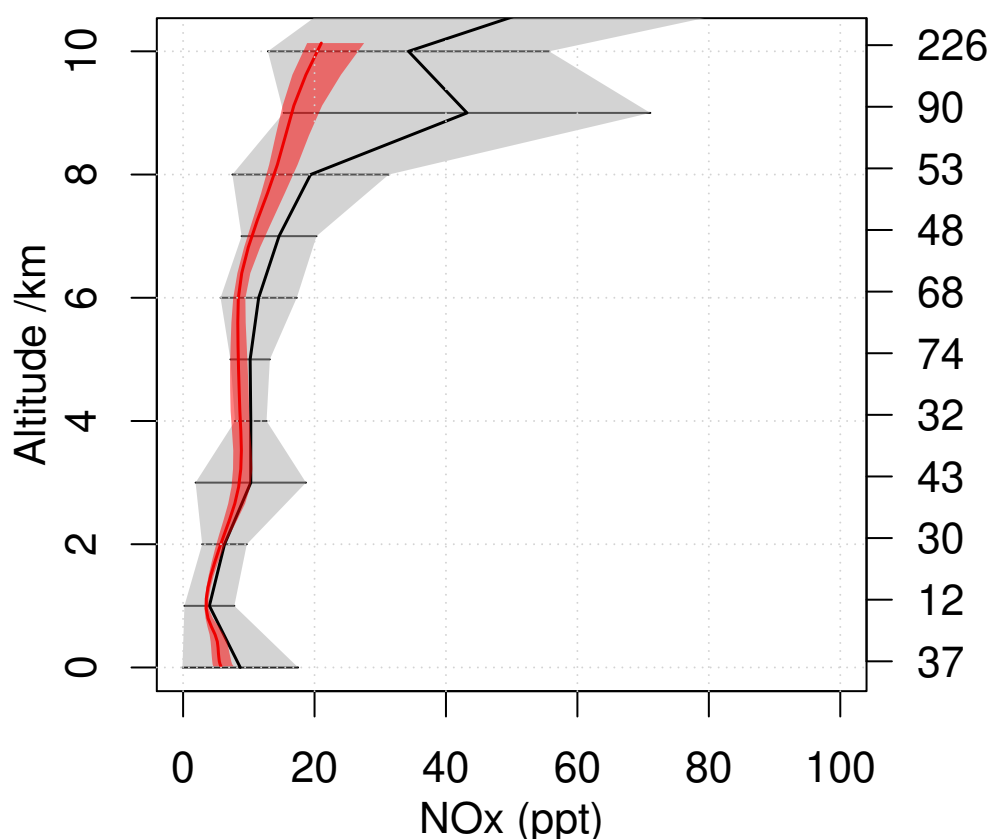
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



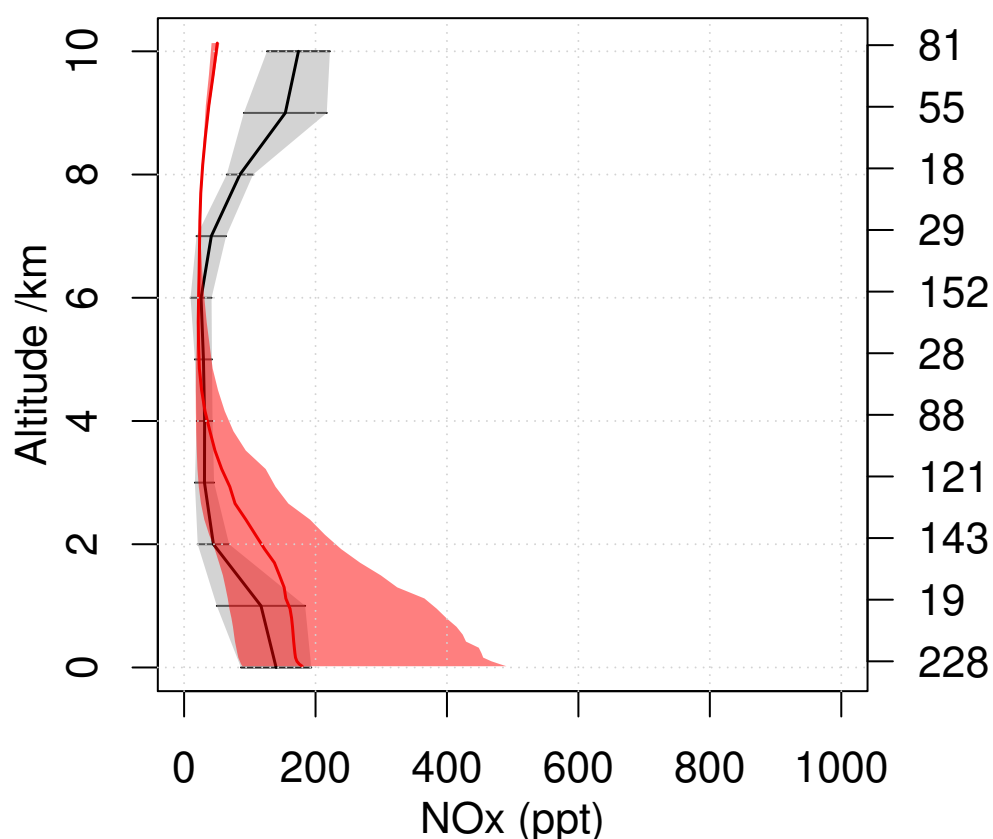
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



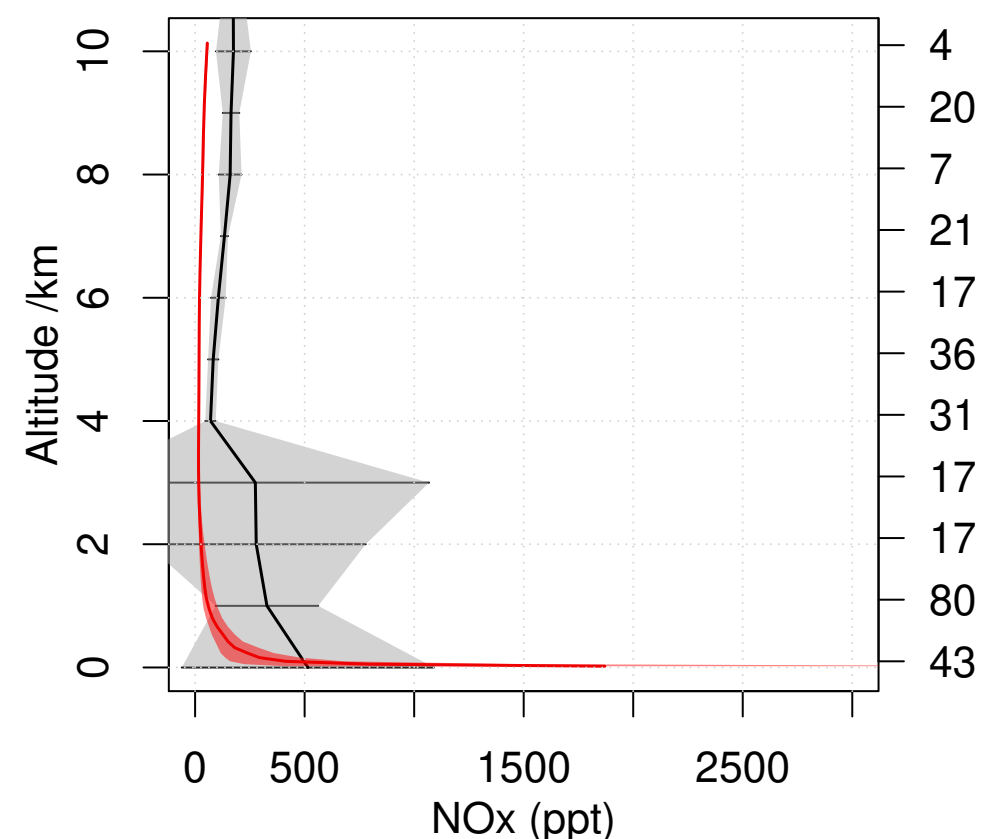
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



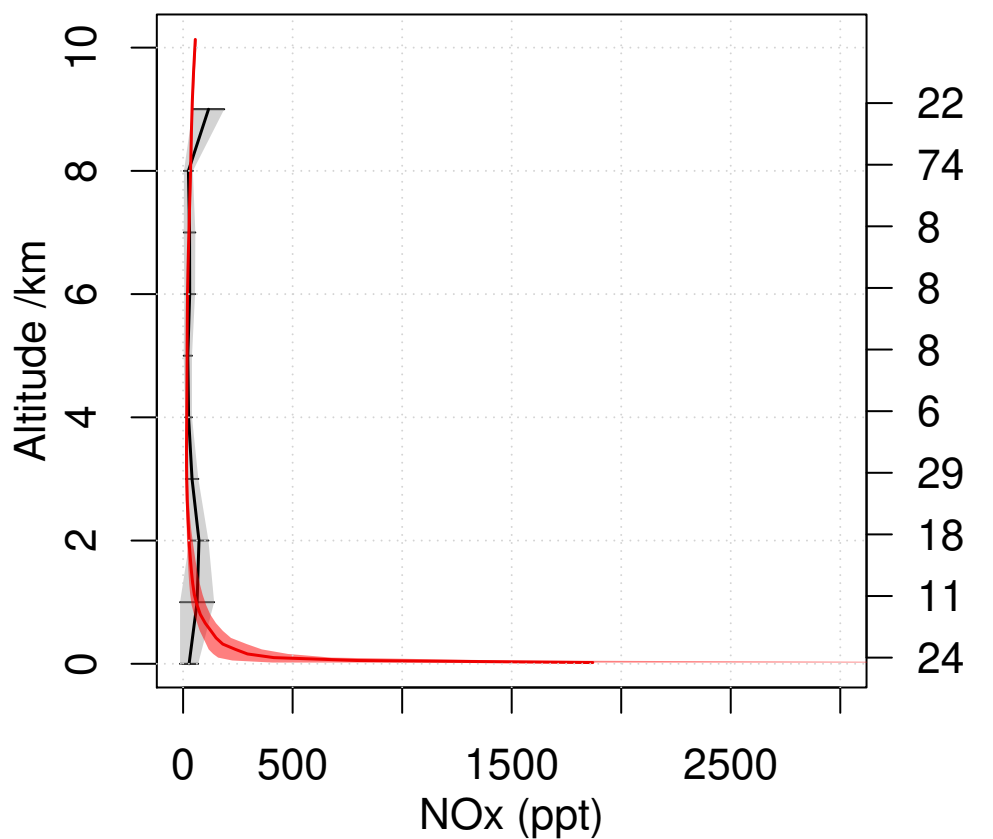
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



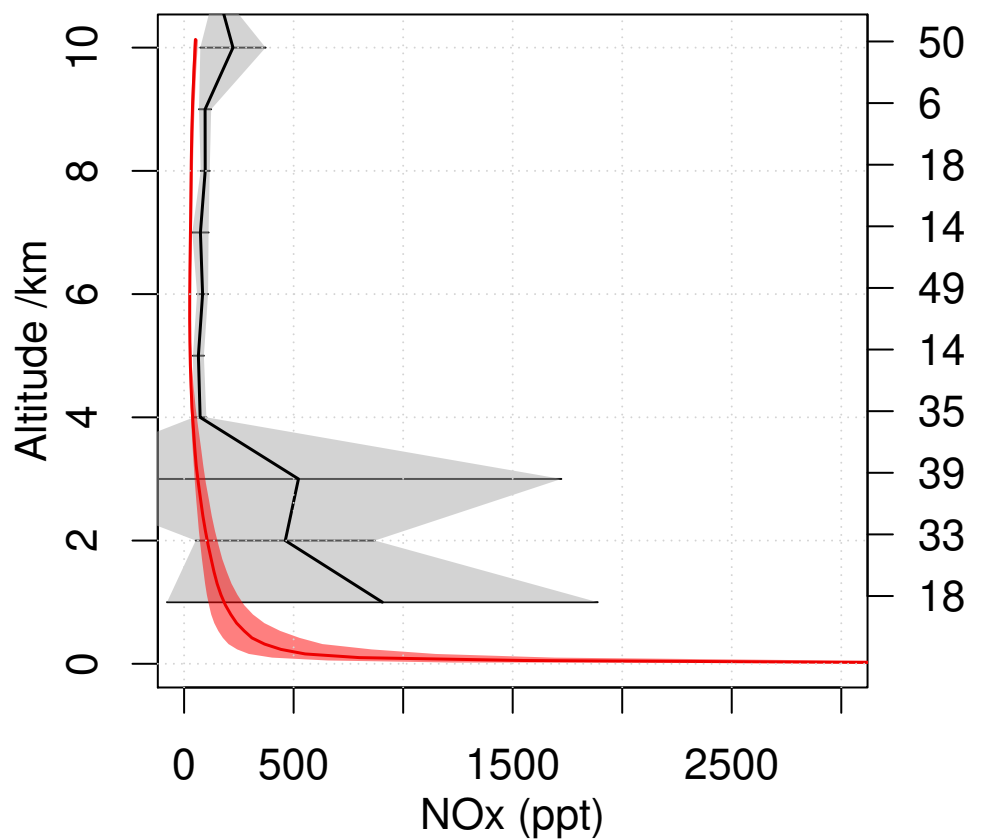
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



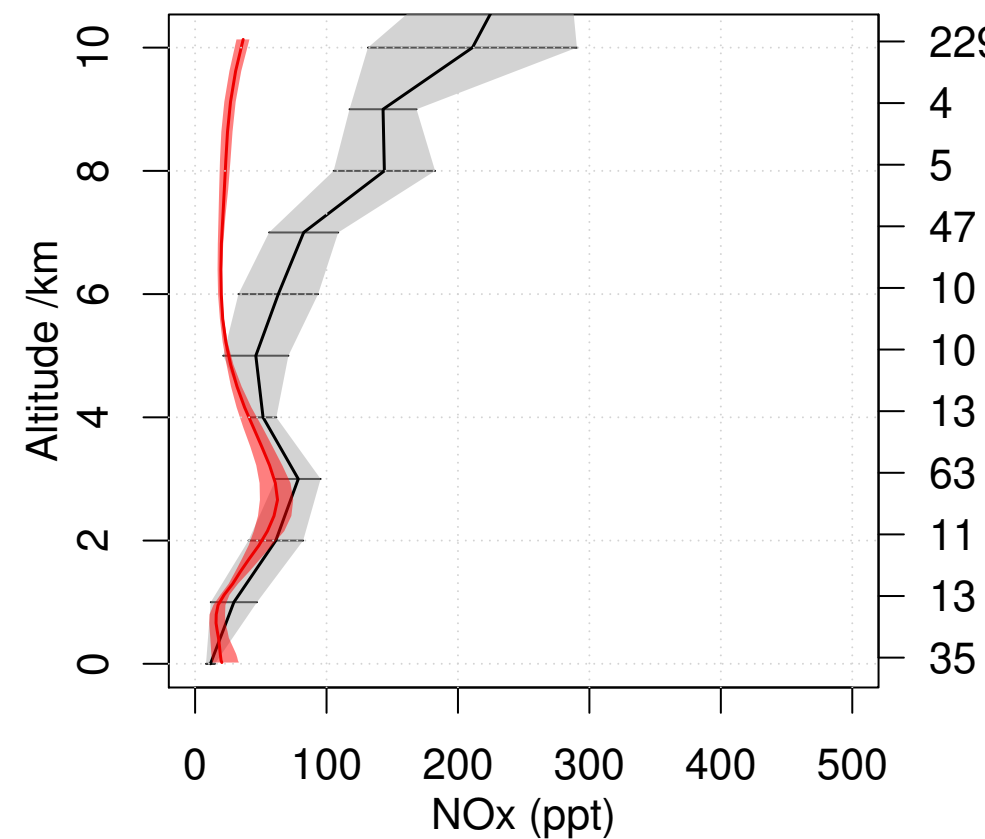
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

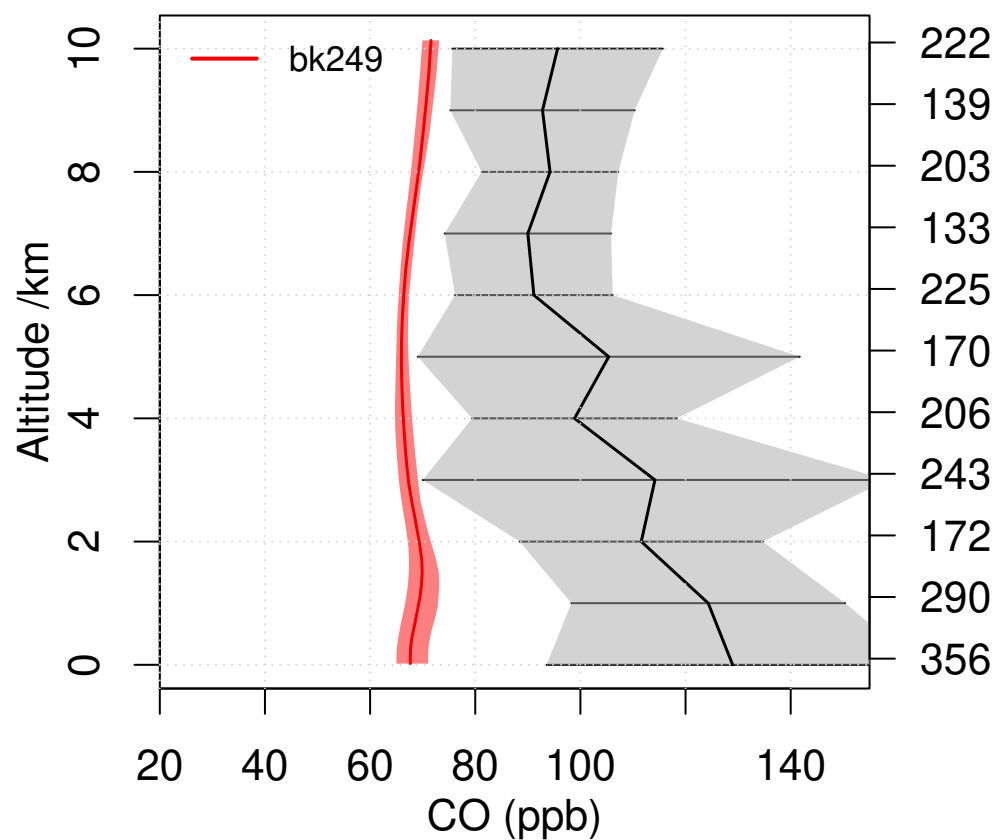


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

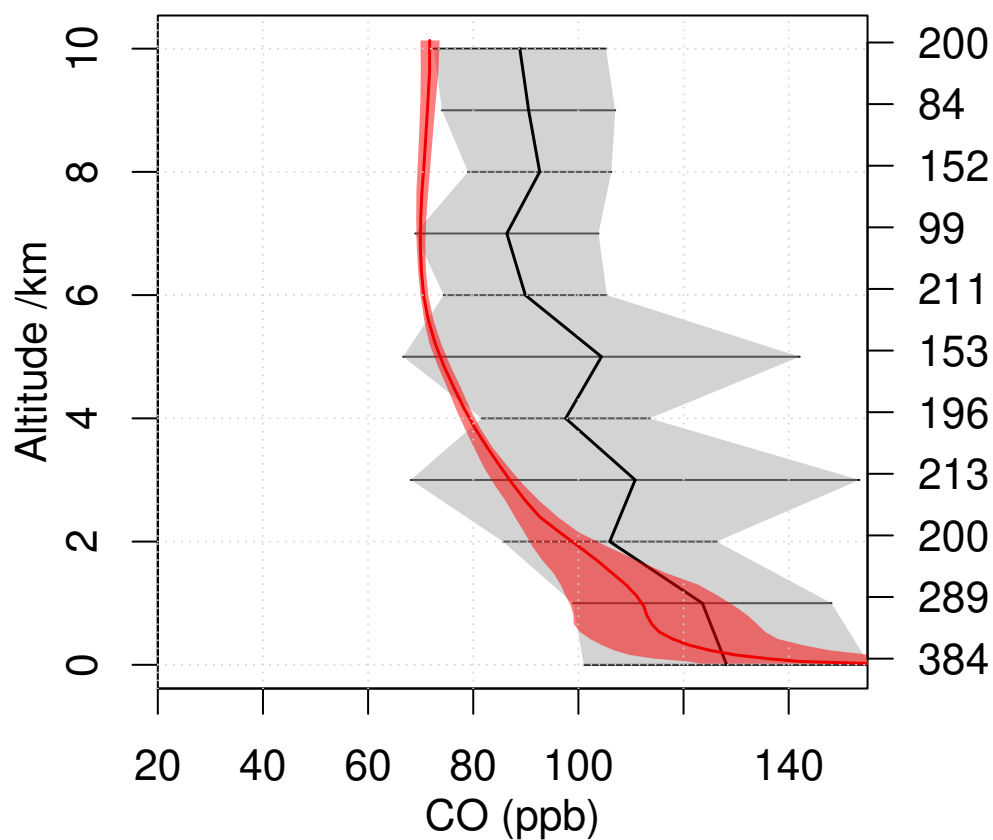


Emmons CO comparison

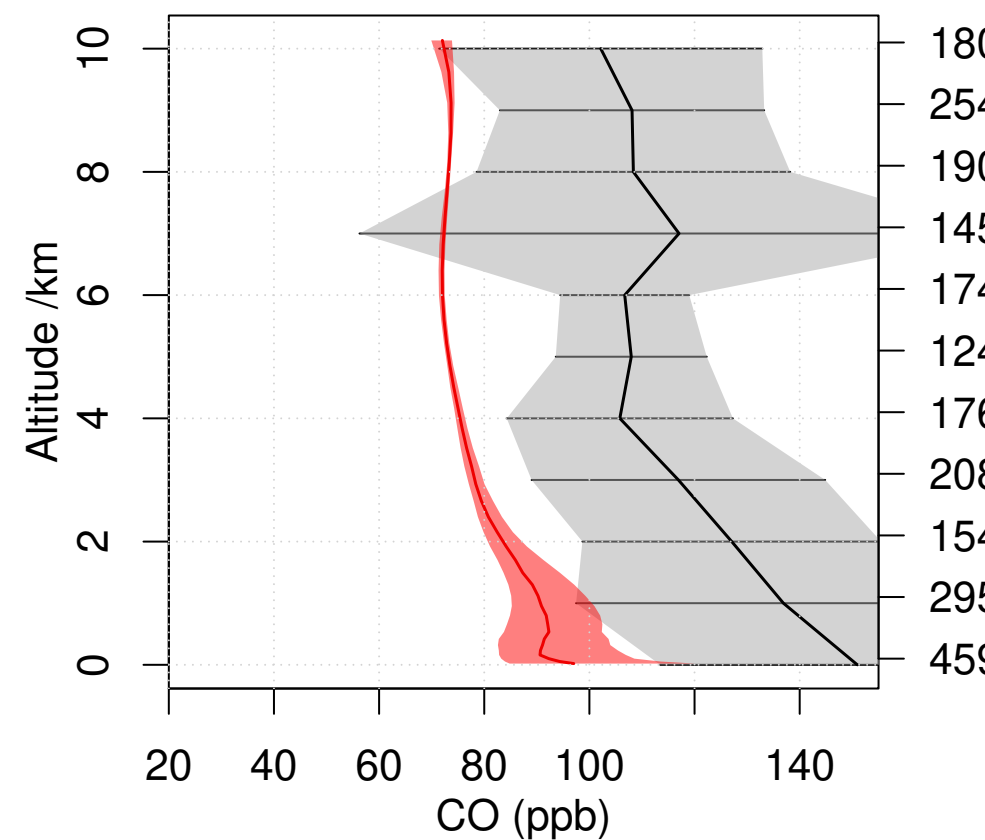
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



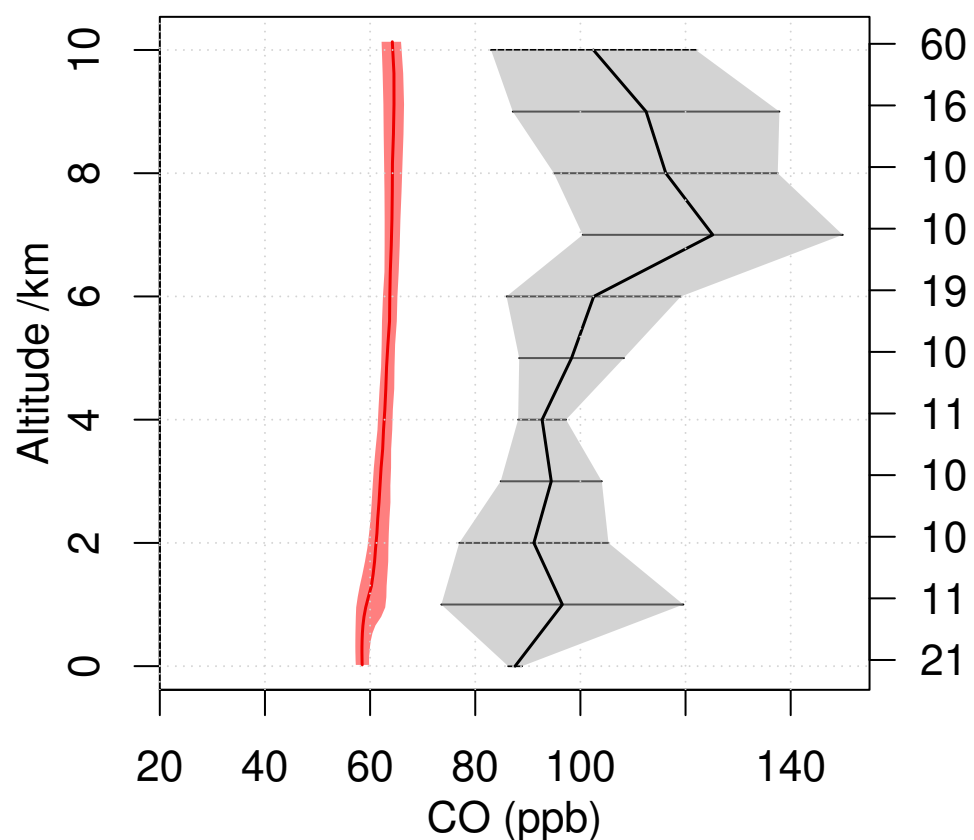
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



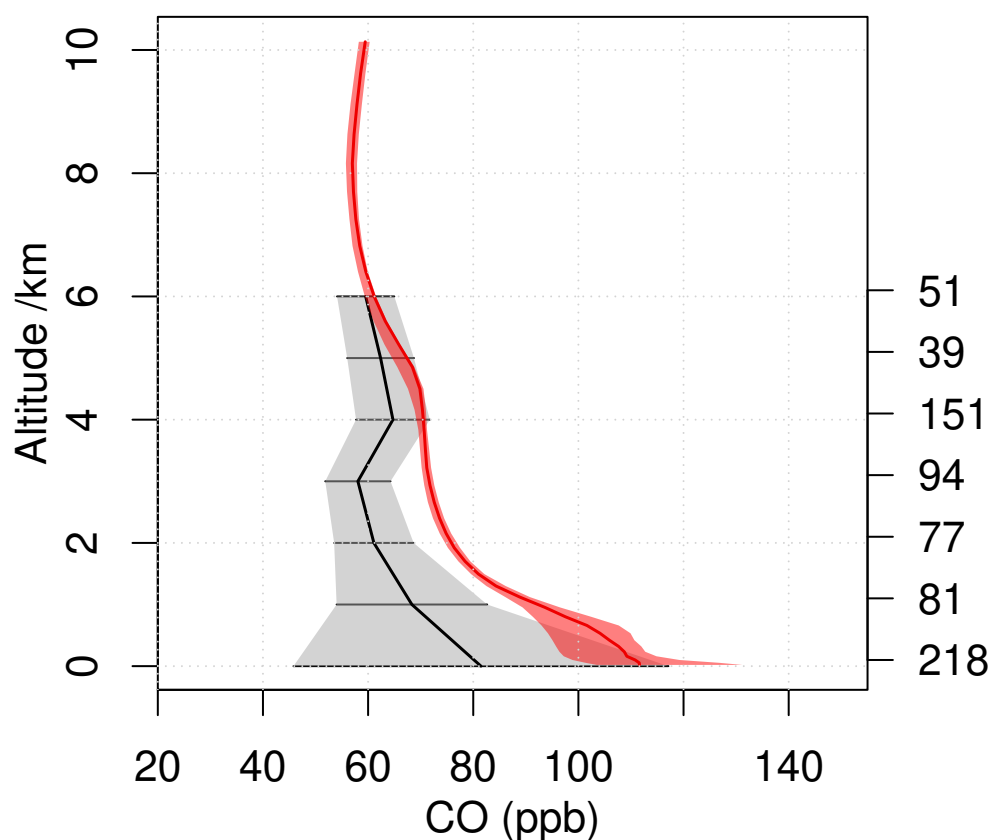
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



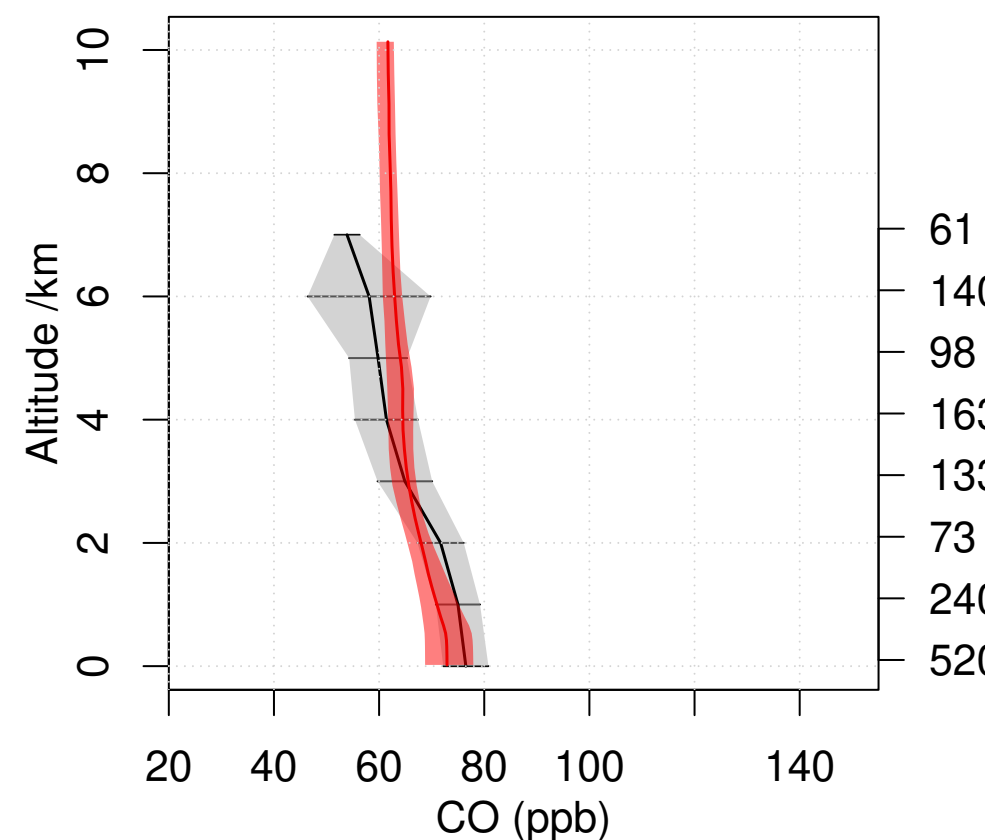
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



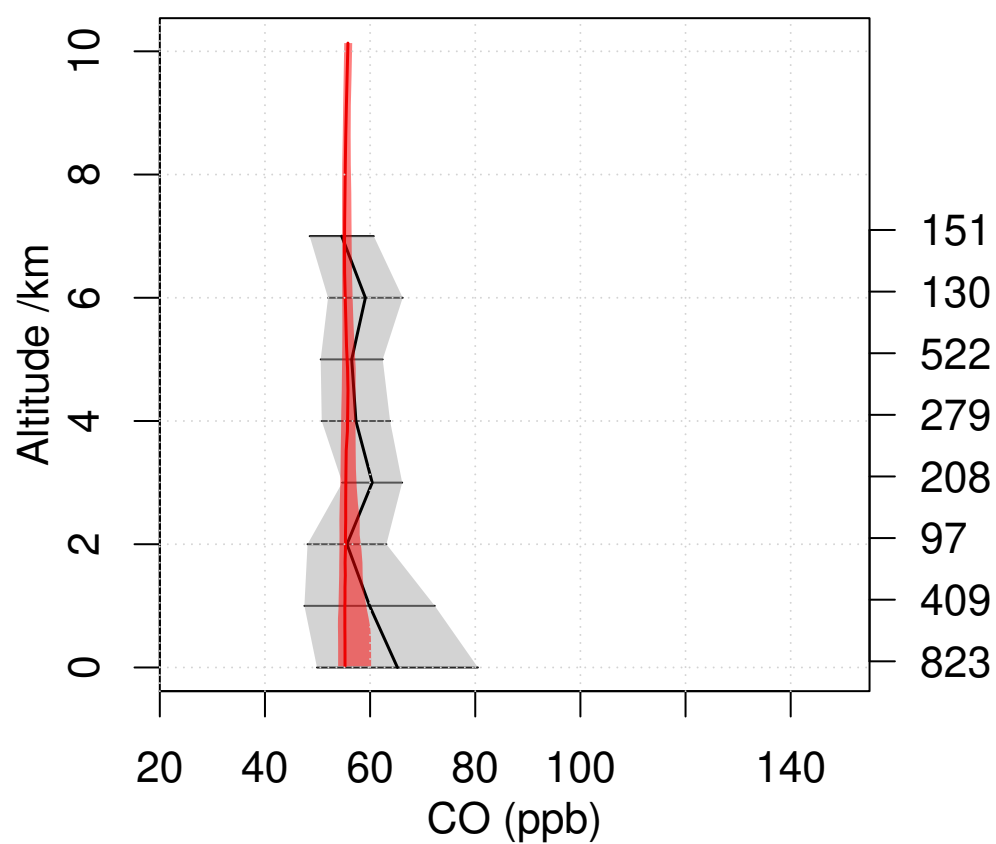
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



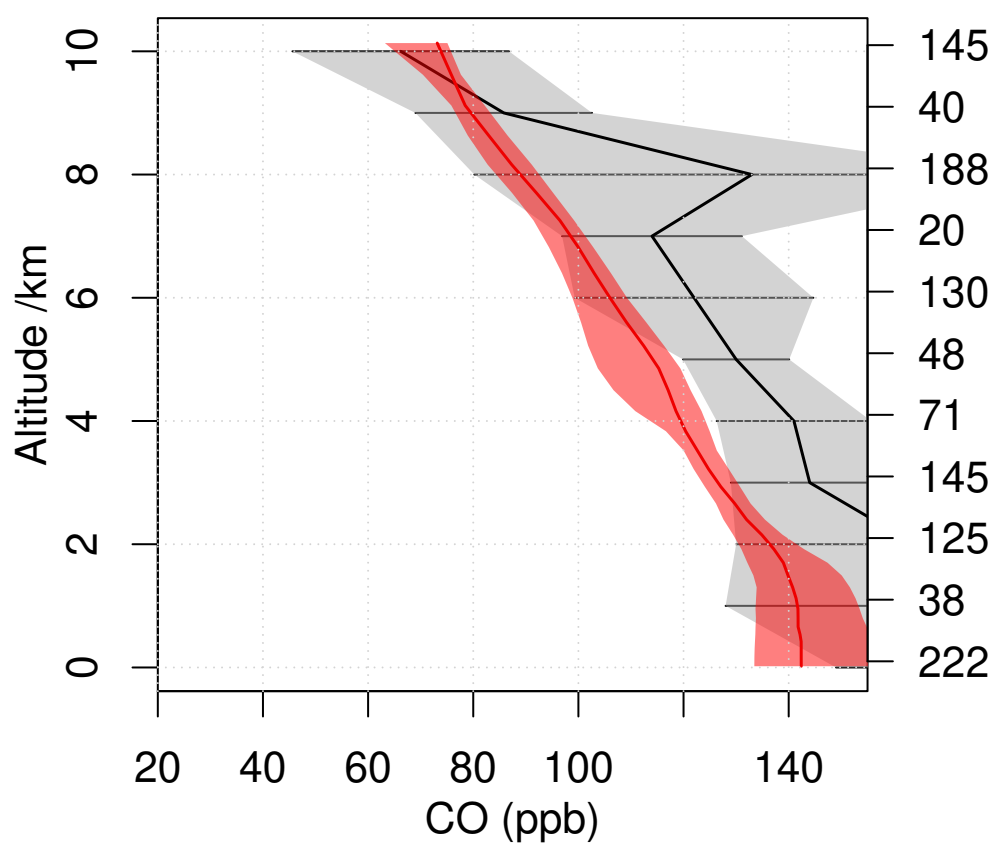
PEM-Tropics-B Christmas-Island 1999 0
Lat 0 – 10 Lon 200 – 220



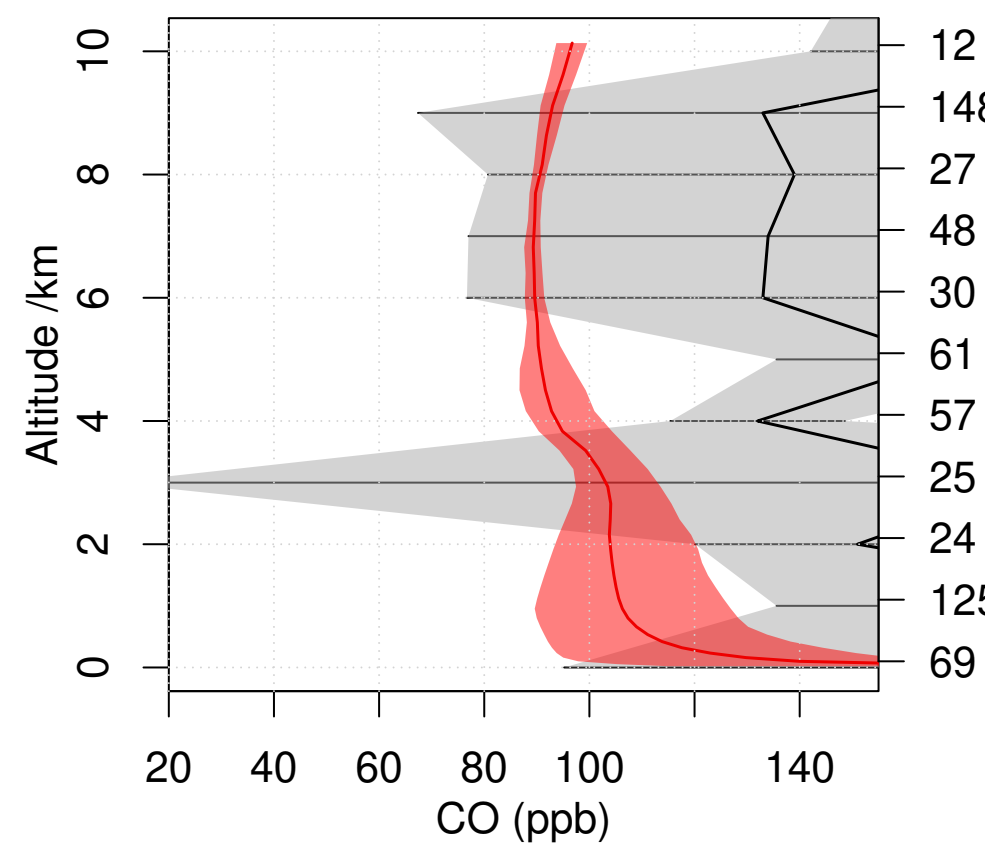
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



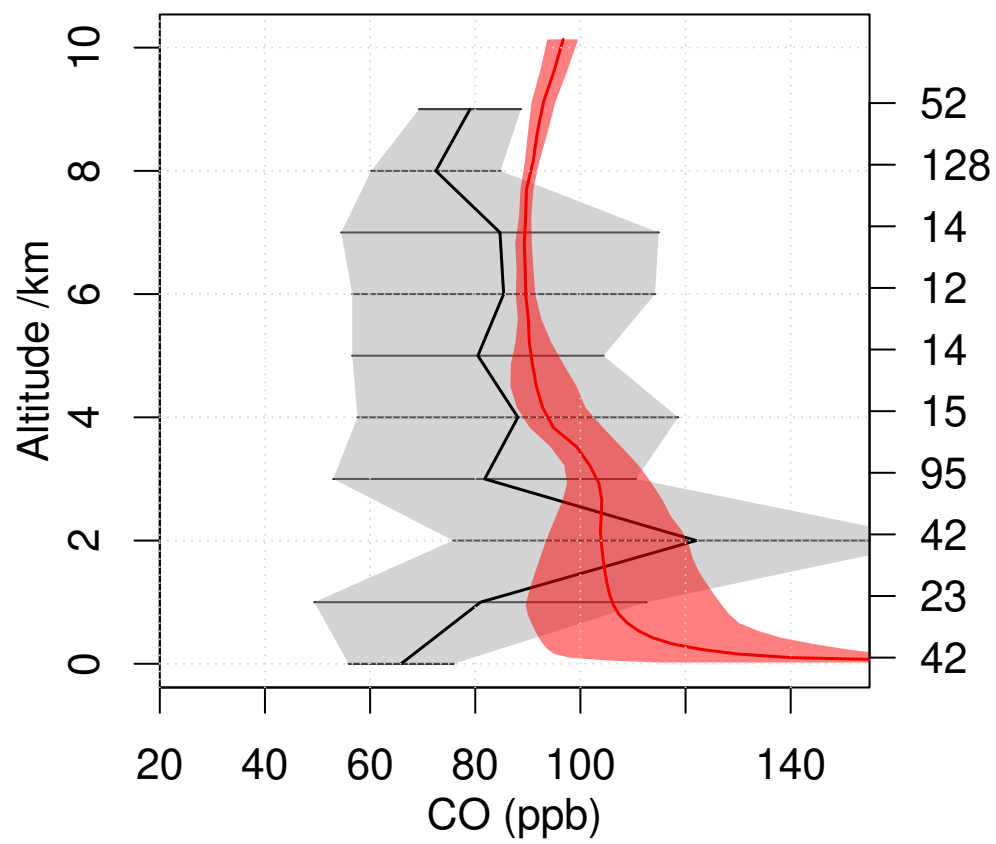
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



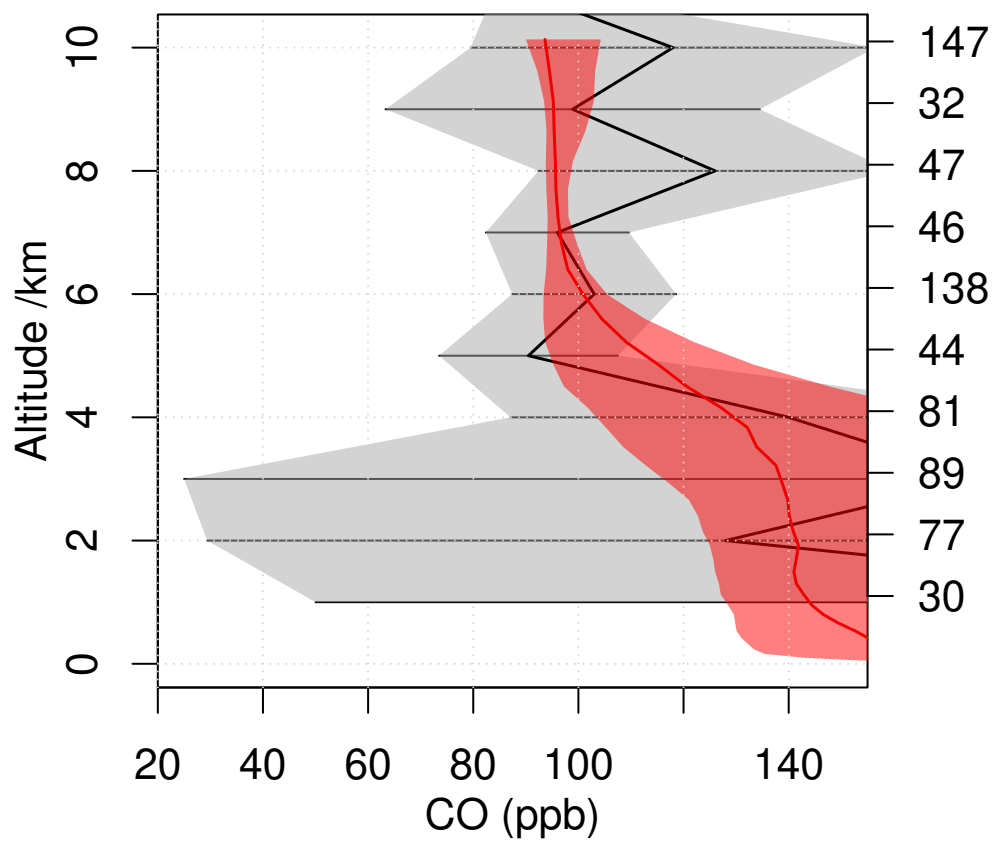
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



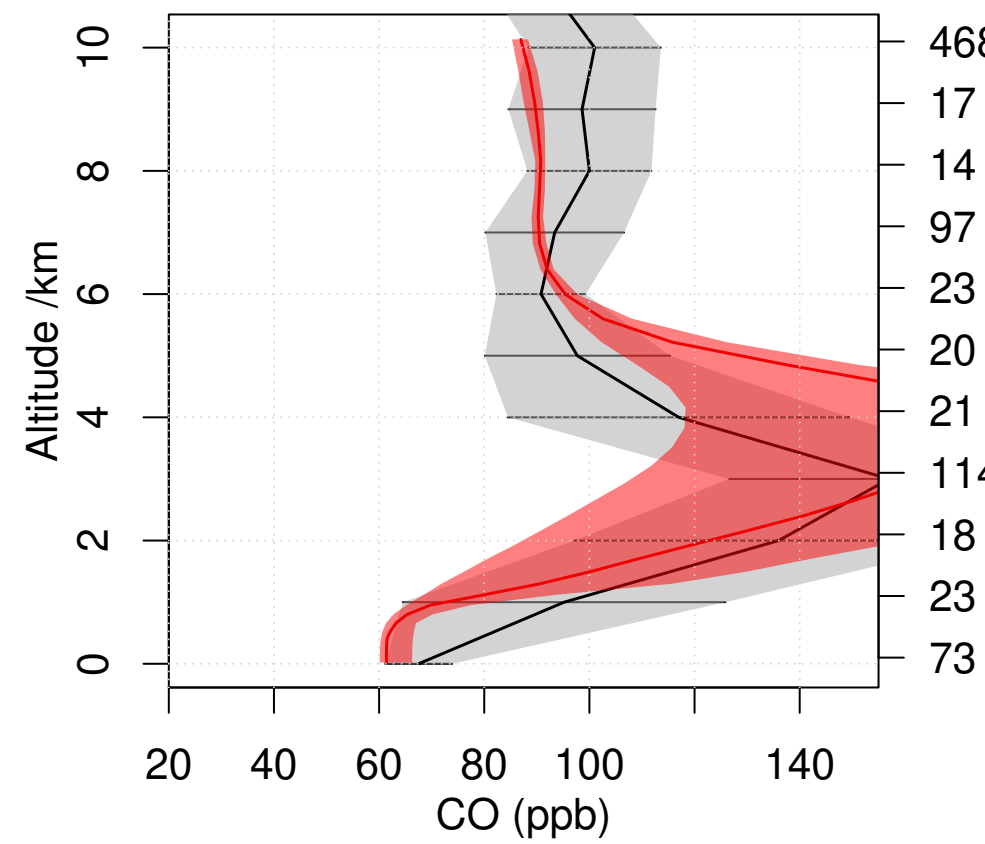
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

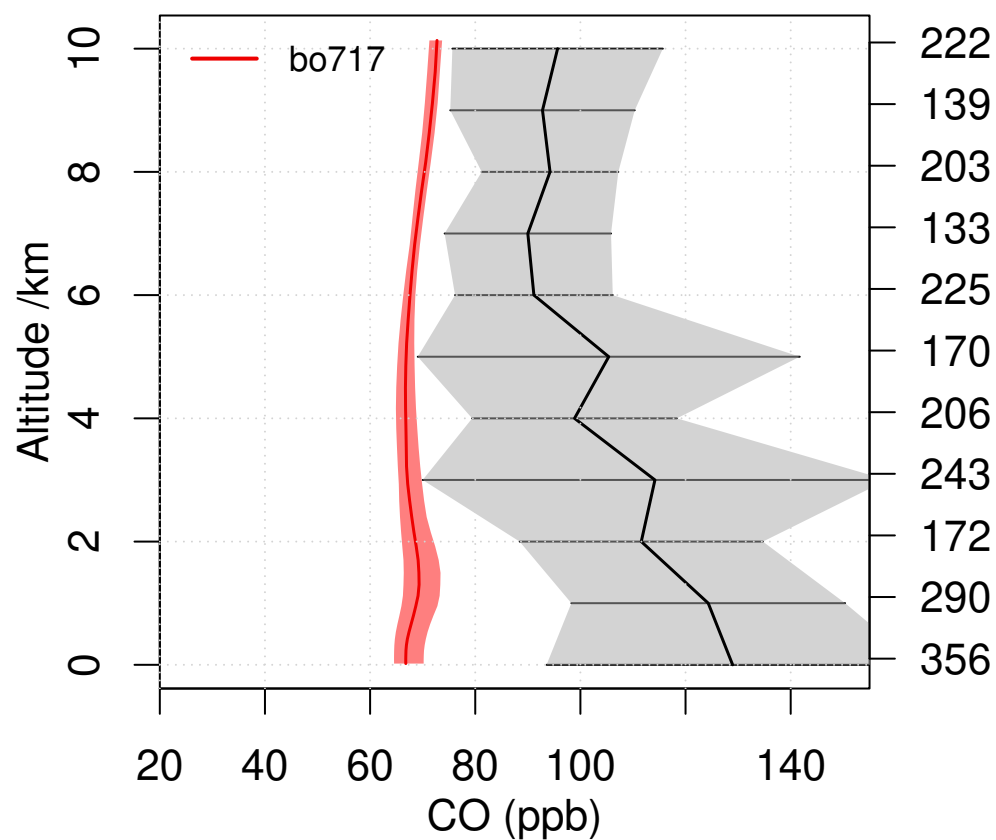


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

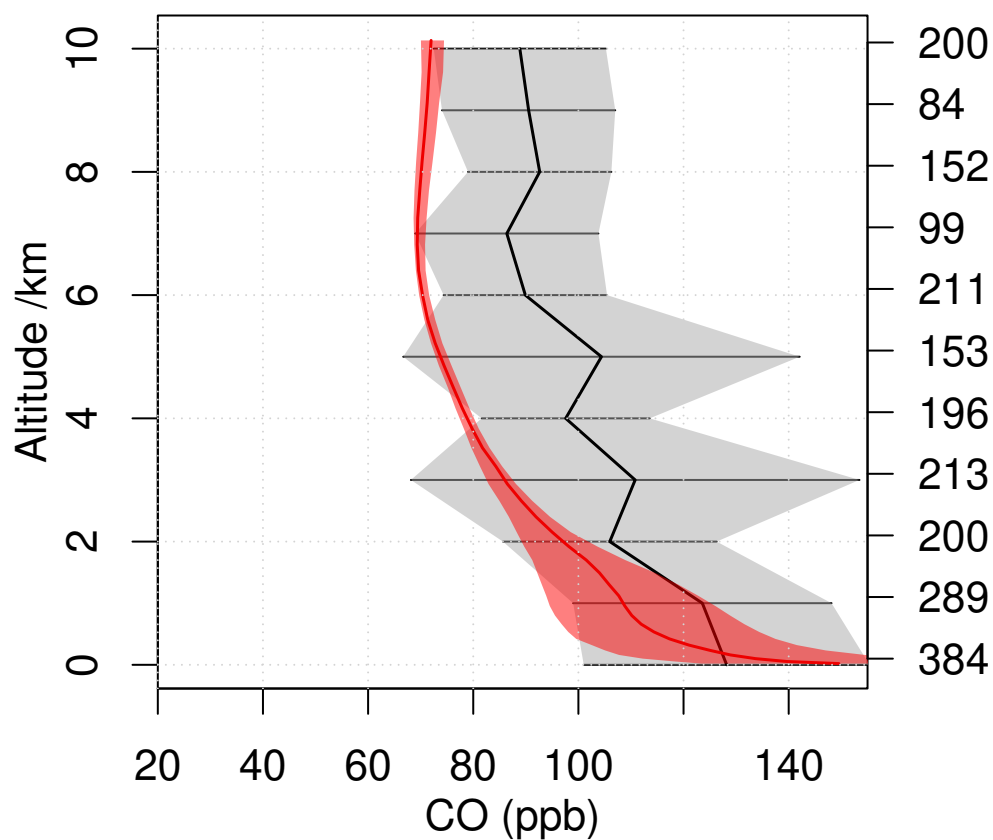


Emmons CO comparison

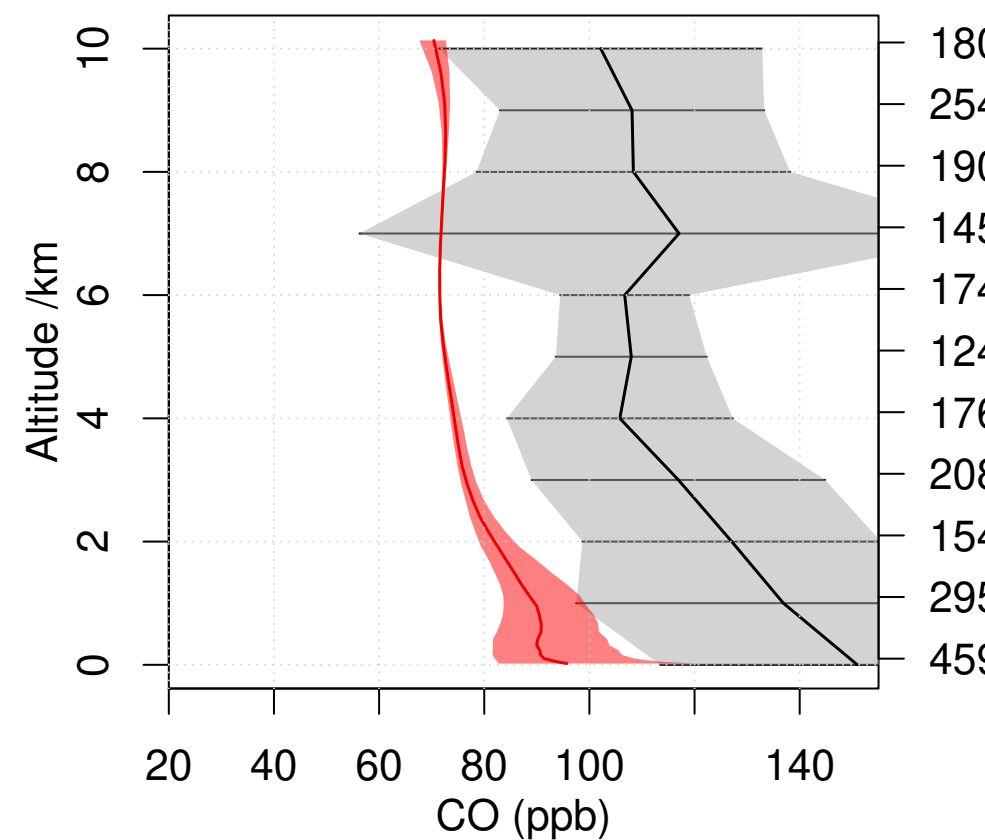
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



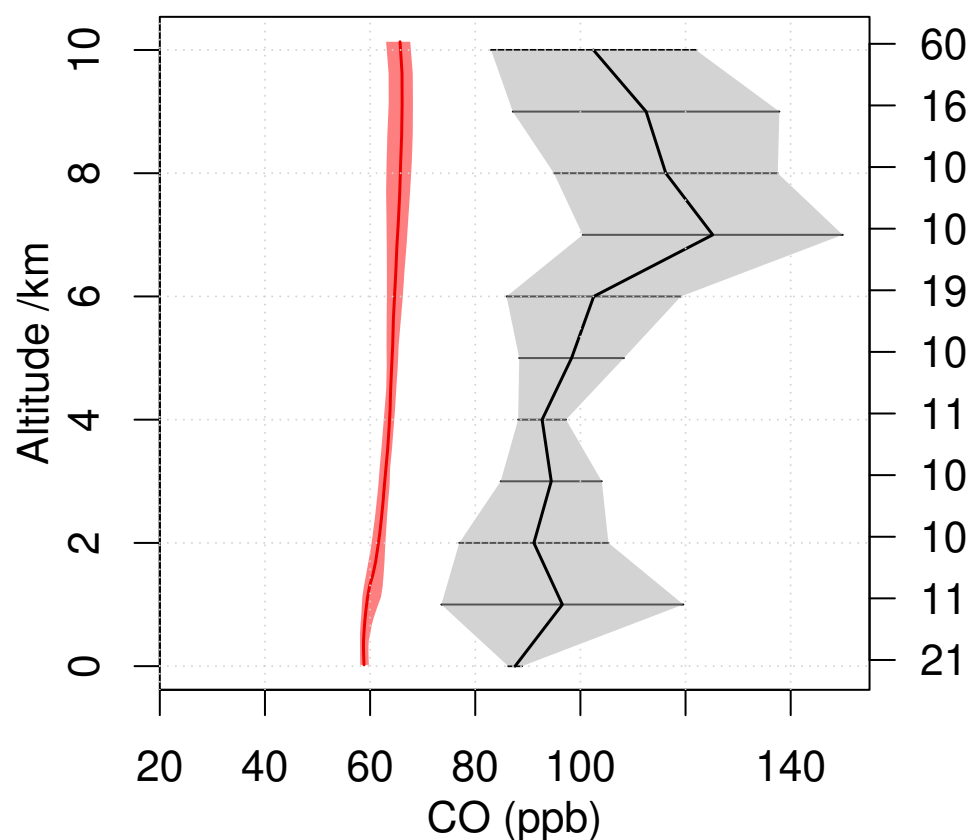
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



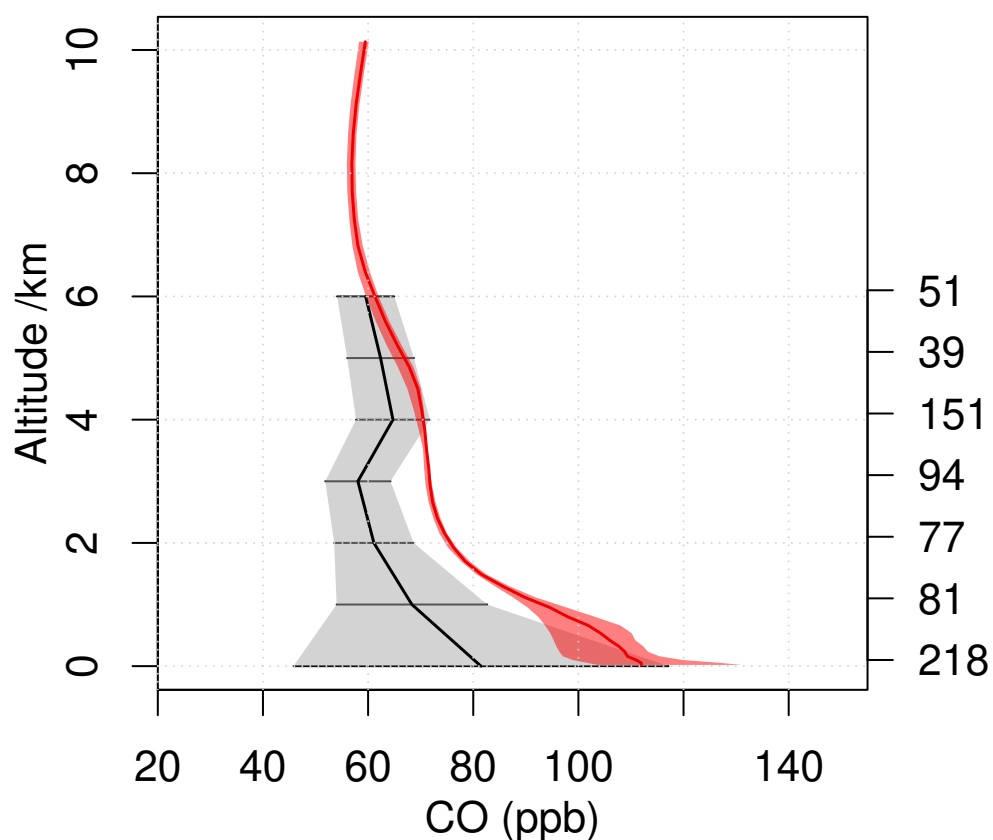
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



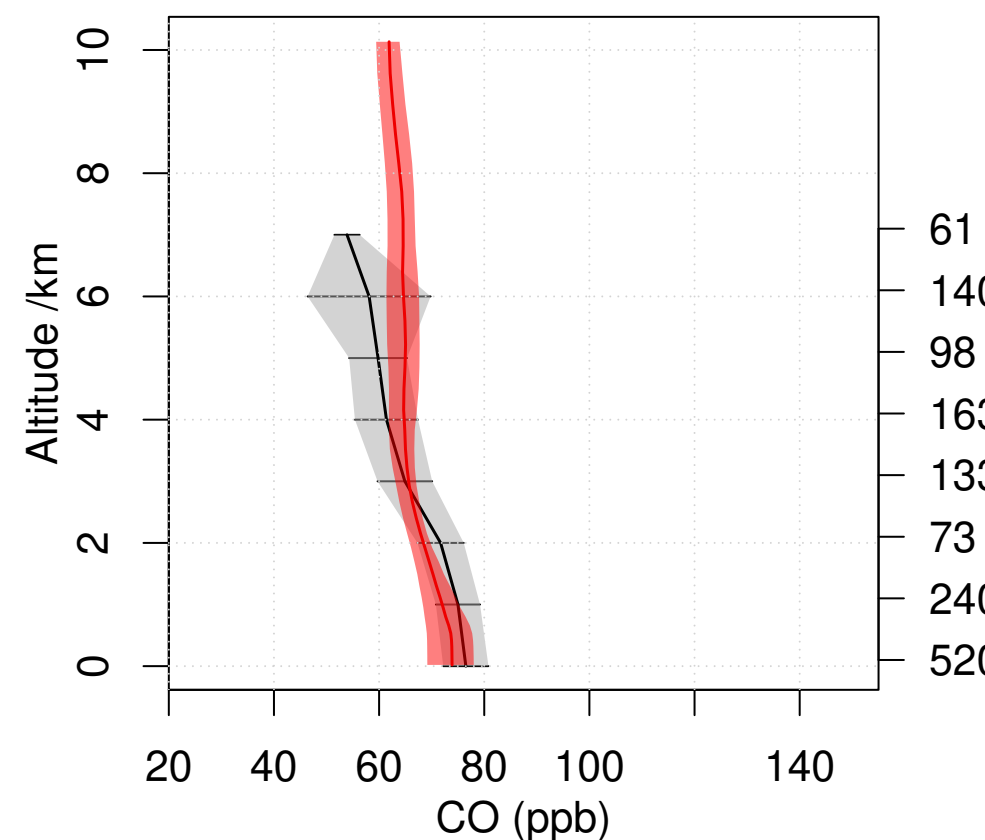
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



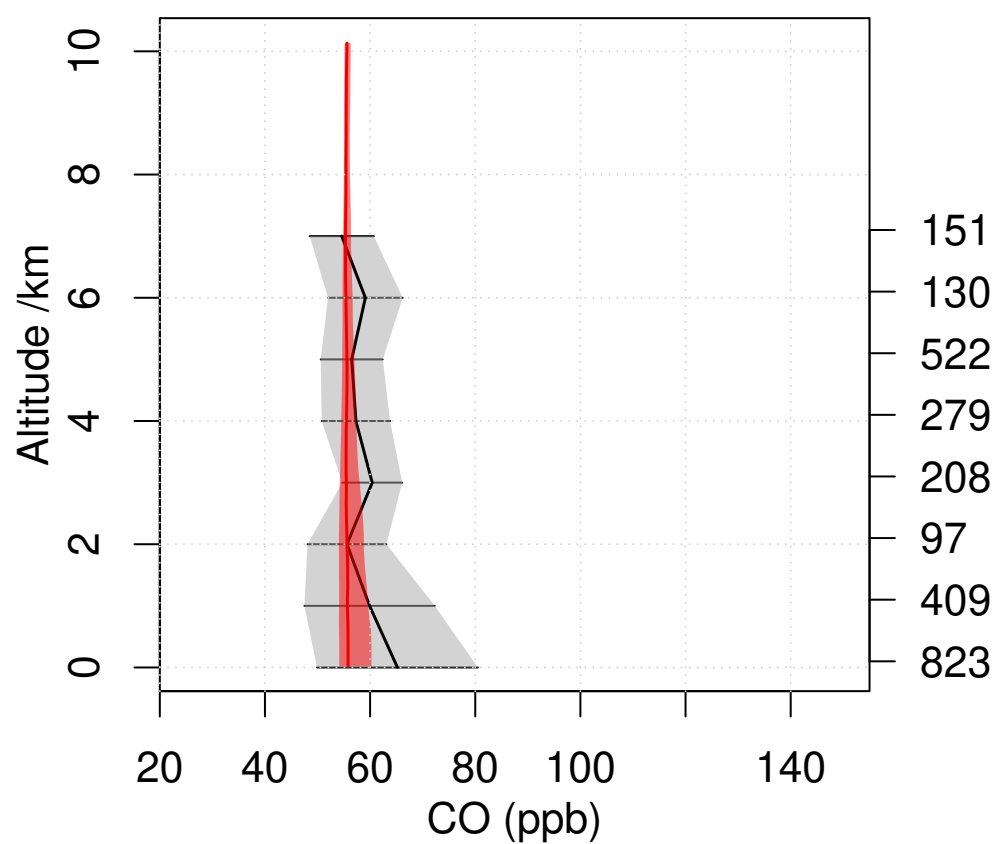
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



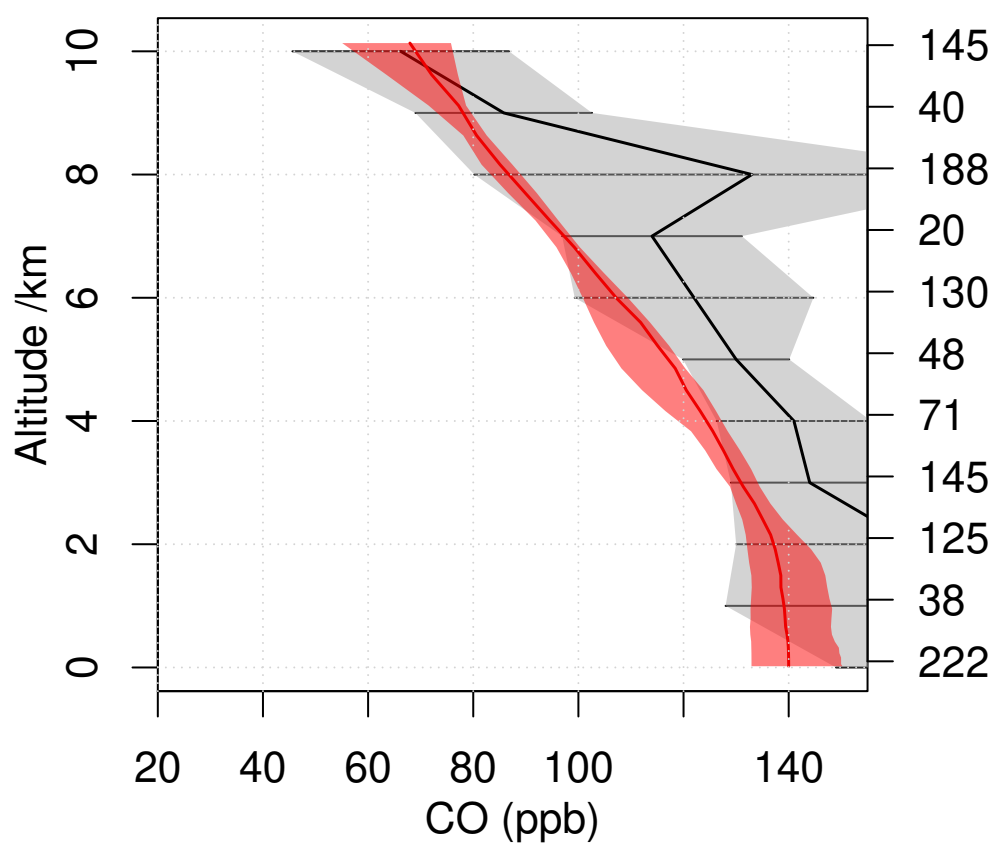
PEM-Tropics-B Christmas-Island 1999 0
Lat 0 – 10 Lon 200 – 220



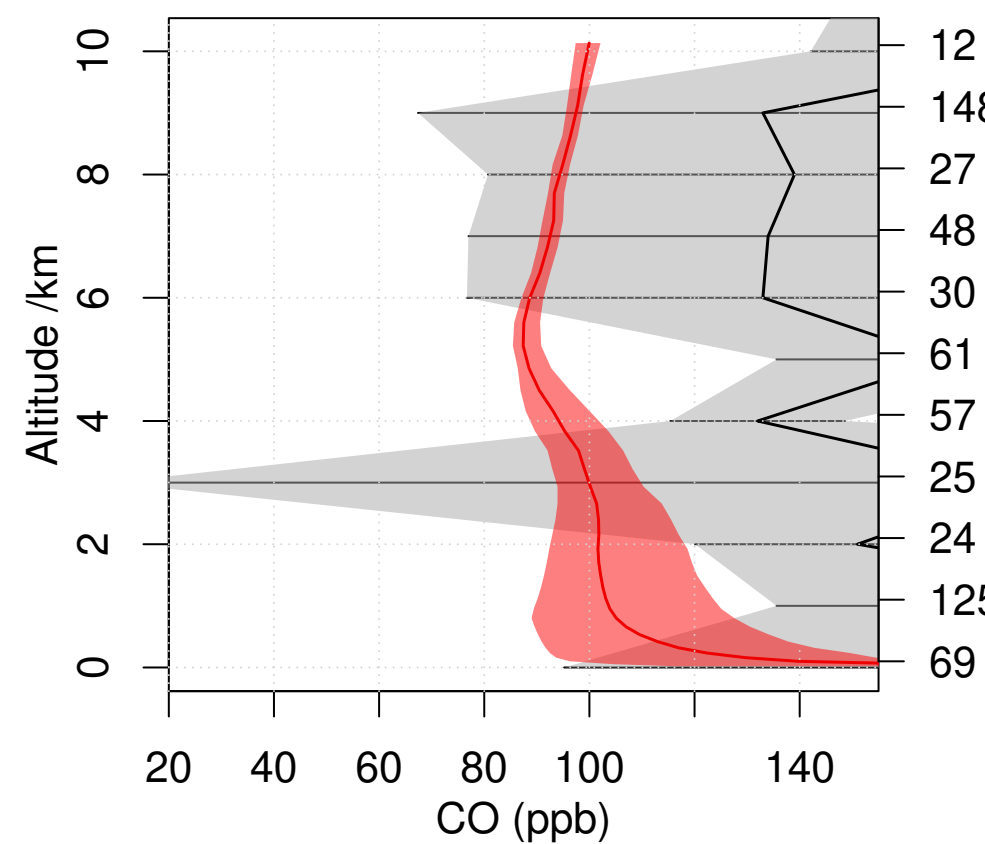
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



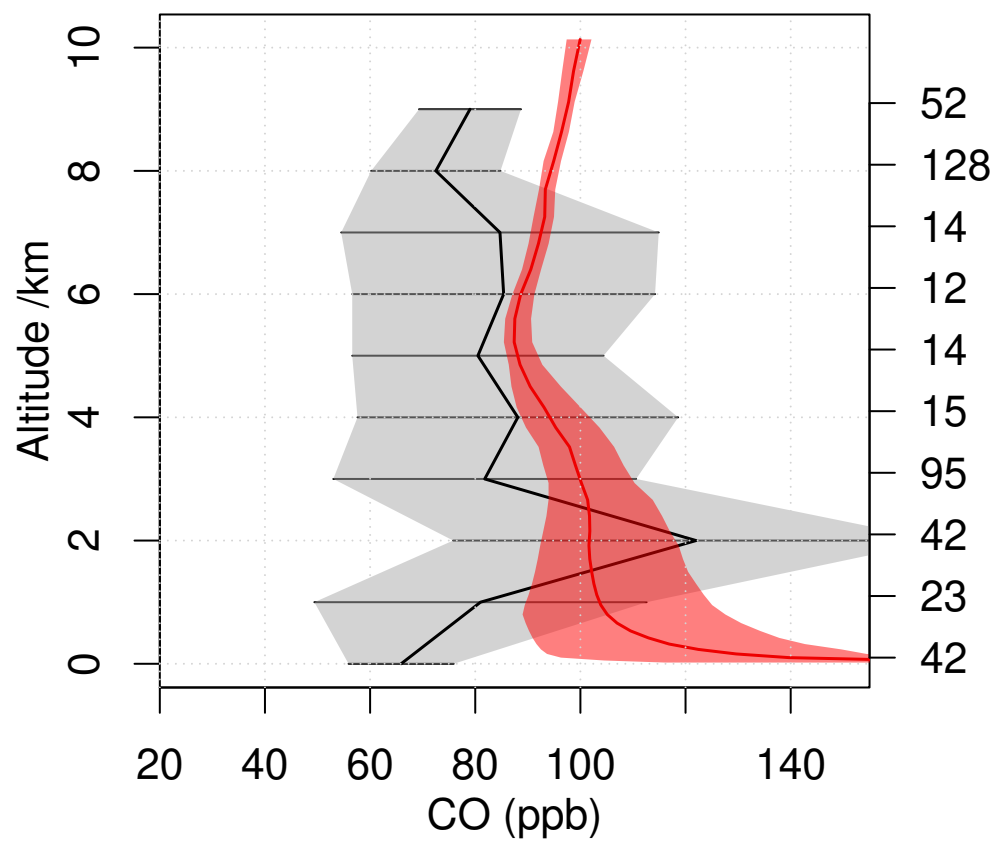
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



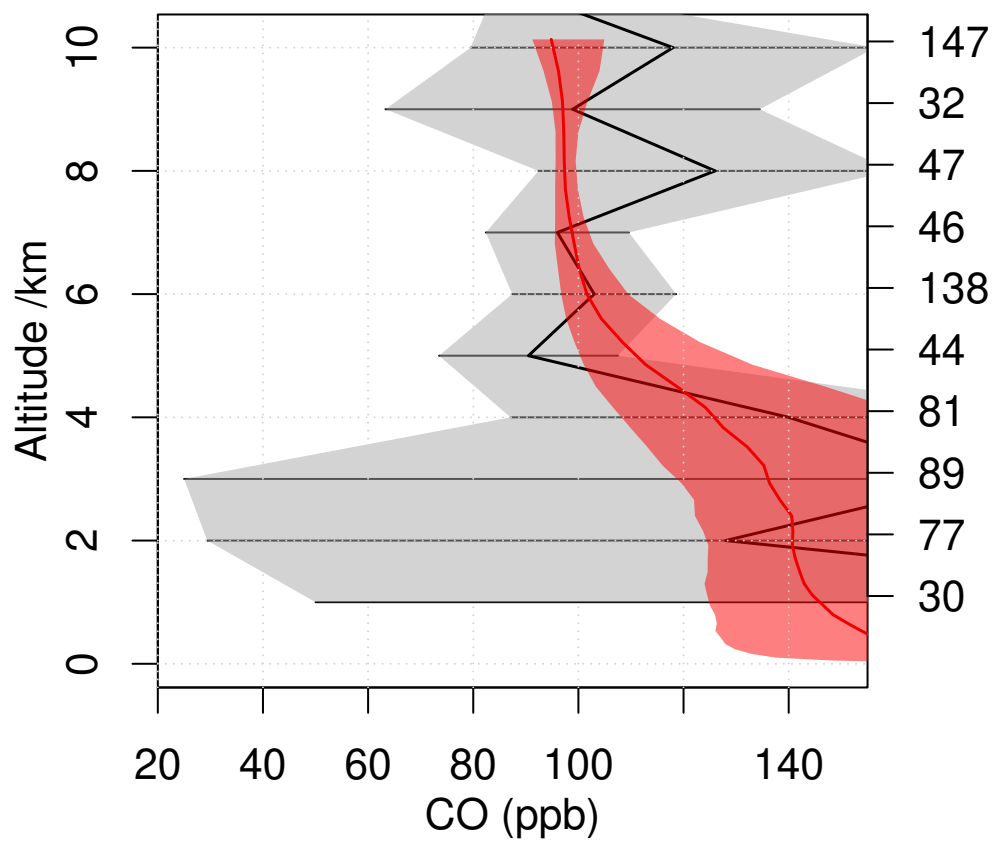
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



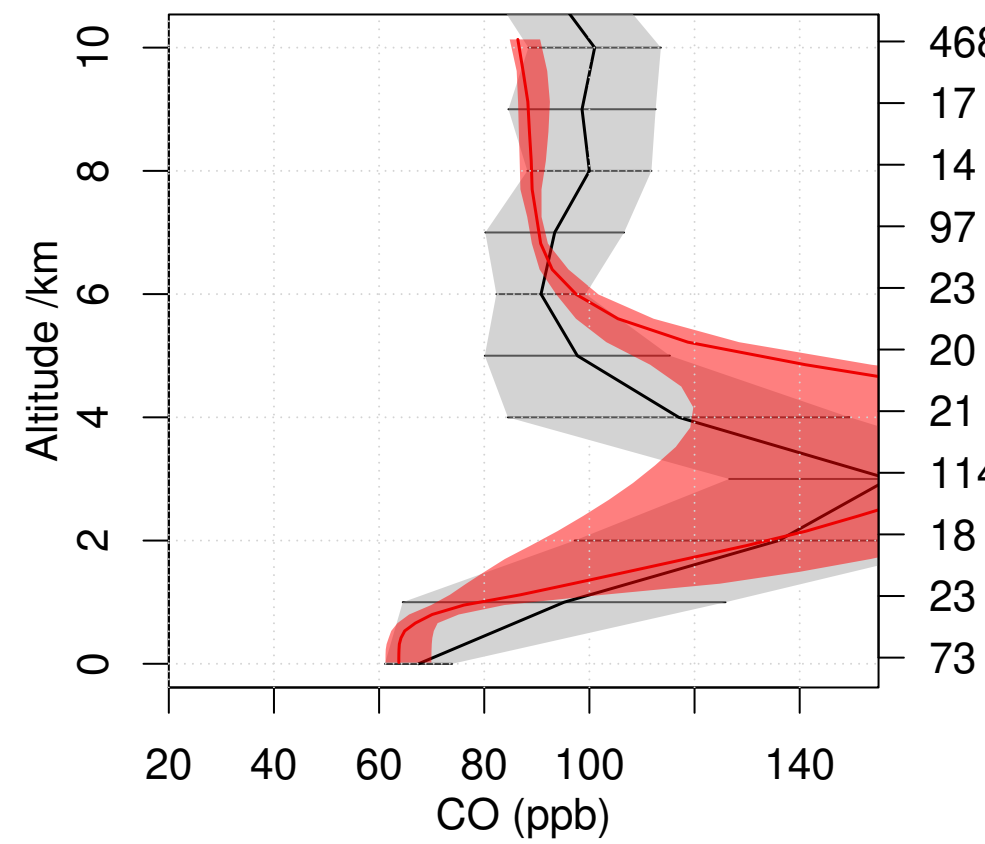
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

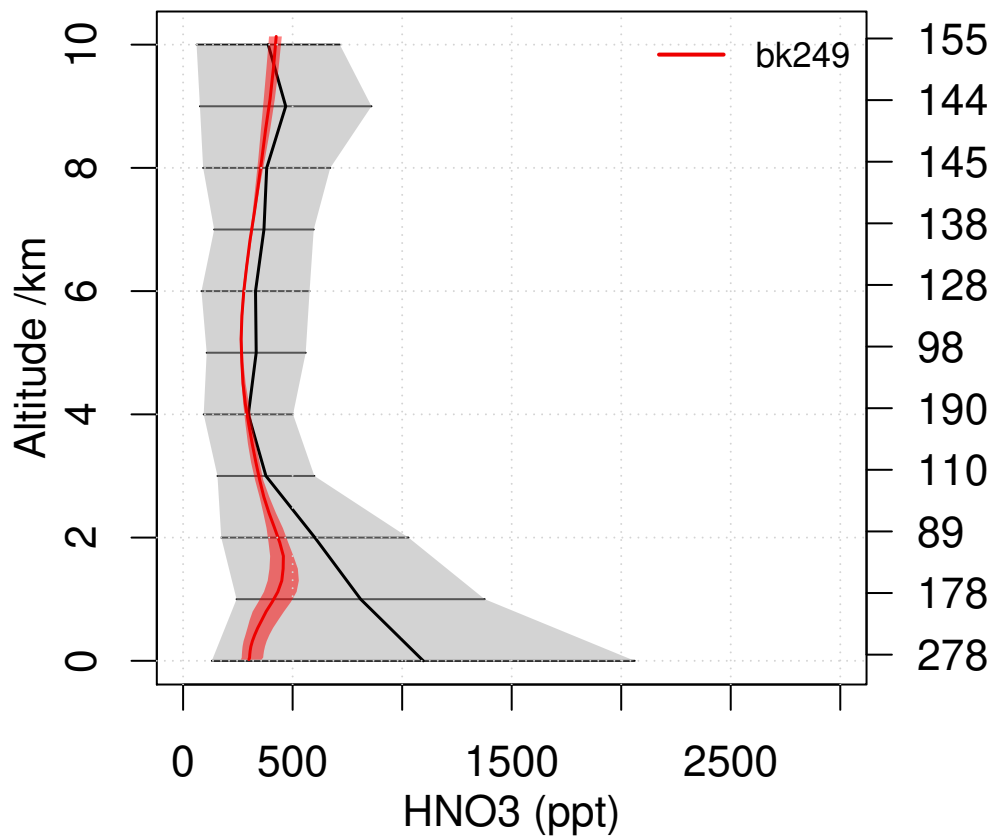


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

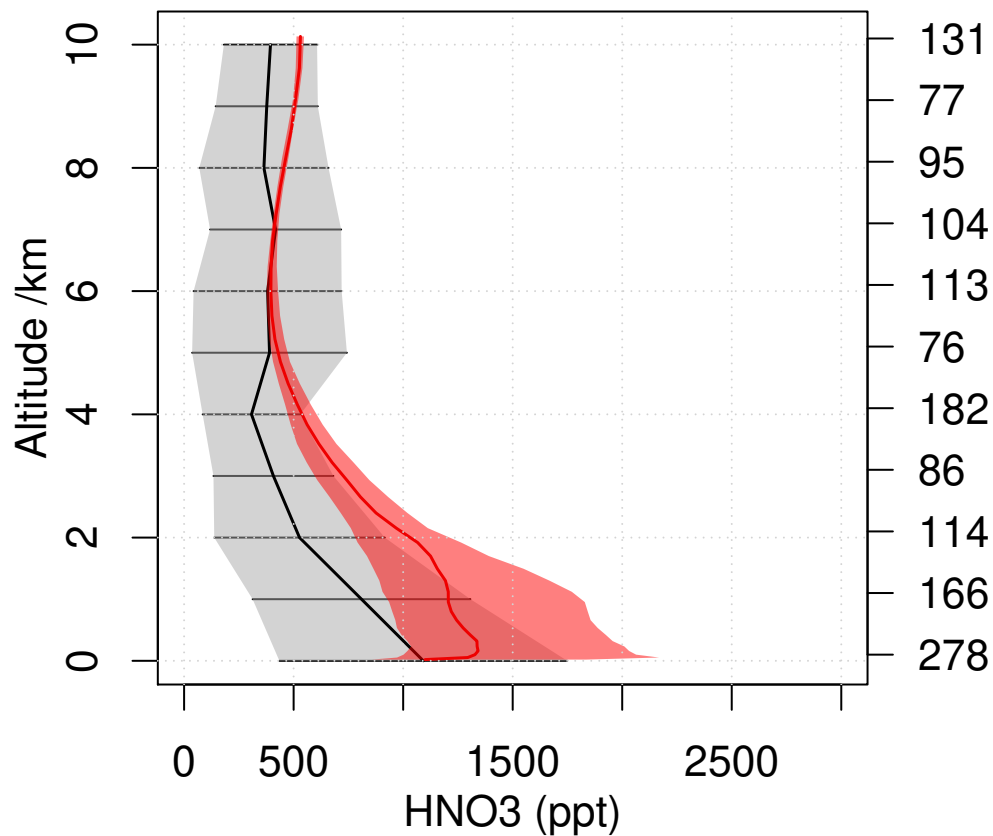


Emmons HNO3 comparison

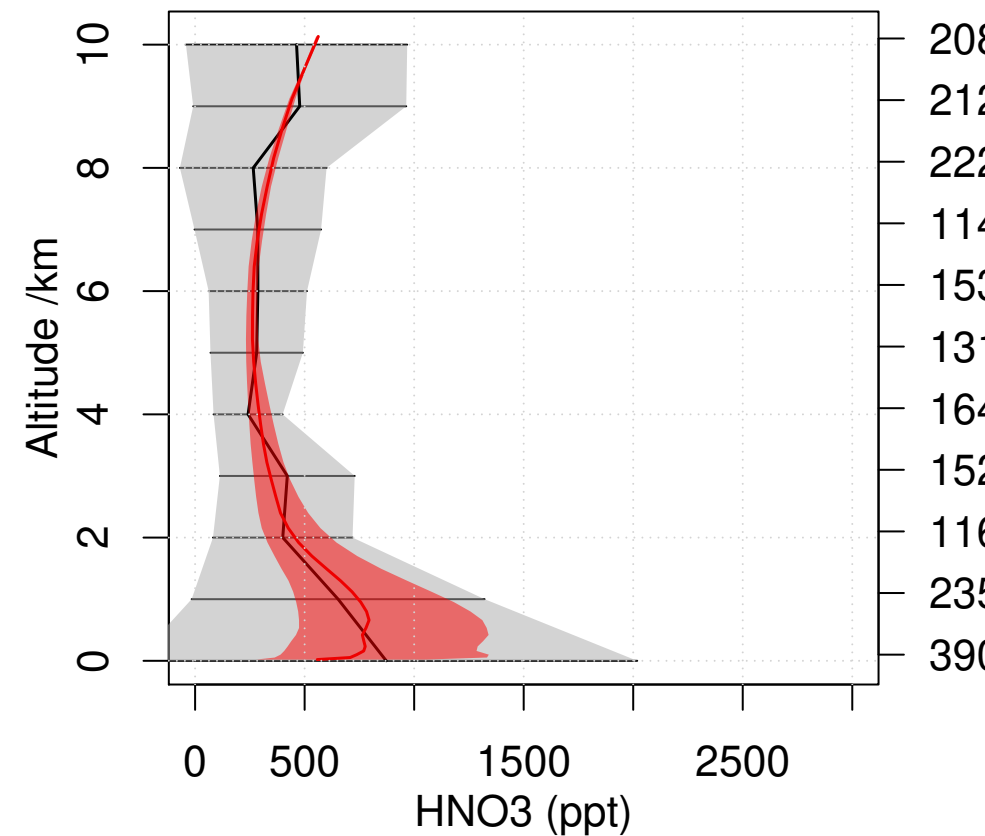
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



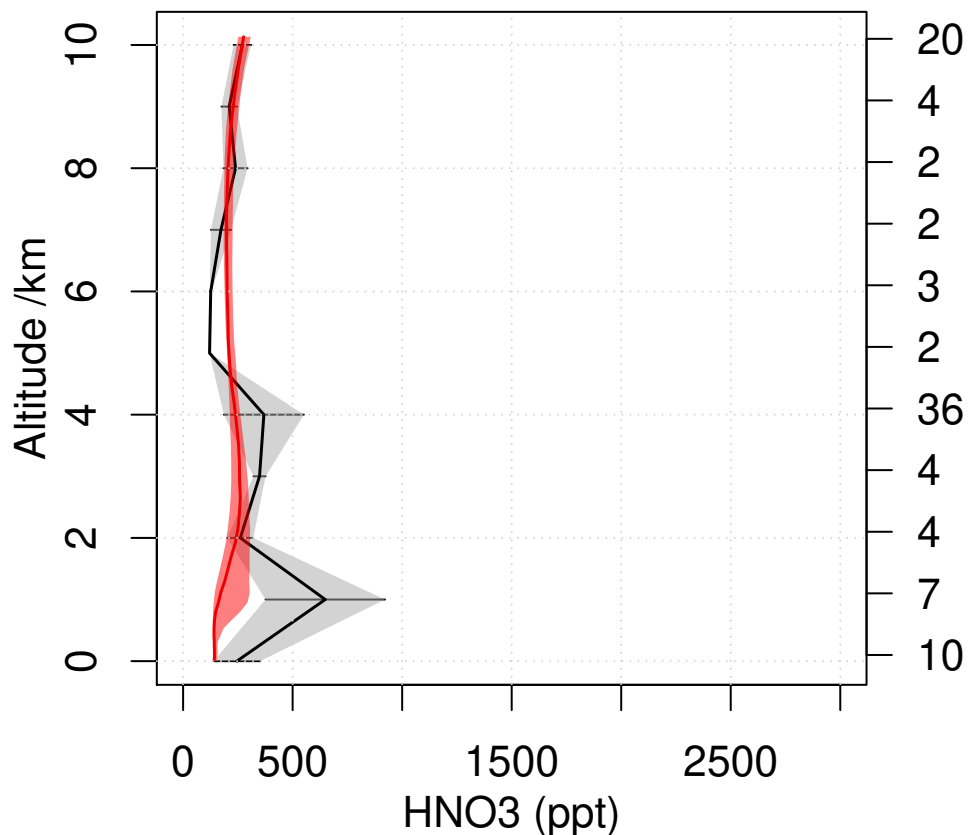
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



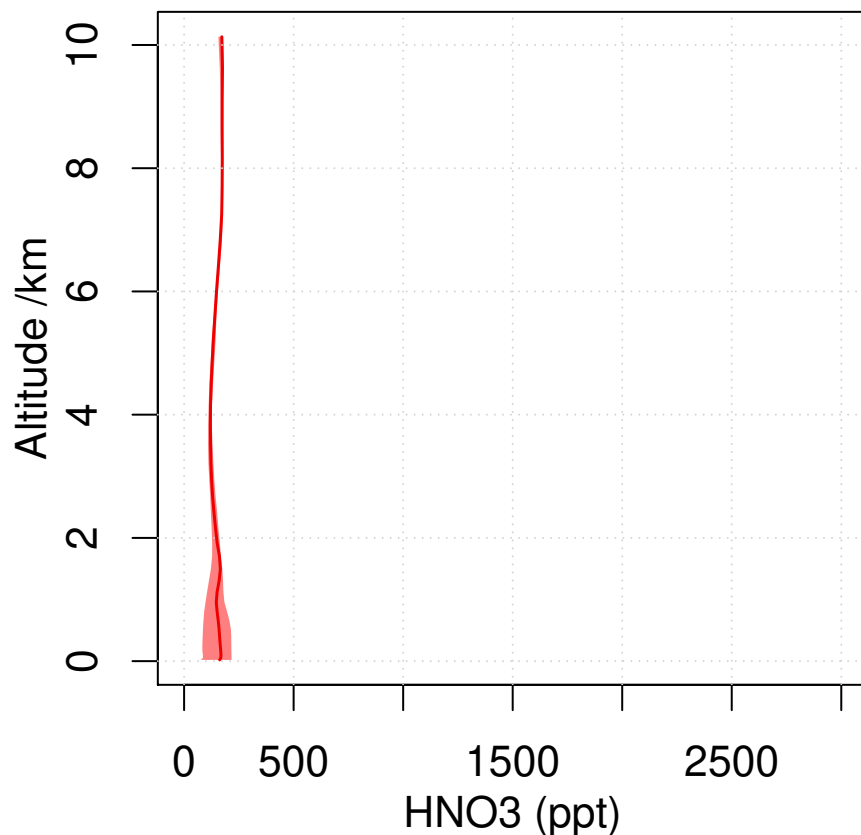
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



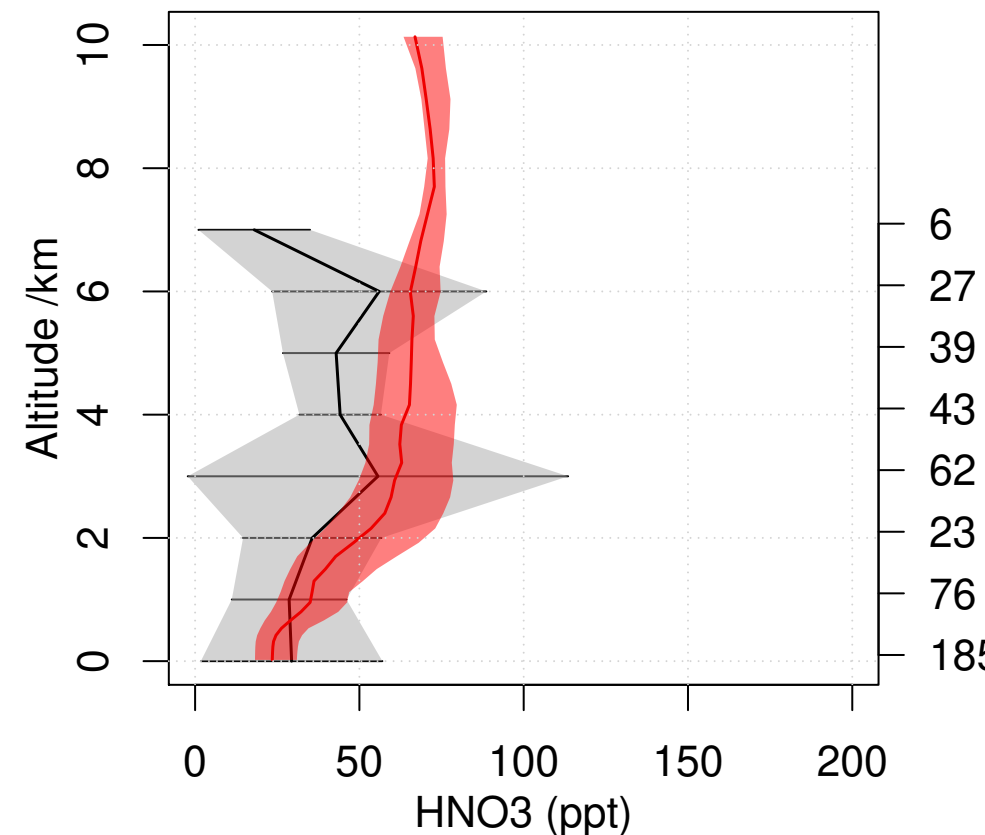
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



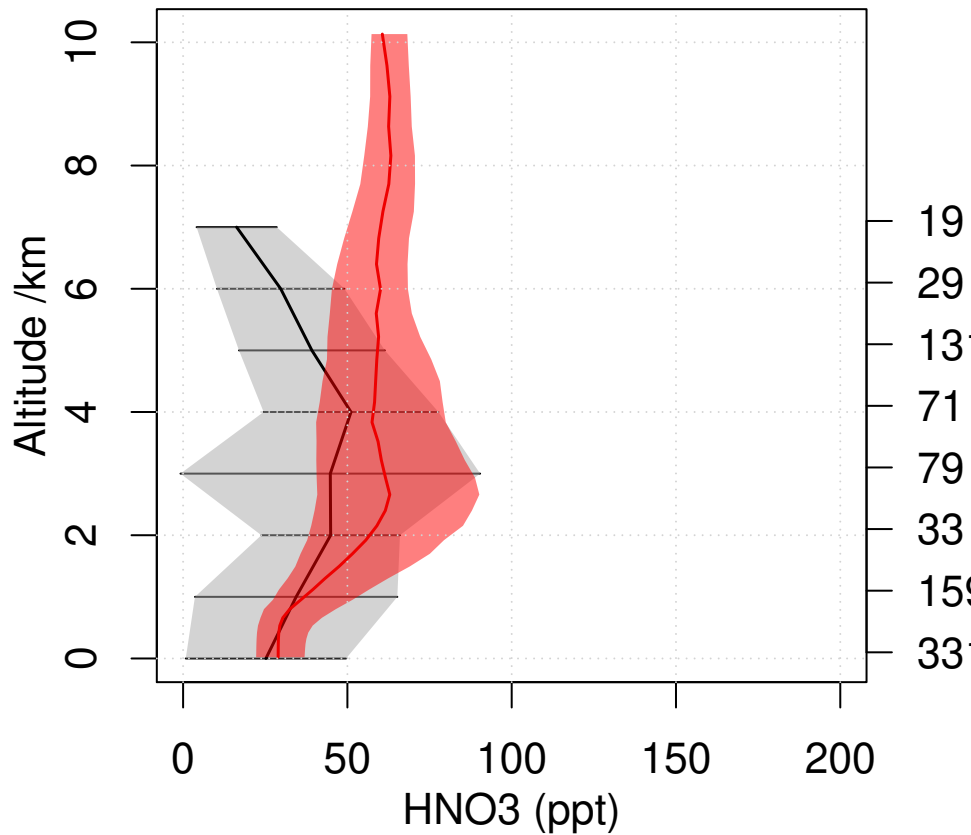
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



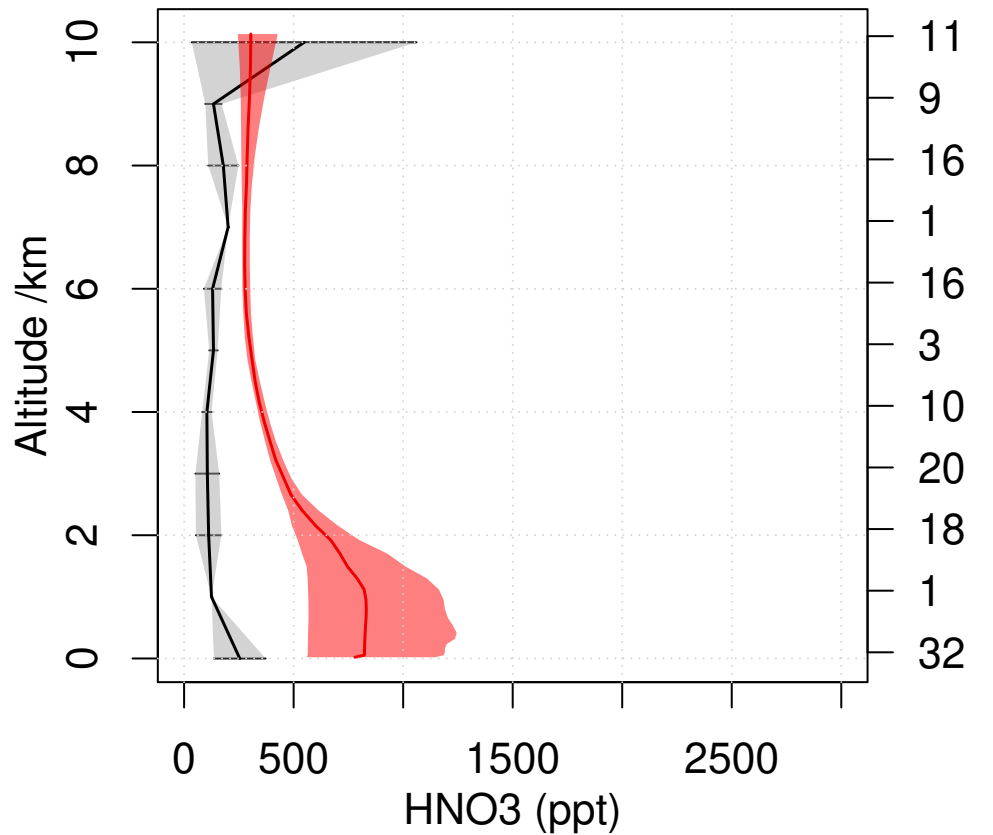
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



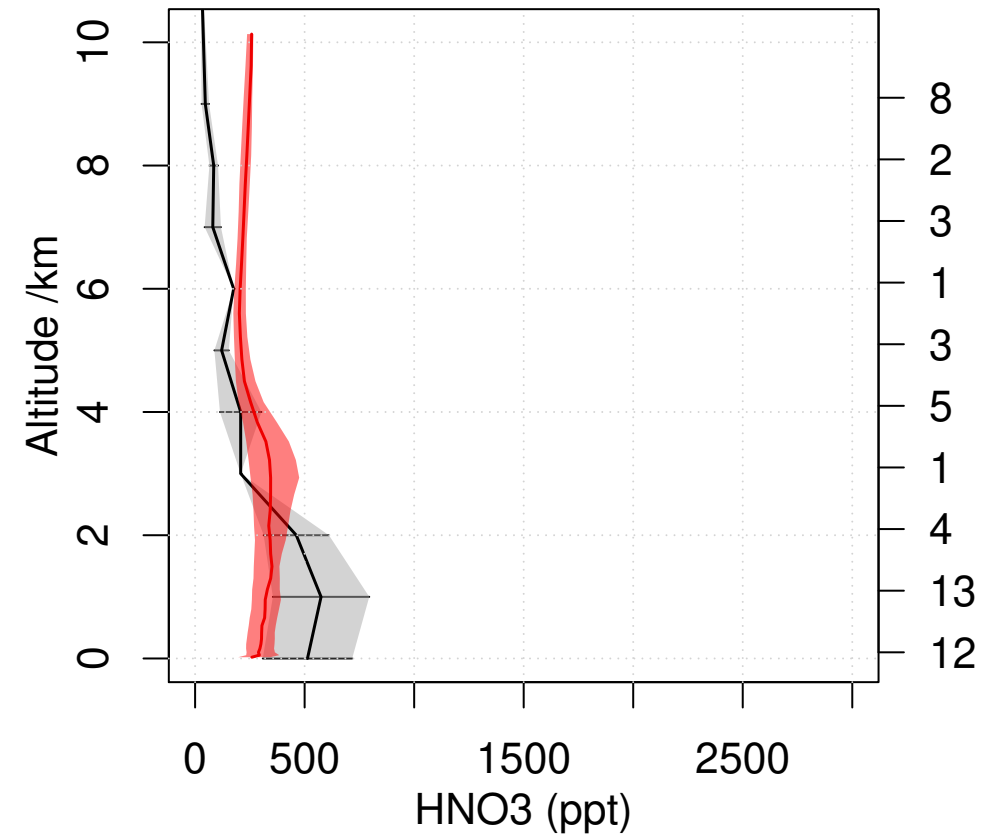
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



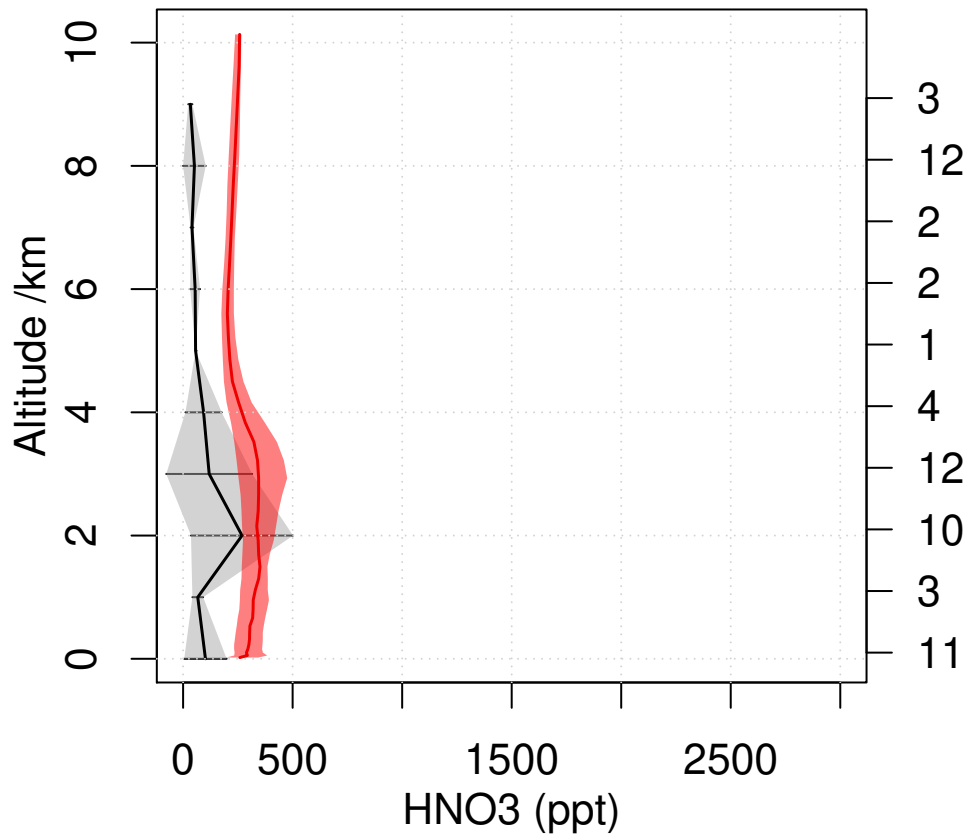
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



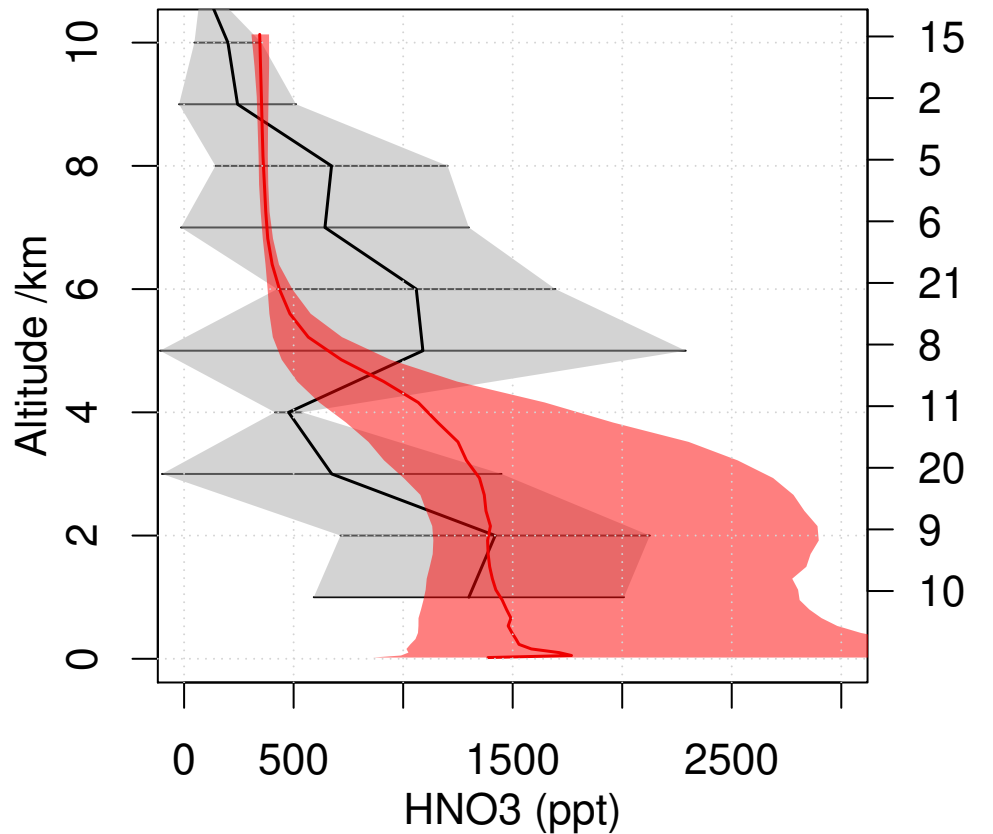
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



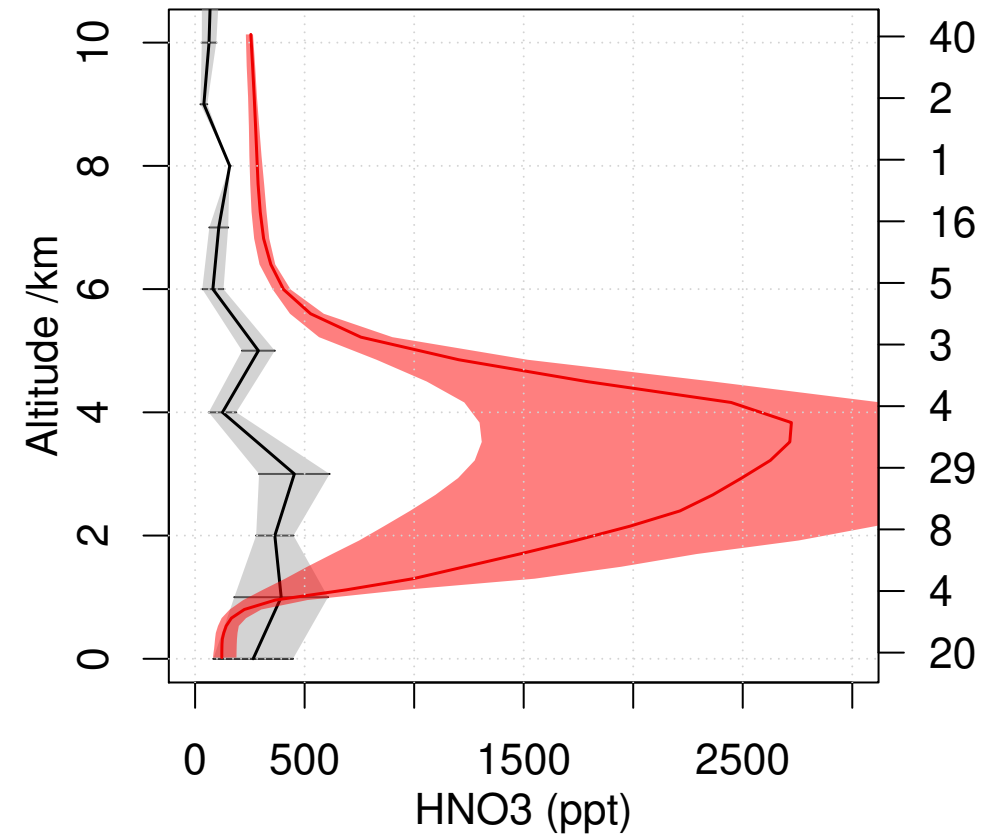
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

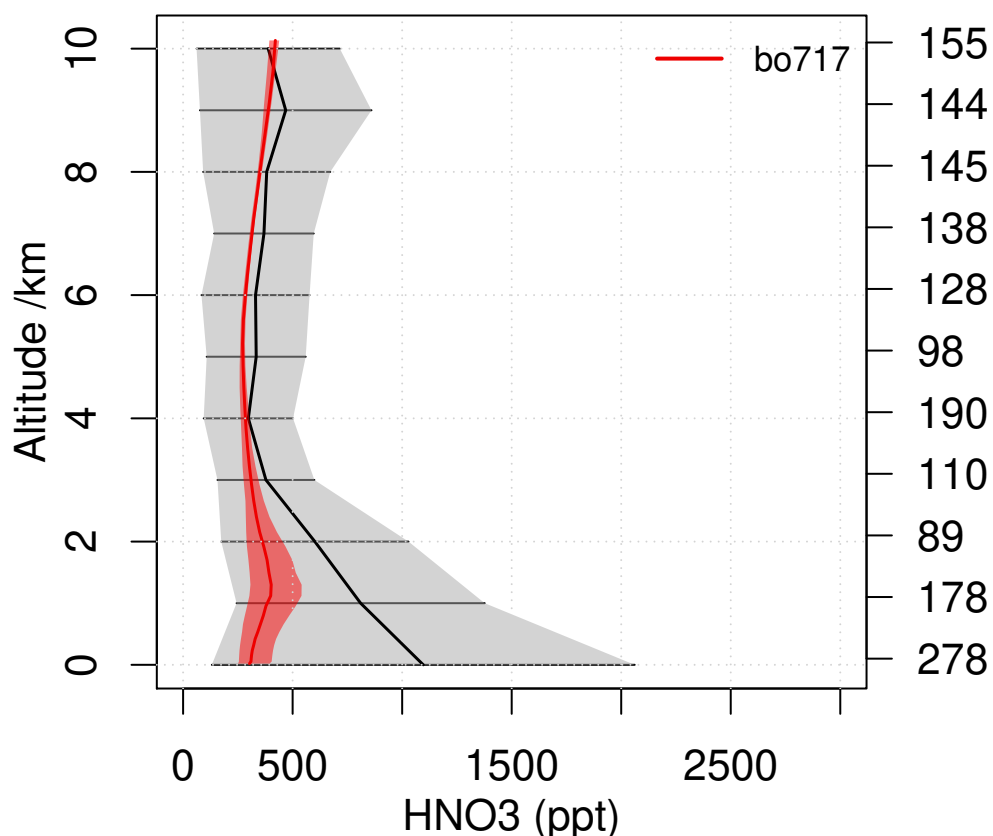


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

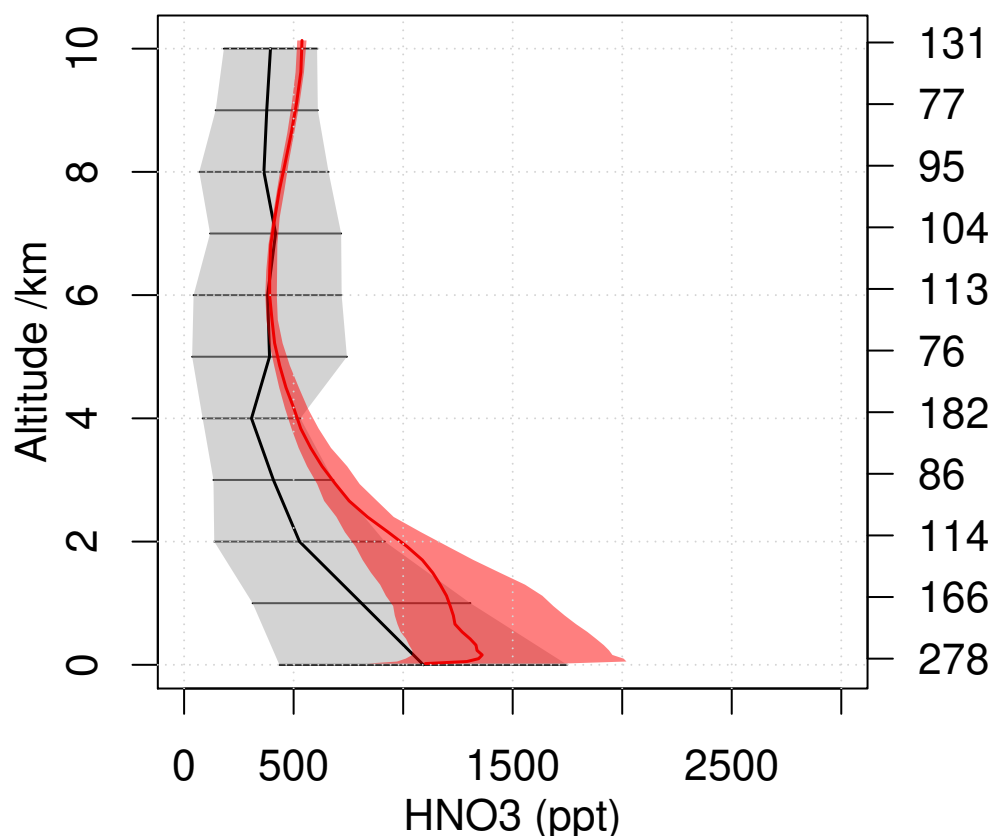


Emmons HNO3 comparison

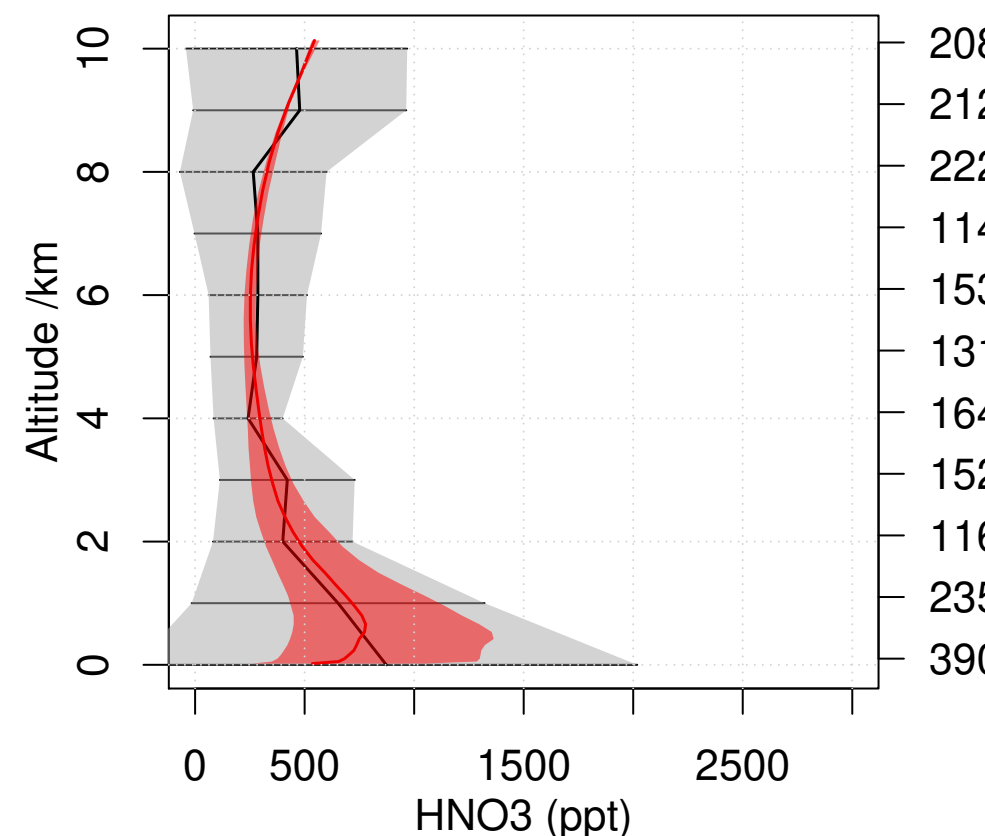
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



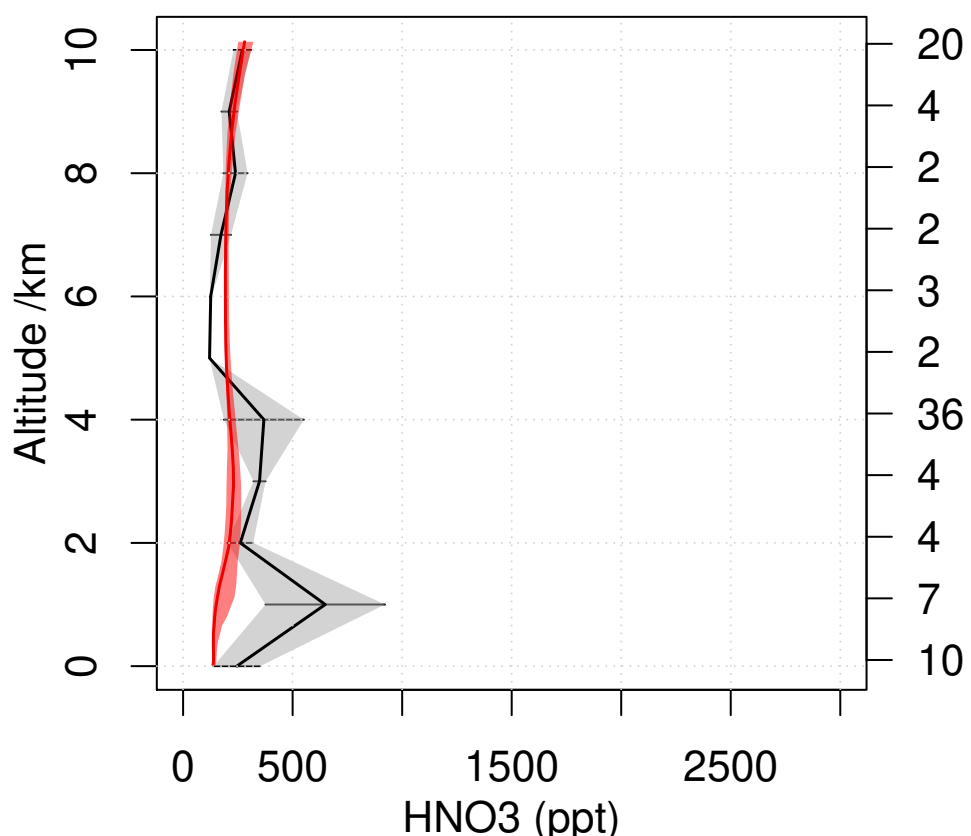
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



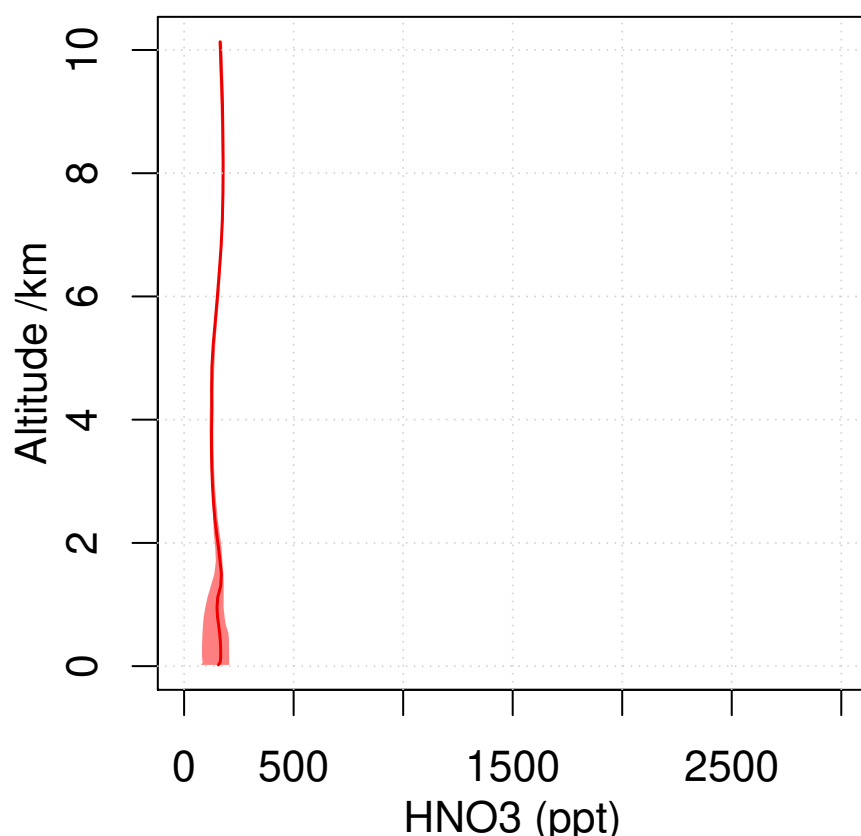
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



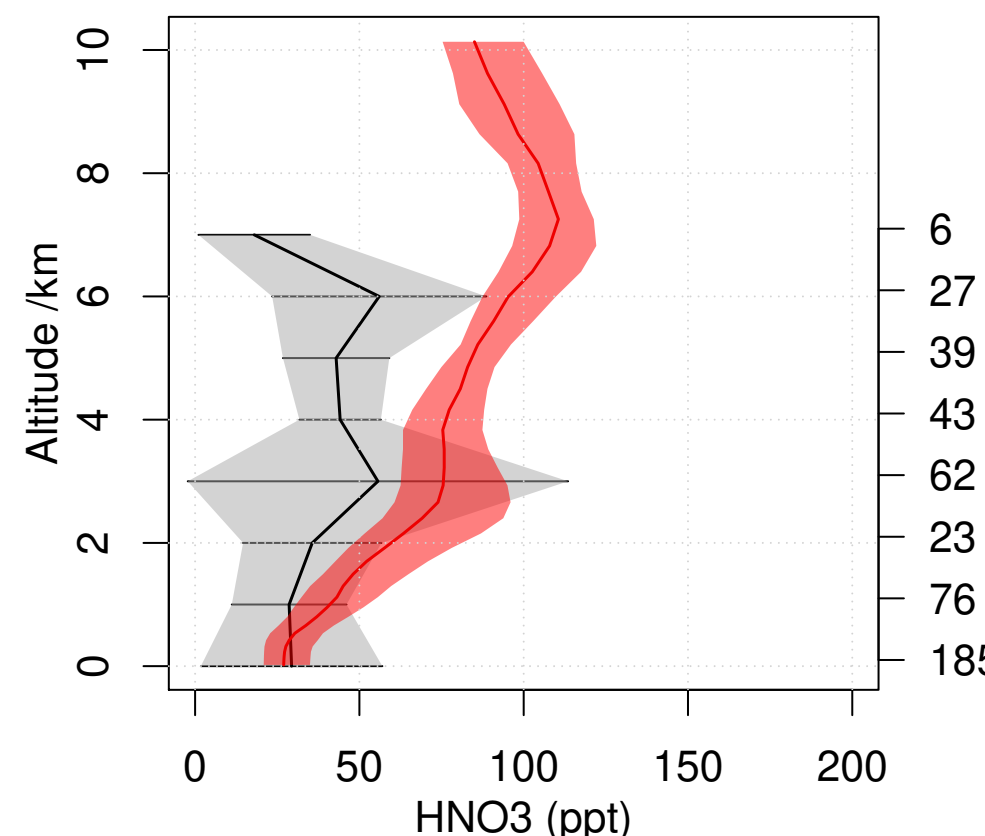
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



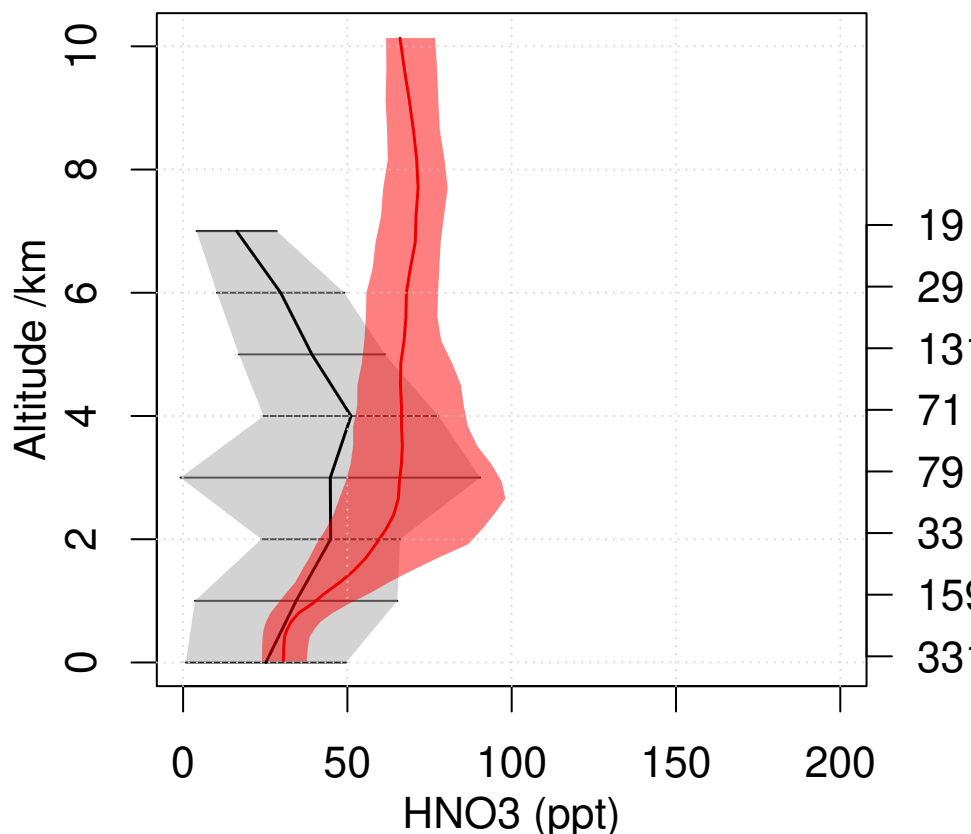
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



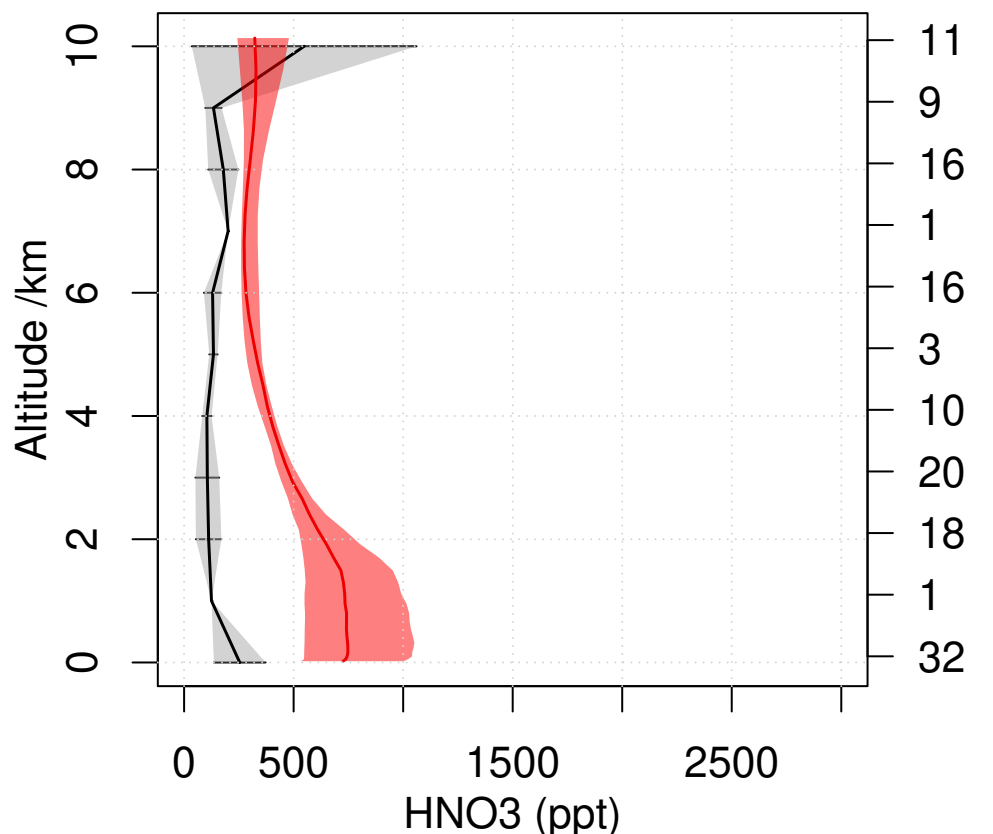
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



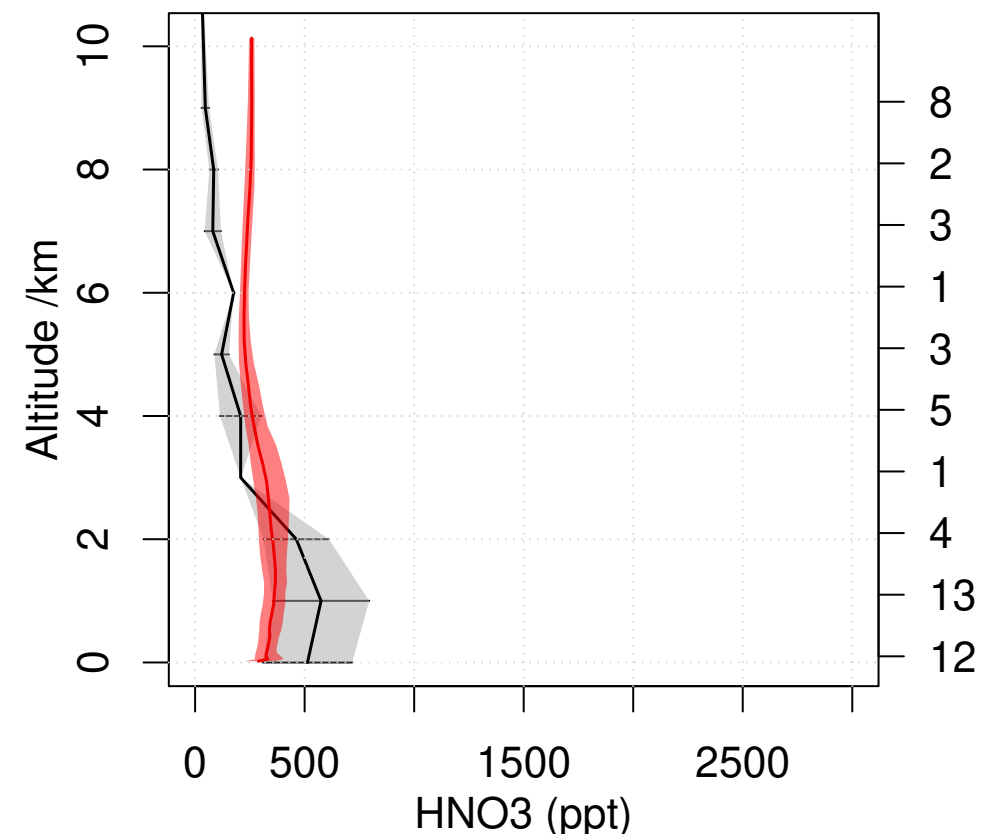
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



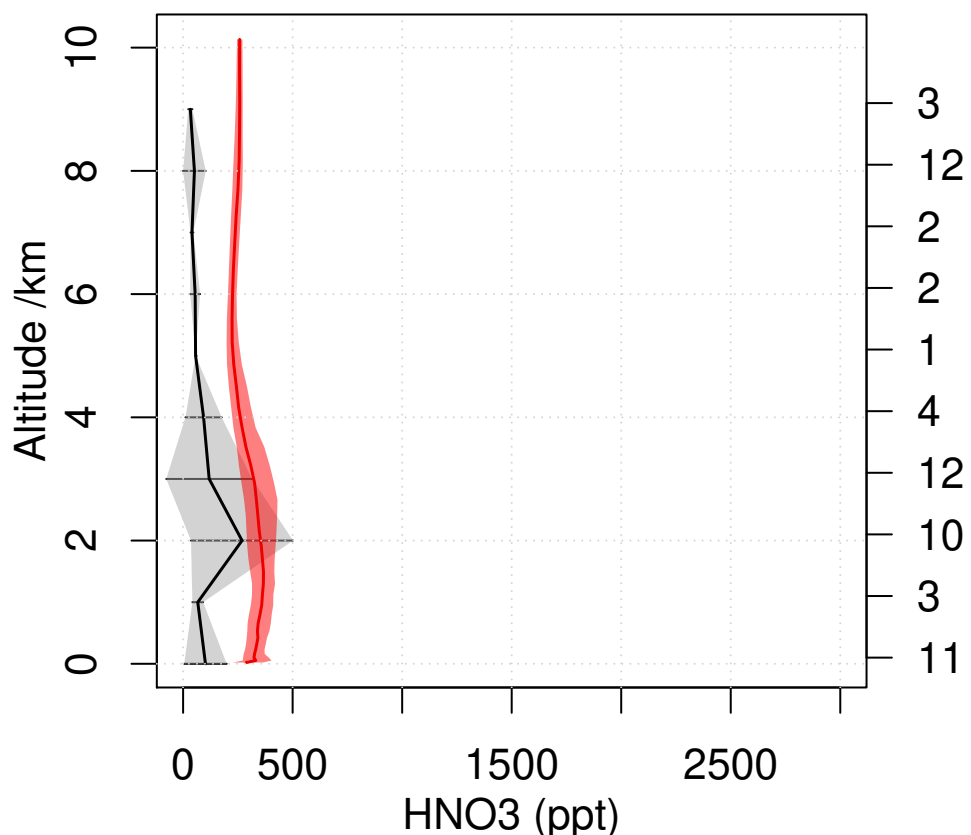
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



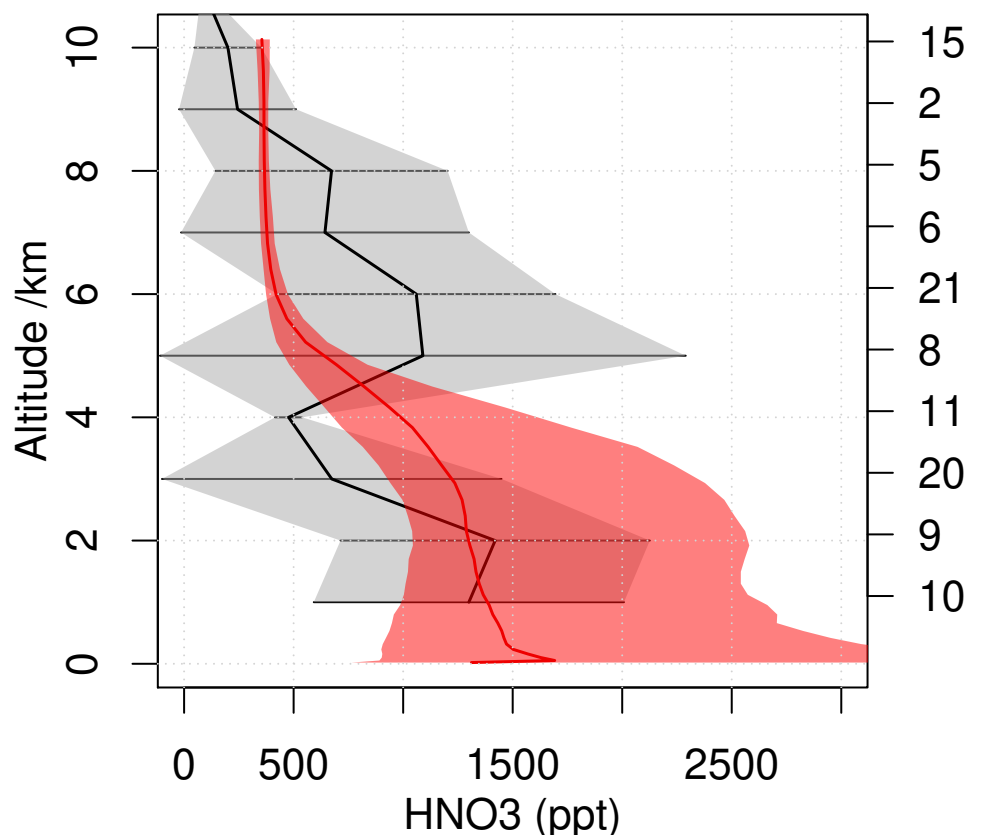
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



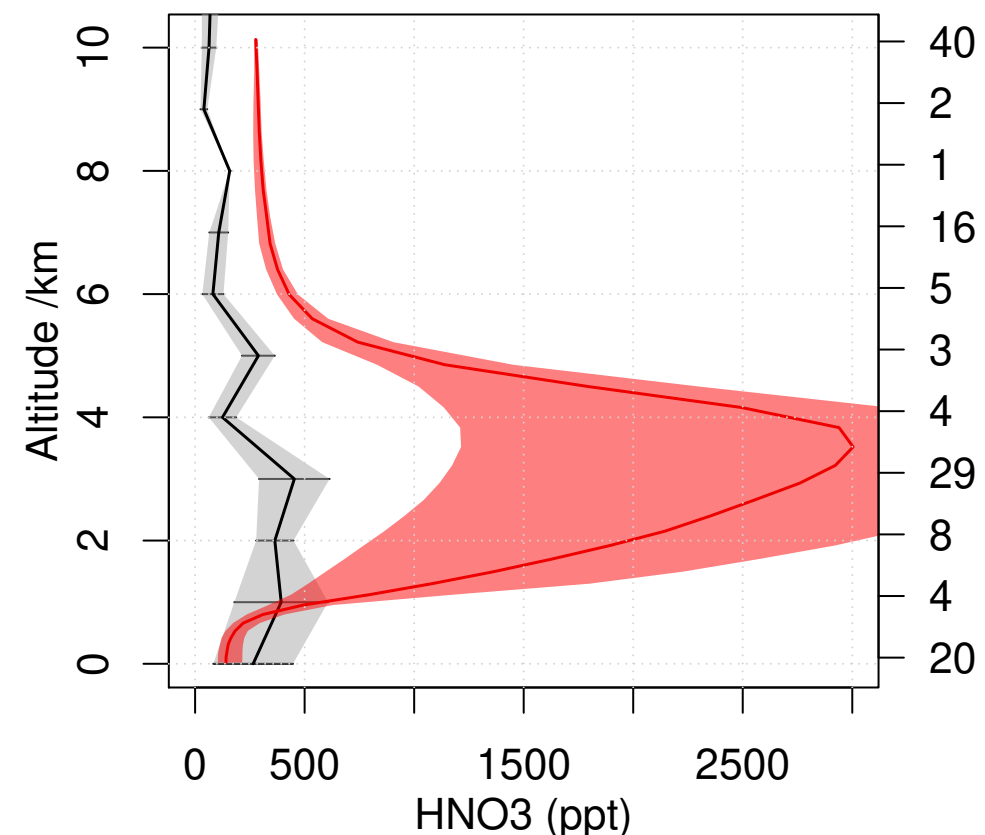
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

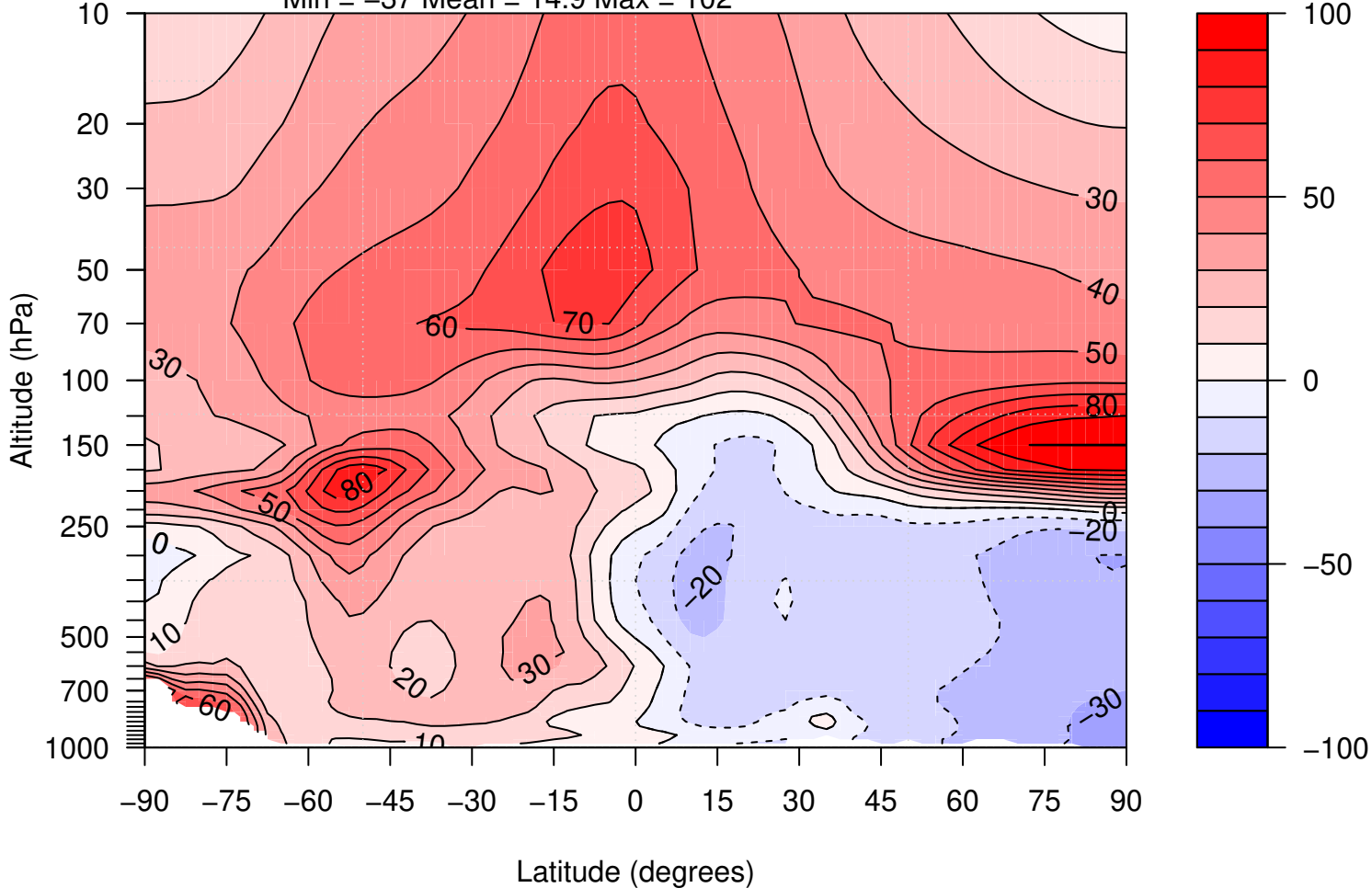


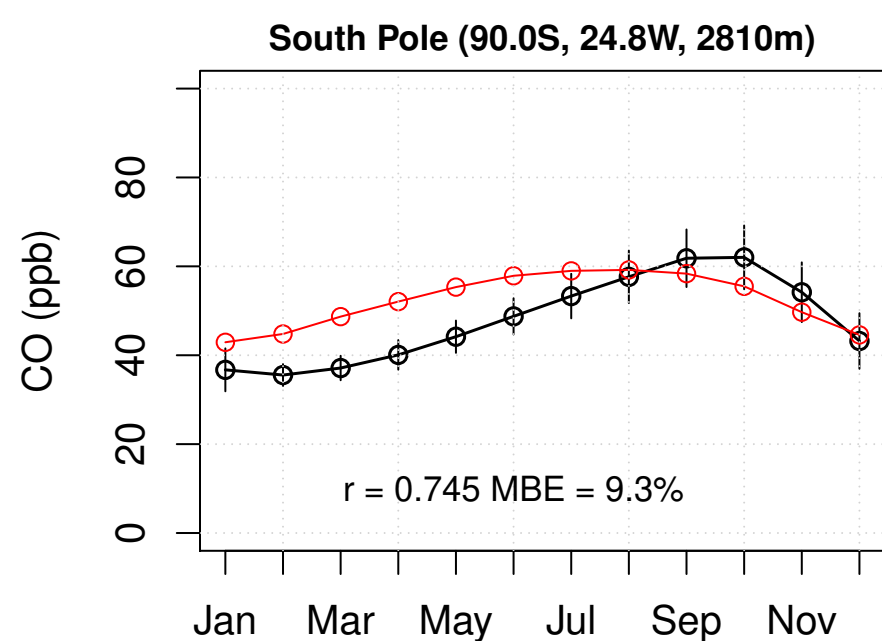
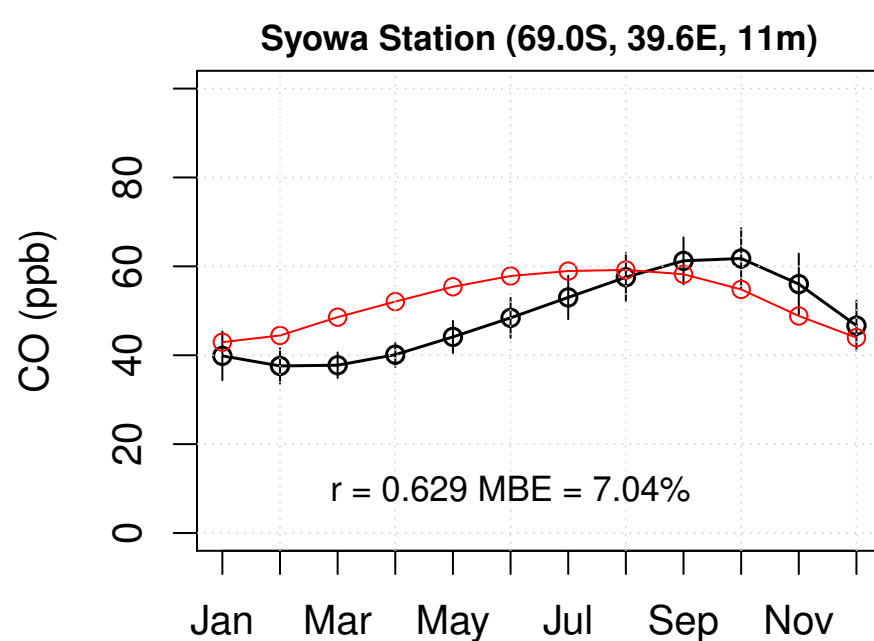
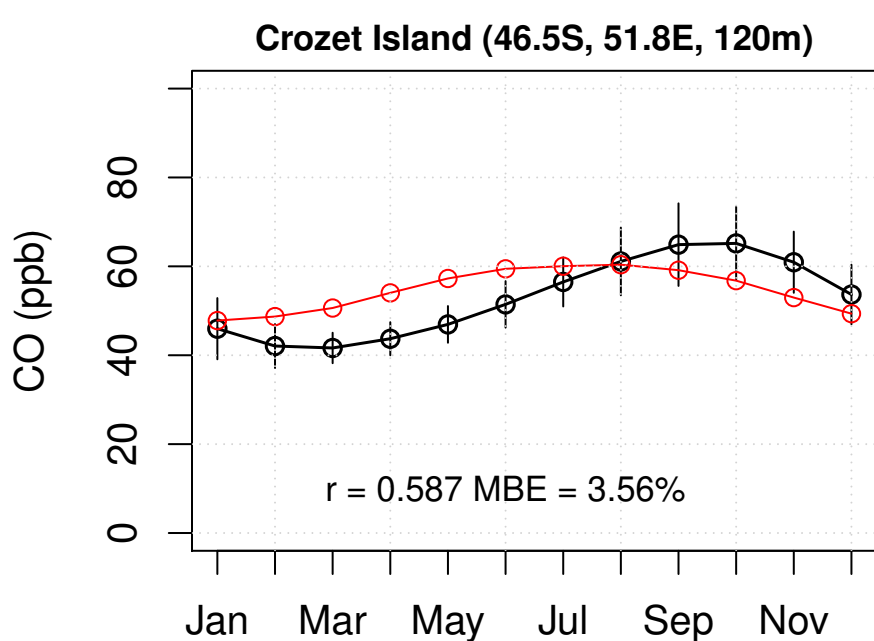
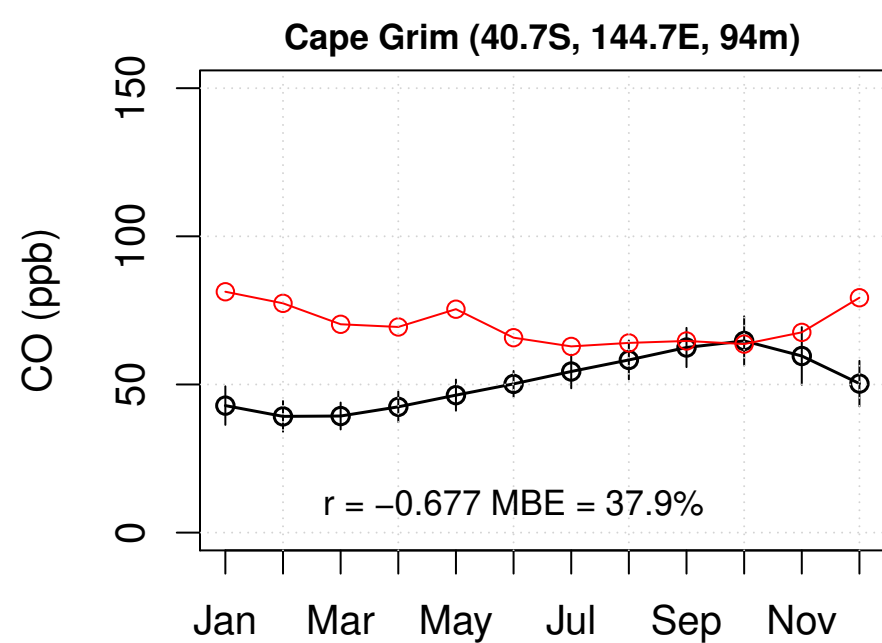
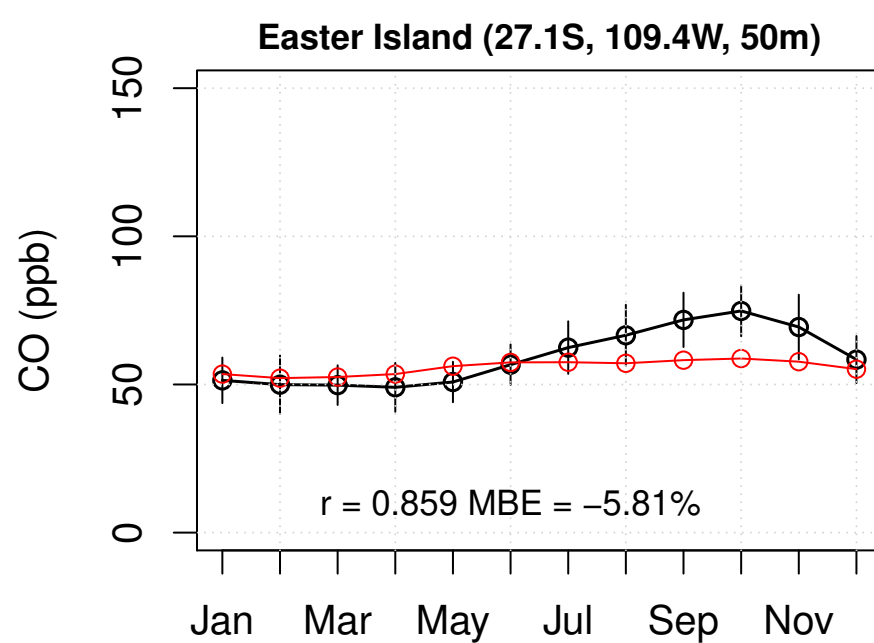
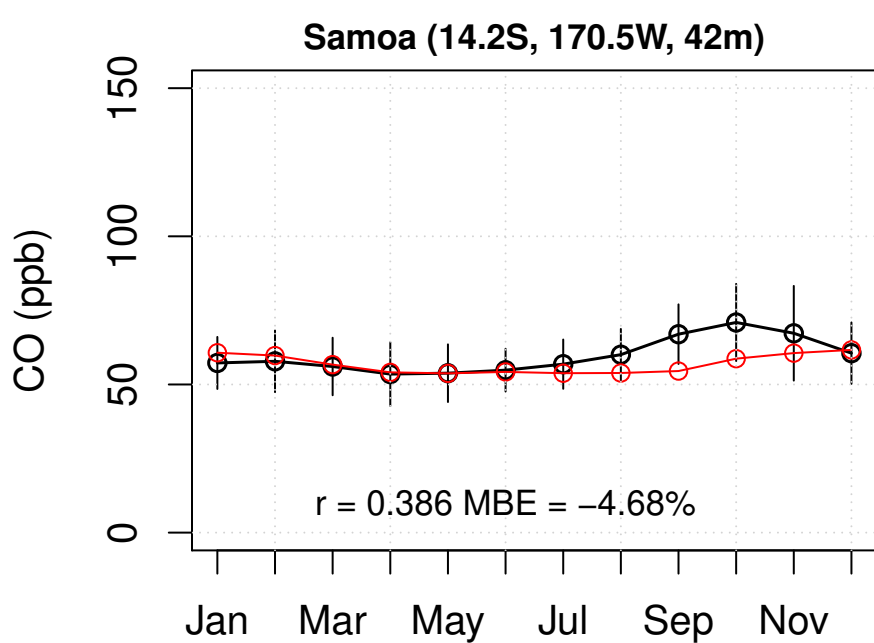
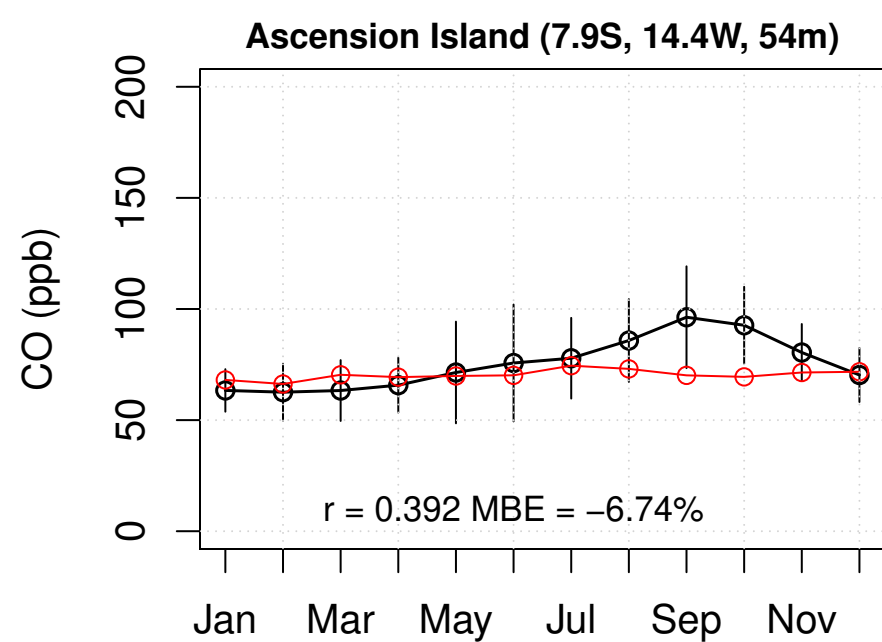
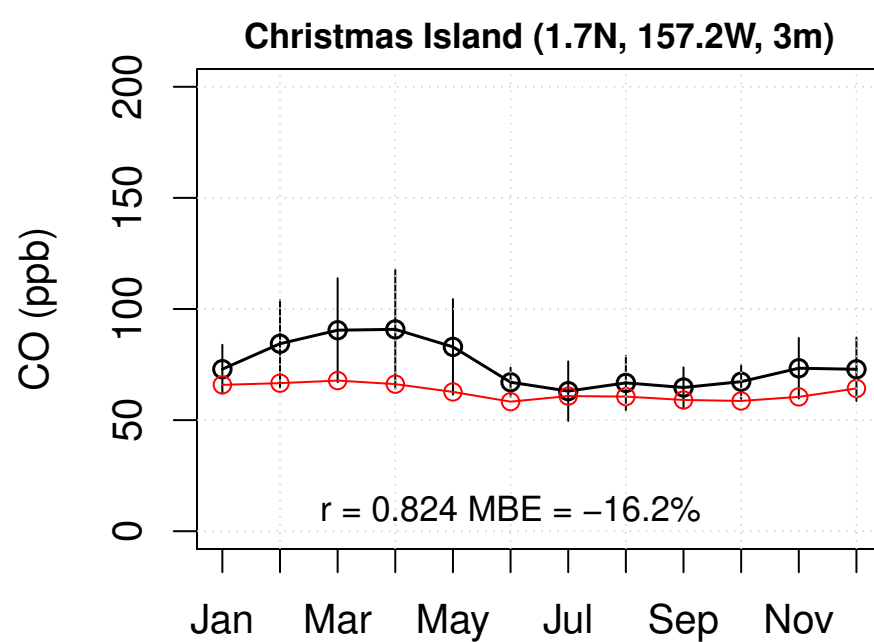
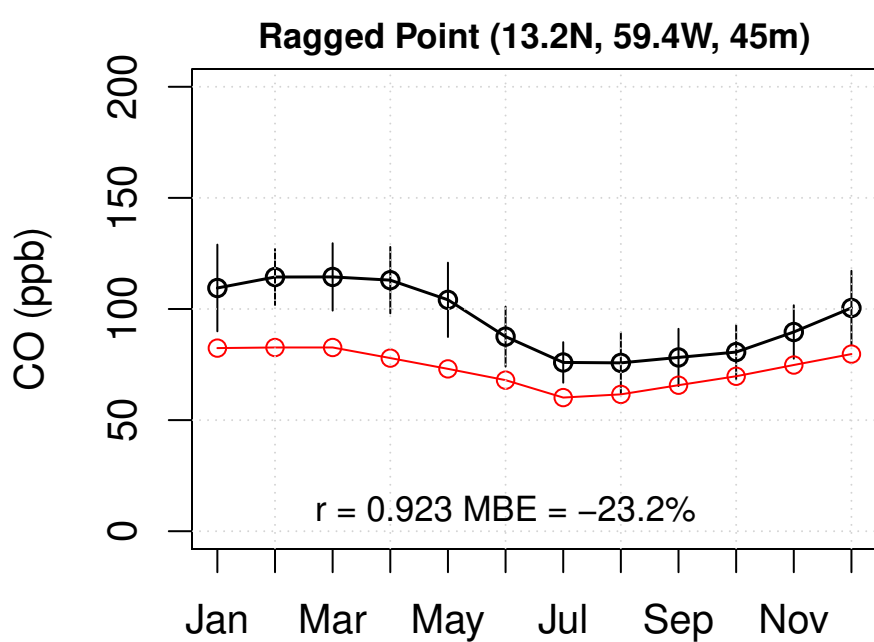
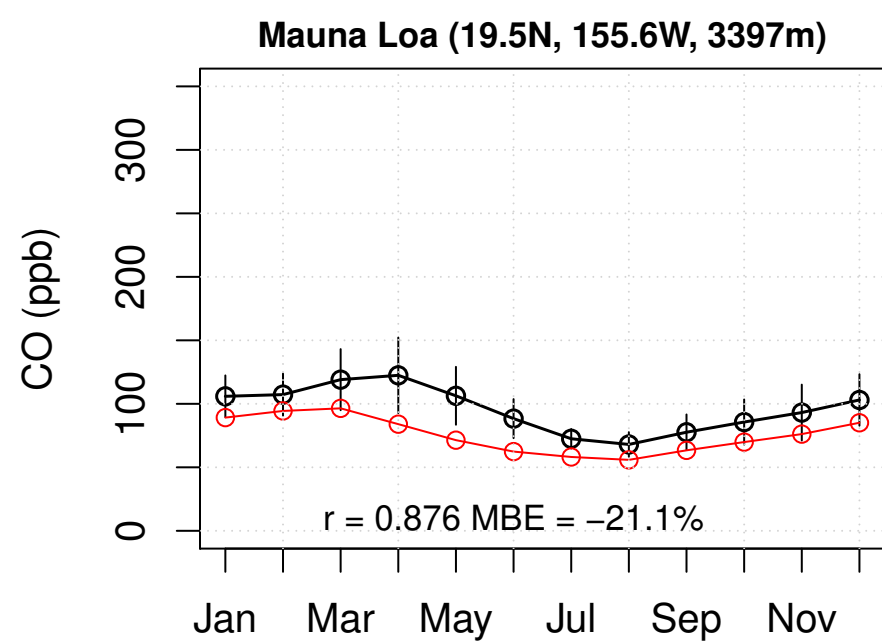
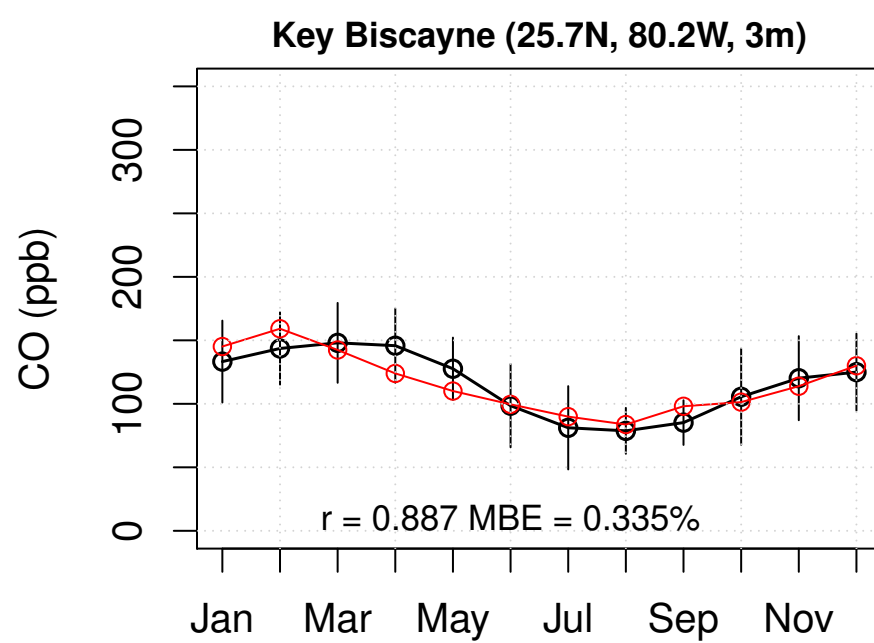
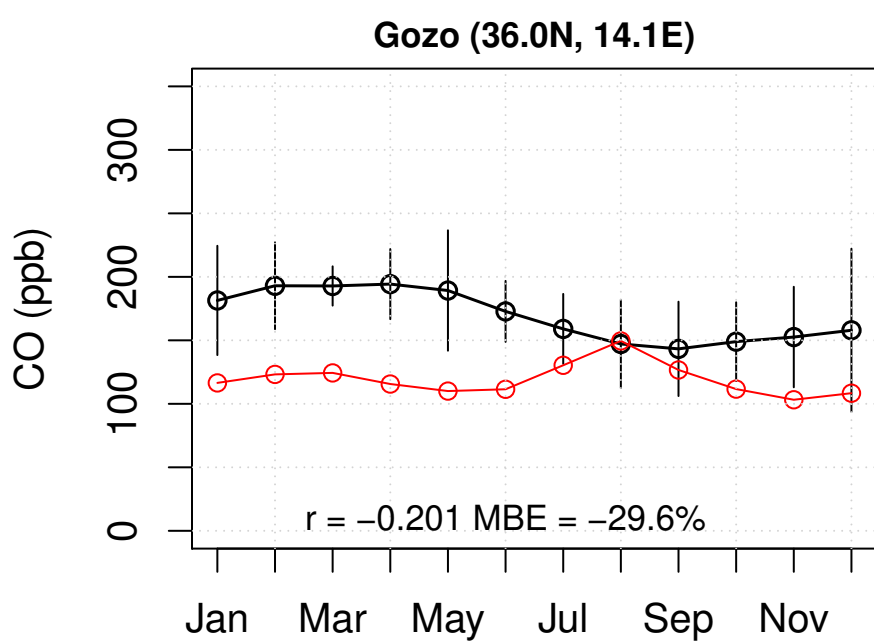
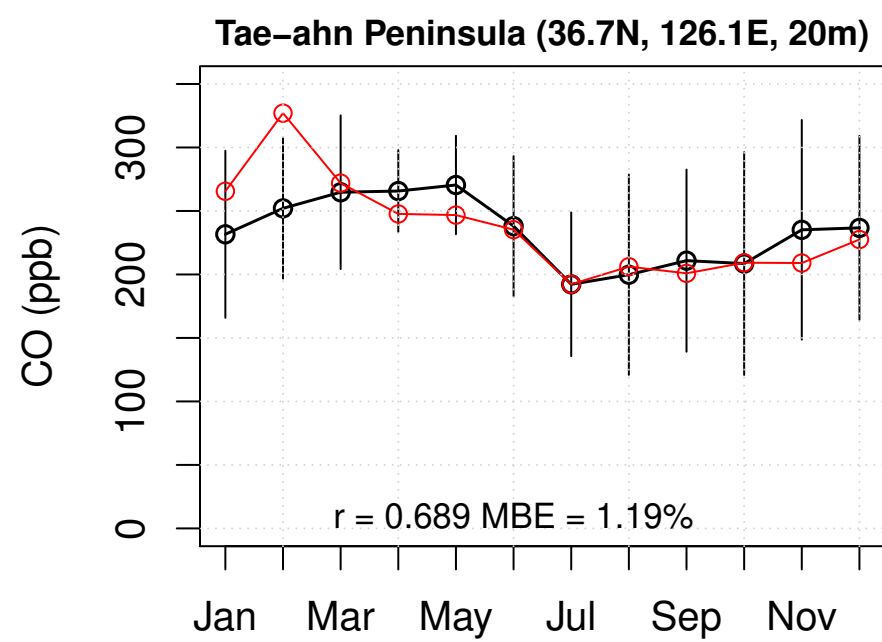
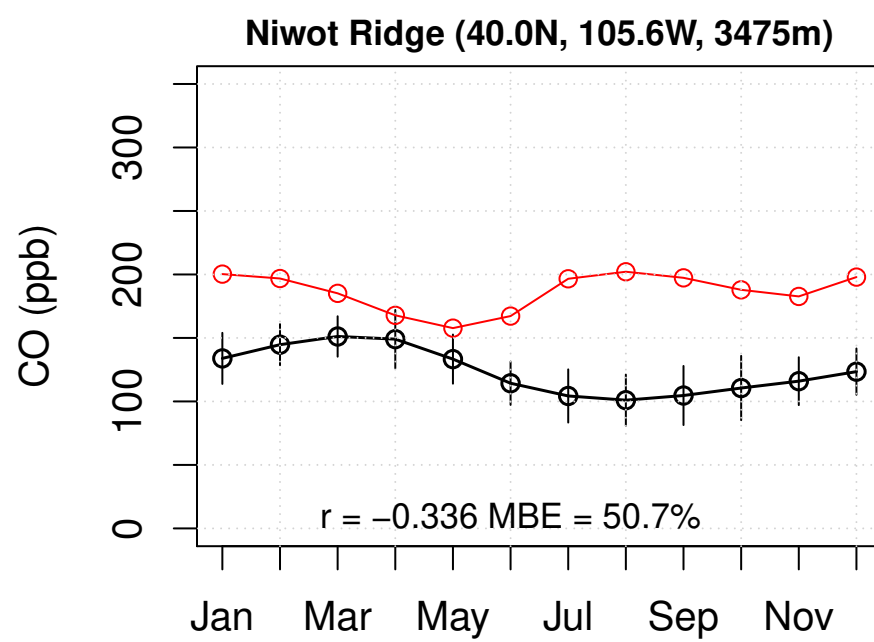
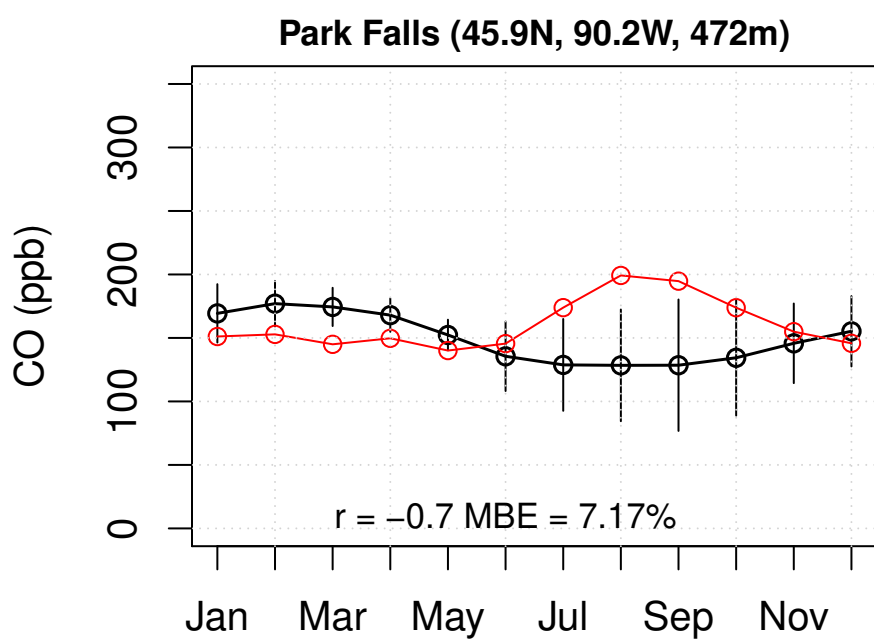
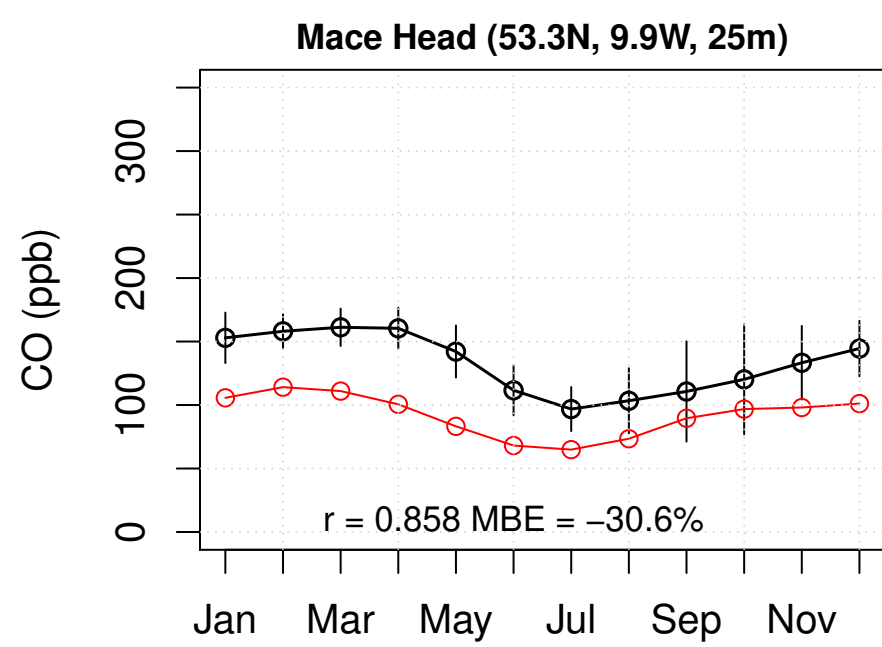
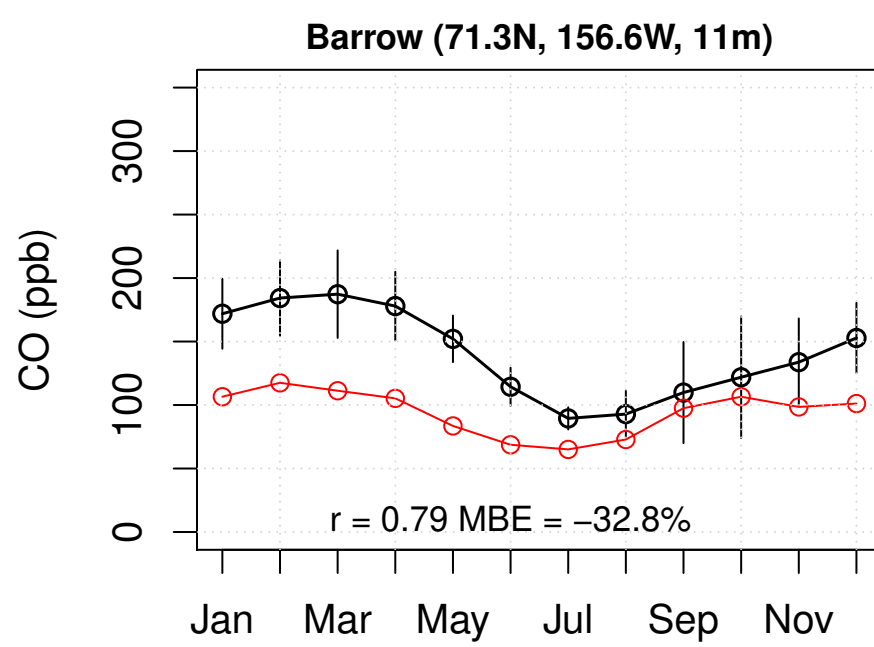
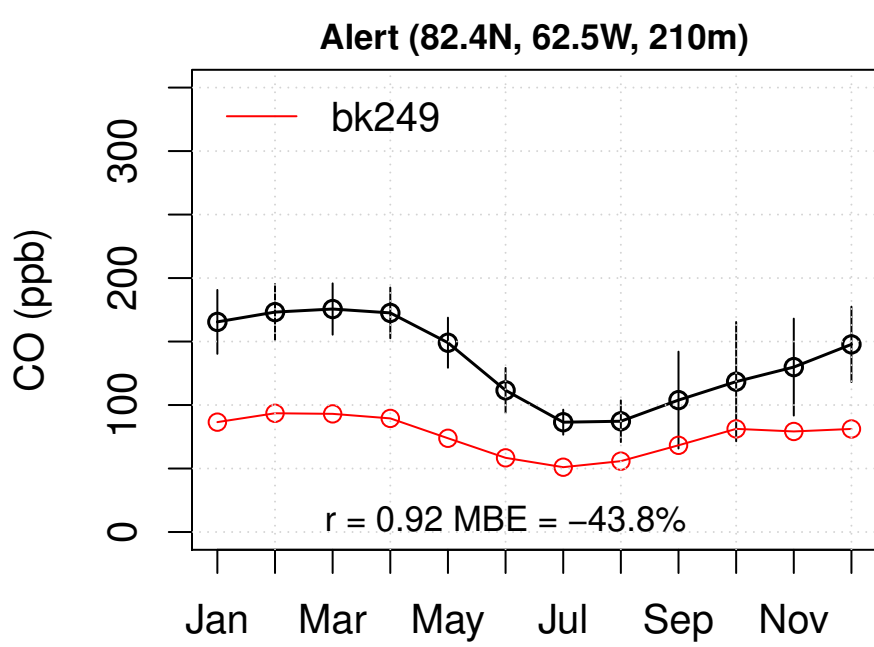
TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

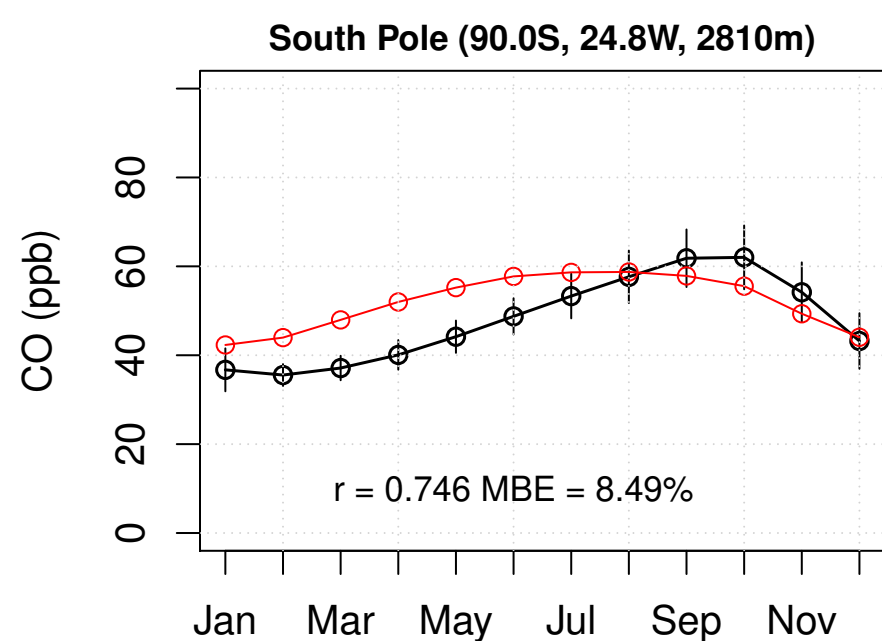
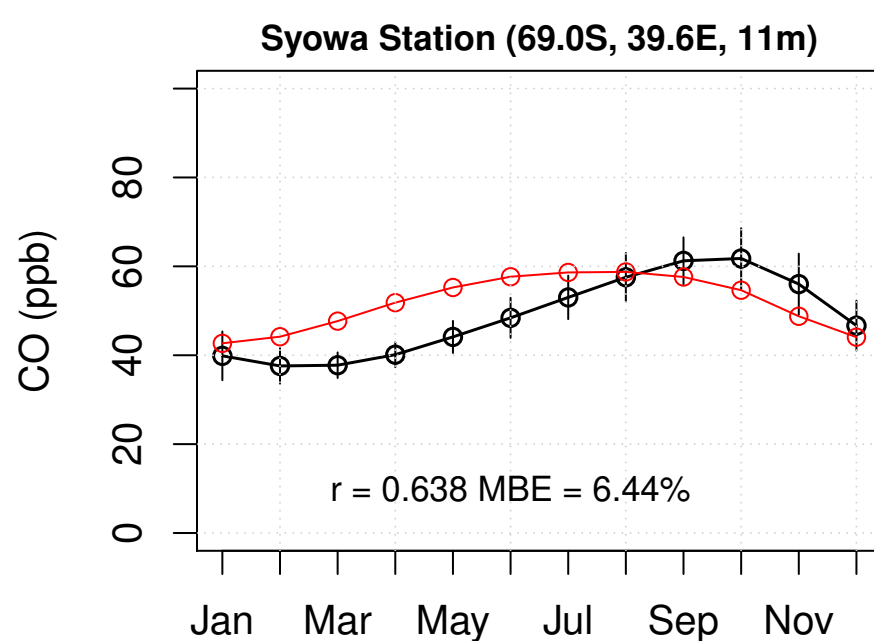
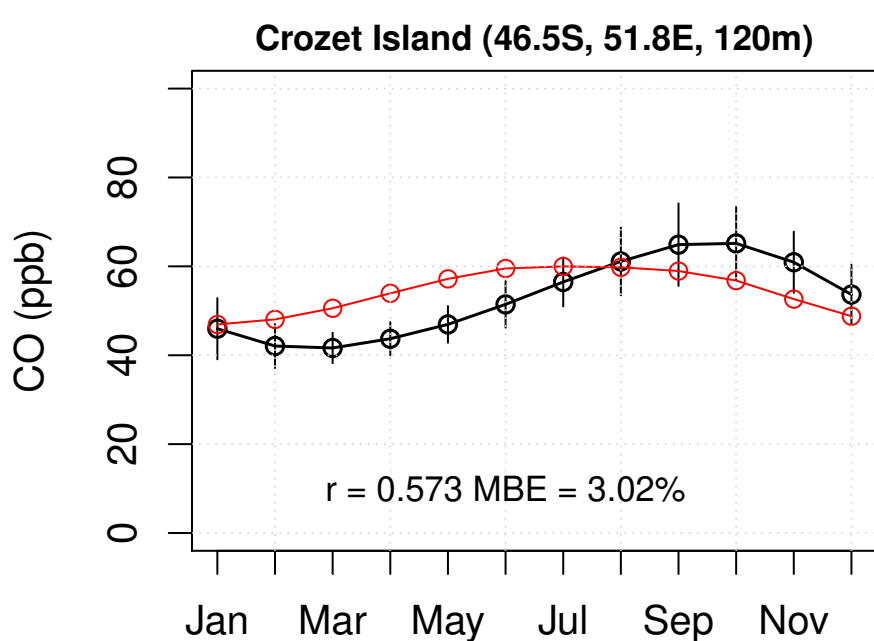
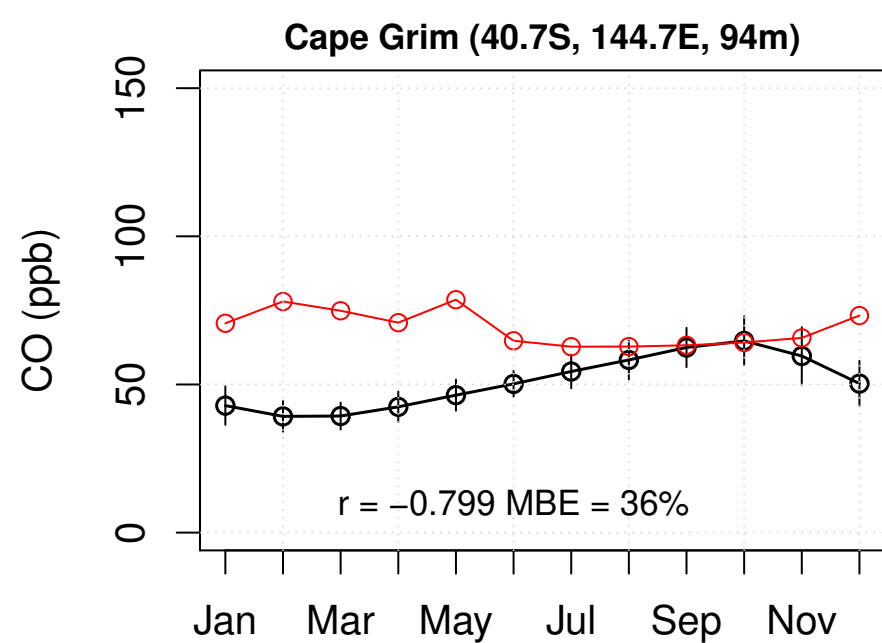
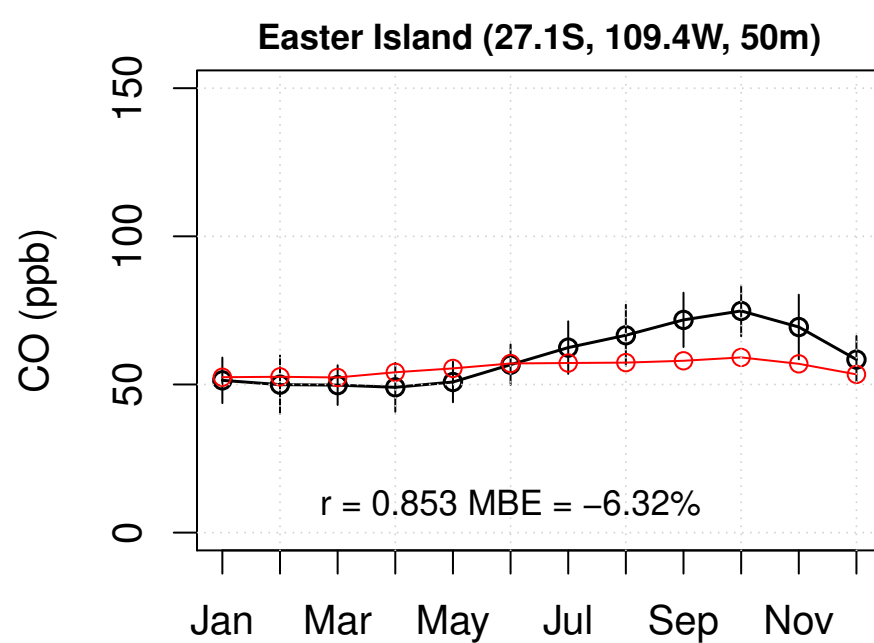
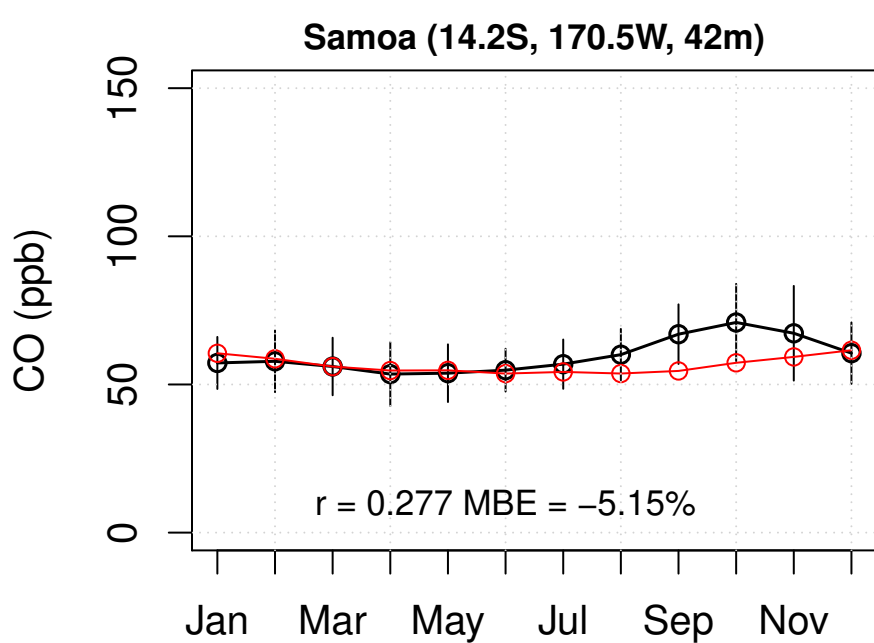
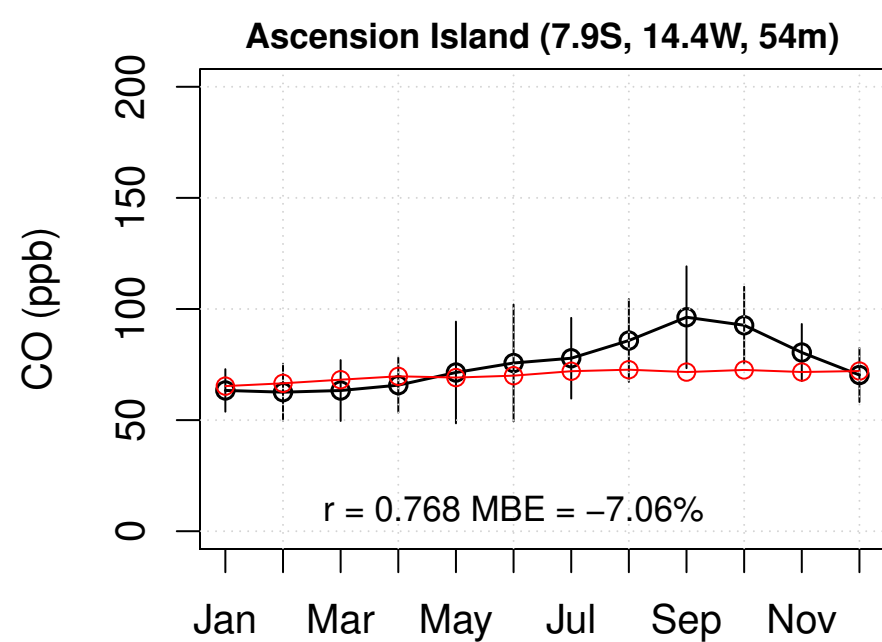
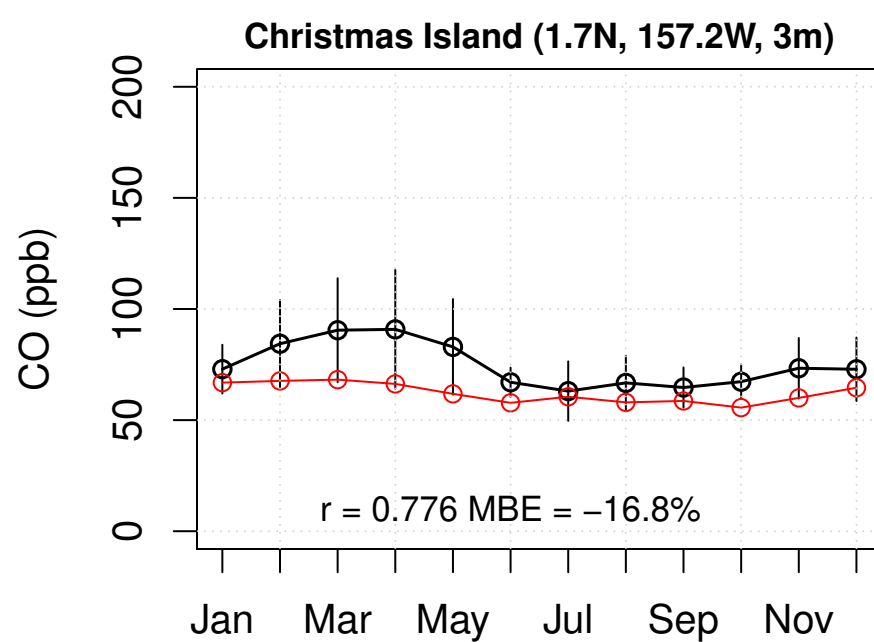
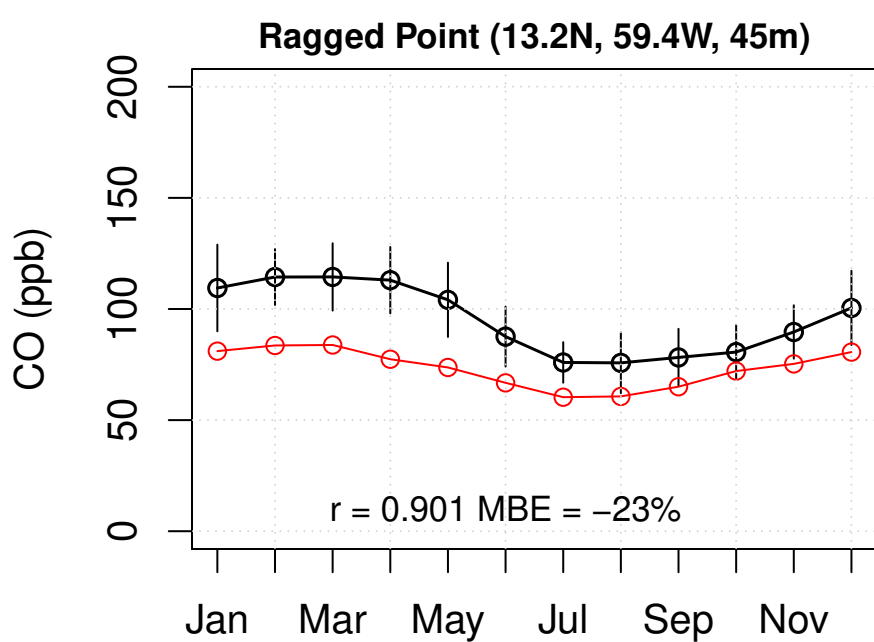
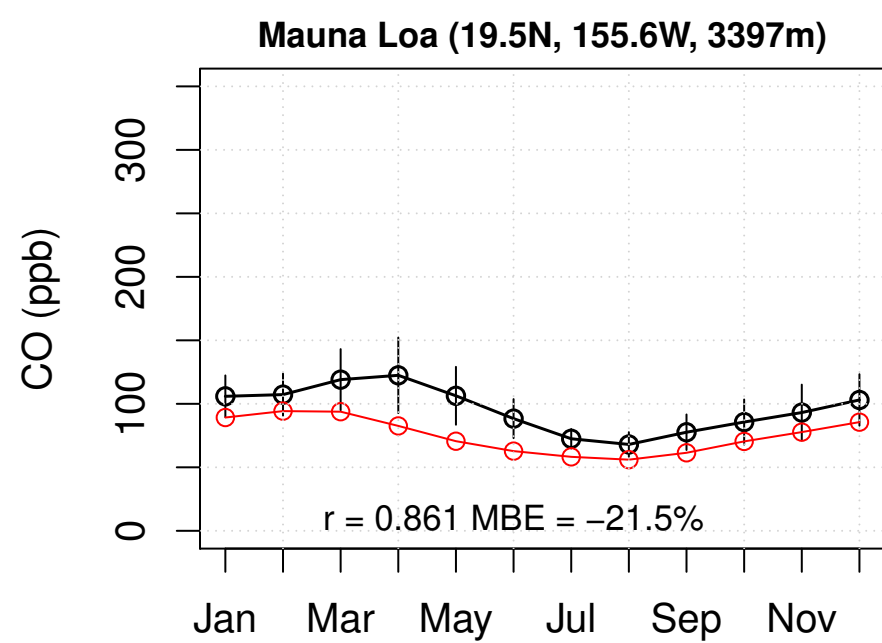
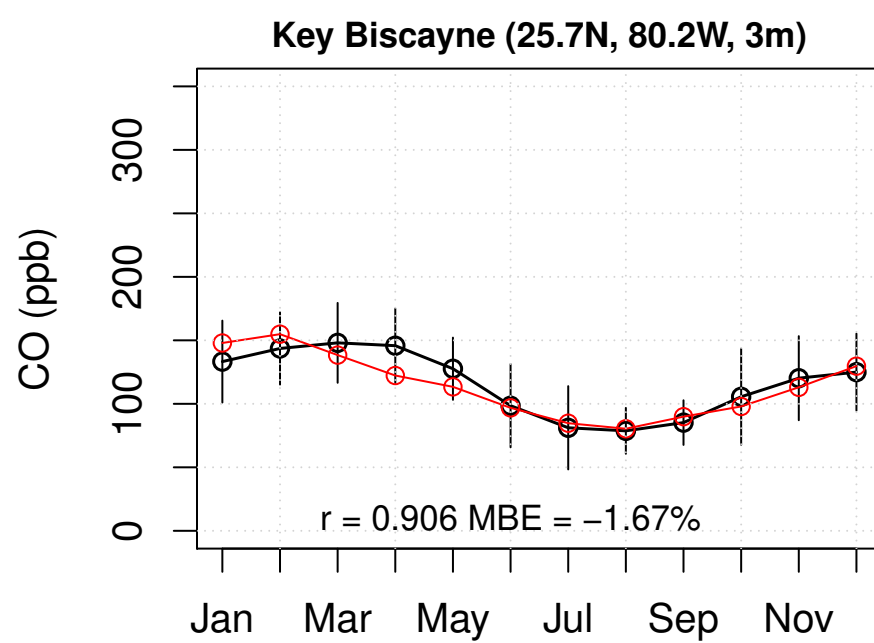
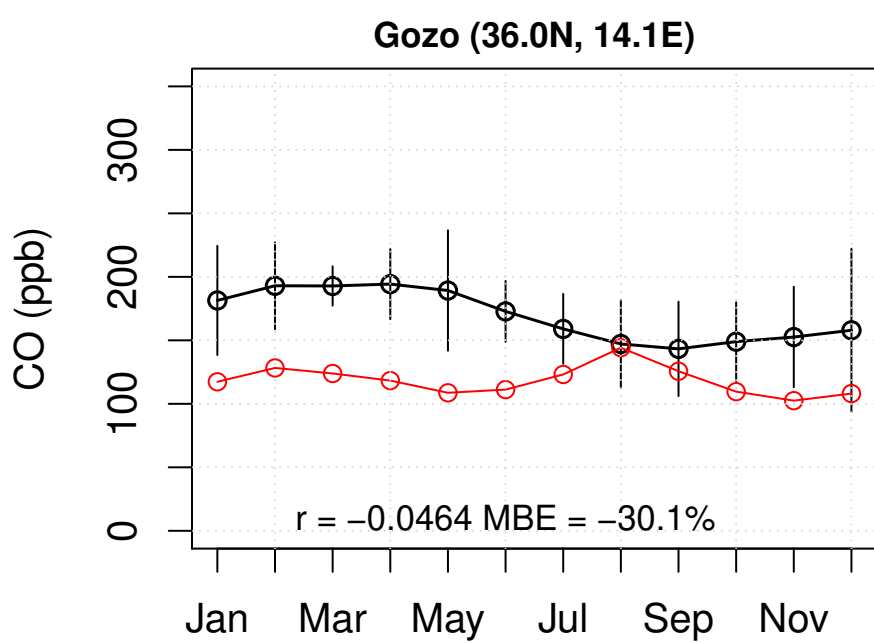
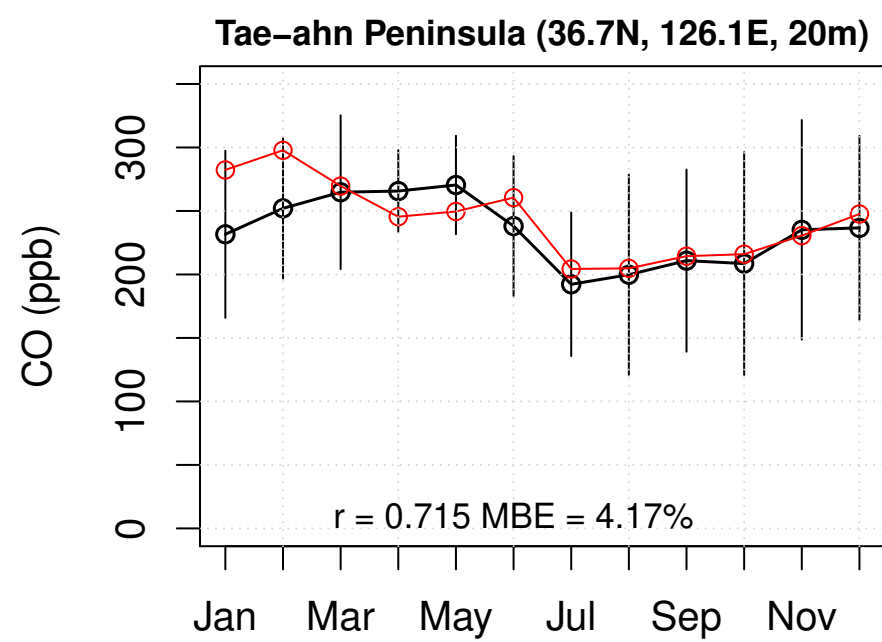
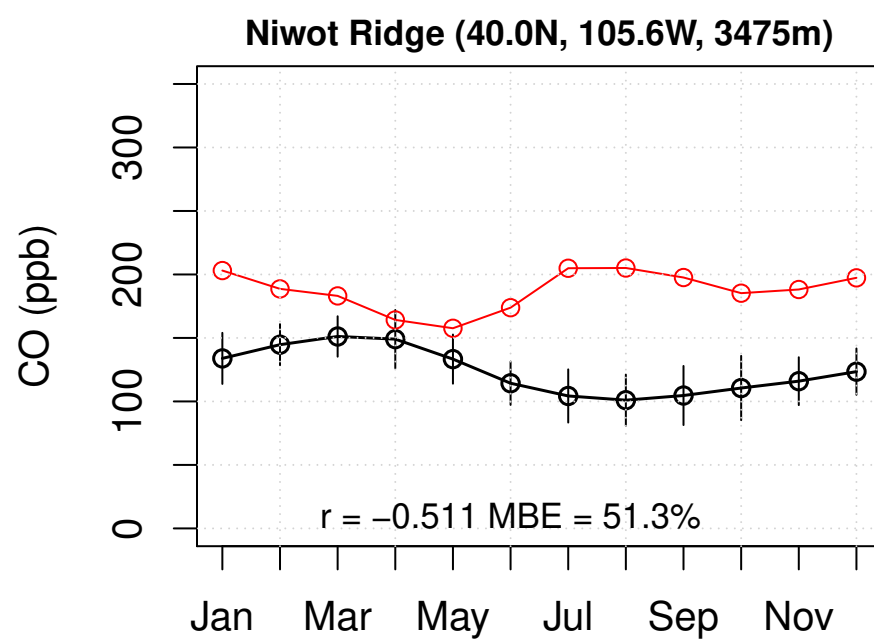
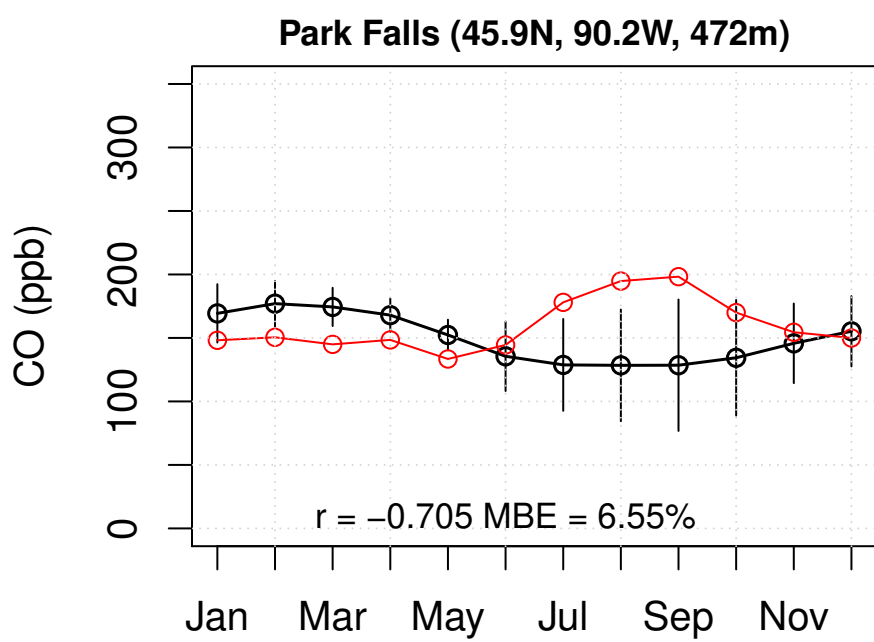
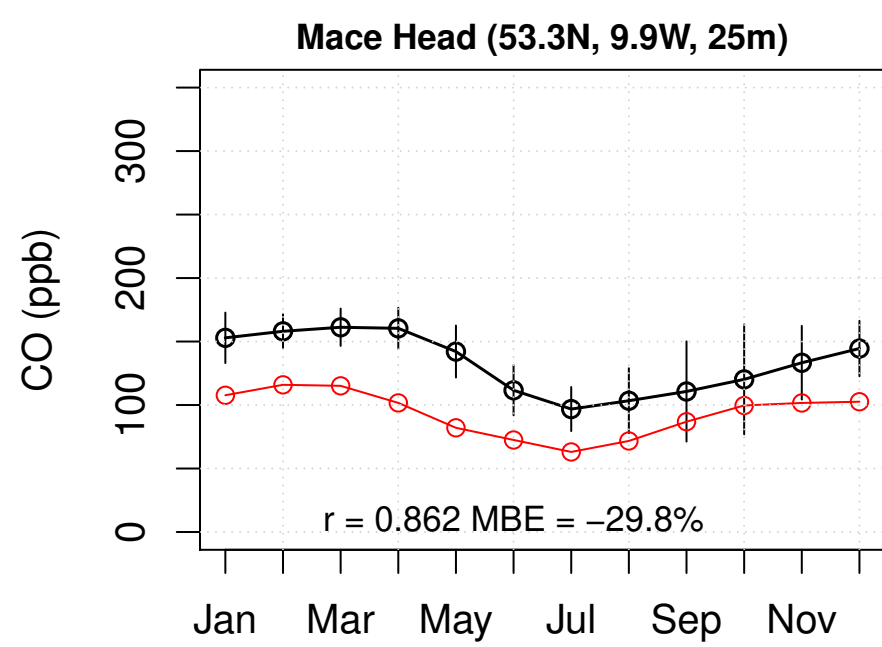
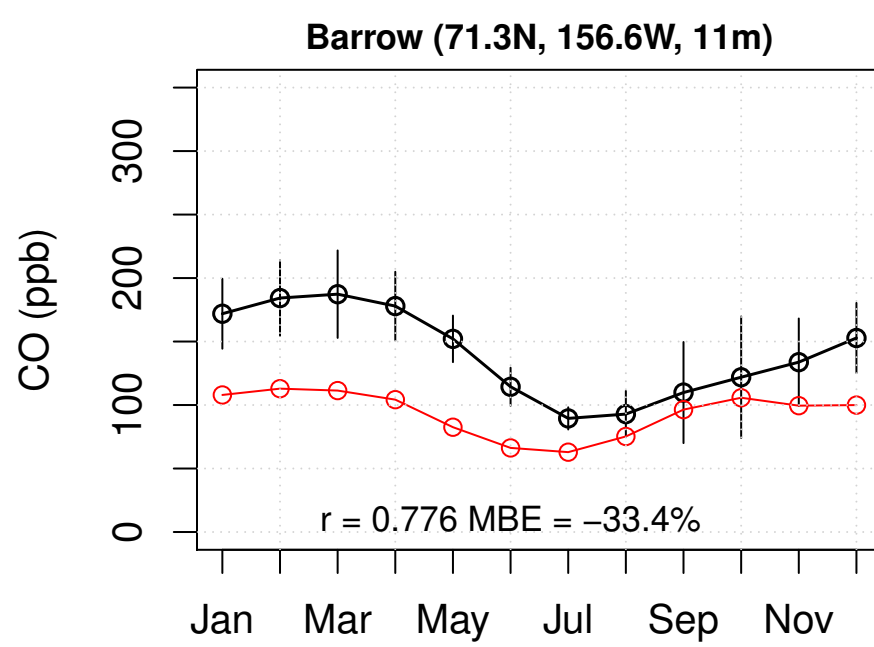
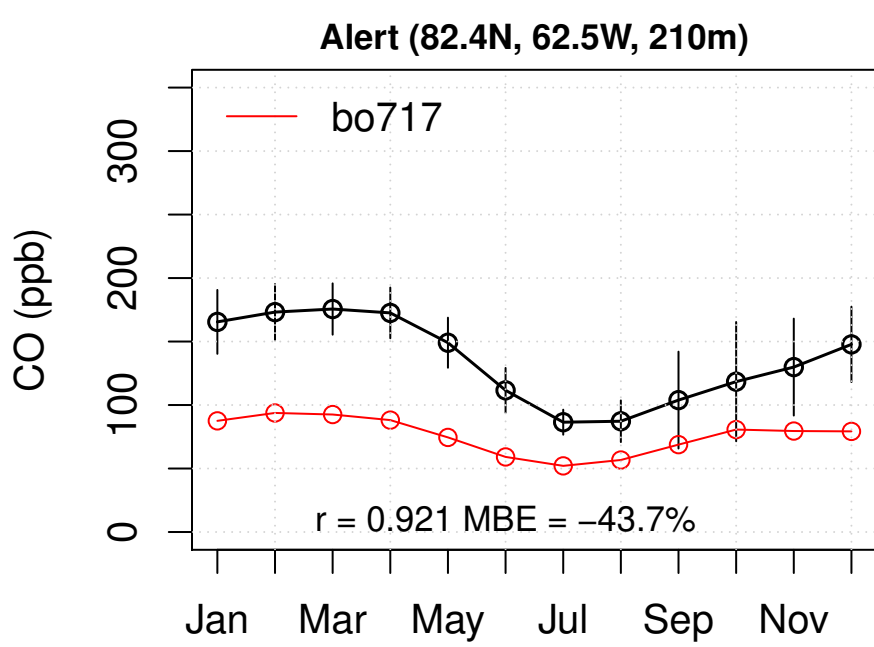


bk249 – ERA Q bias

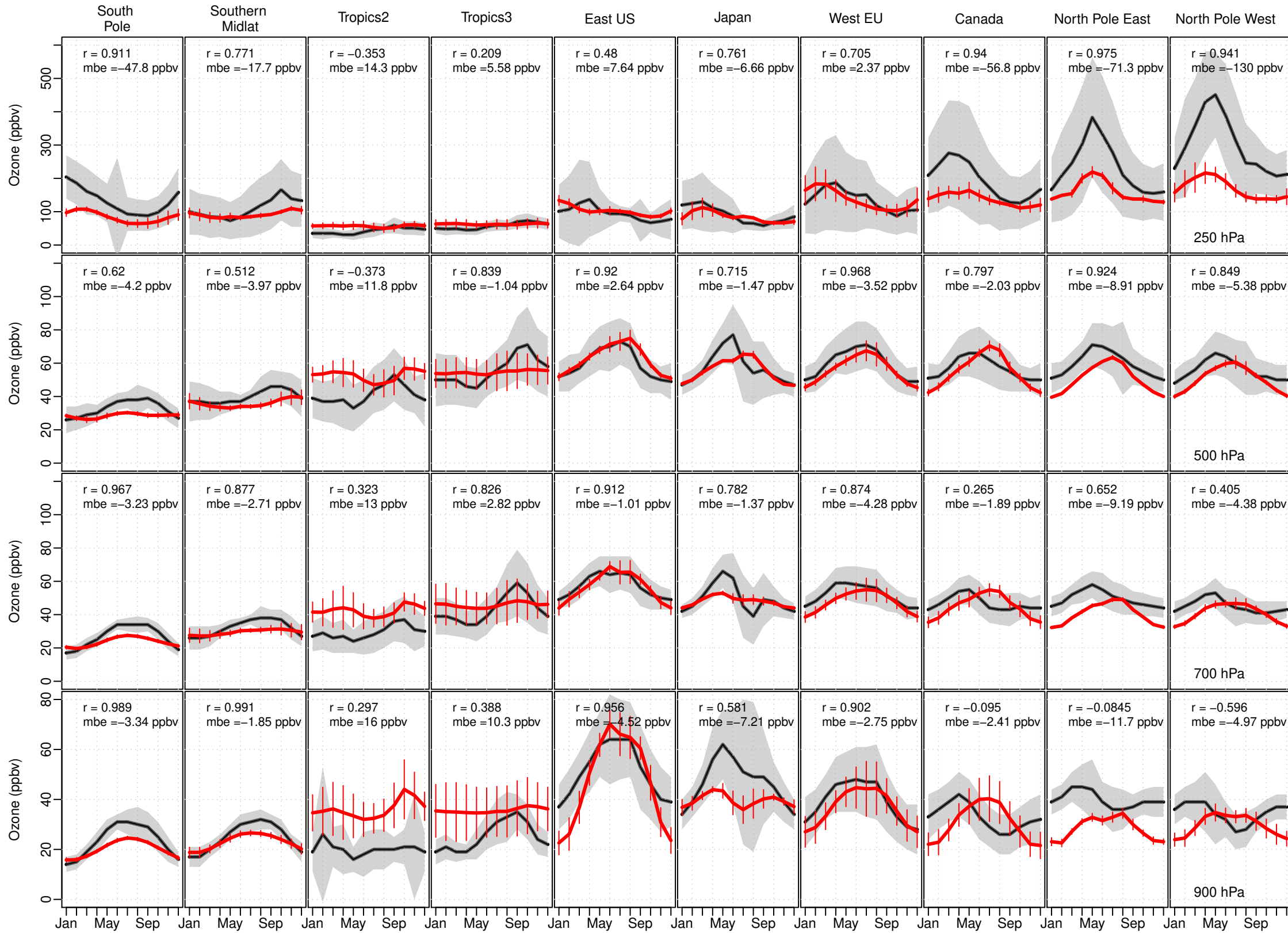
Min = -37 Mean = 14.9 Max = 102



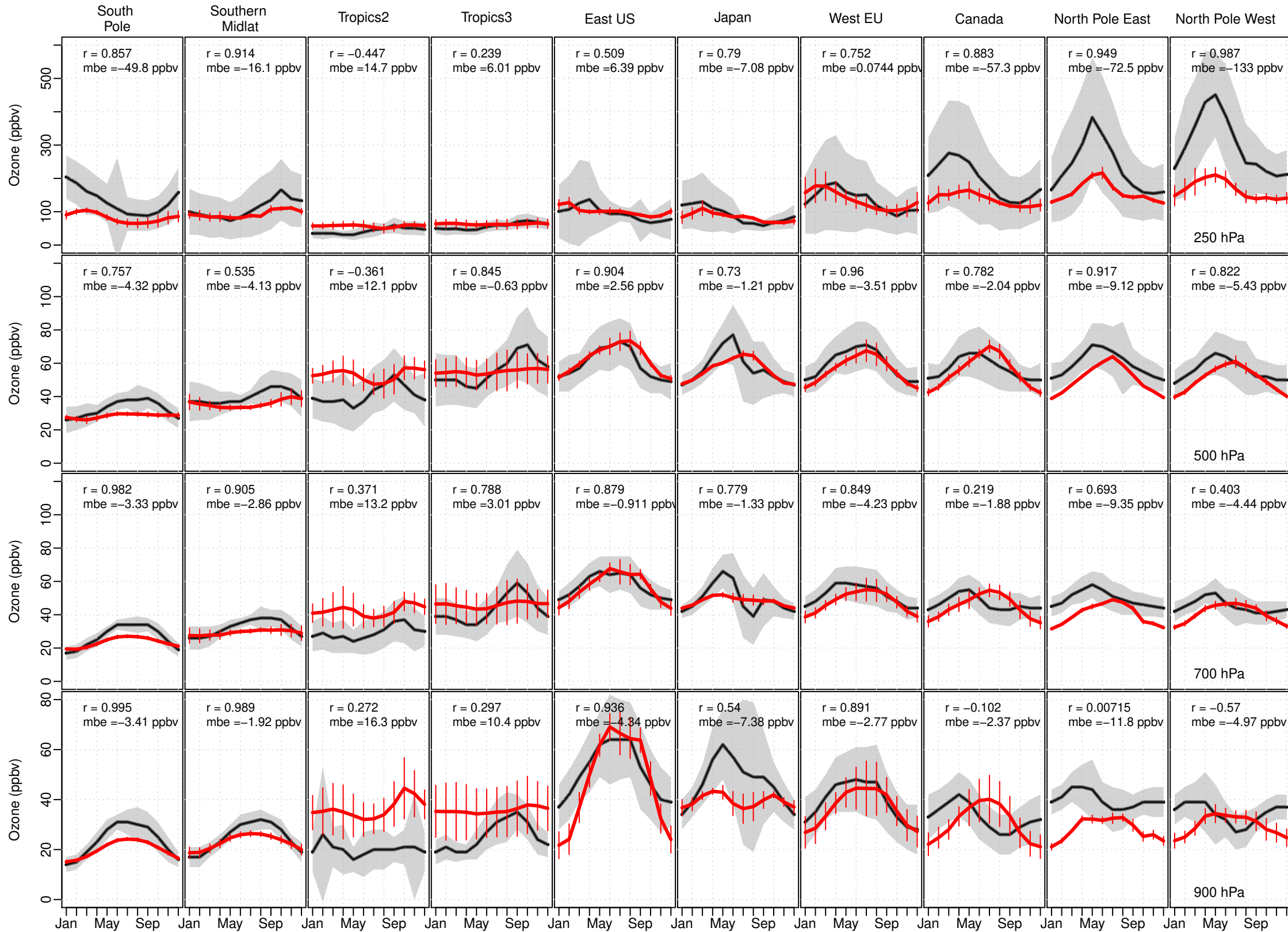




bk249 TiImes ozone sonde comparison

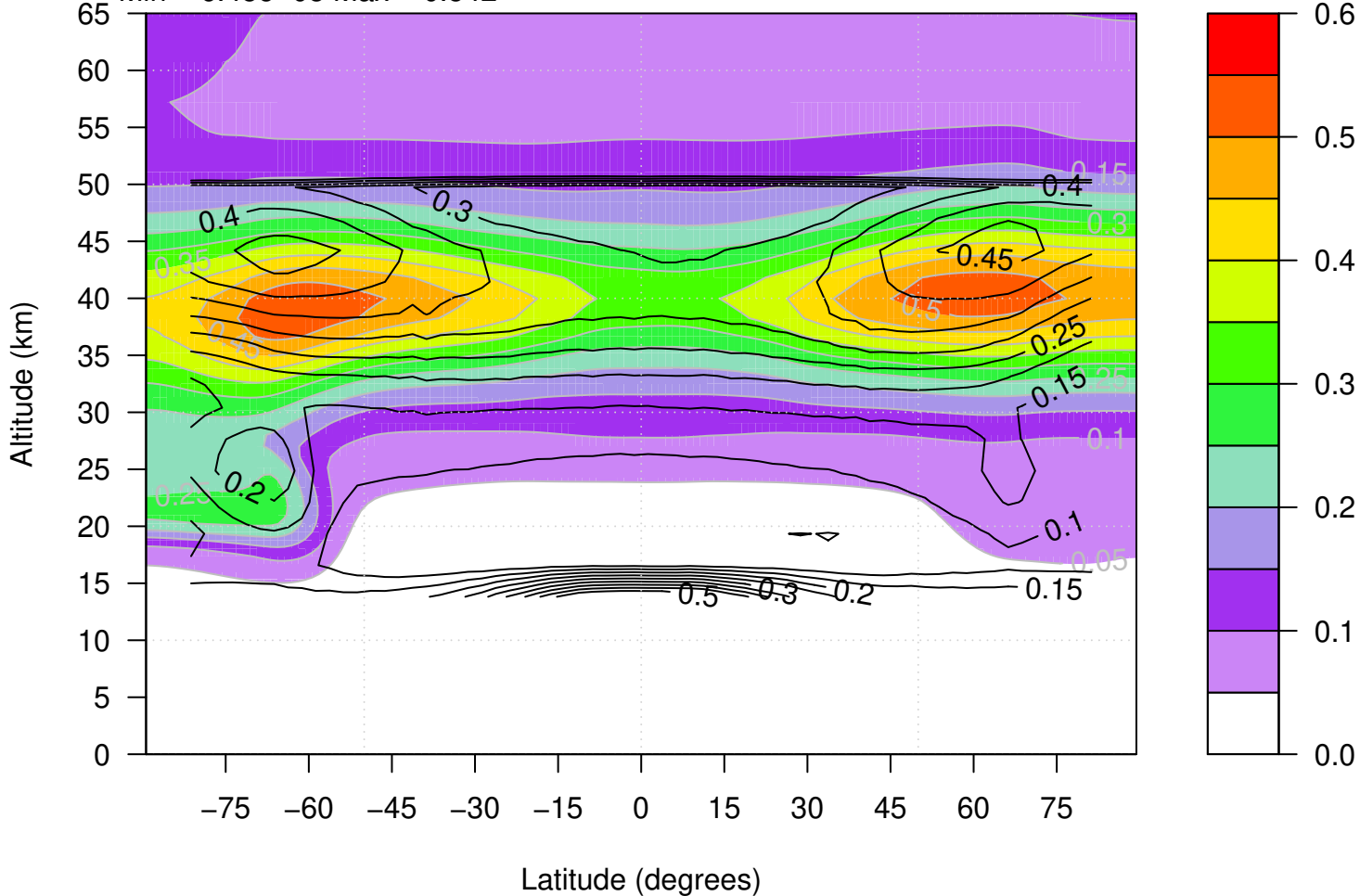


bo717 Tilmes ozone sonde comparison



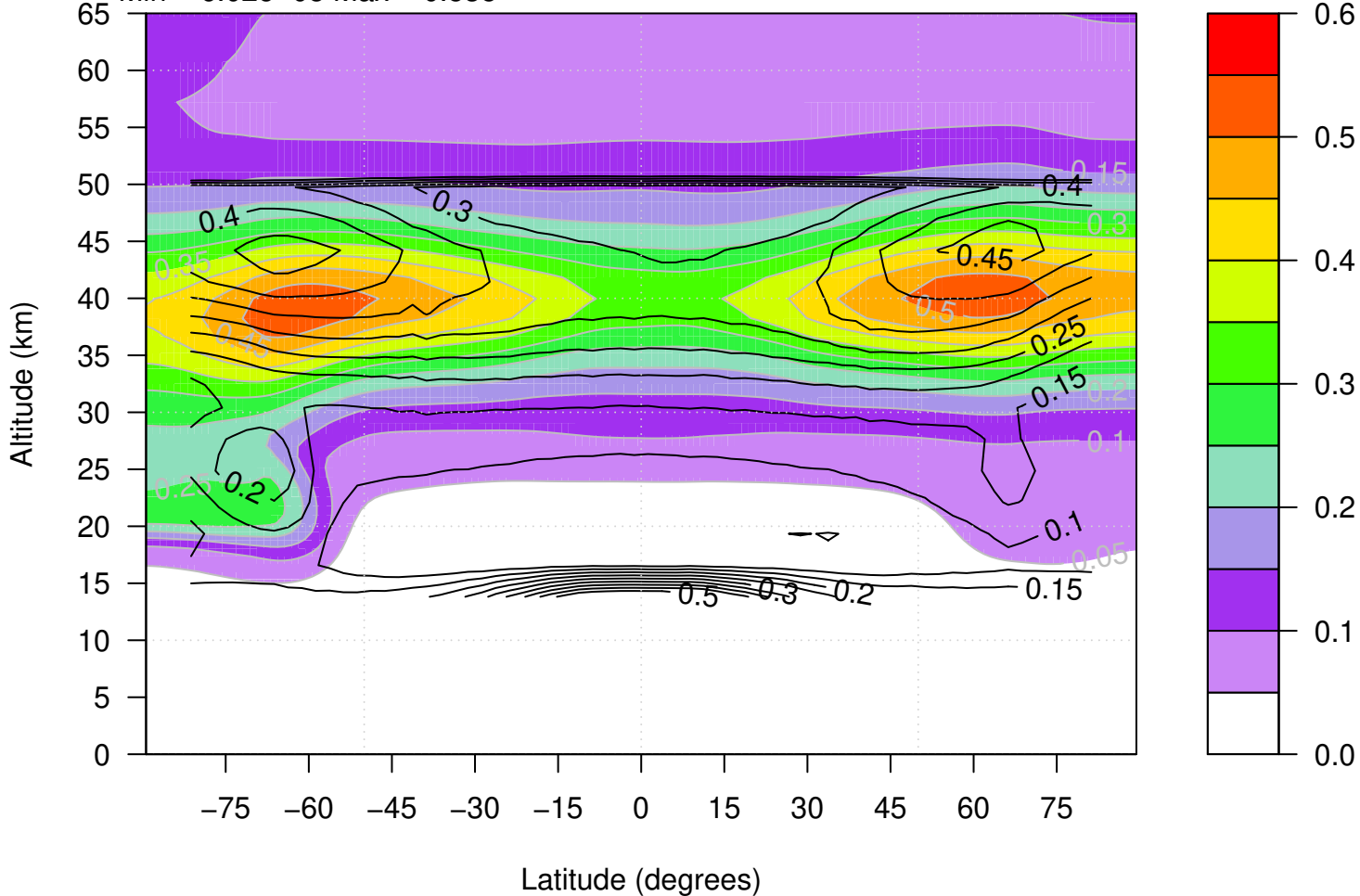
MLS – UKCA bk249 ClO comparison

Min = 6.45×10^{-8} Max = 0.542

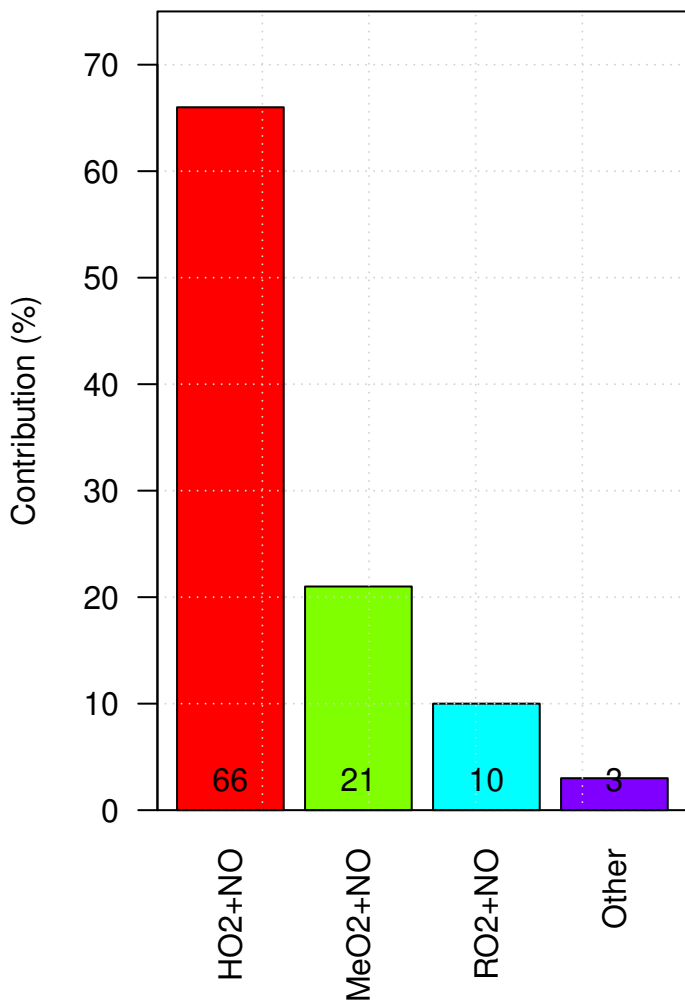


MLS – UKCA bo717 ClO comparison

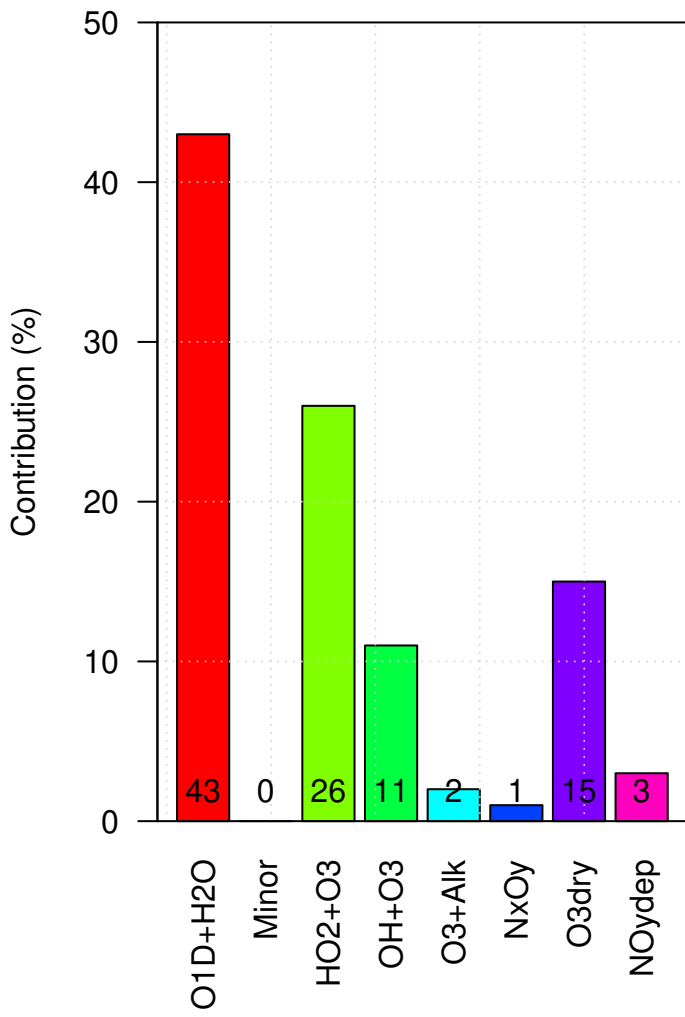
Min = 6.02×10^{-8} Max = 0.535



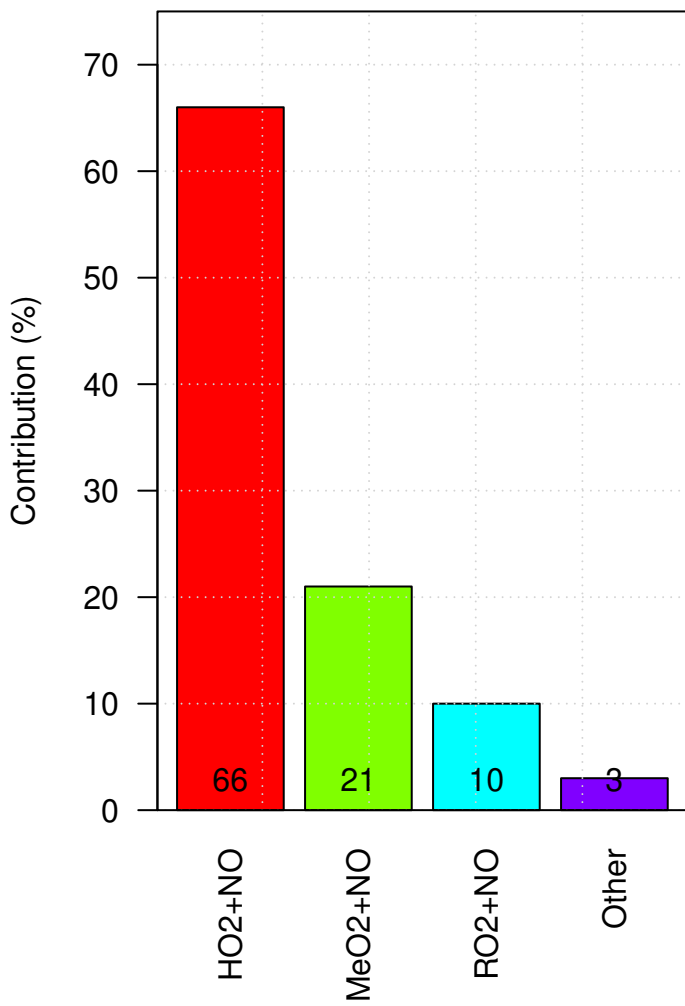
bk249 Production of Tropospheric Ox



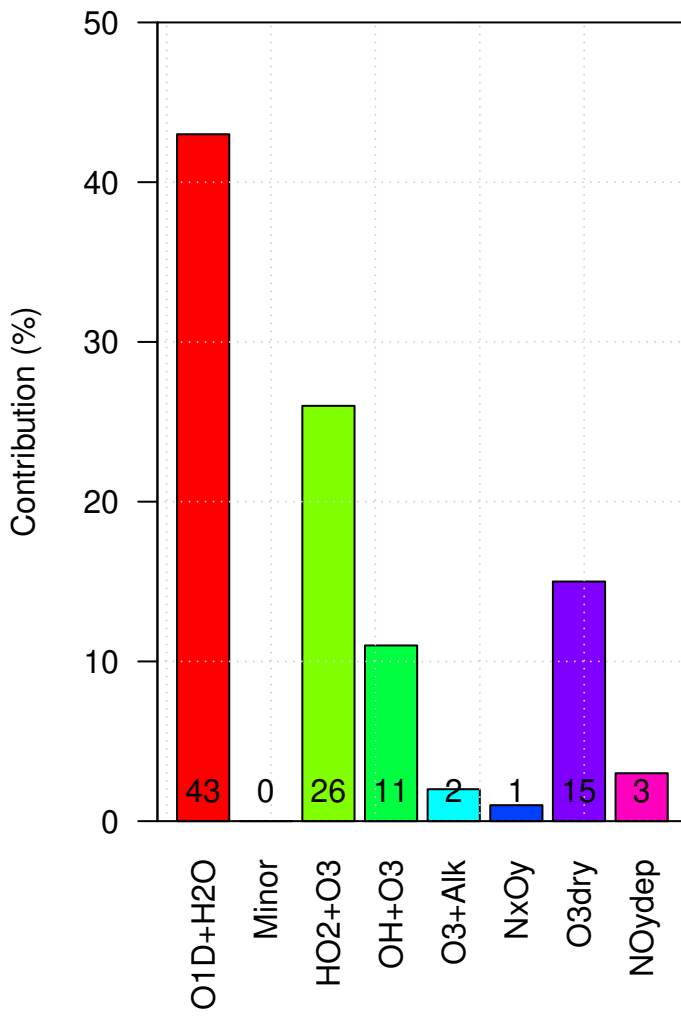
bk249 Loss of Tropospheric Ox



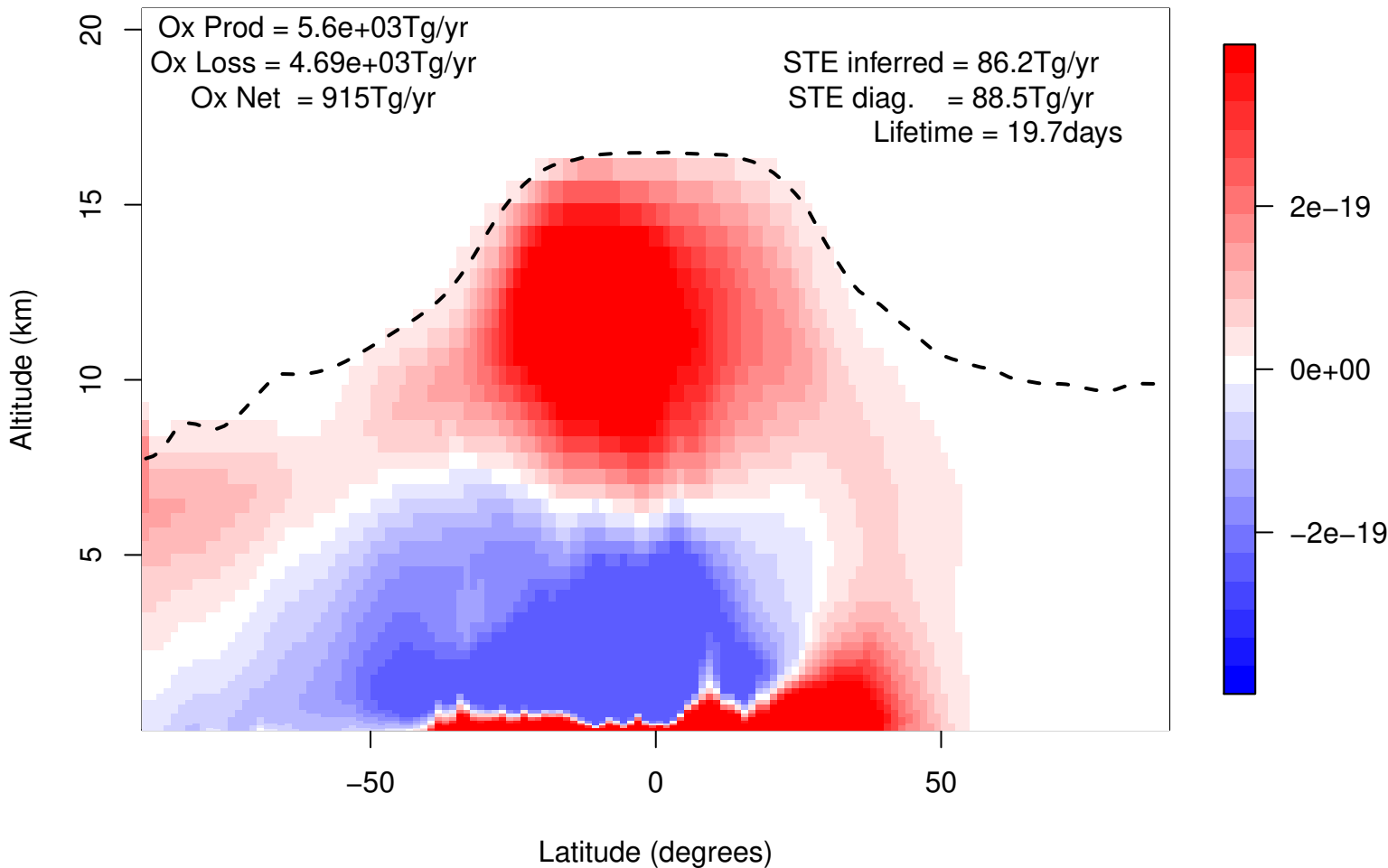
bo717 Production of Tropospheric Ox



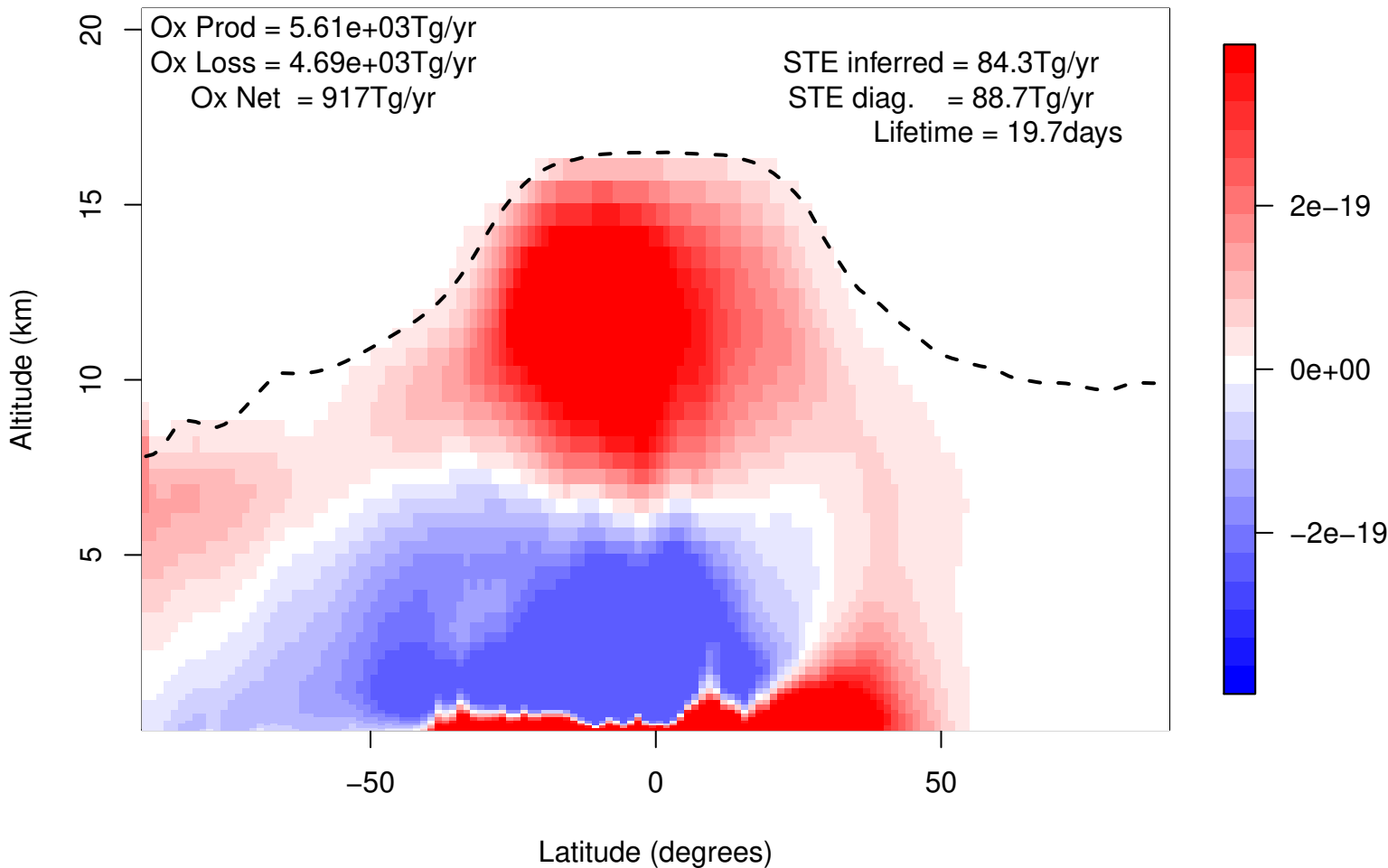
bo717 Loss of Tropospheric Ox



UKCA bk249 Ox Net Chemical Production



UKCA bo717 Ox Net Chemical Production



UKCA bk249

[OH] Air mass weighted (10^6 molecules cm^{-3})

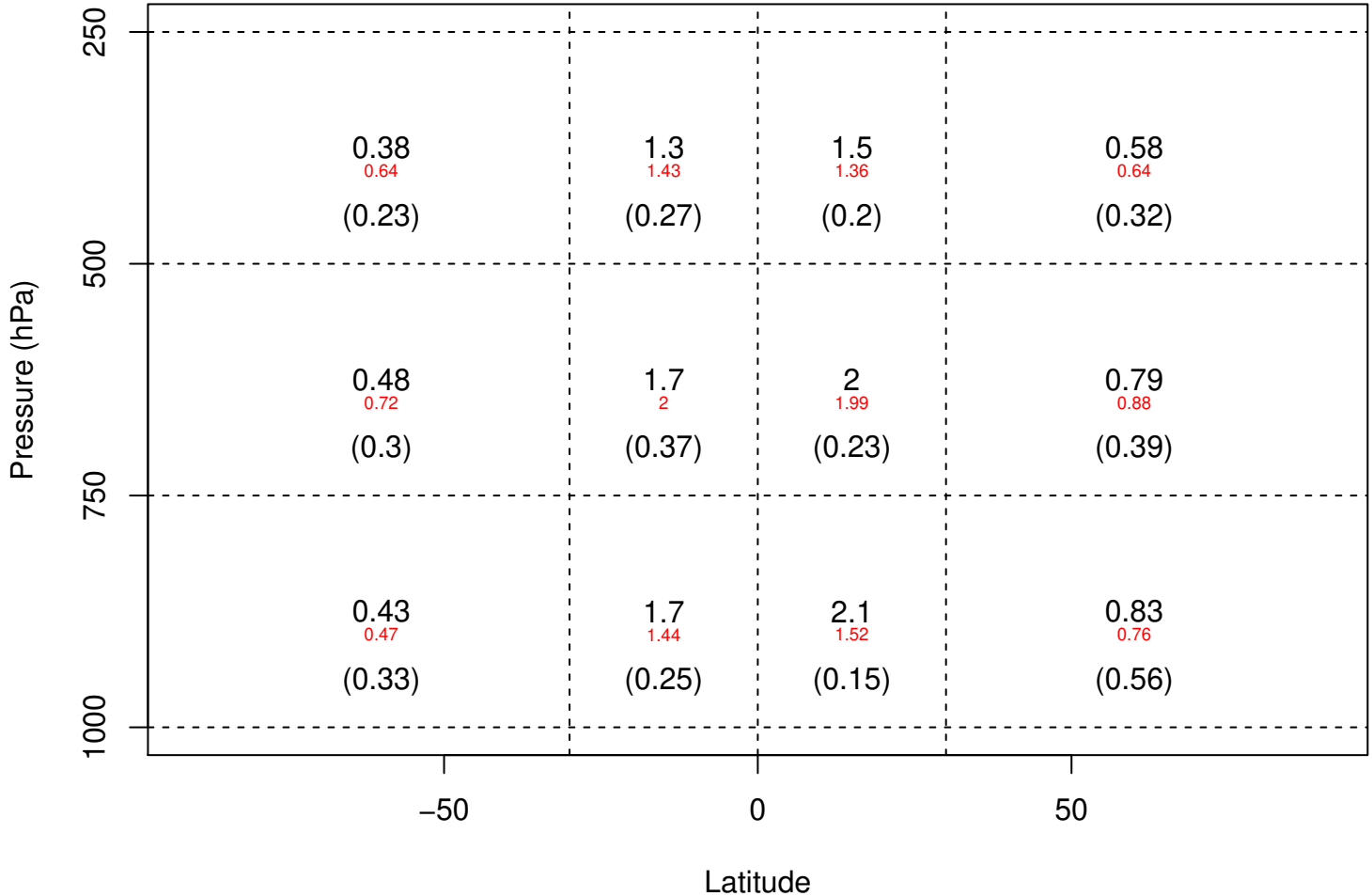
Mean OH= $1.23\text{e}+06$ molec/cm³

ACCMIP Multi-model Mean= $1.17 (+/- 0.1) \text{e}+06$ molec/cm³

NH:SH ratio= 1.38 Patra et al 2014: $0.97 +/- 0.12$

Red: Spivakovsky values

Values in (): Std dev



UKCA bo717

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

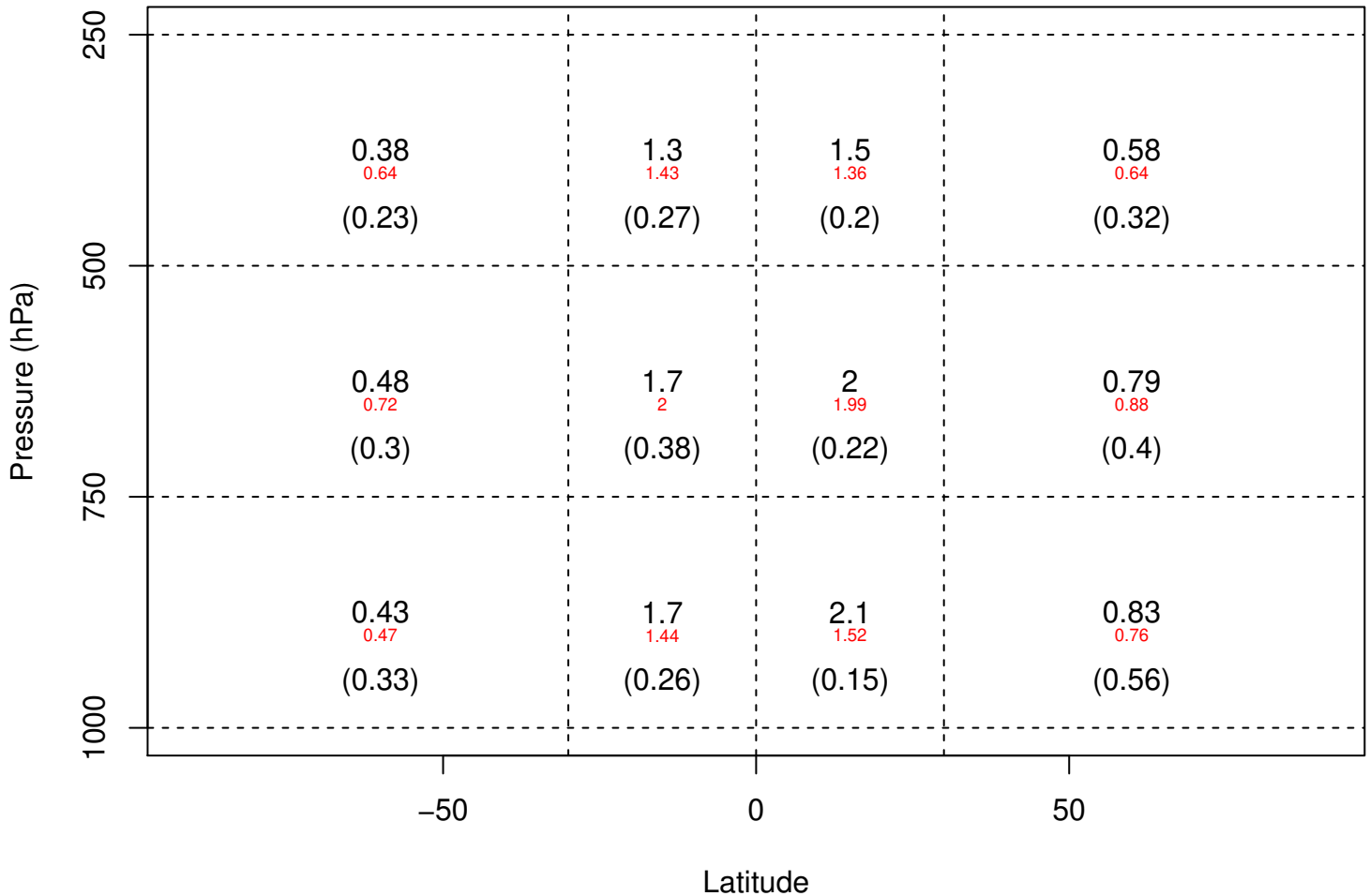
Mean OH= 1.23e+06 molec/cm³

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

NH:SH ratio= 1.38 Patra et al 2014: 0.97 +/- 0.12

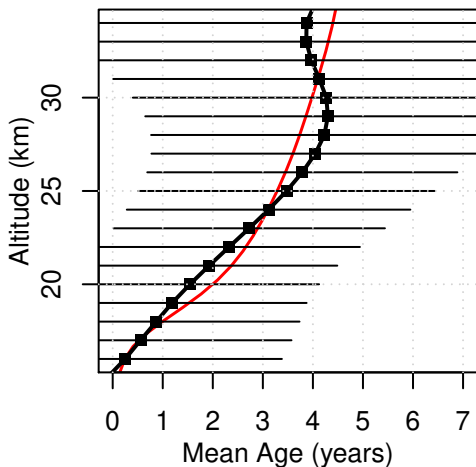
Red: Spivakovsky values

Values in (): Std dev

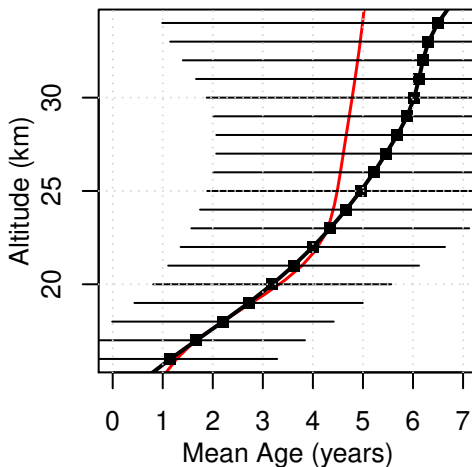


UKCA bk249 Mean Age of Air

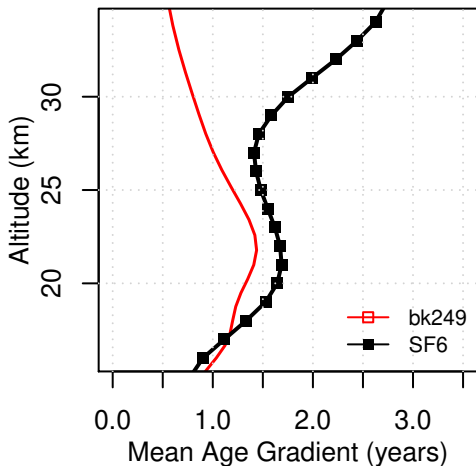
Tropical Mean Age Profile



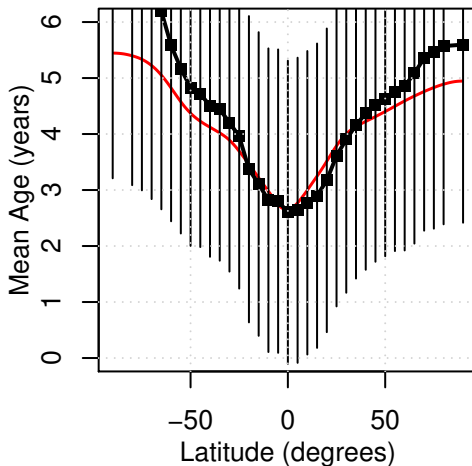
Midlatitude Mean Age Profile



Trop-Midlat Mean Age Gradient Prof

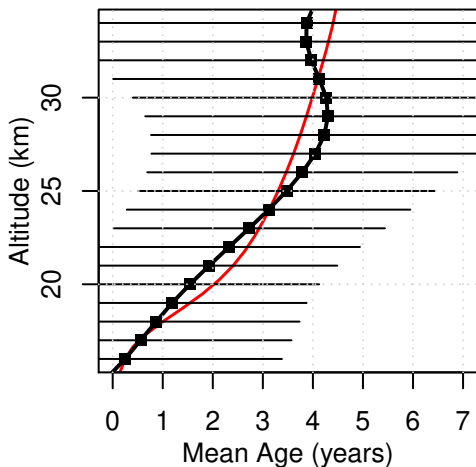


Mean Age, 23km (~50hPa)

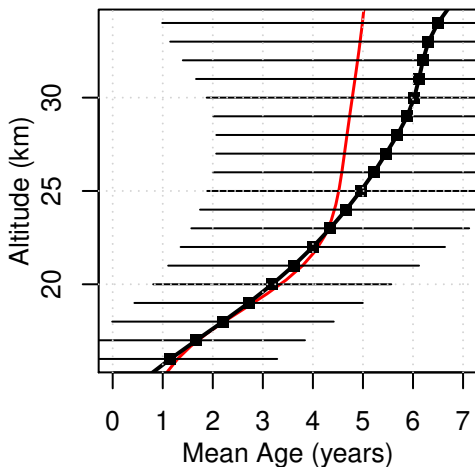


UKCA bo717 Mean Age of Air

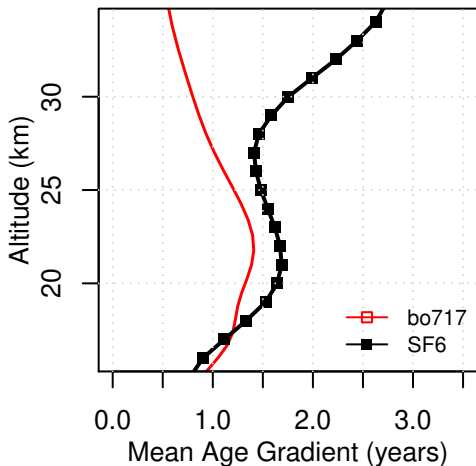
Tropical Mean Age Profile



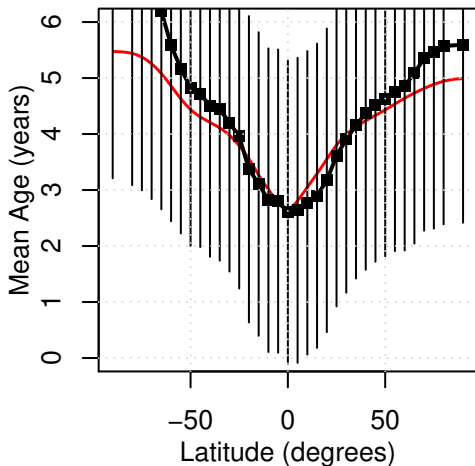
Midlatitude Mean Age Profile



Trop-Midlat Mean Age Gradient Prof



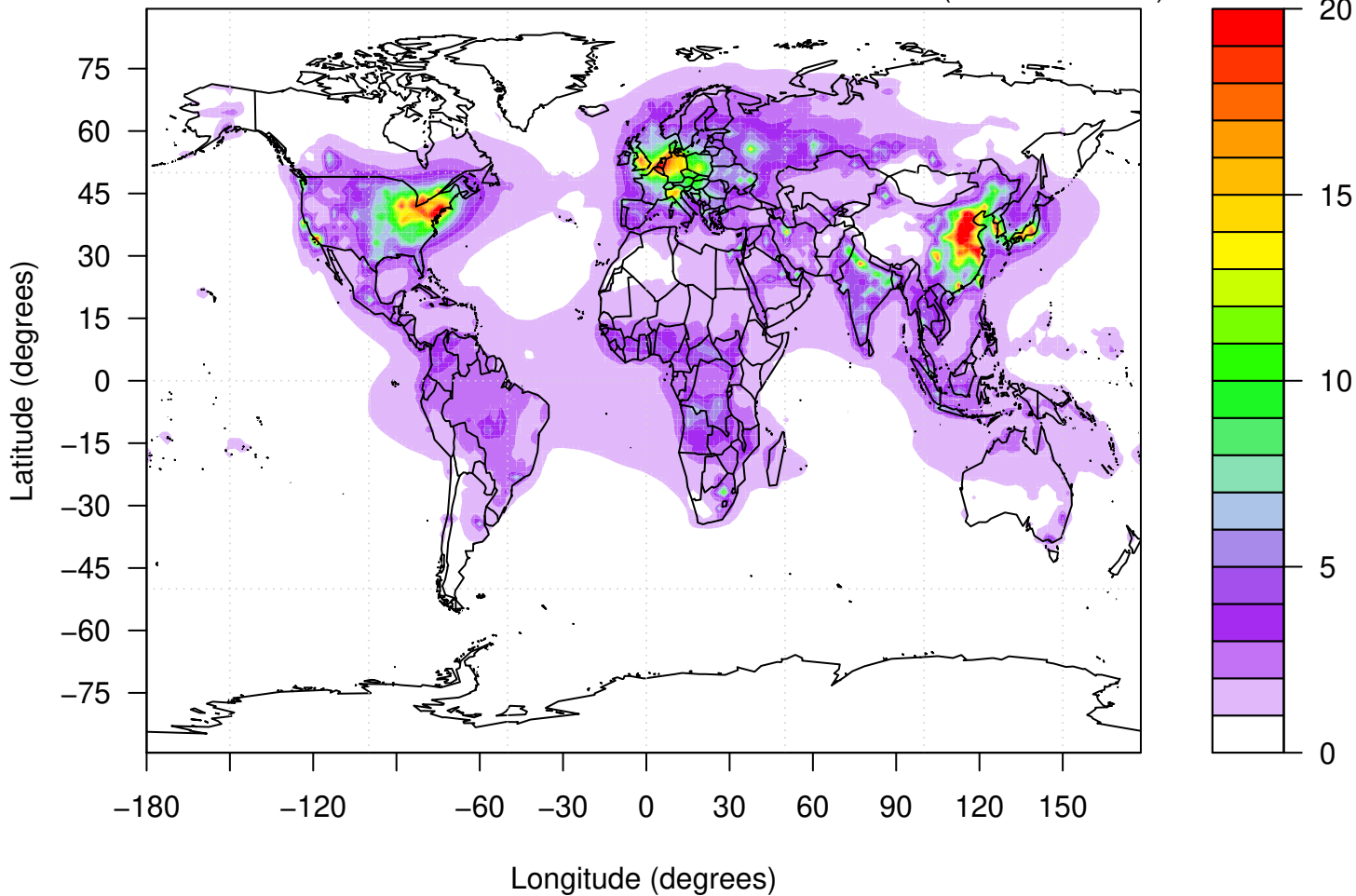
Mean Age, 23km (~50hPa)



bk249 tropospheric NO₂ column

Min = 0.0131 Mean = 1.14 Max = 41.5

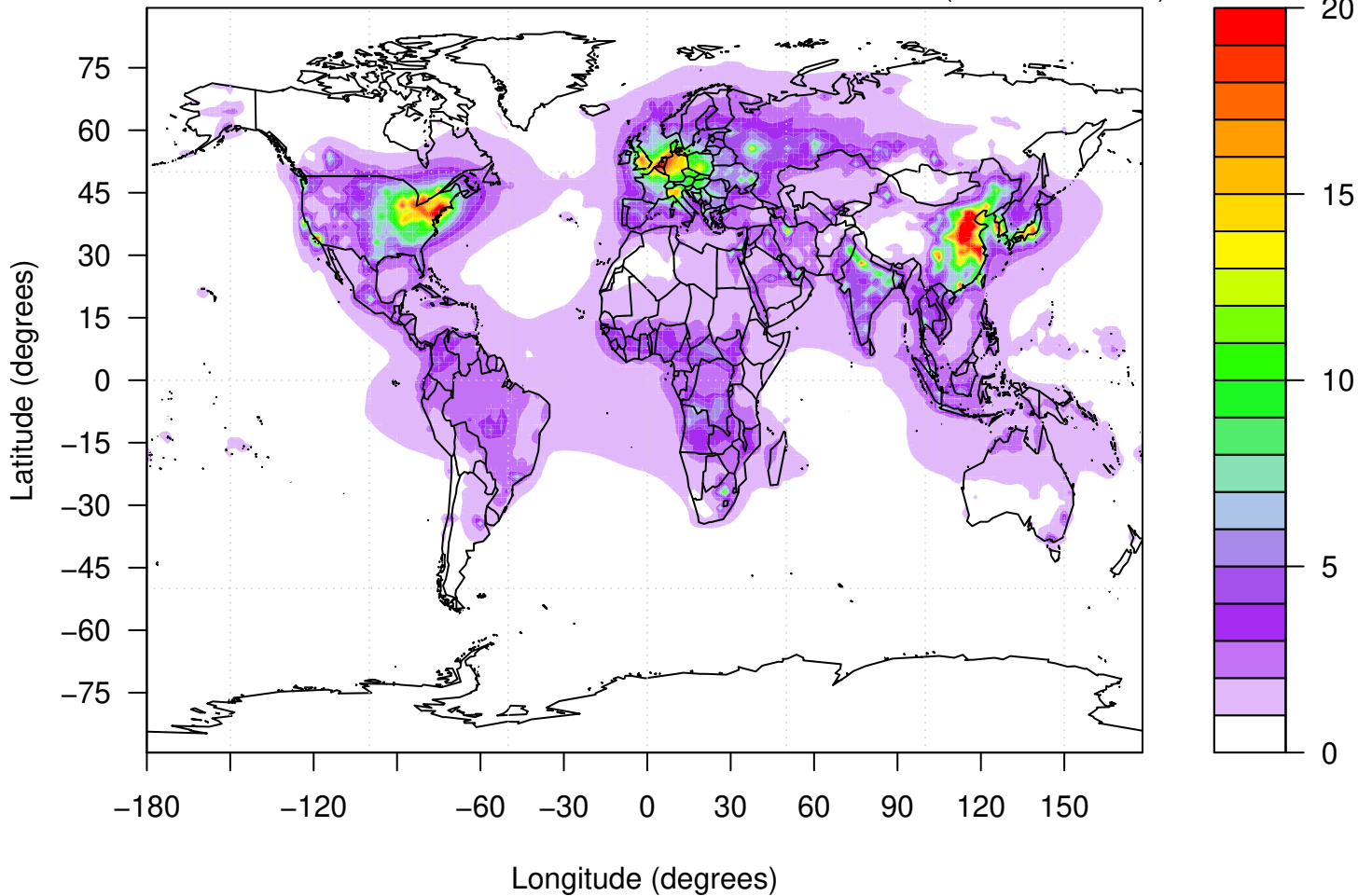
10¹⁵ (molecules cm⁻²)



bo717 tropospheric NO₂ column

Min = 0.0129 Mean = 1.14 Max = 41.5

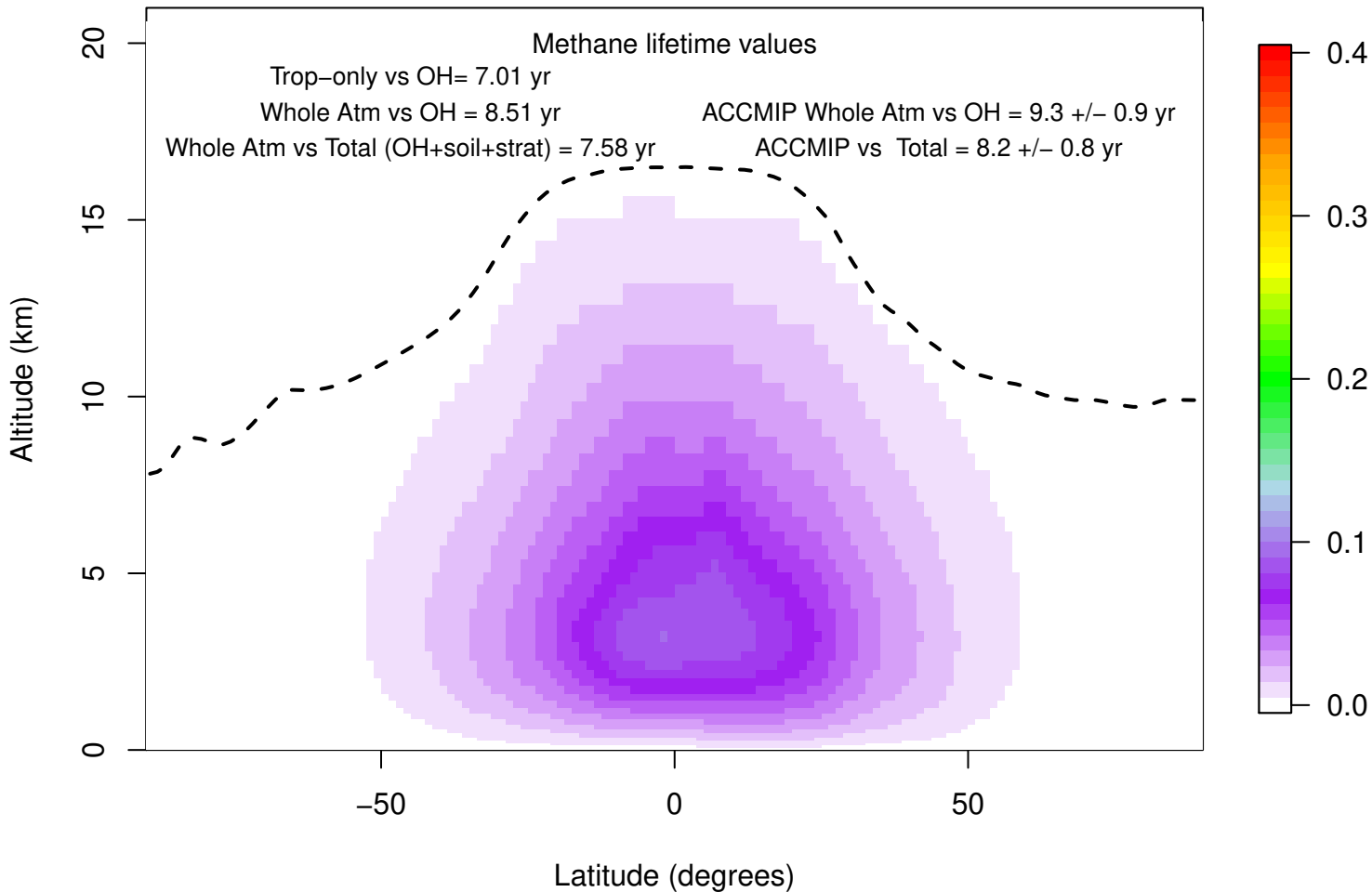
10¹⁵ (molecules cm⁻²)



Methane lifetime not plotted.

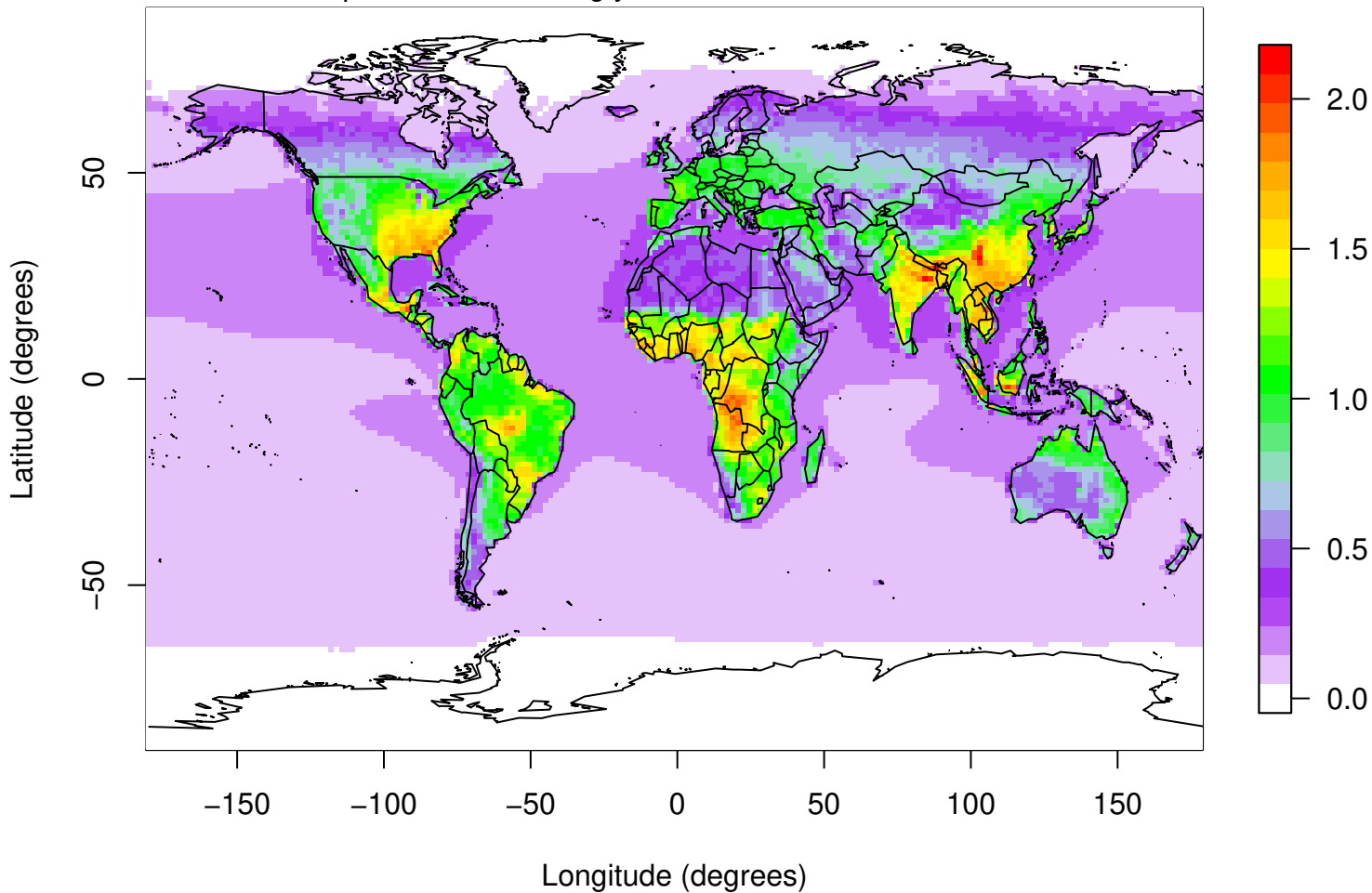
UKCA bo717

% CH₄ + OH flux (moles cm⁻³ s⁻¹)



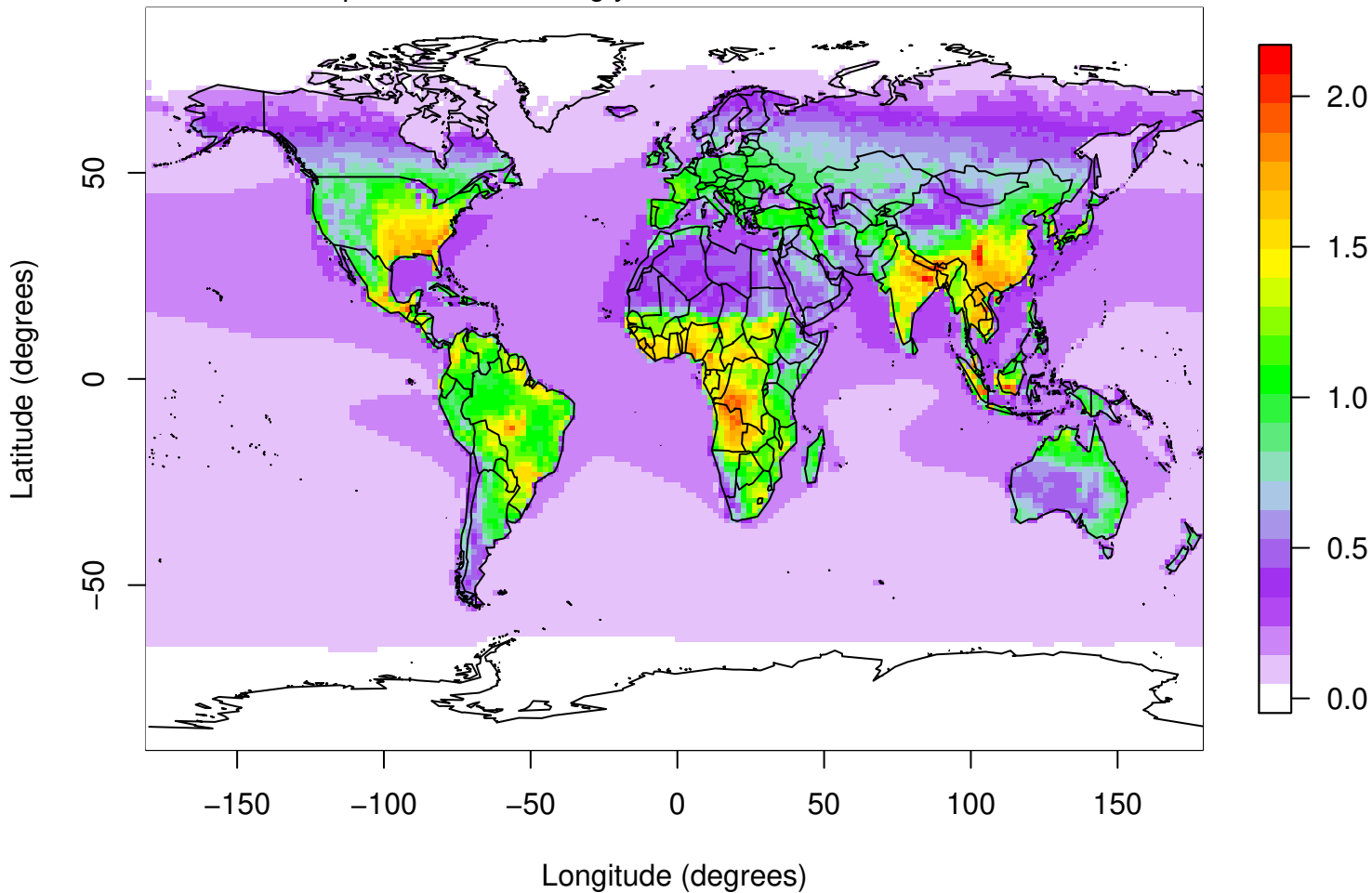
UKCA Ox deposition bk249

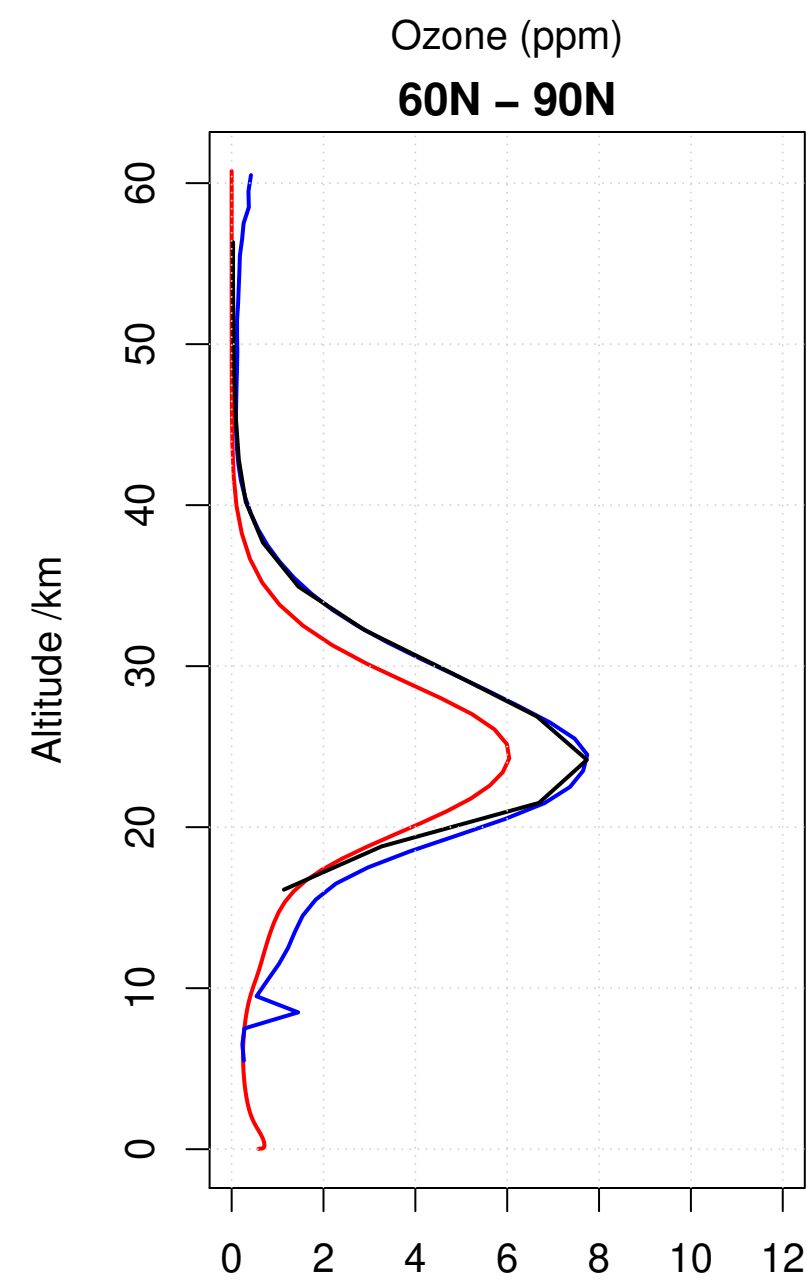
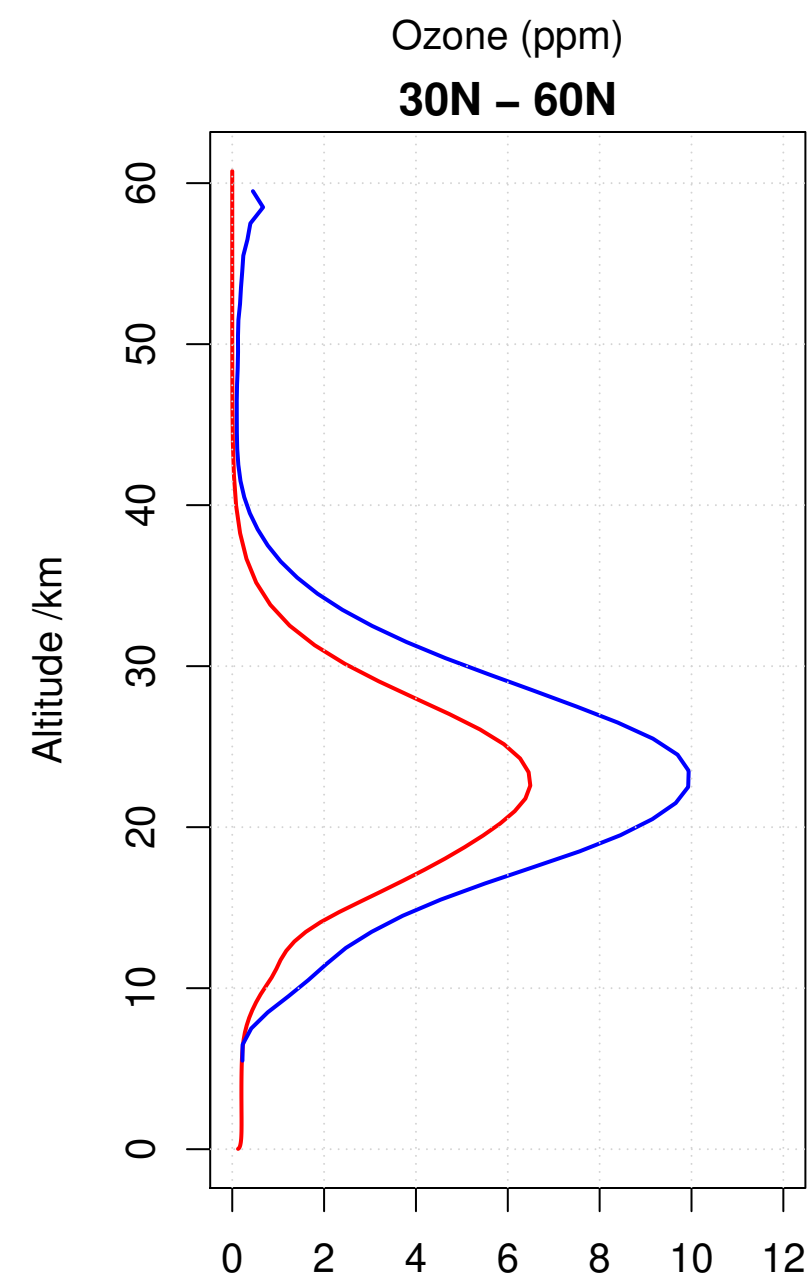
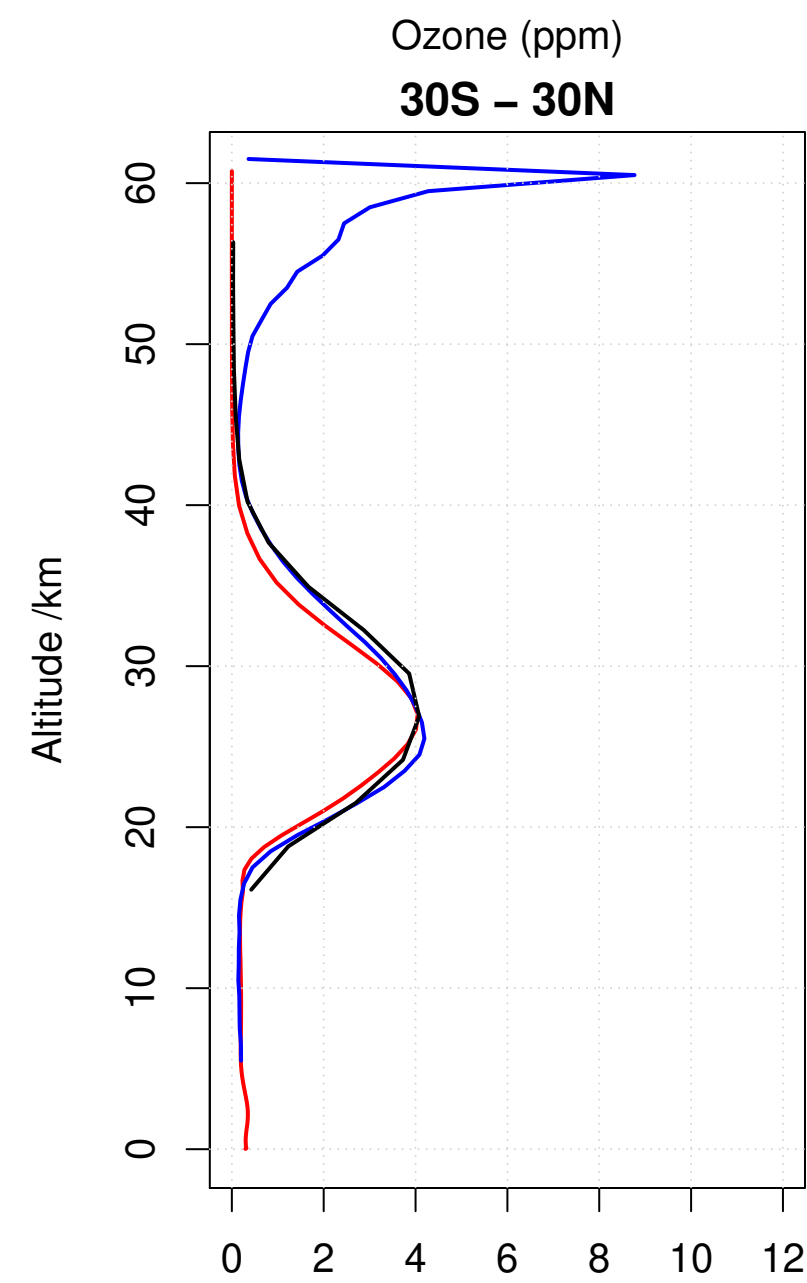
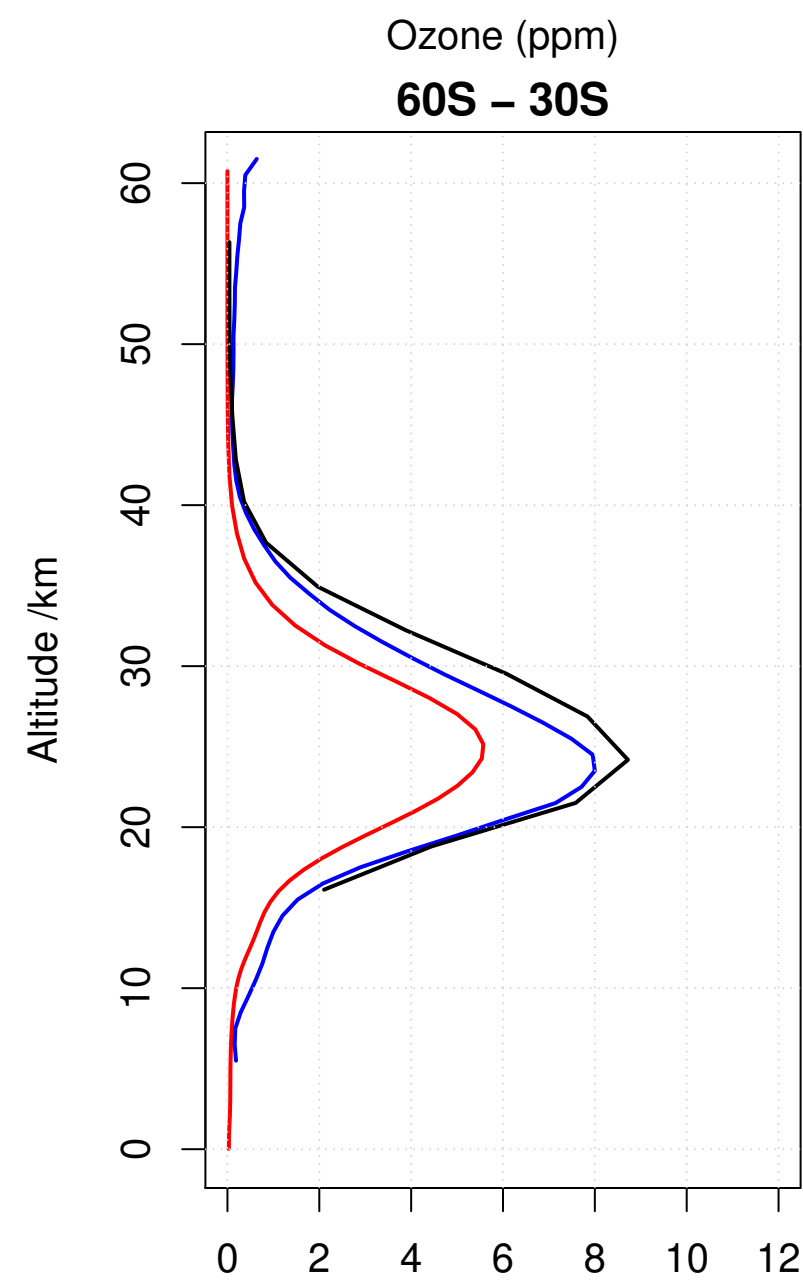
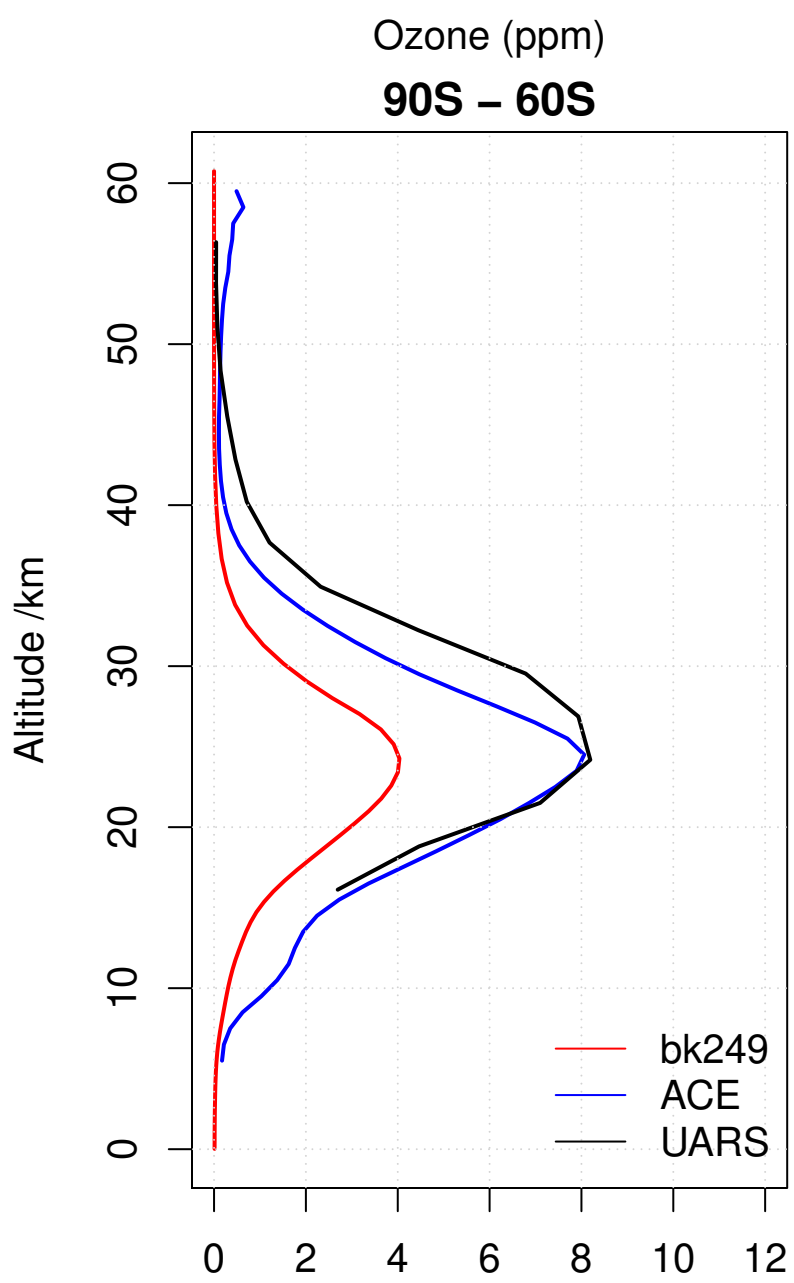
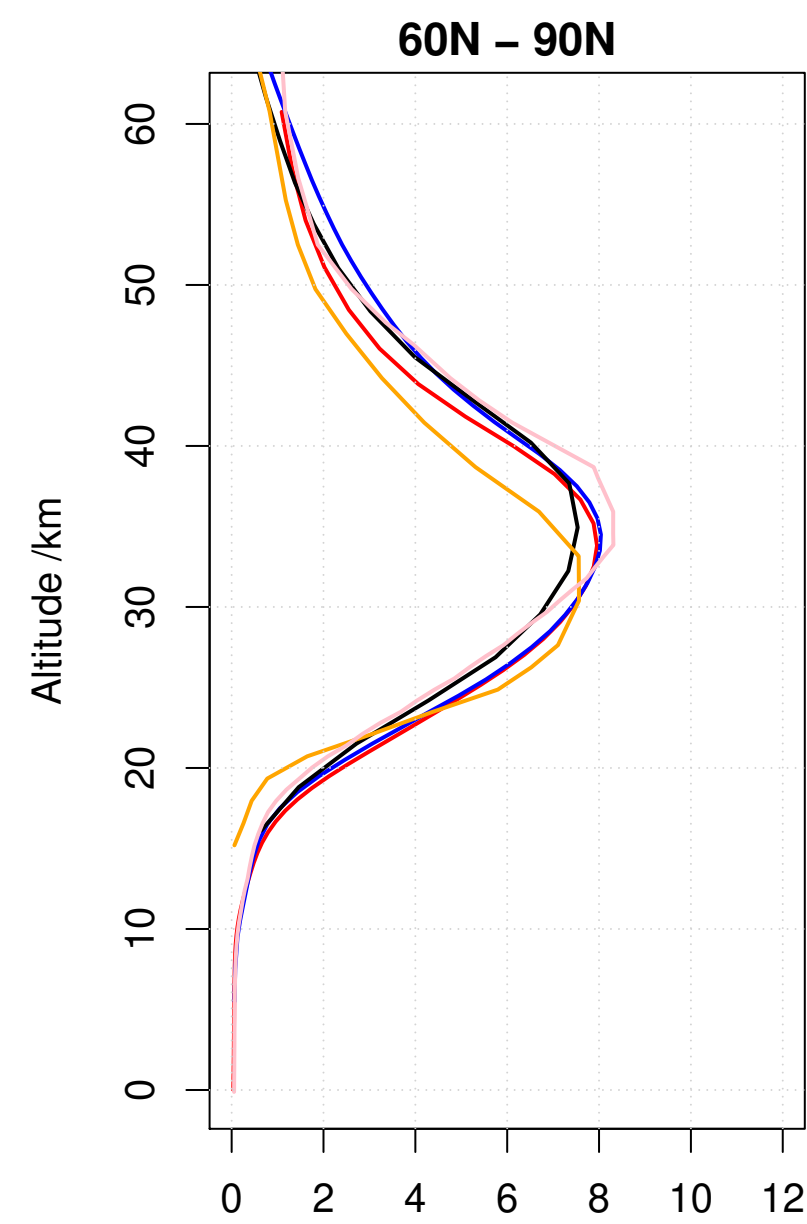
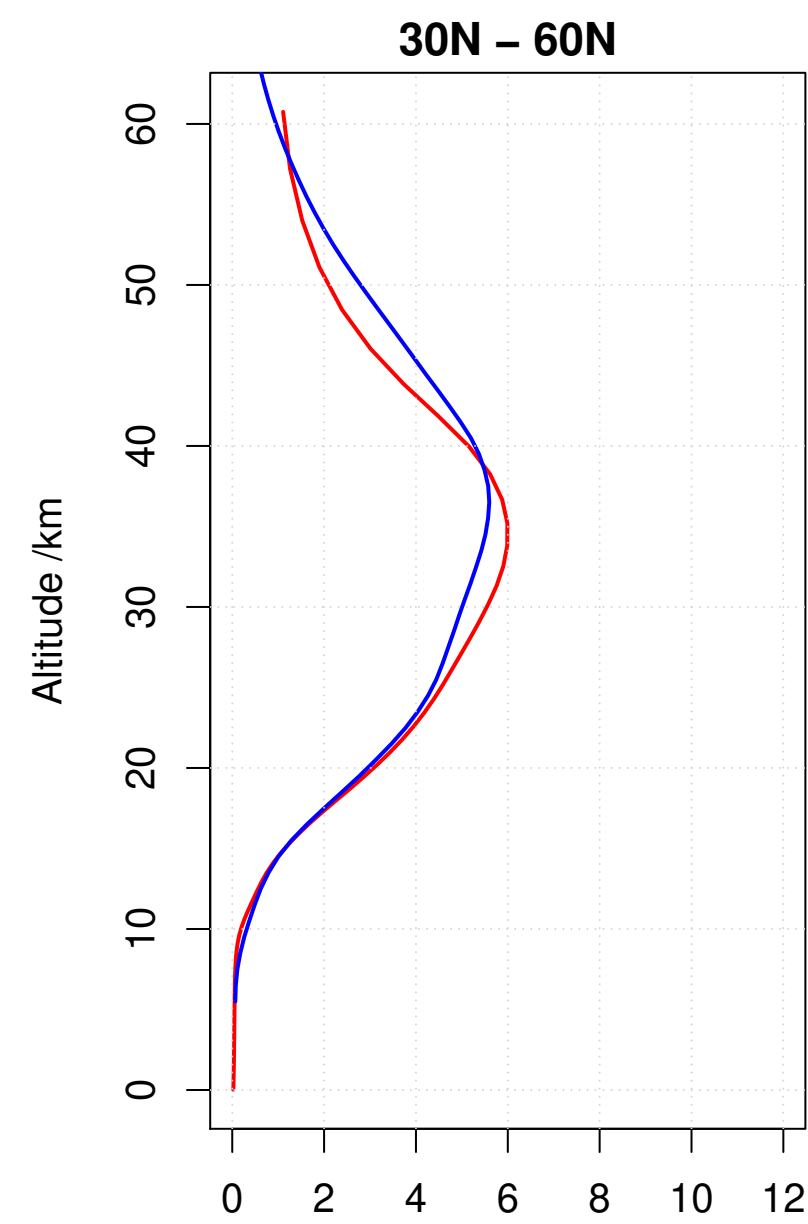
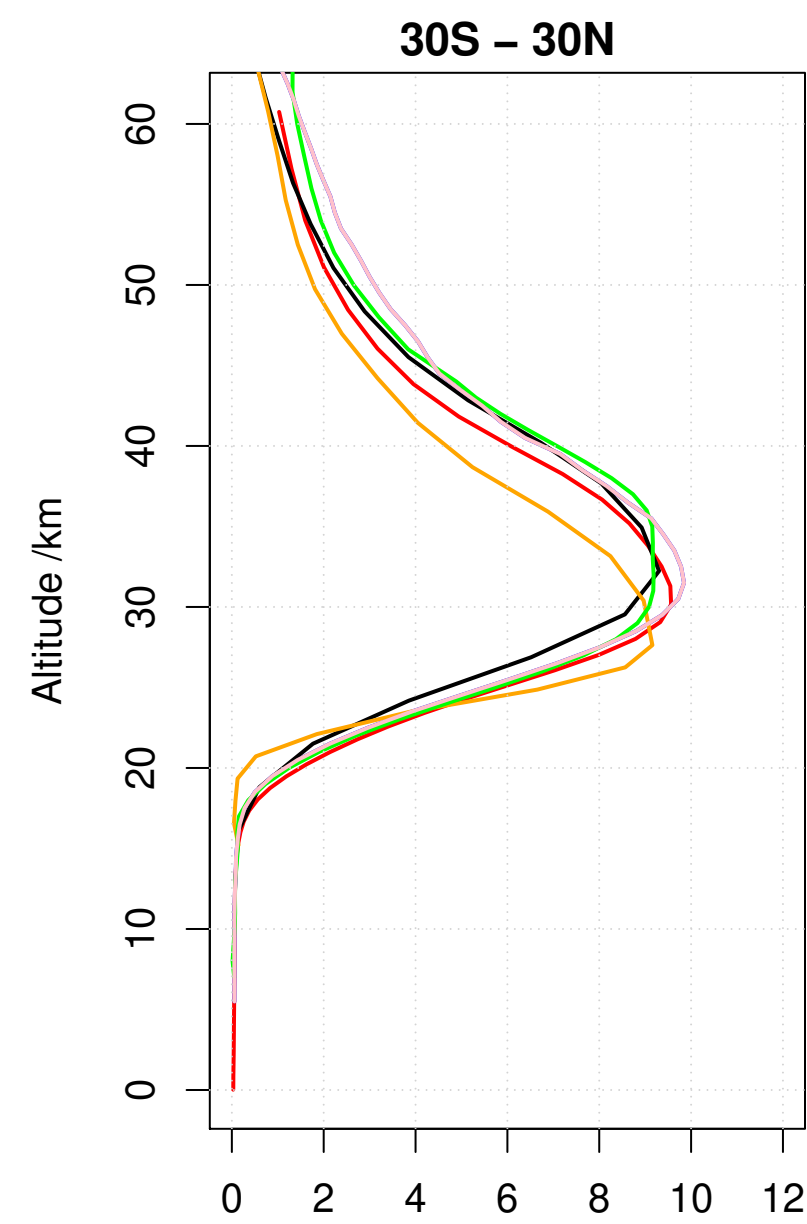
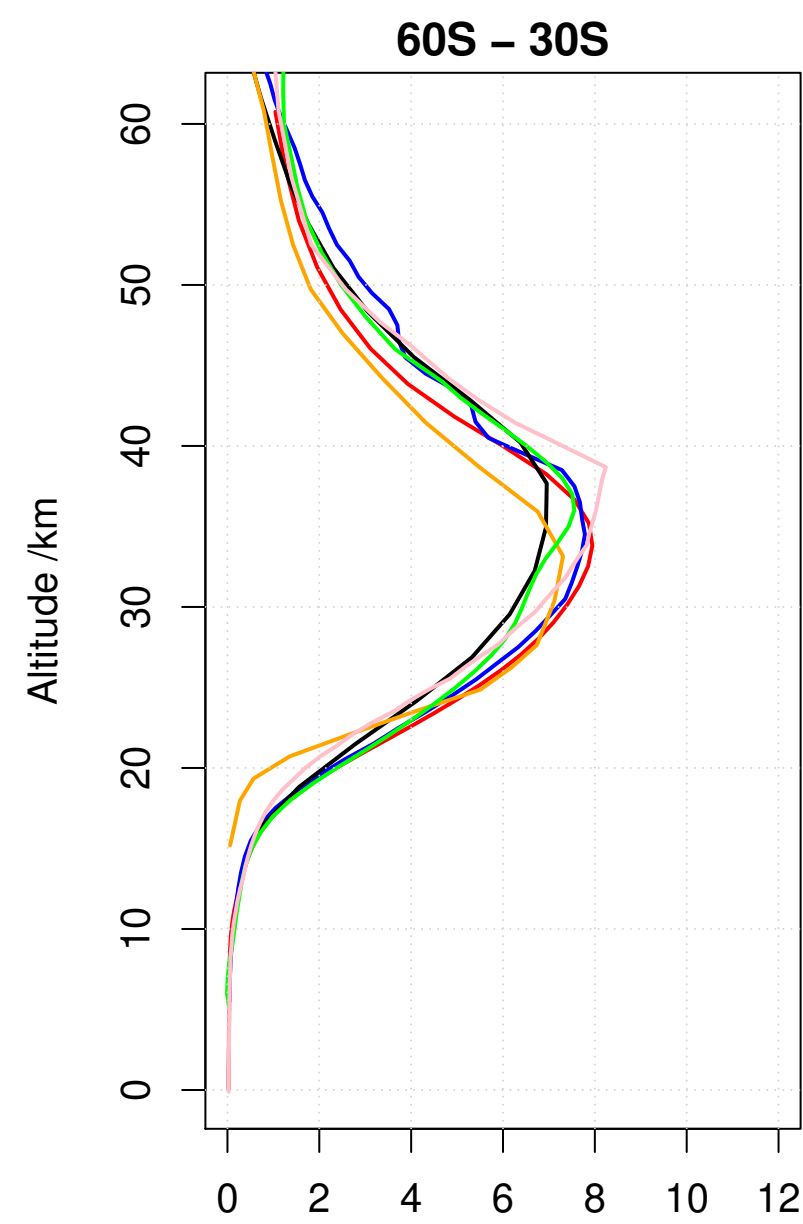
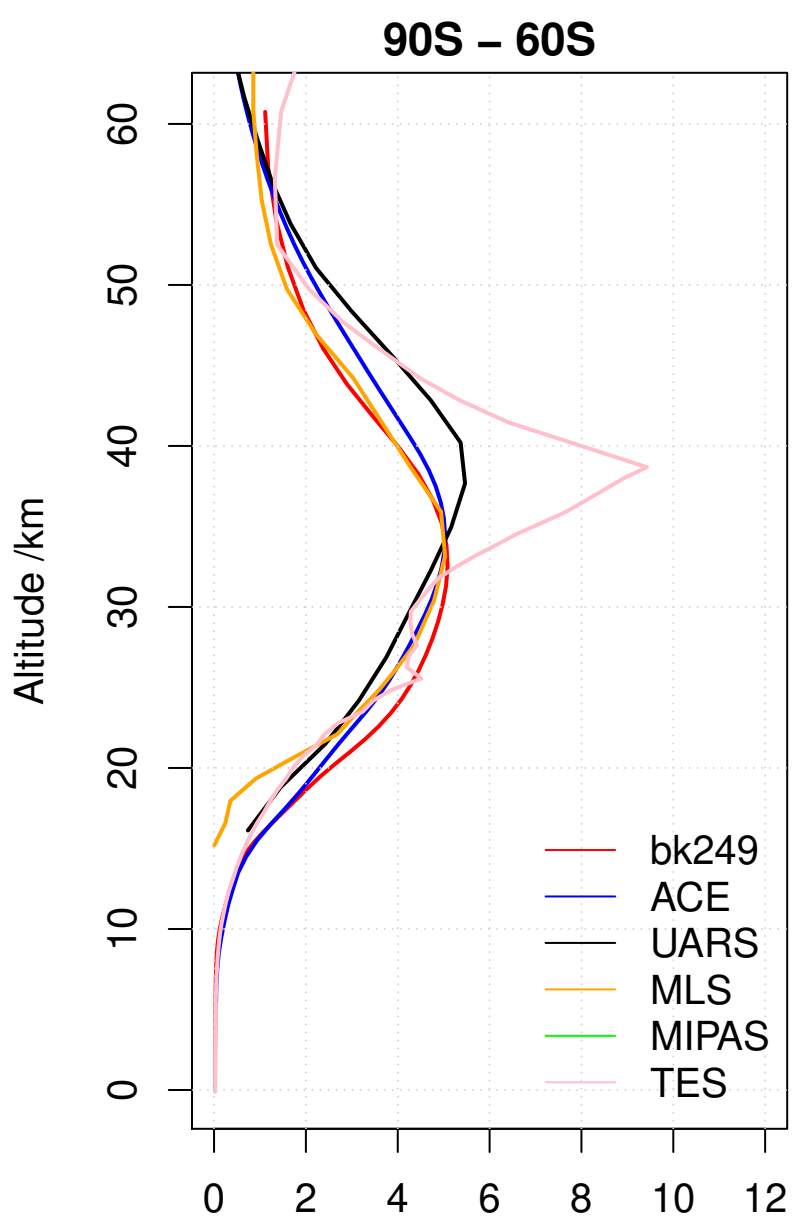
Total Ox Deposition = $1e+03$ Tg/yr

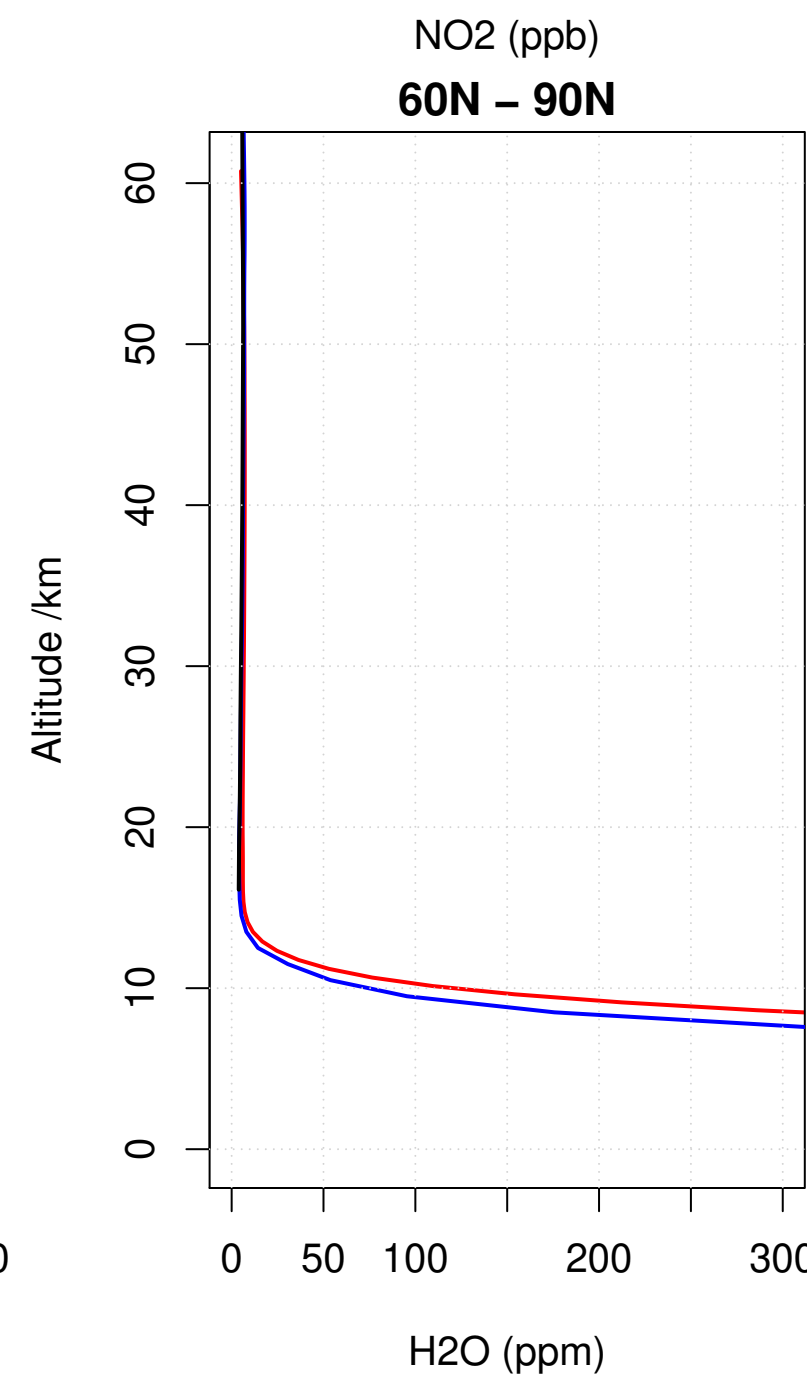
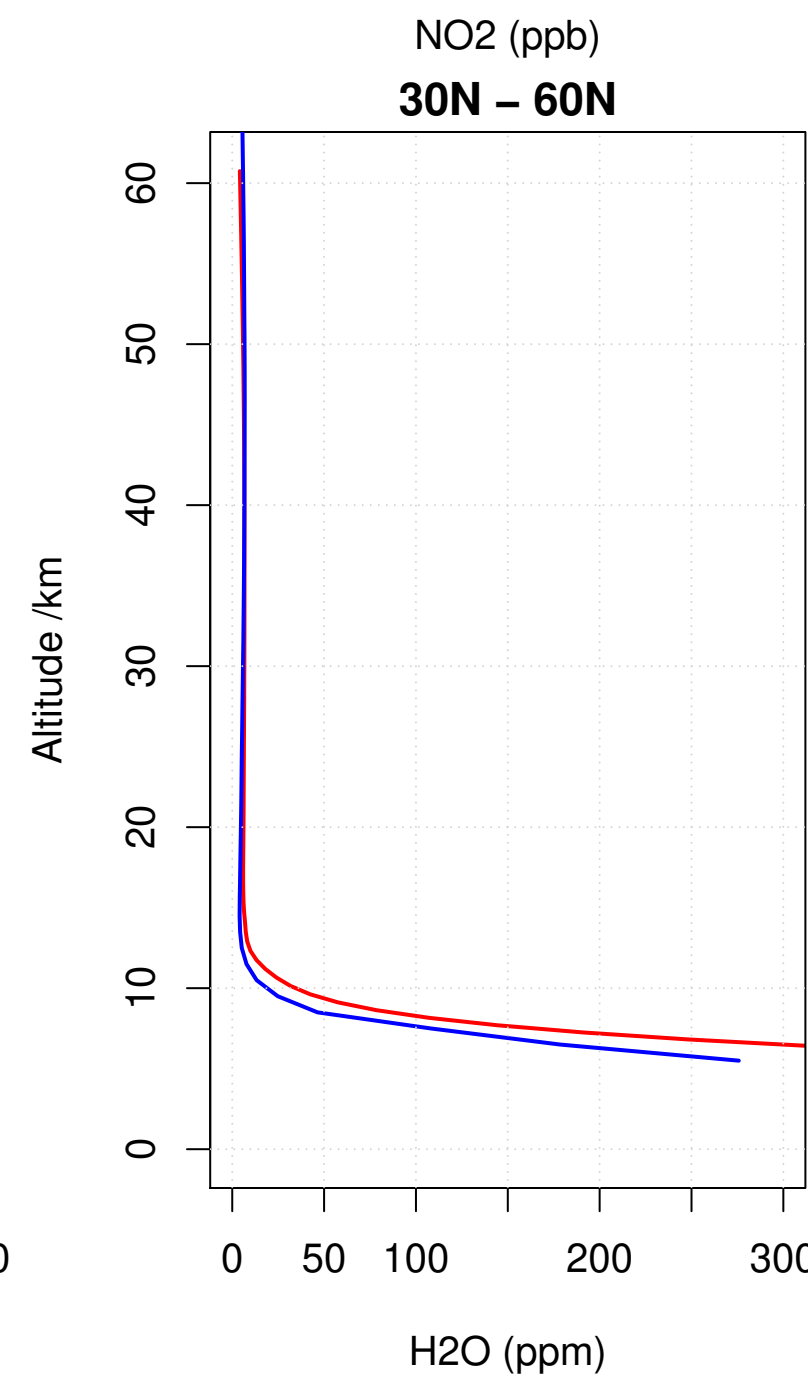
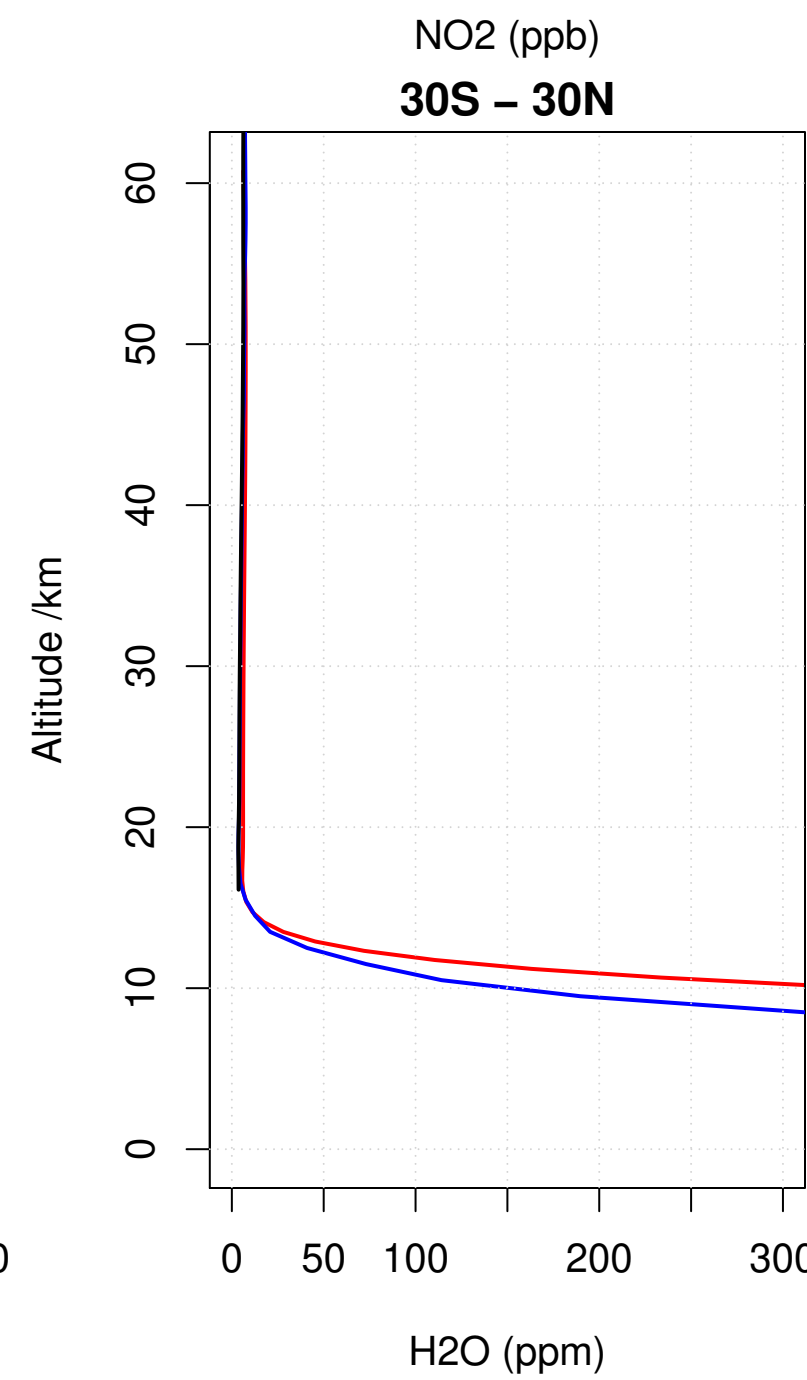
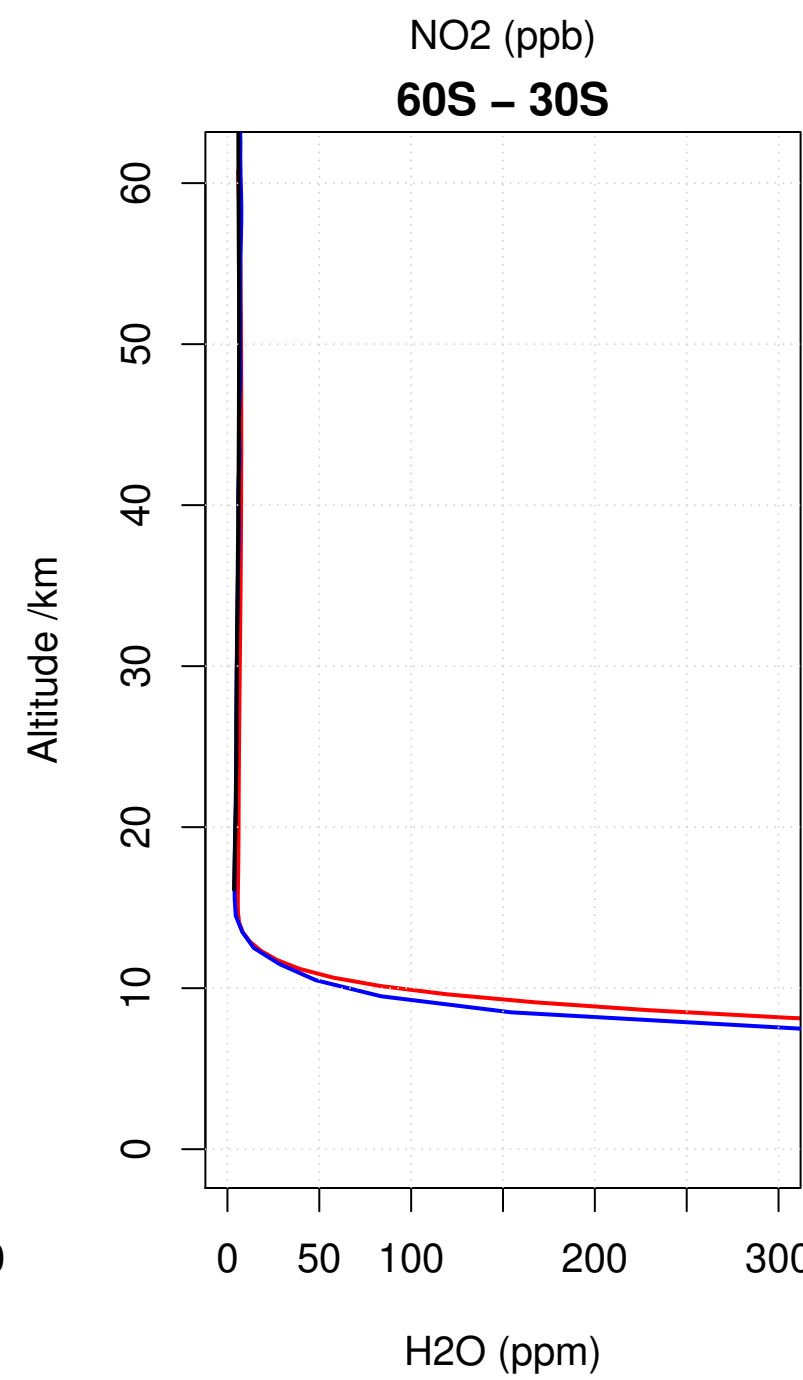
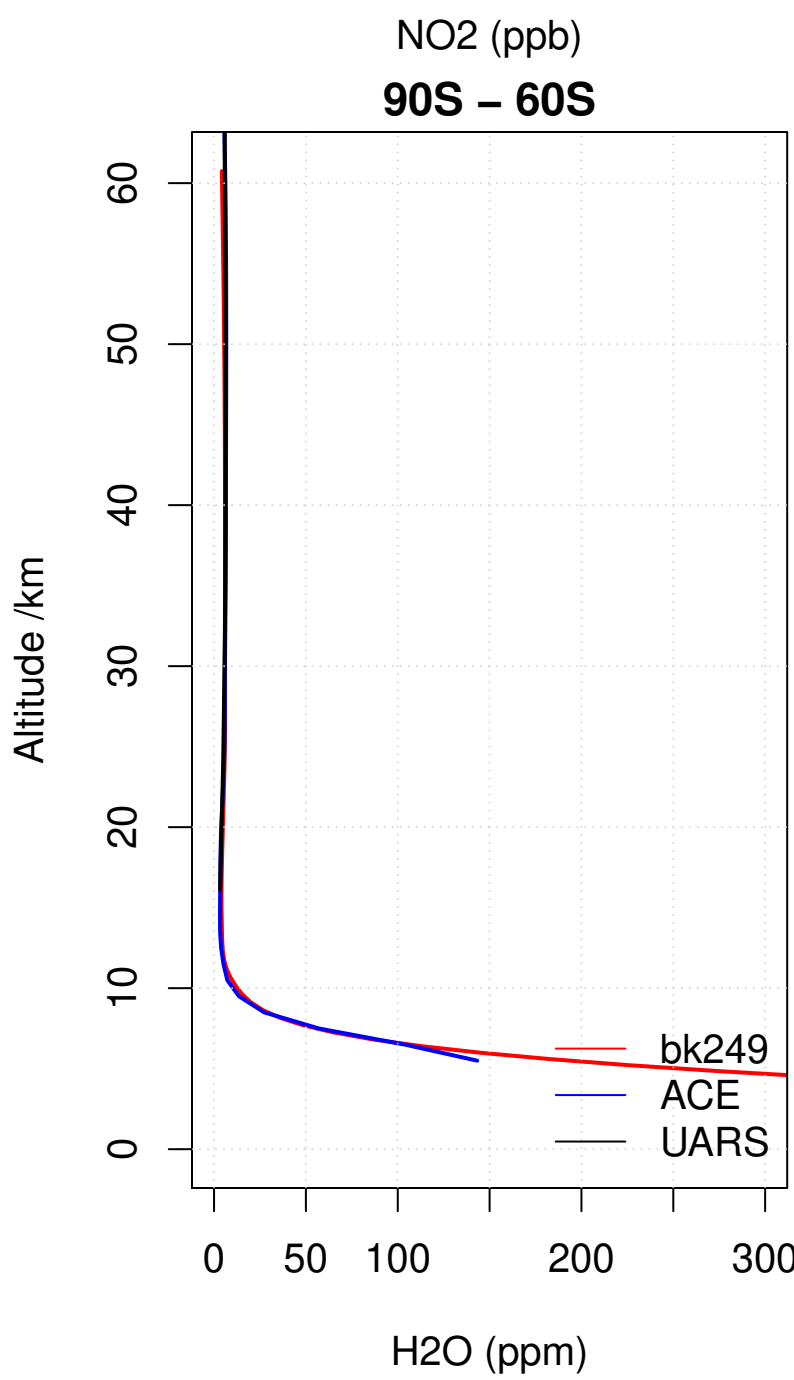
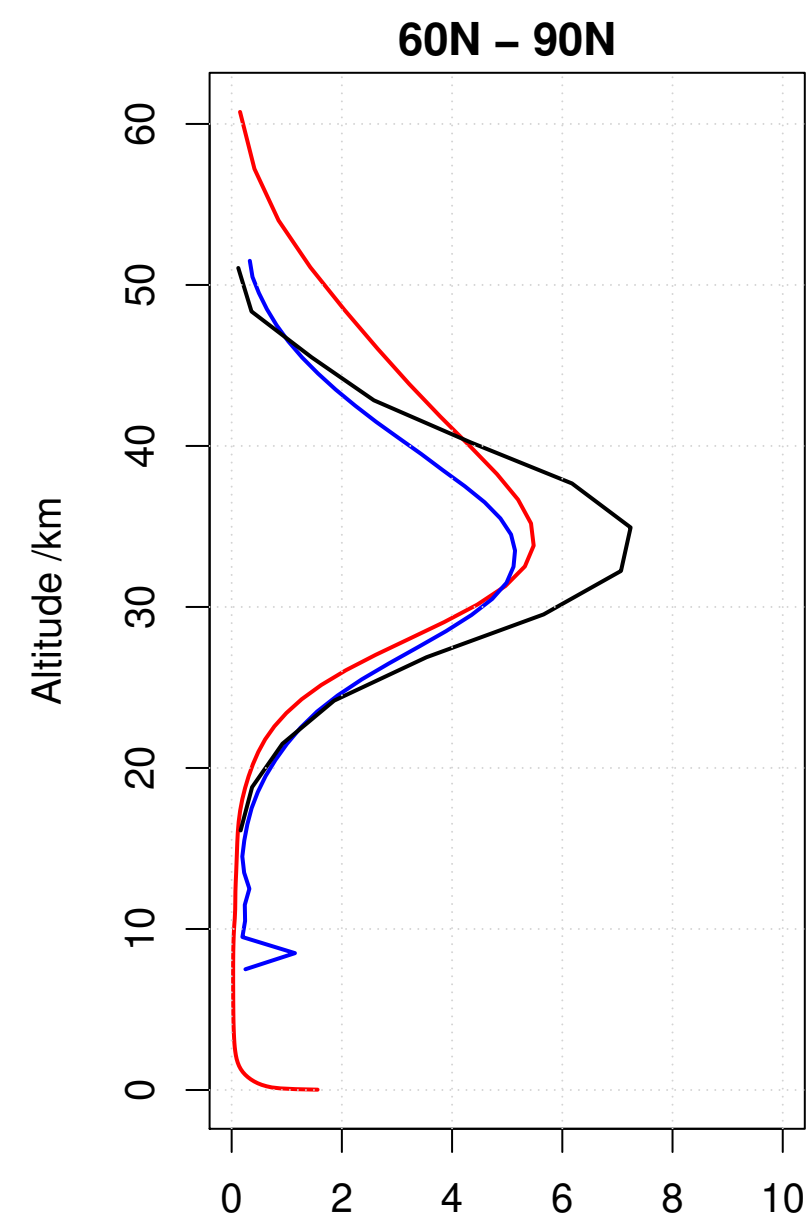
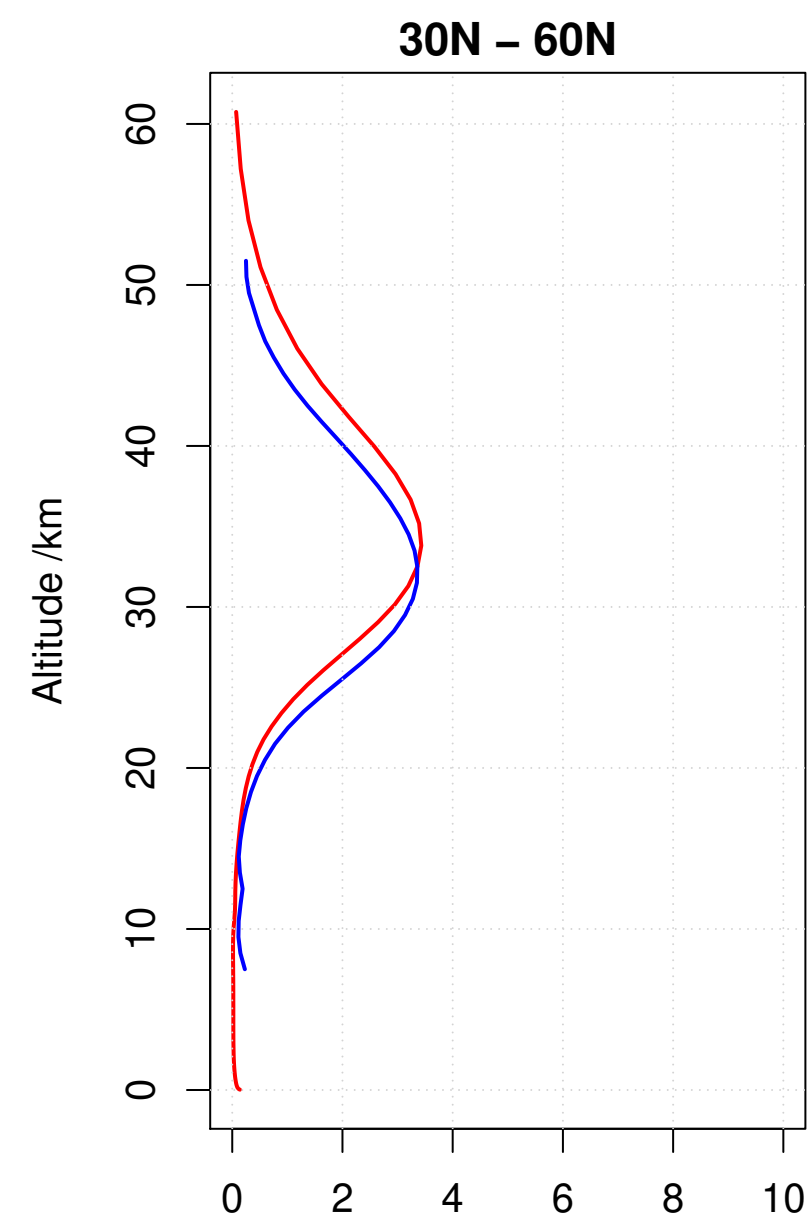
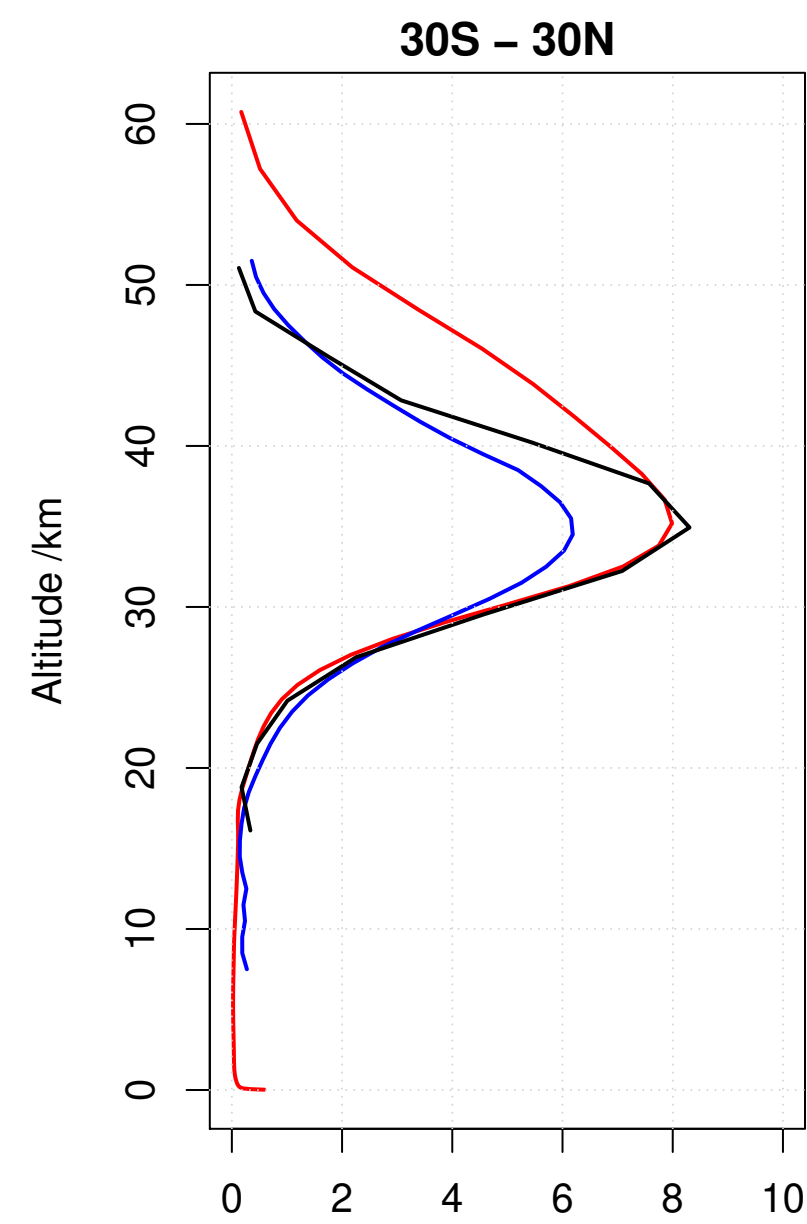
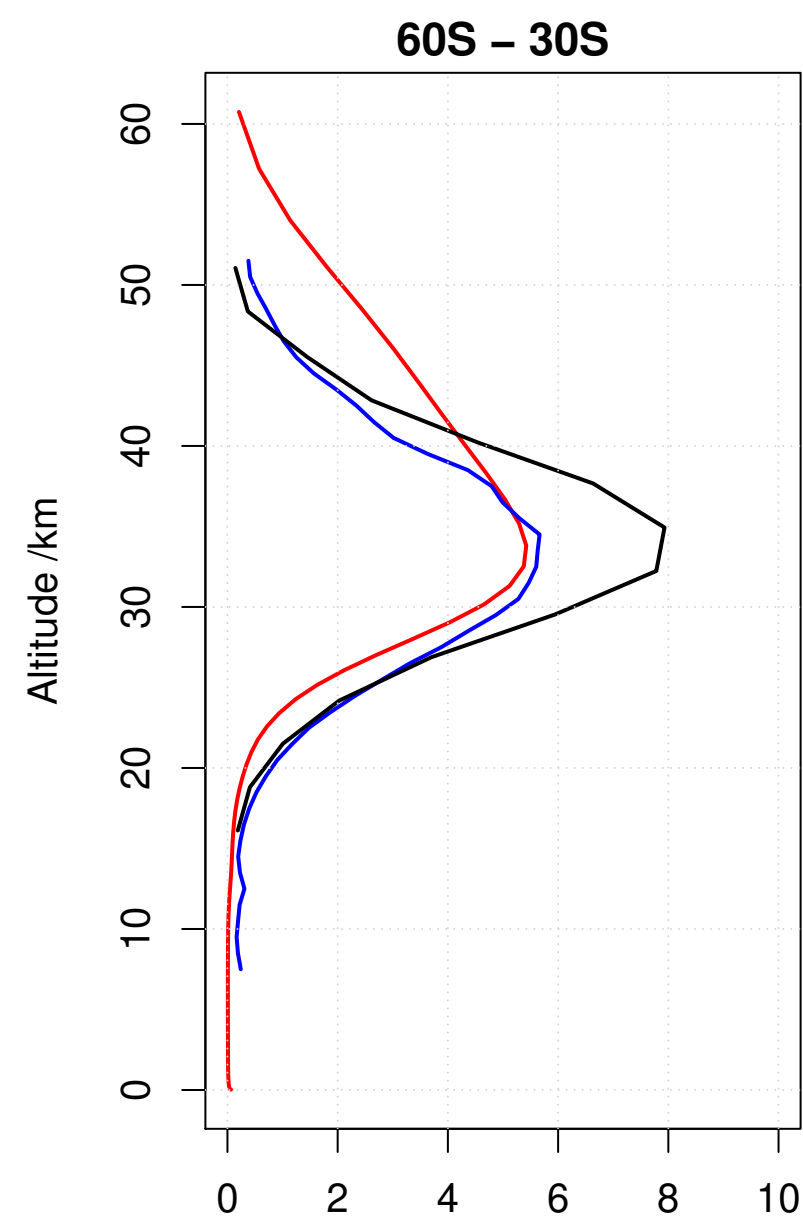
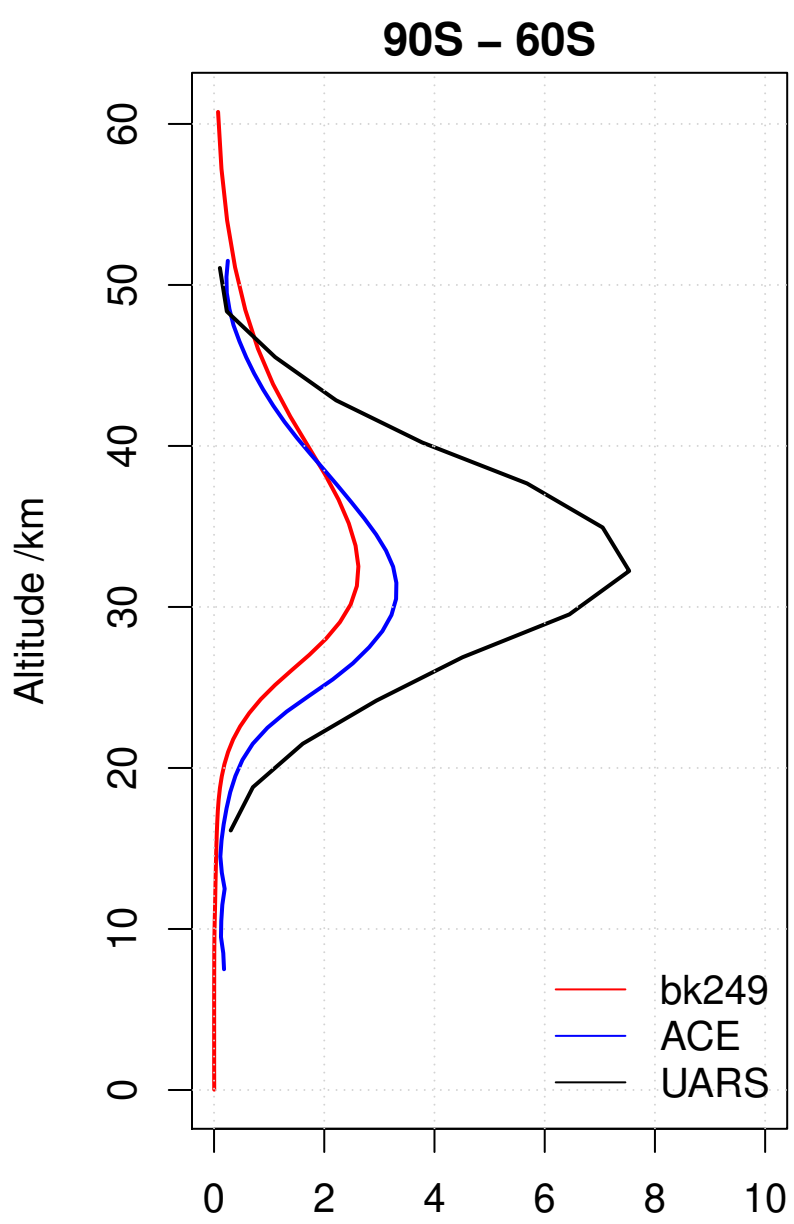


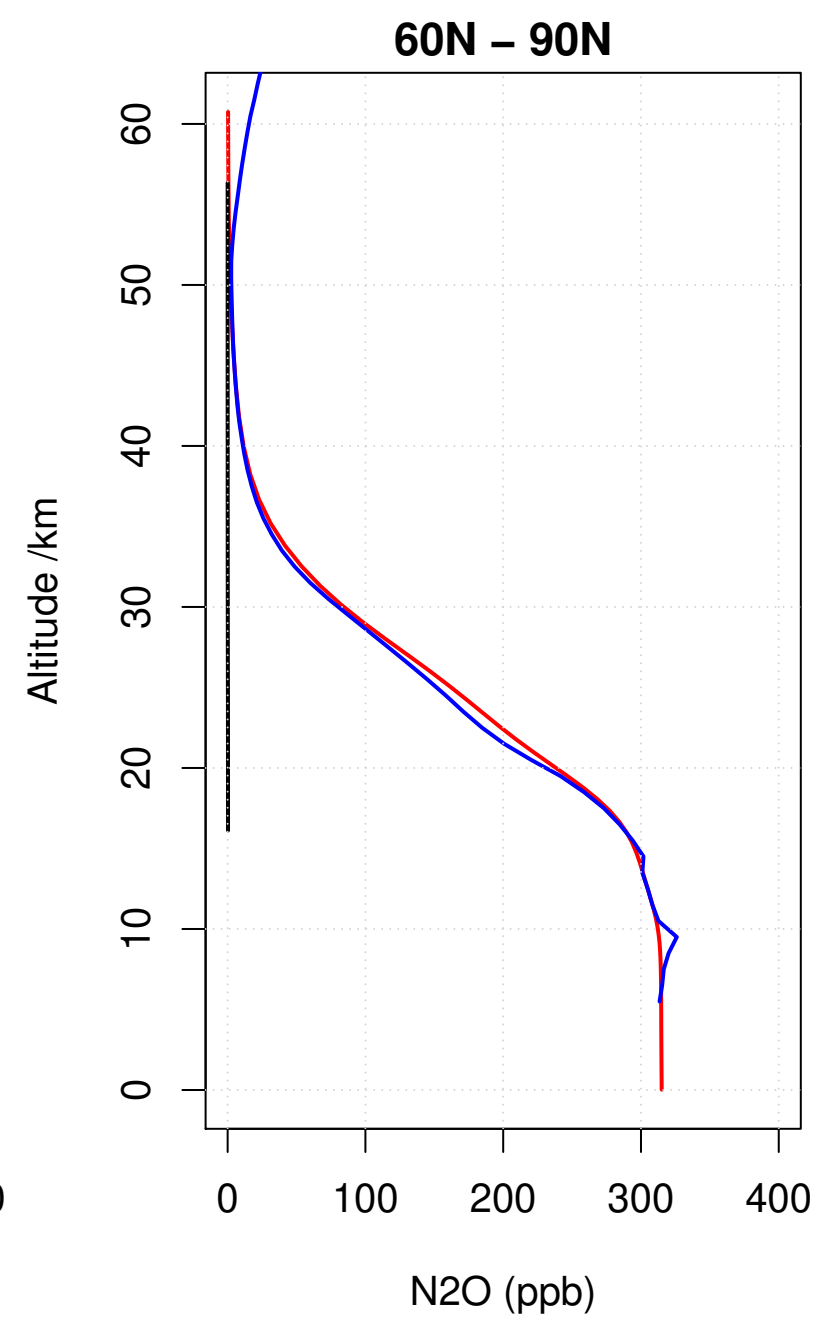
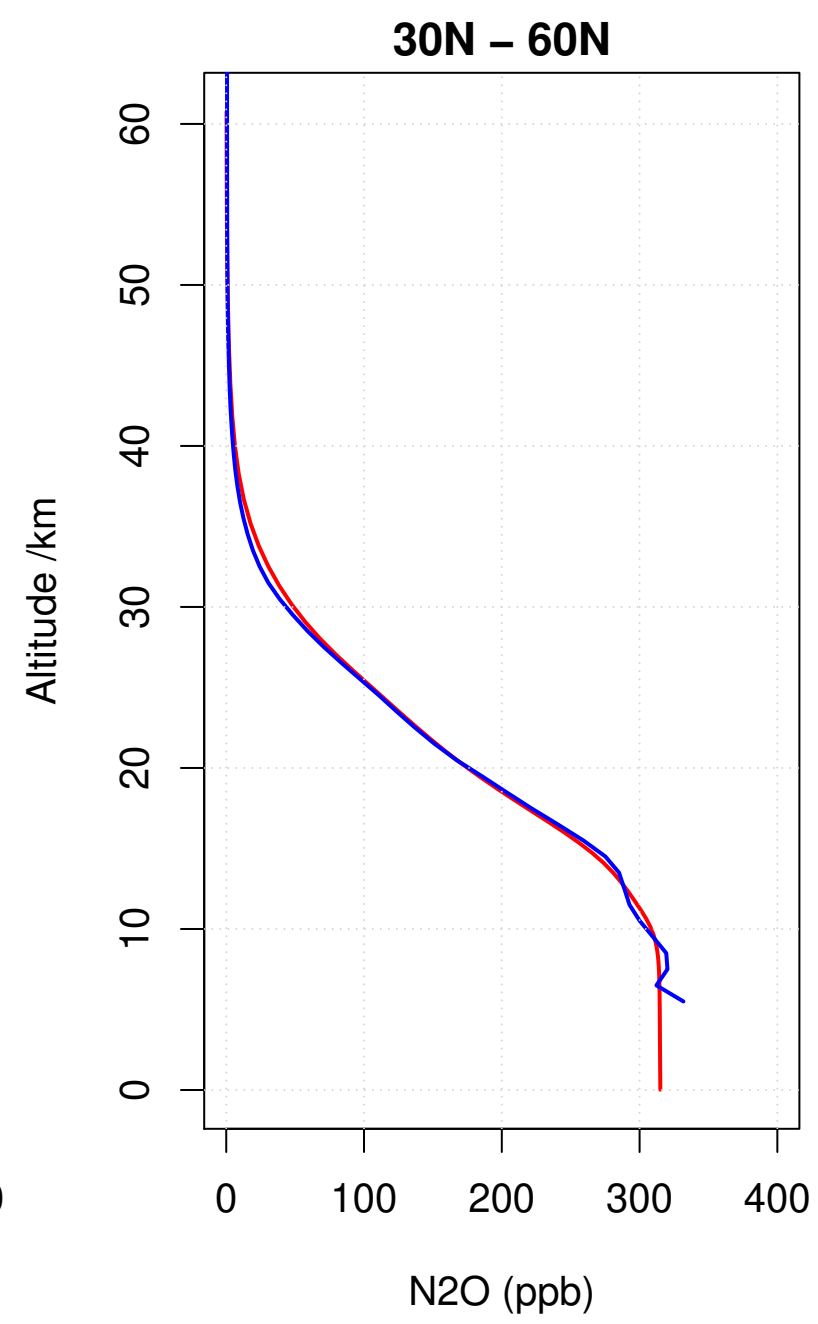
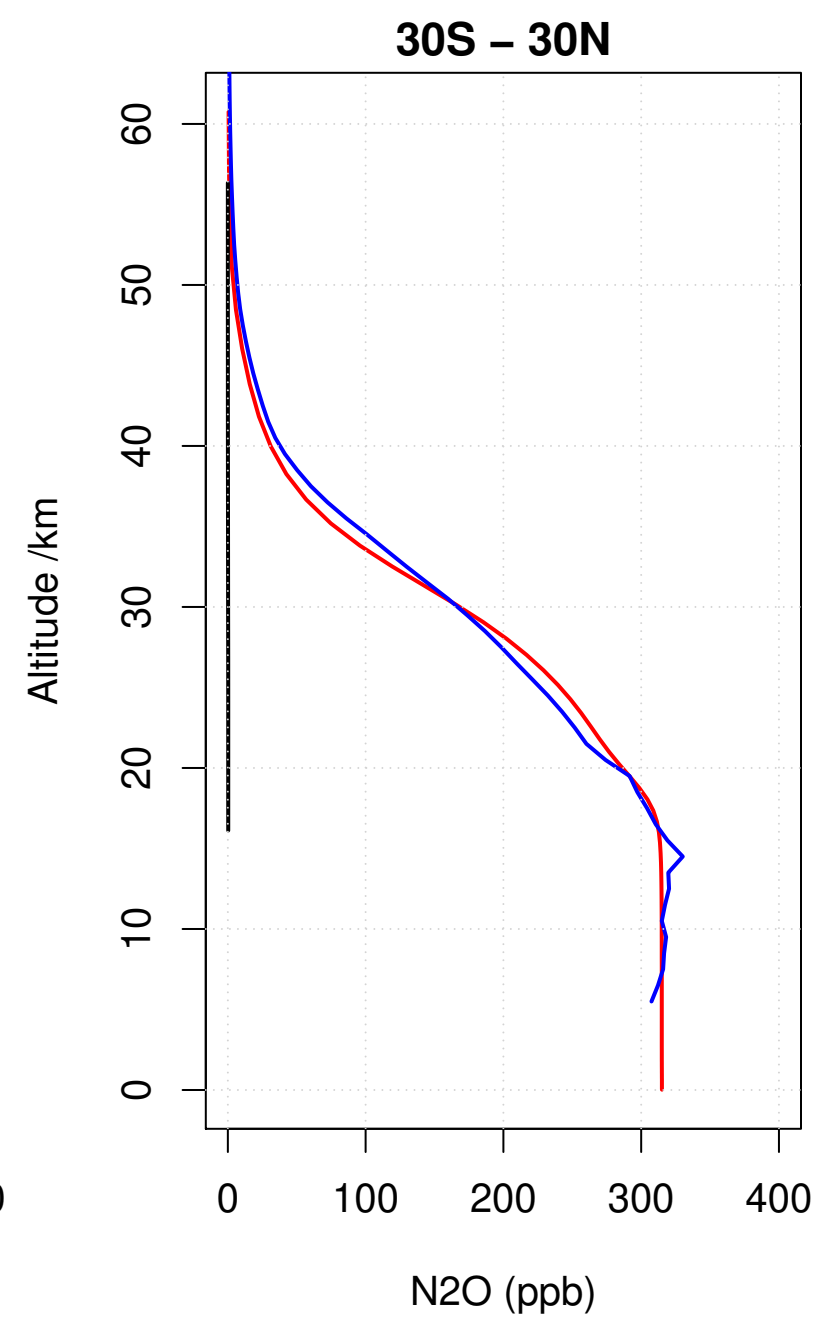
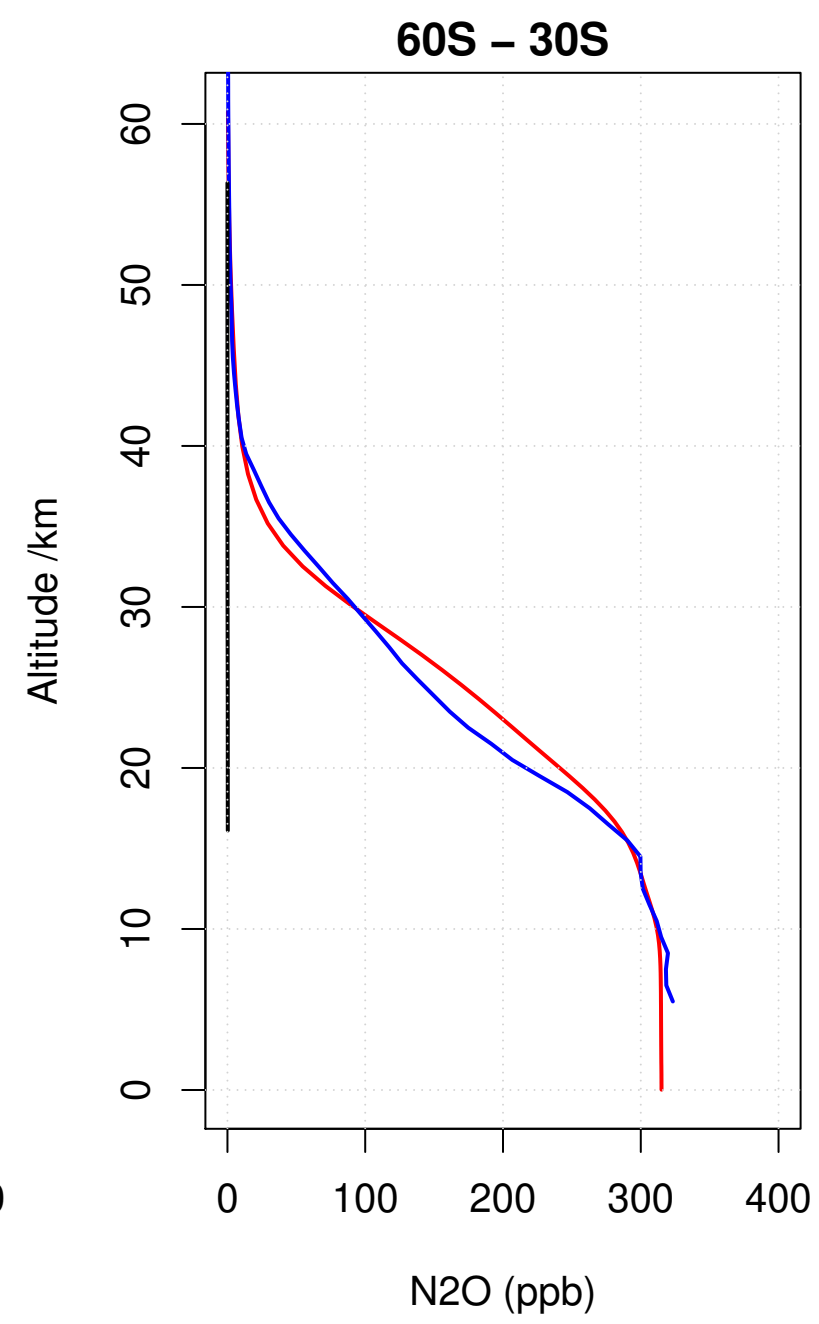
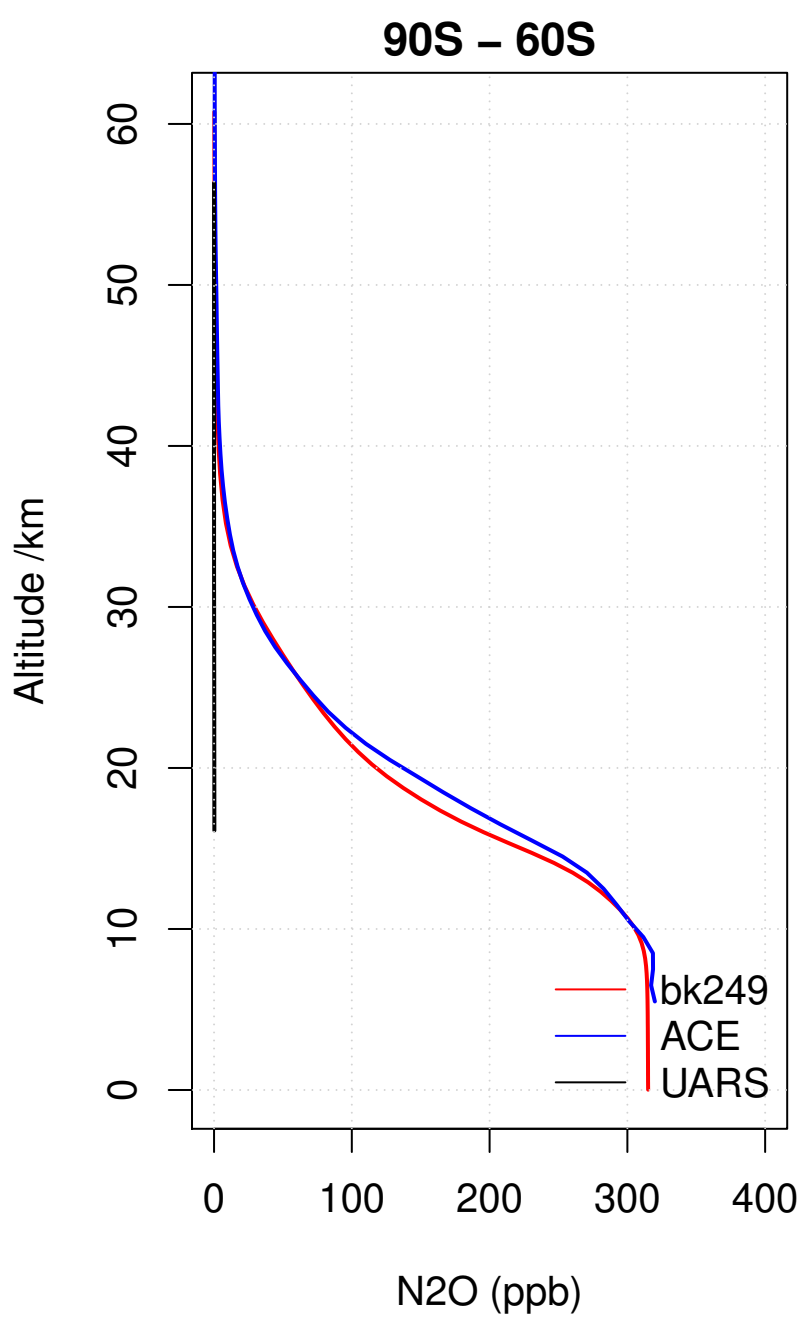
UKCA Ox deposition bo717

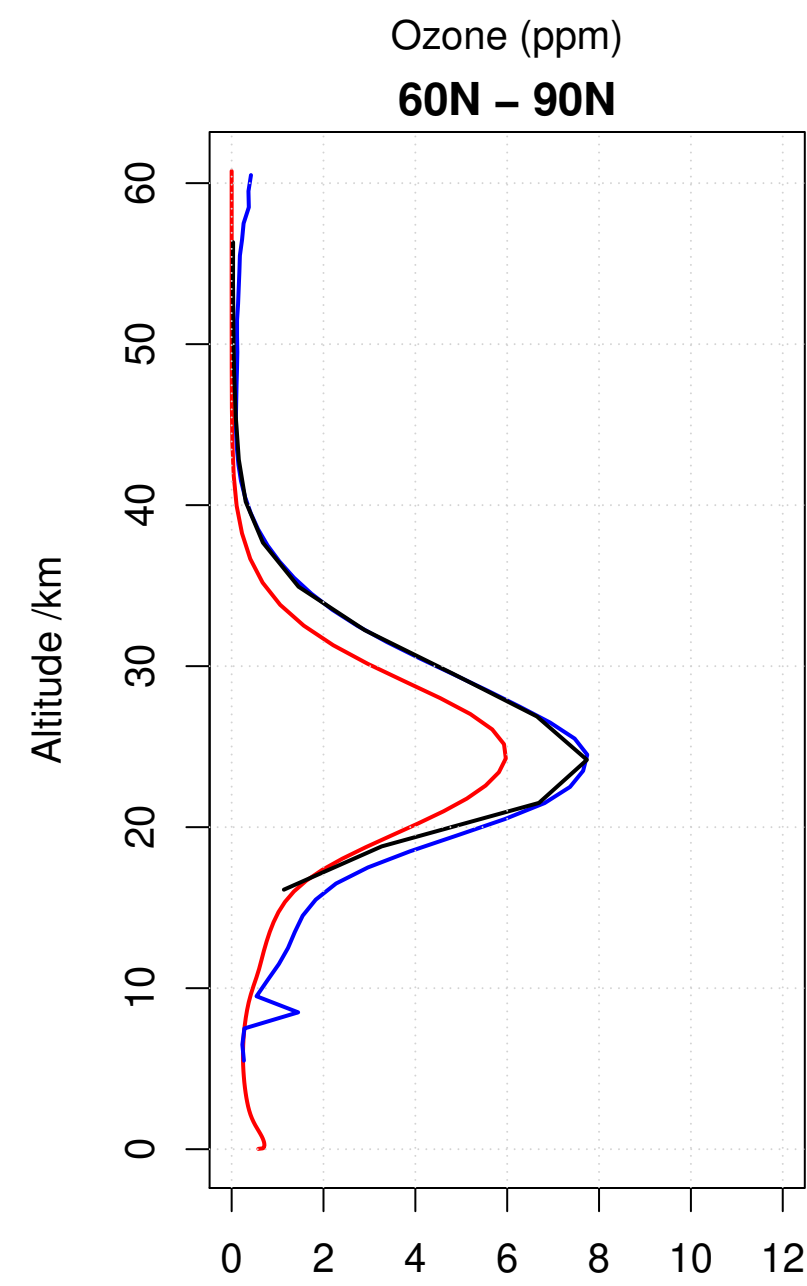
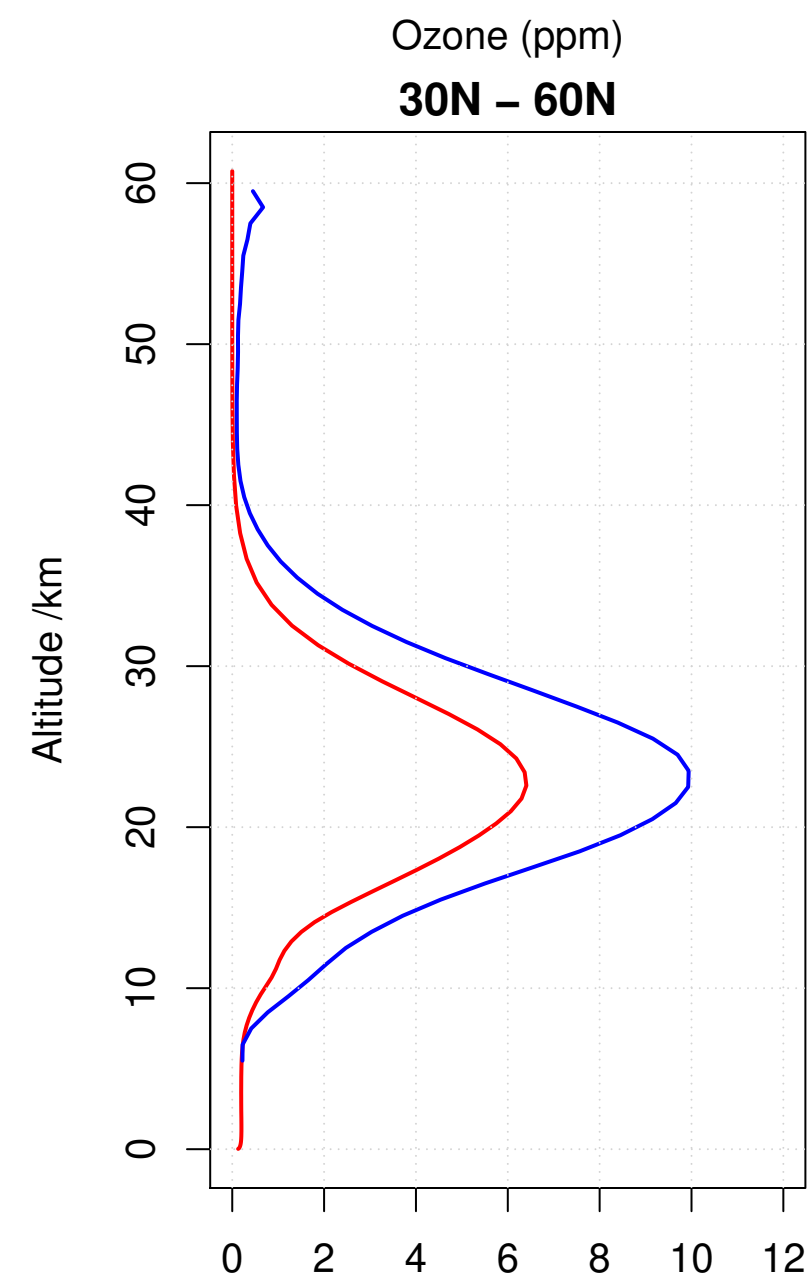
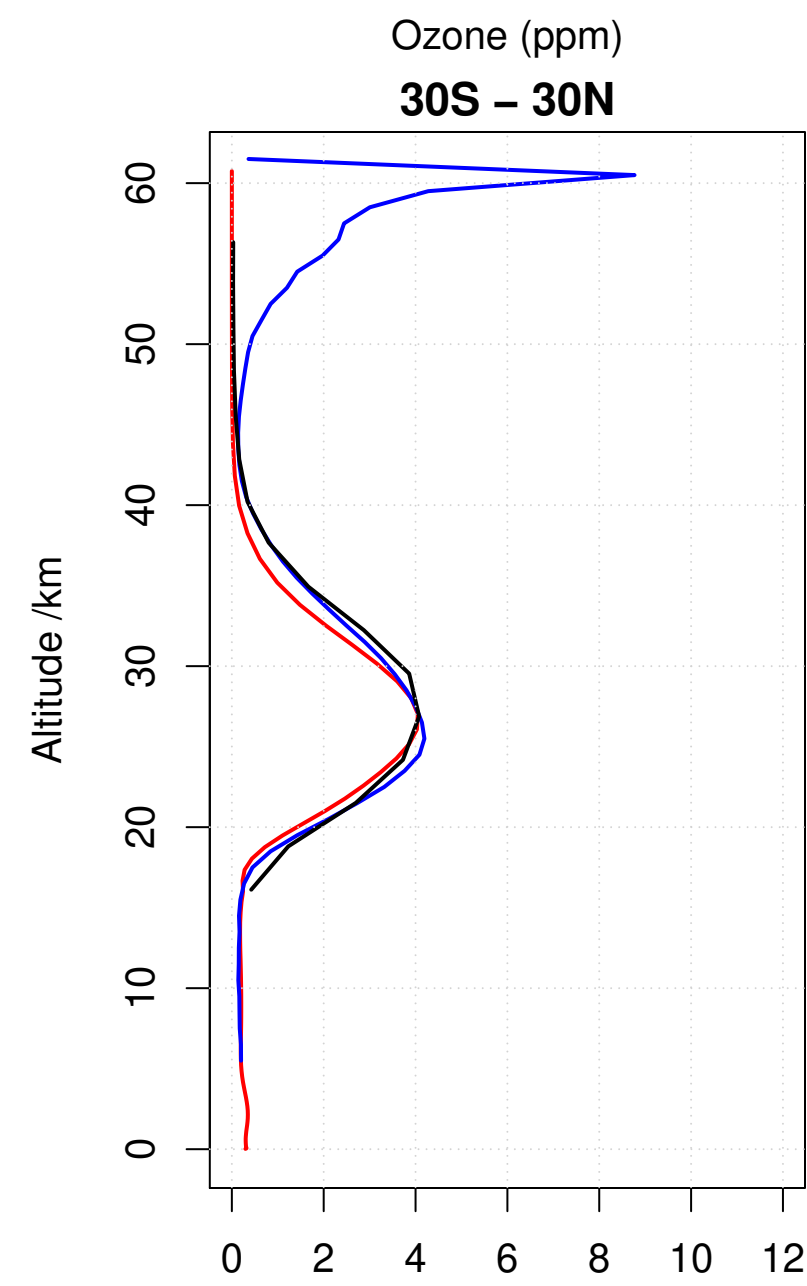
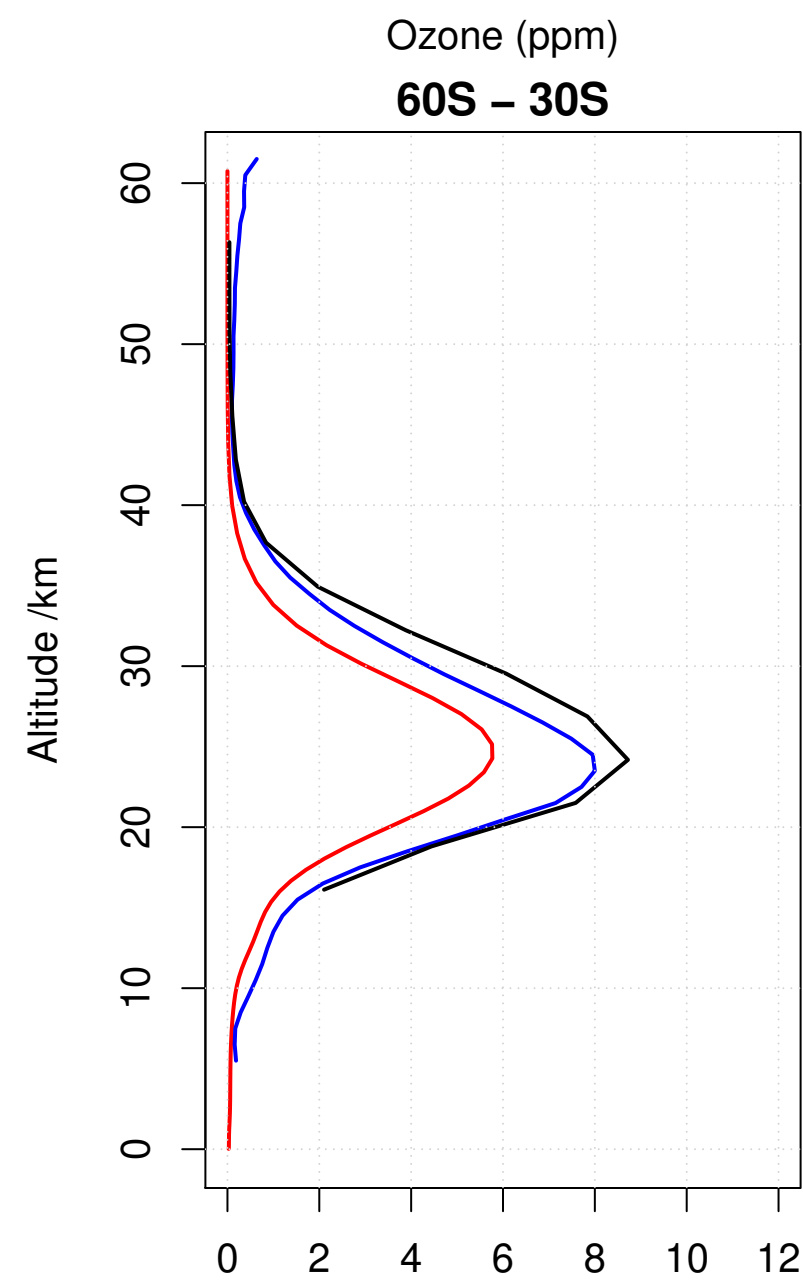
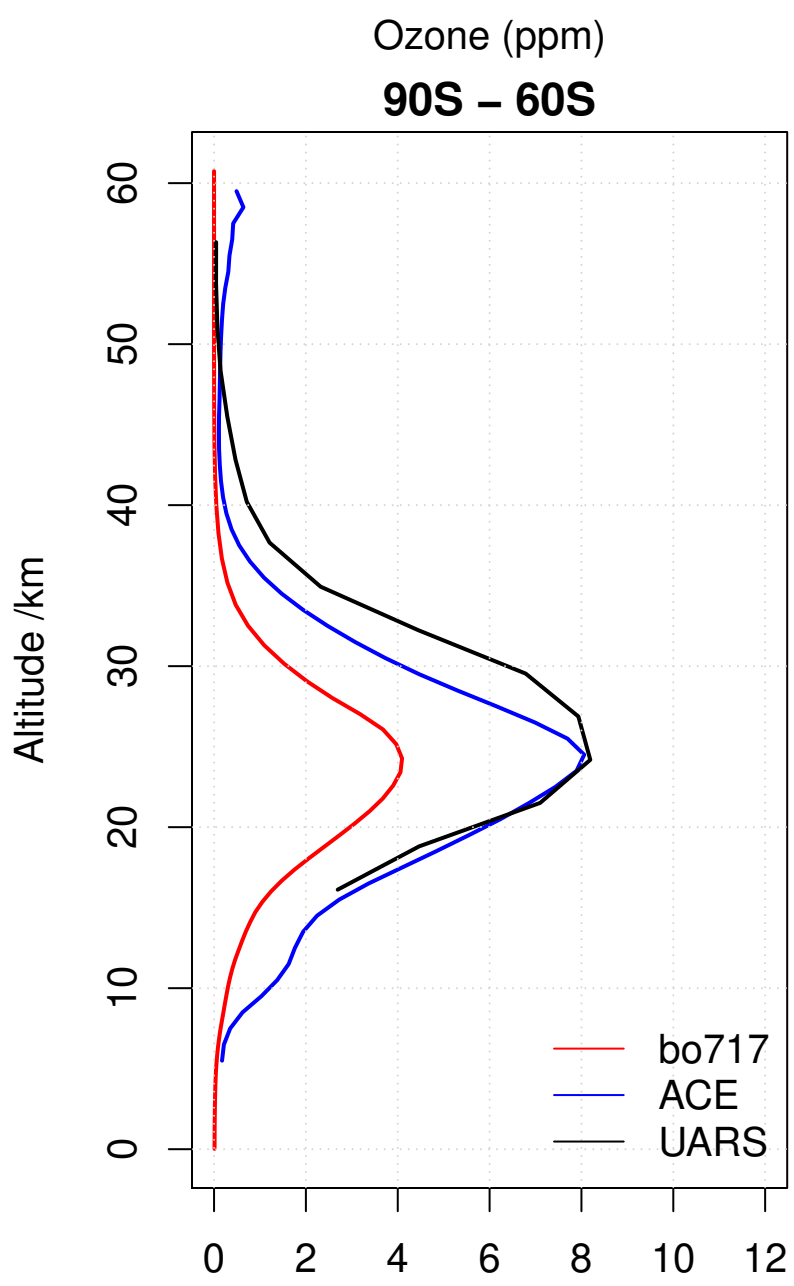
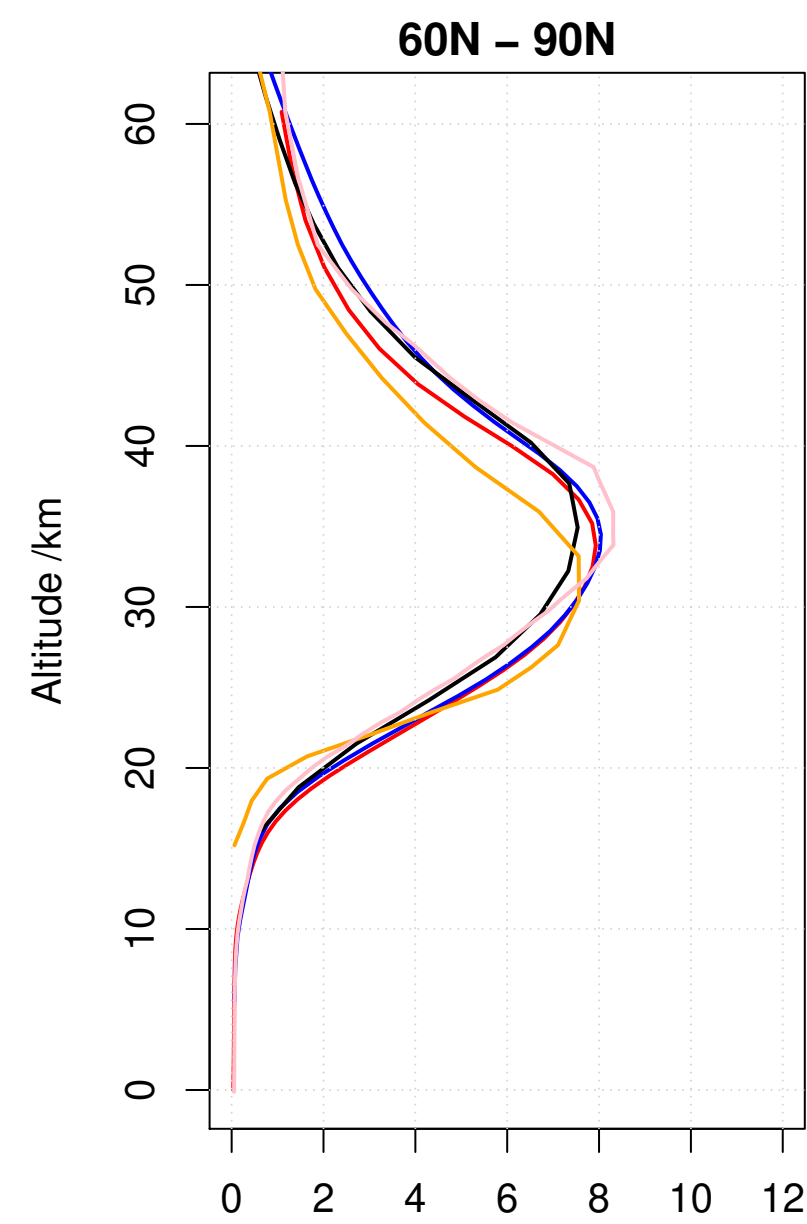
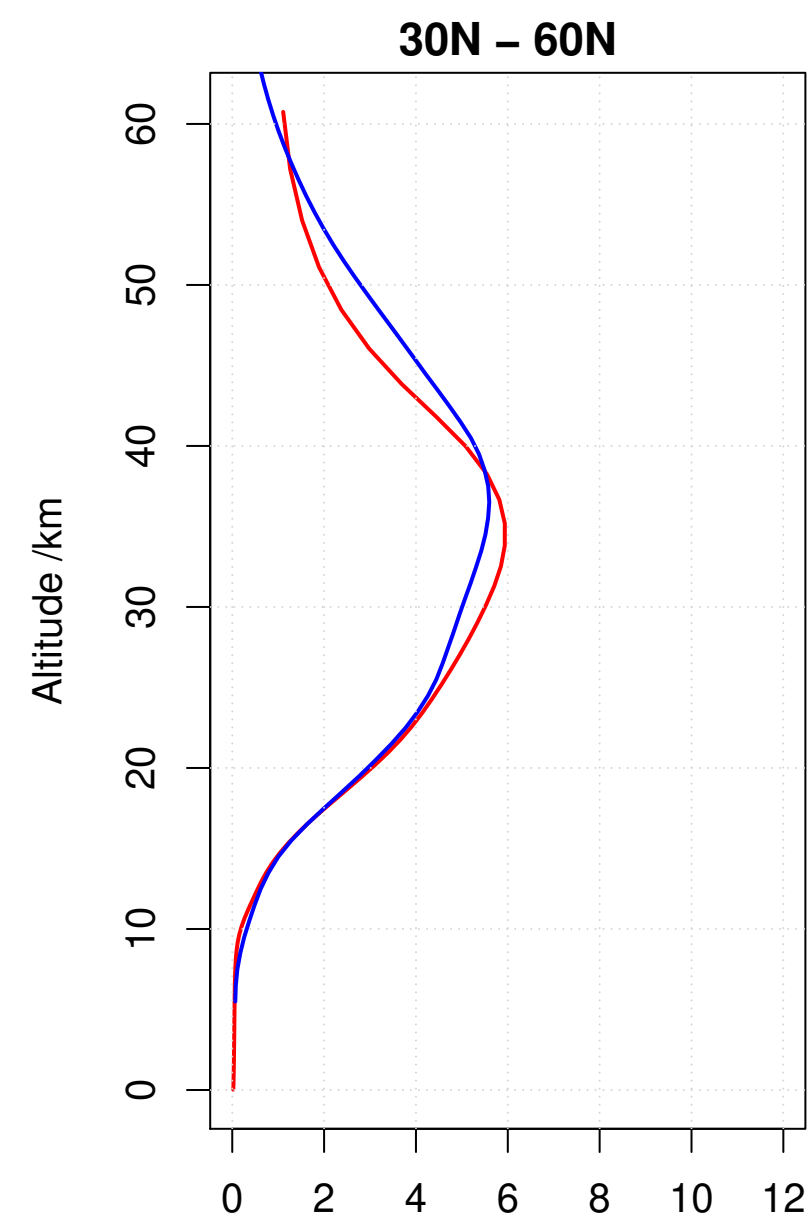
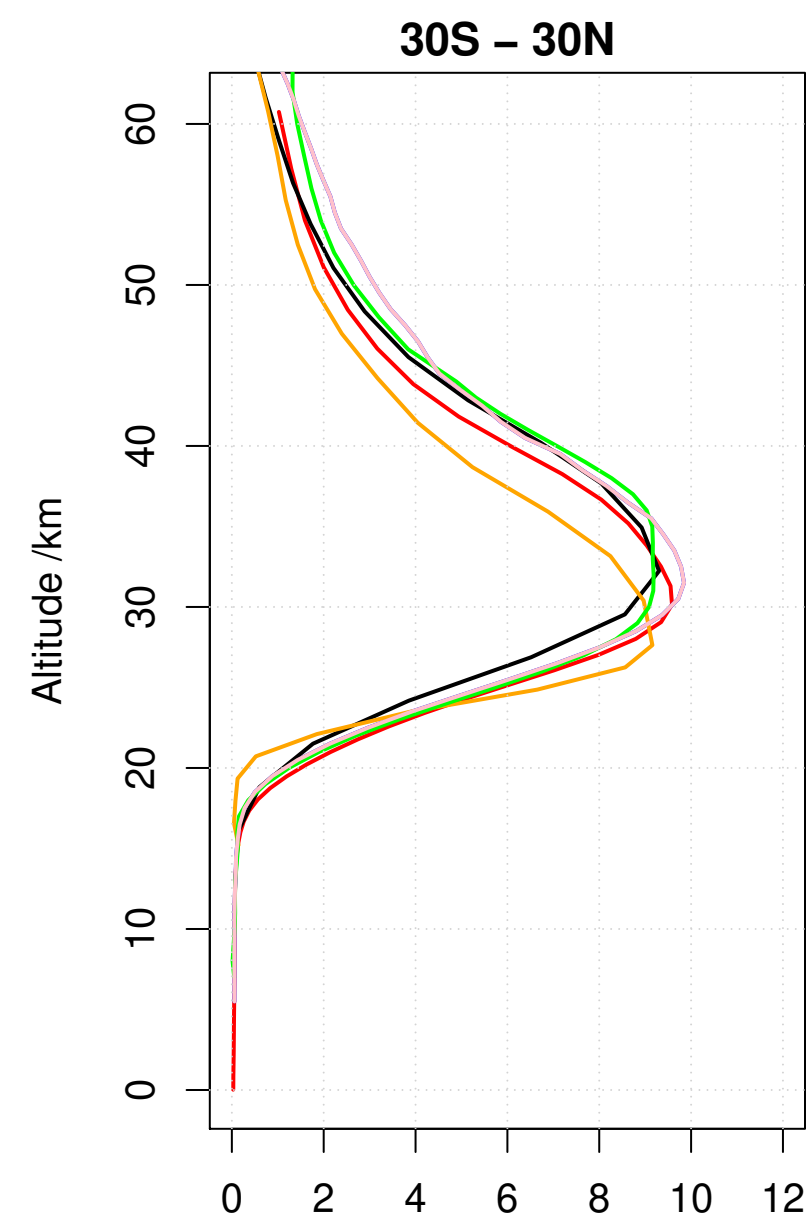
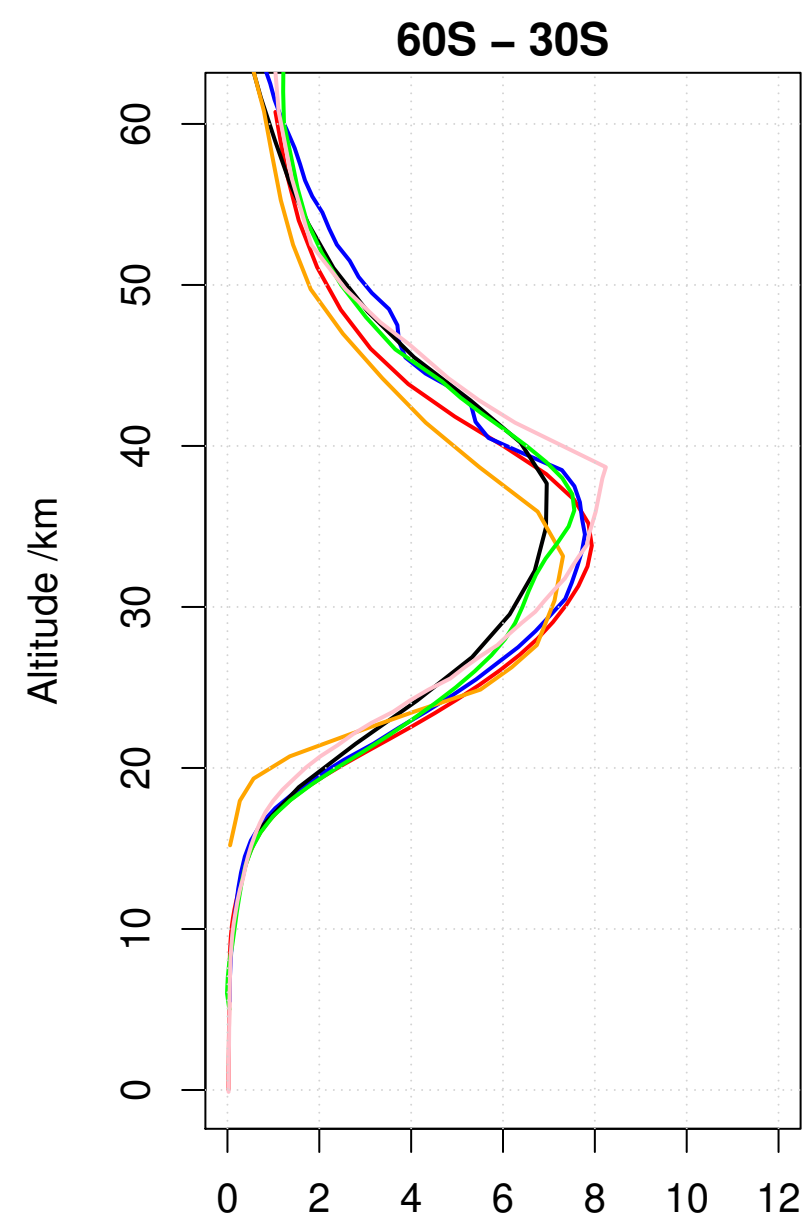
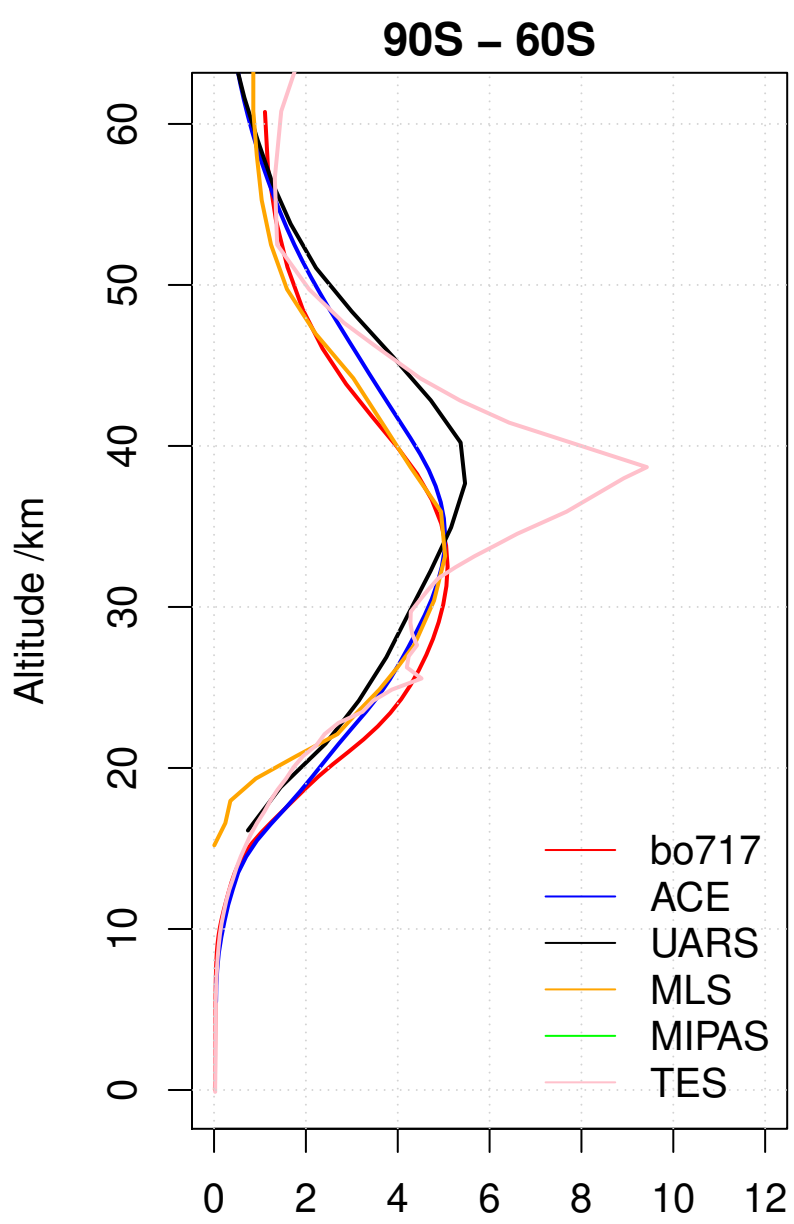
Total Ox Deposition = $1e+03$ Tg/yr

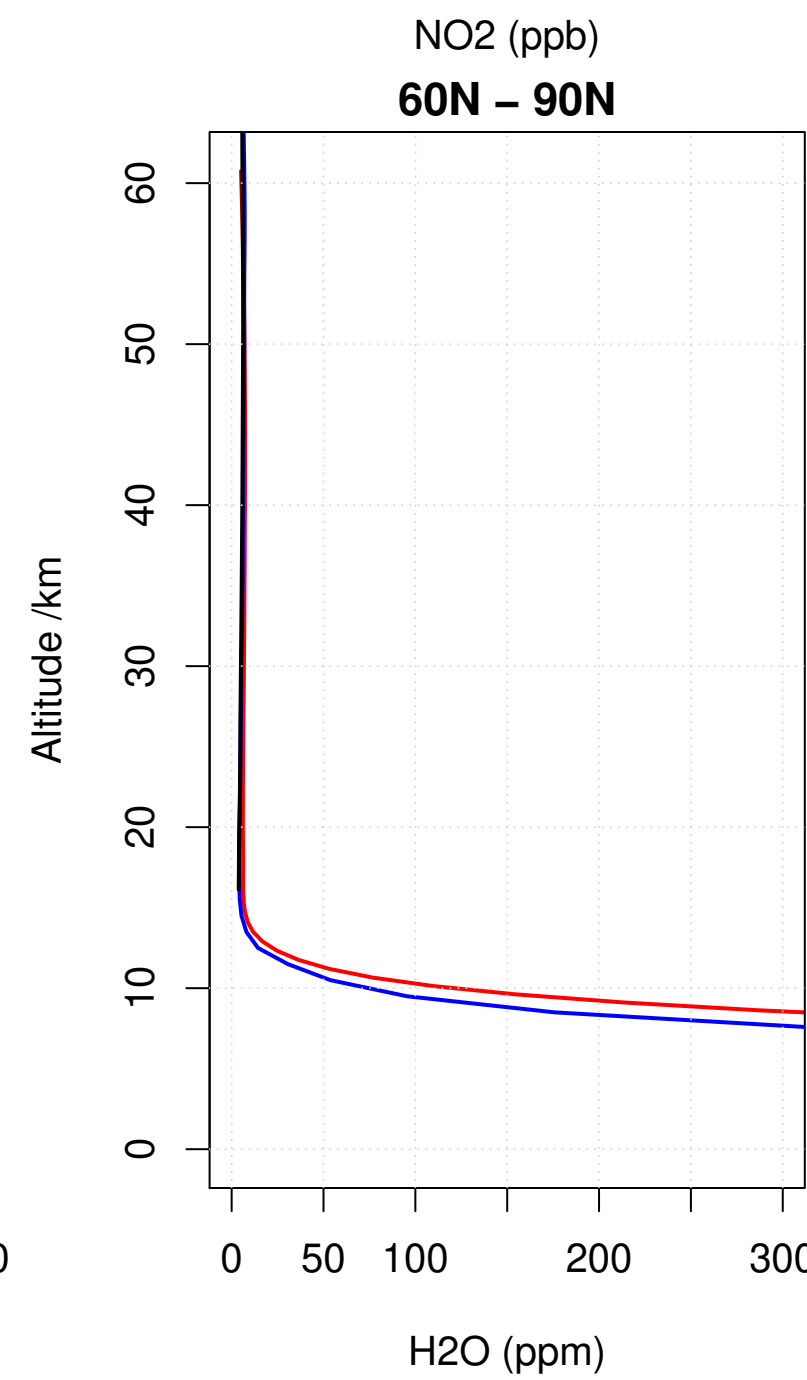
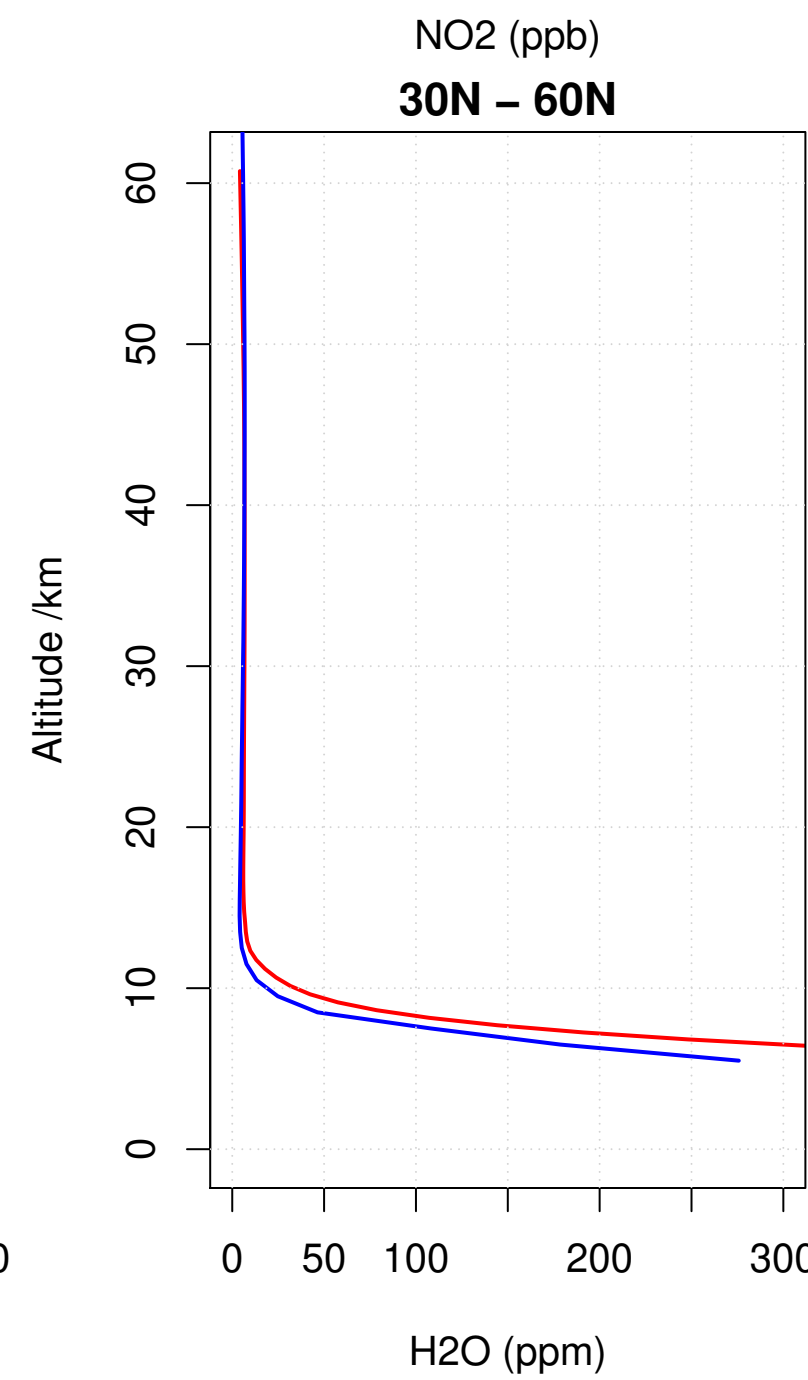
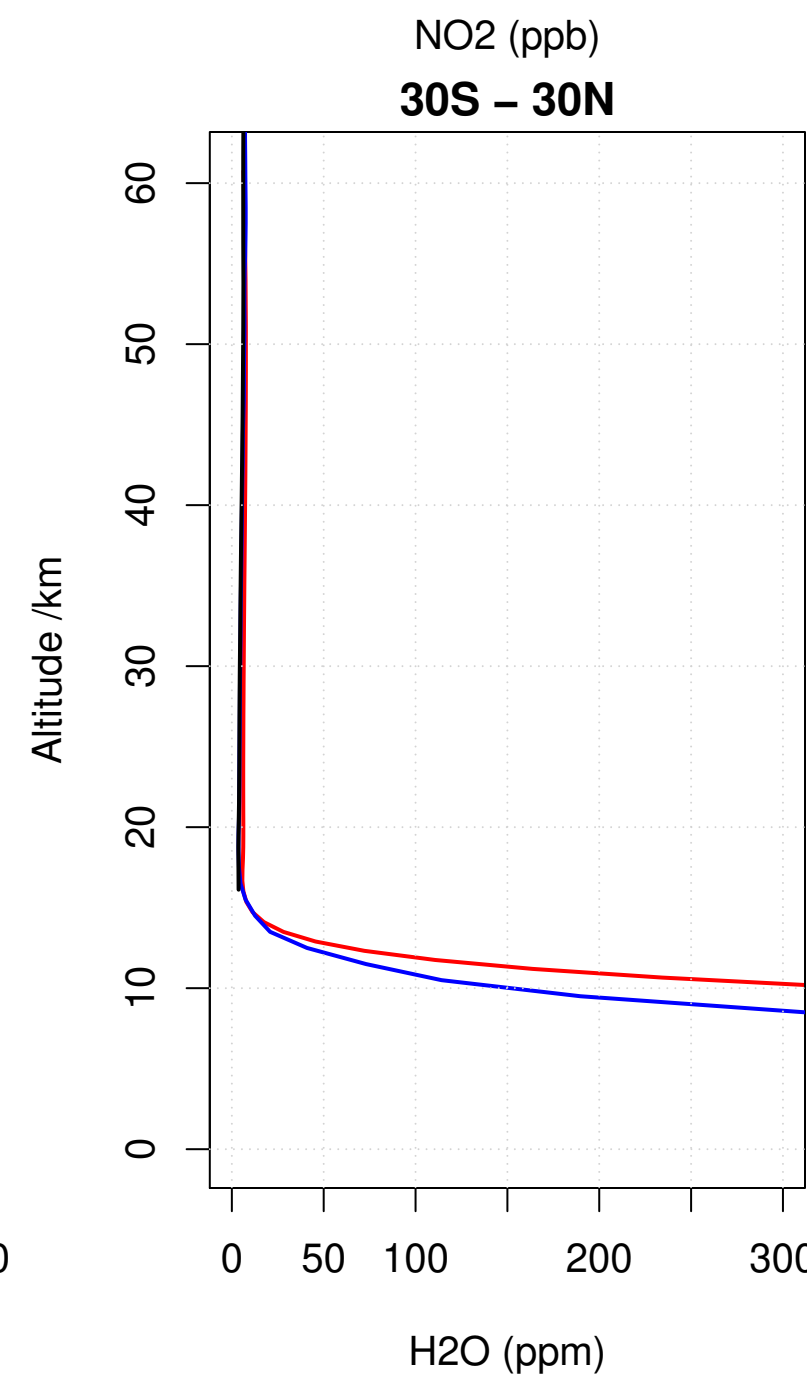
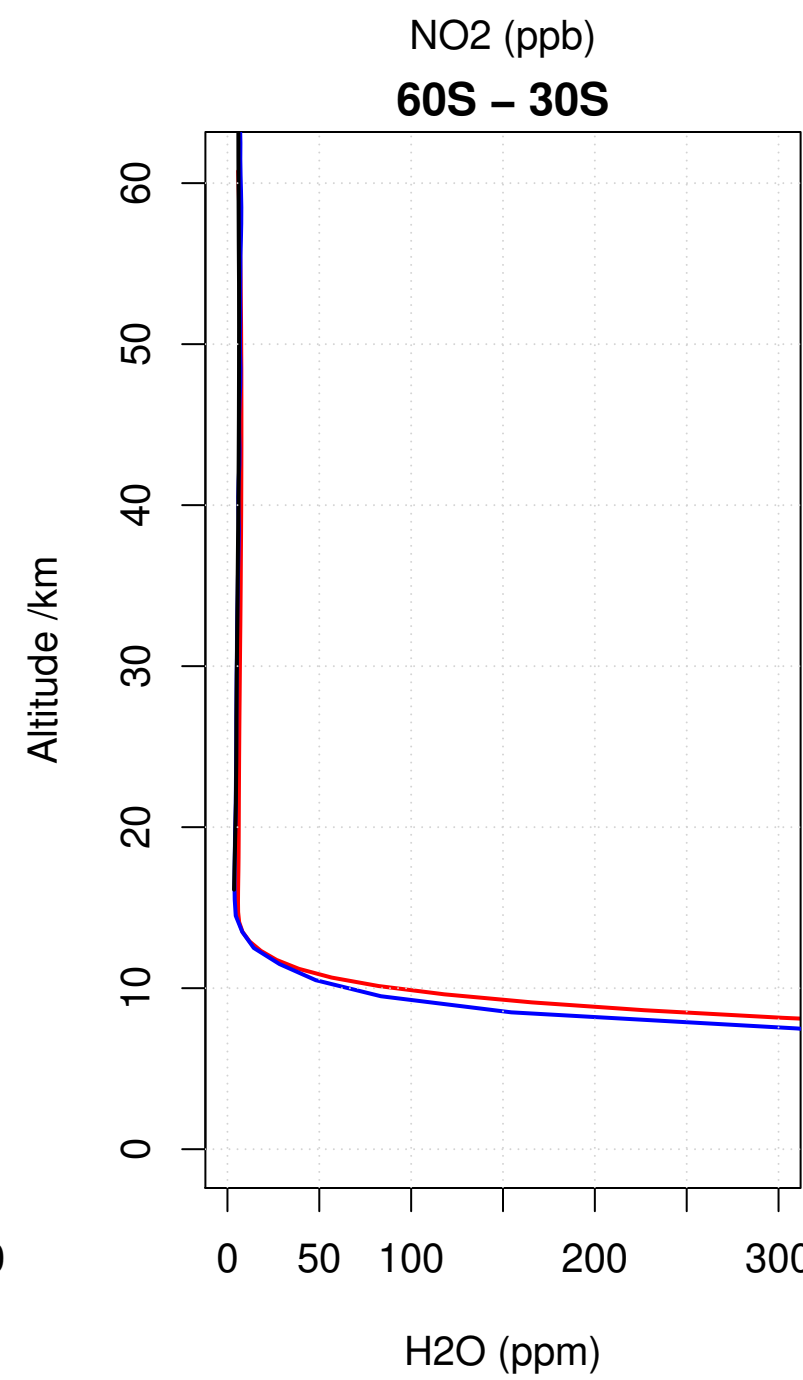
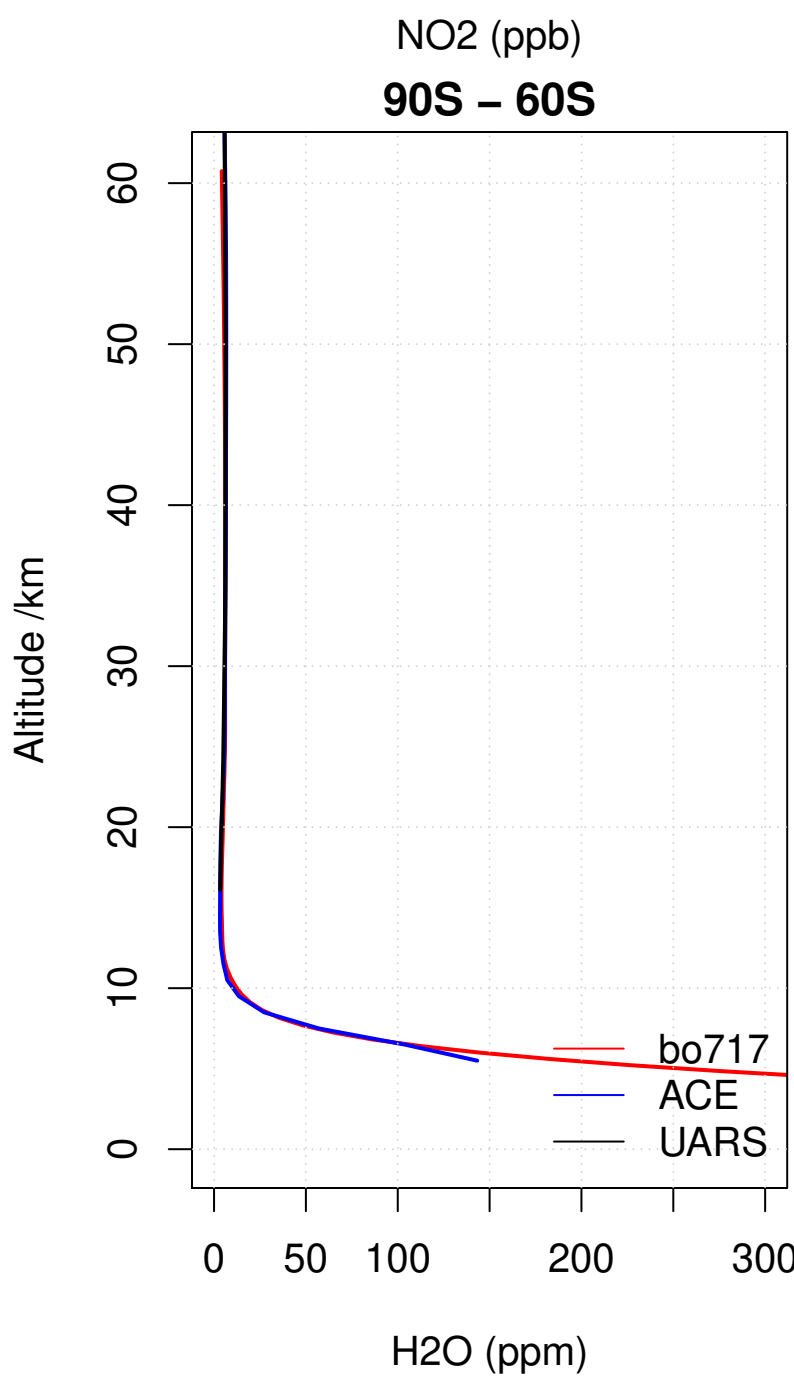
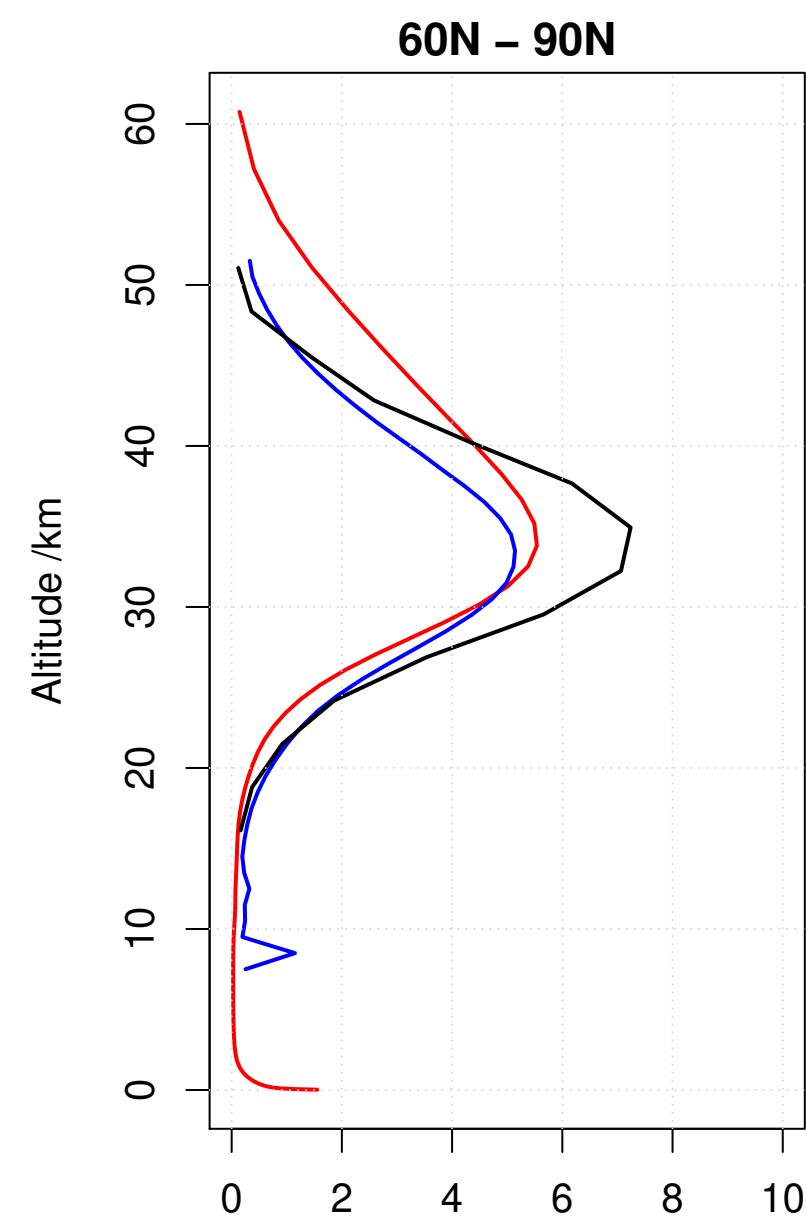
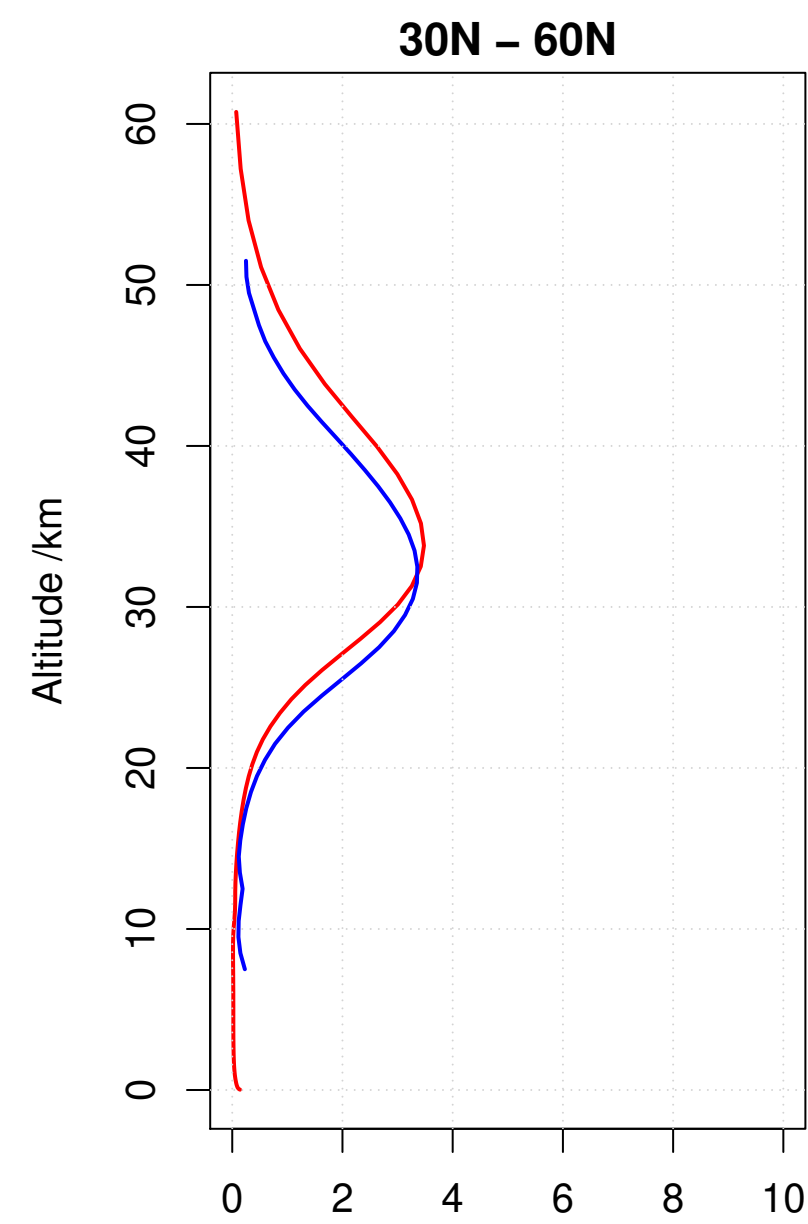
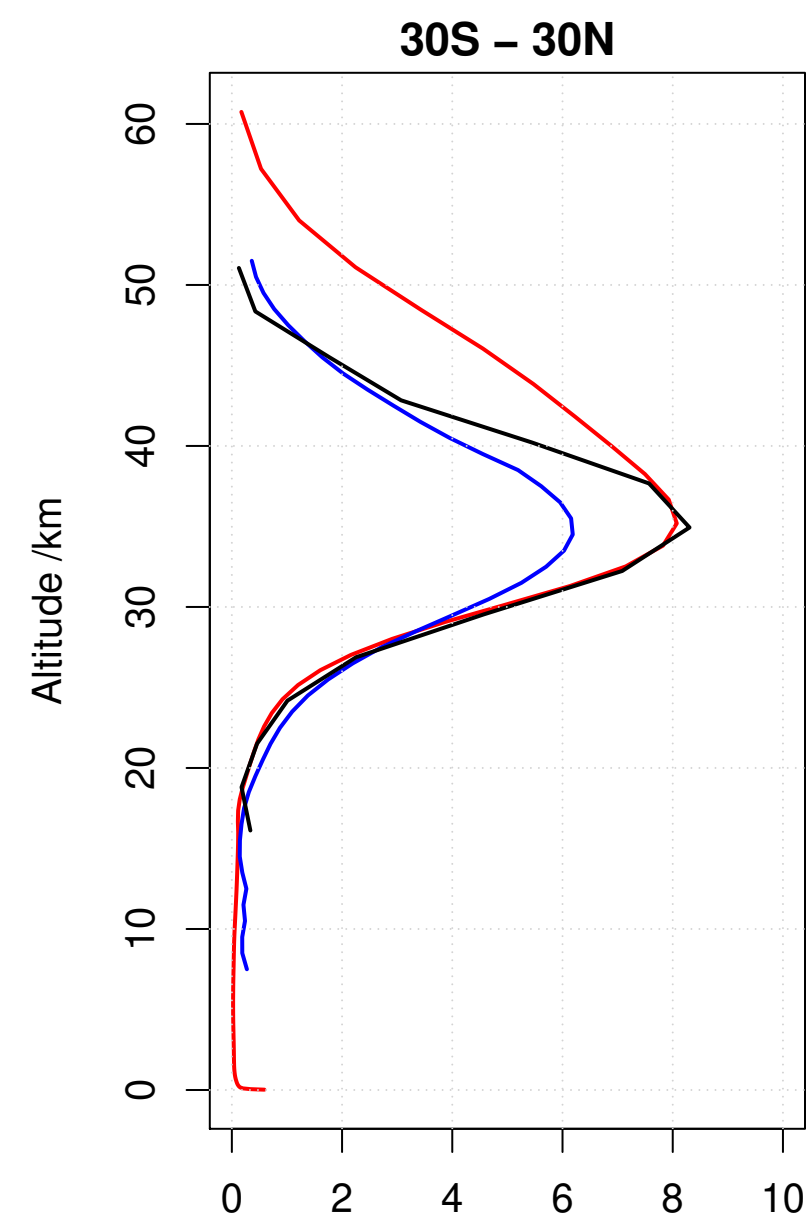
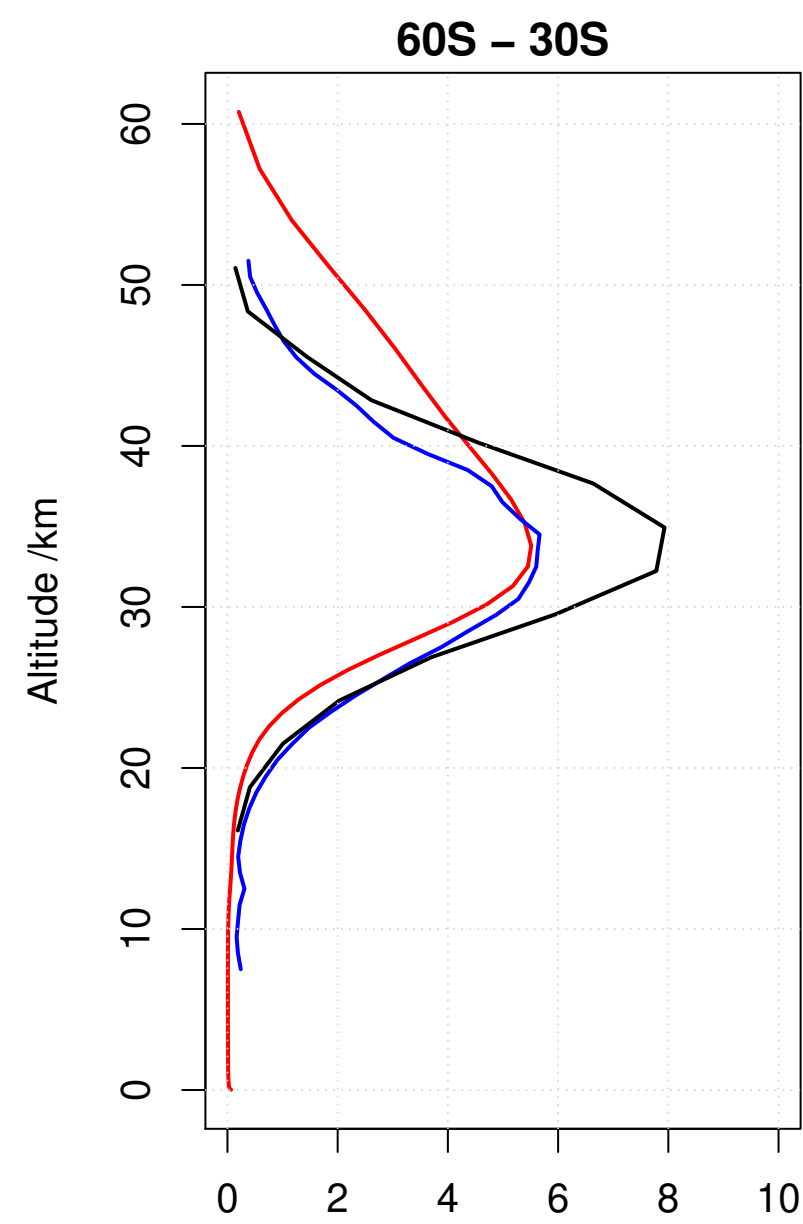
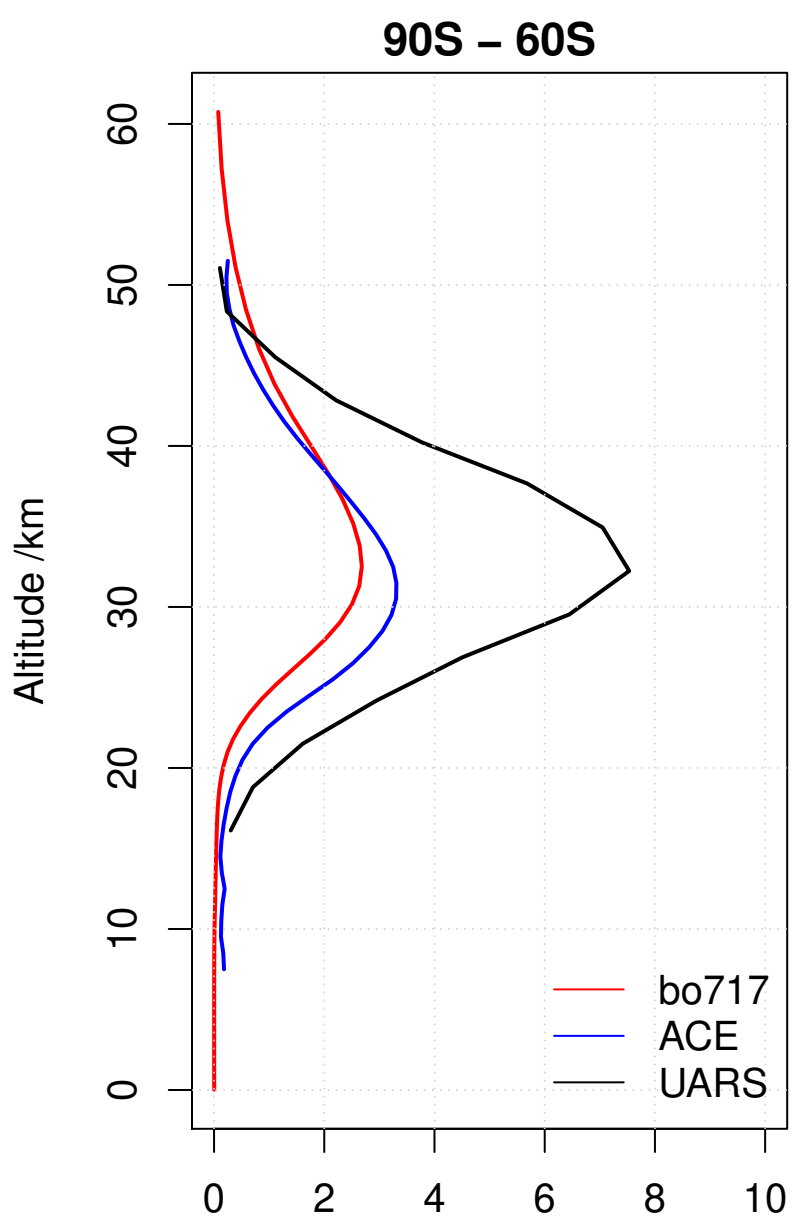


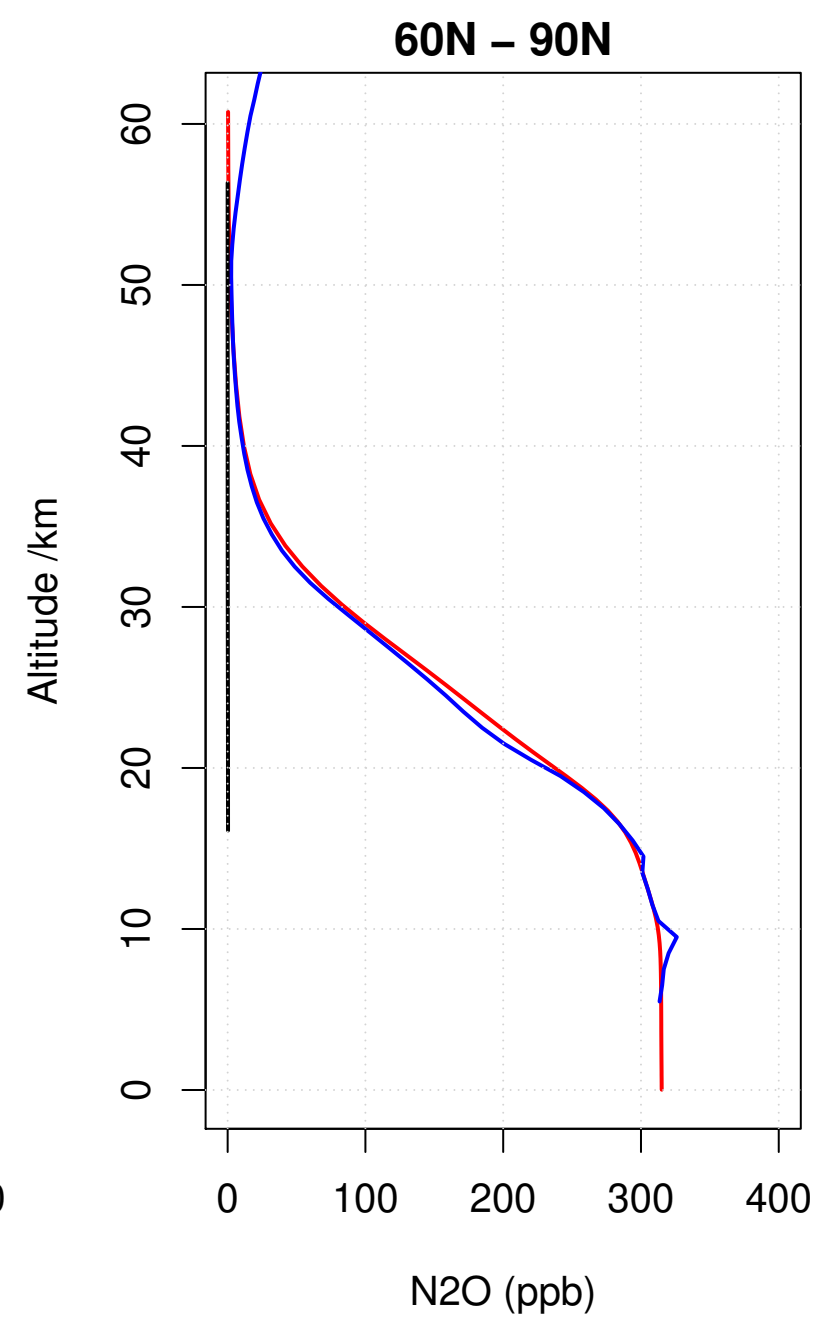
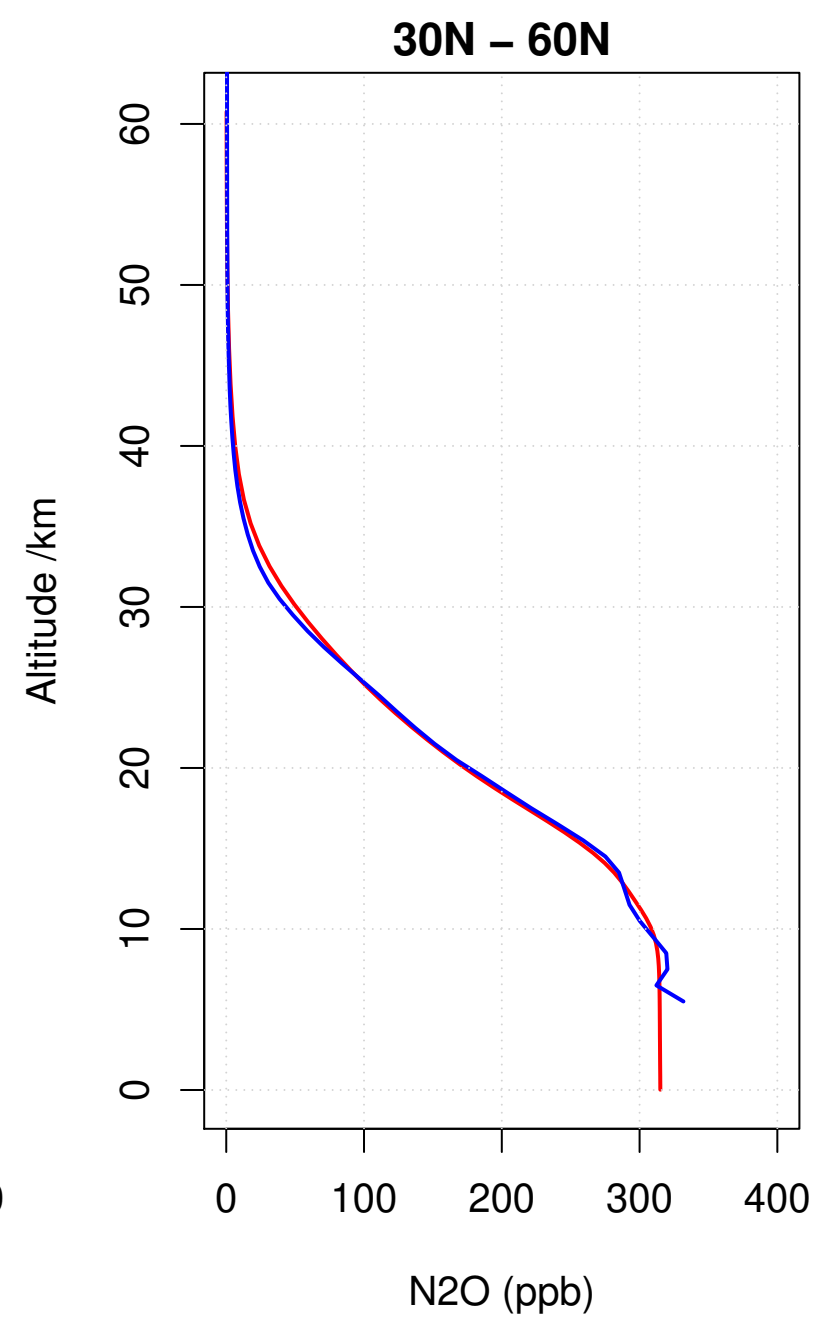
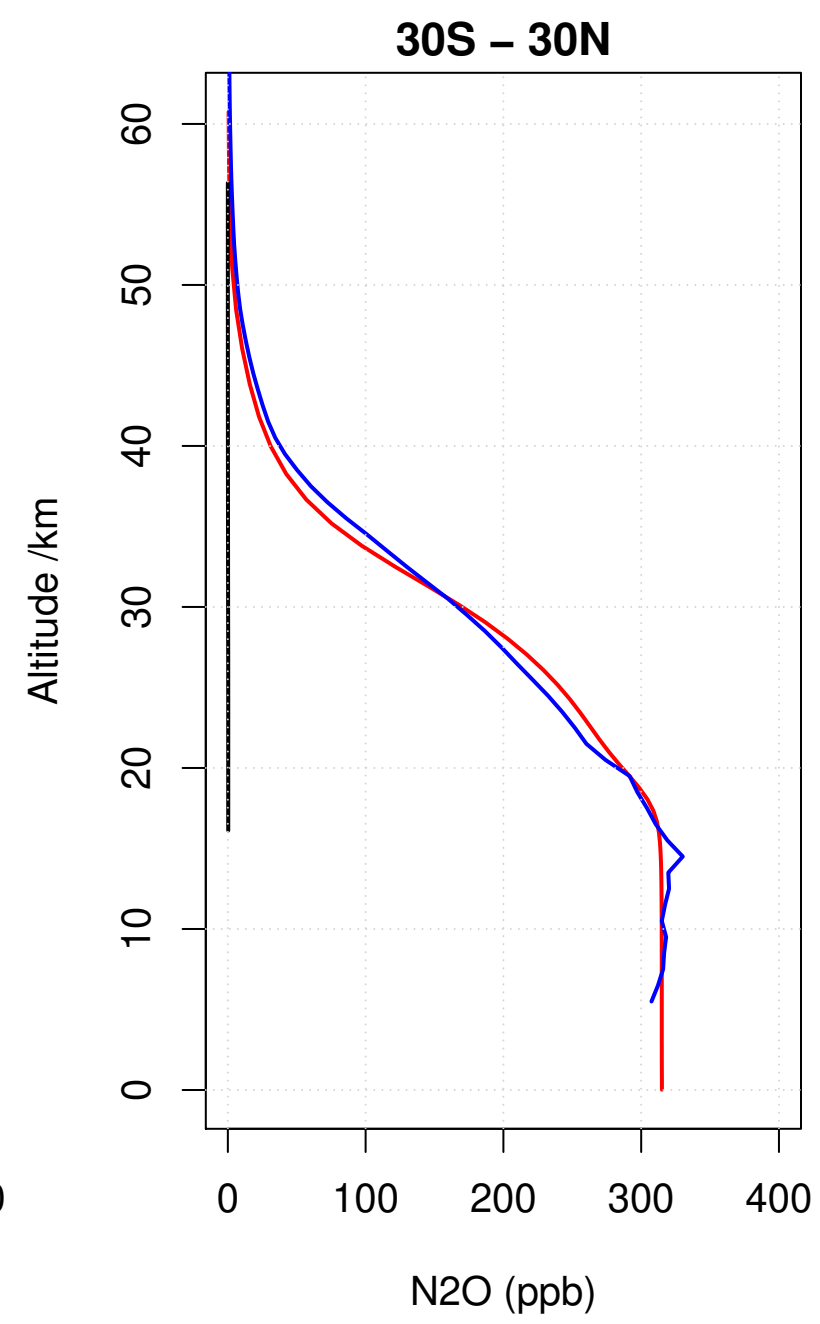
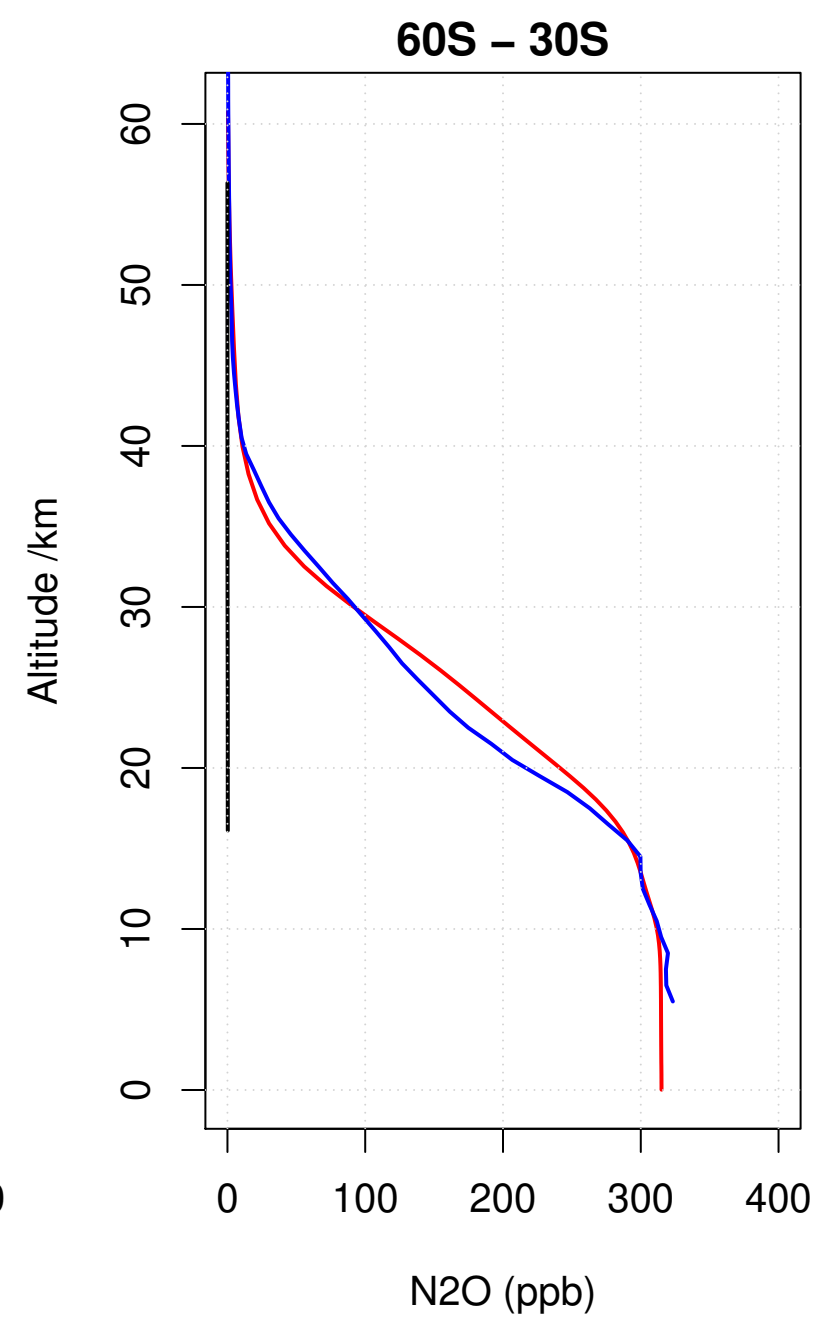
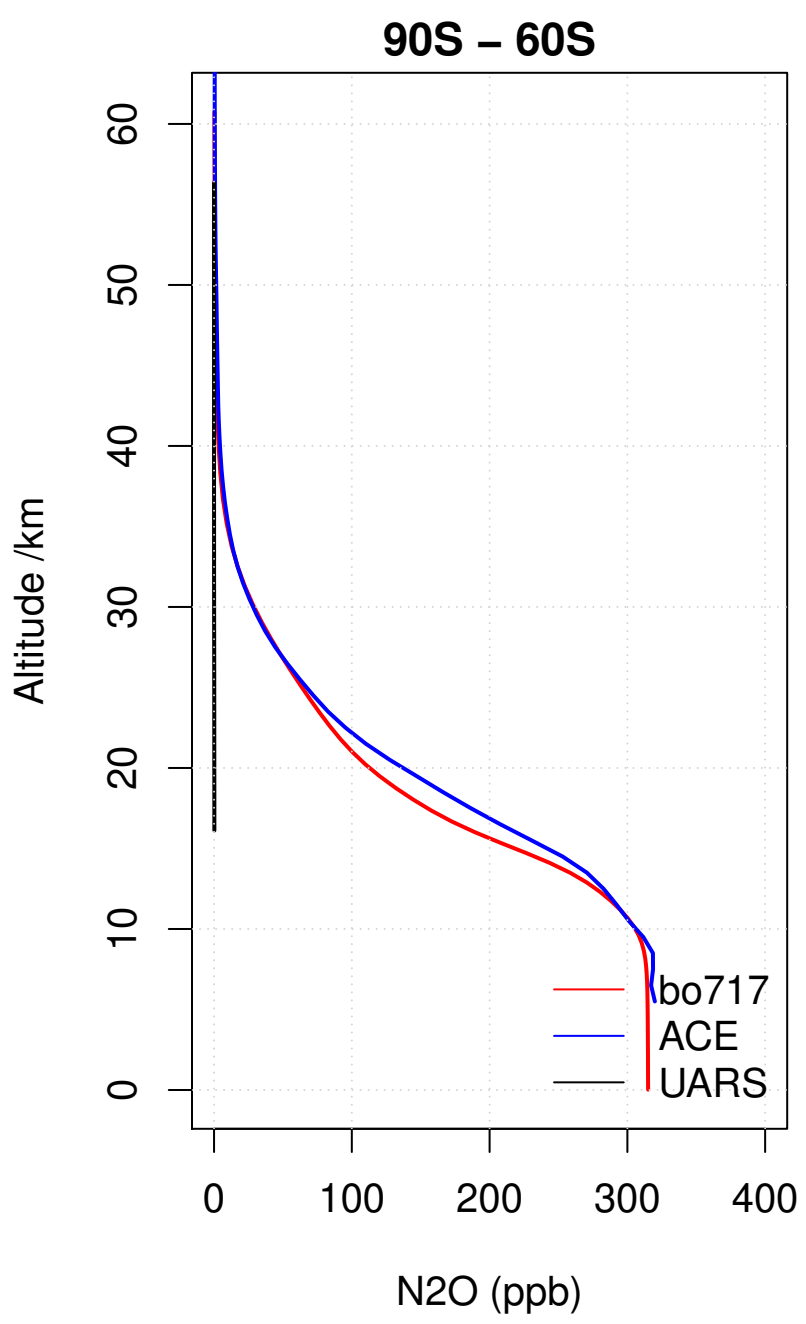








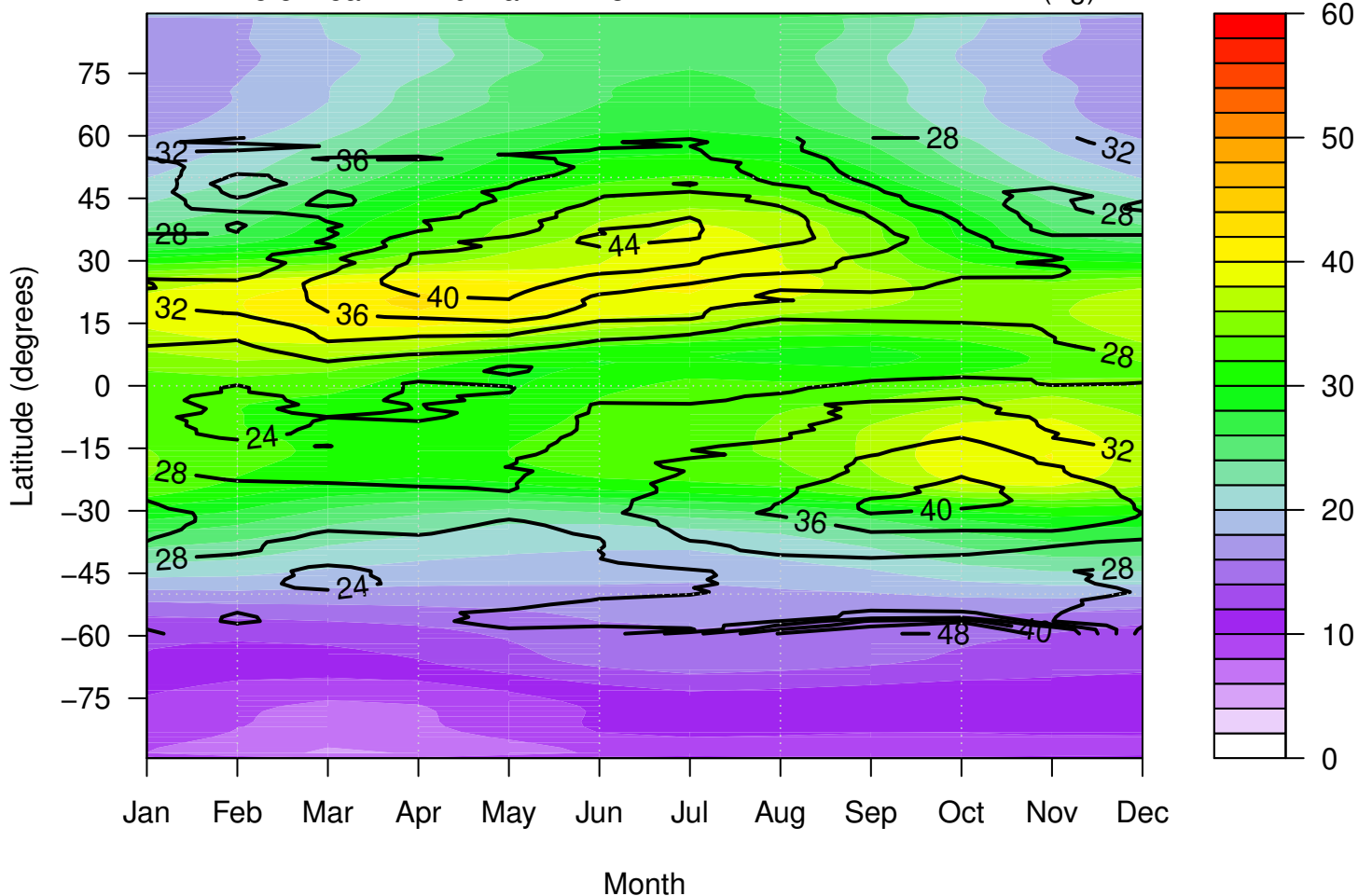




bk249 tropospheric O₃ column

Min = 5.8 Mean = 24.9 Max = 42.3

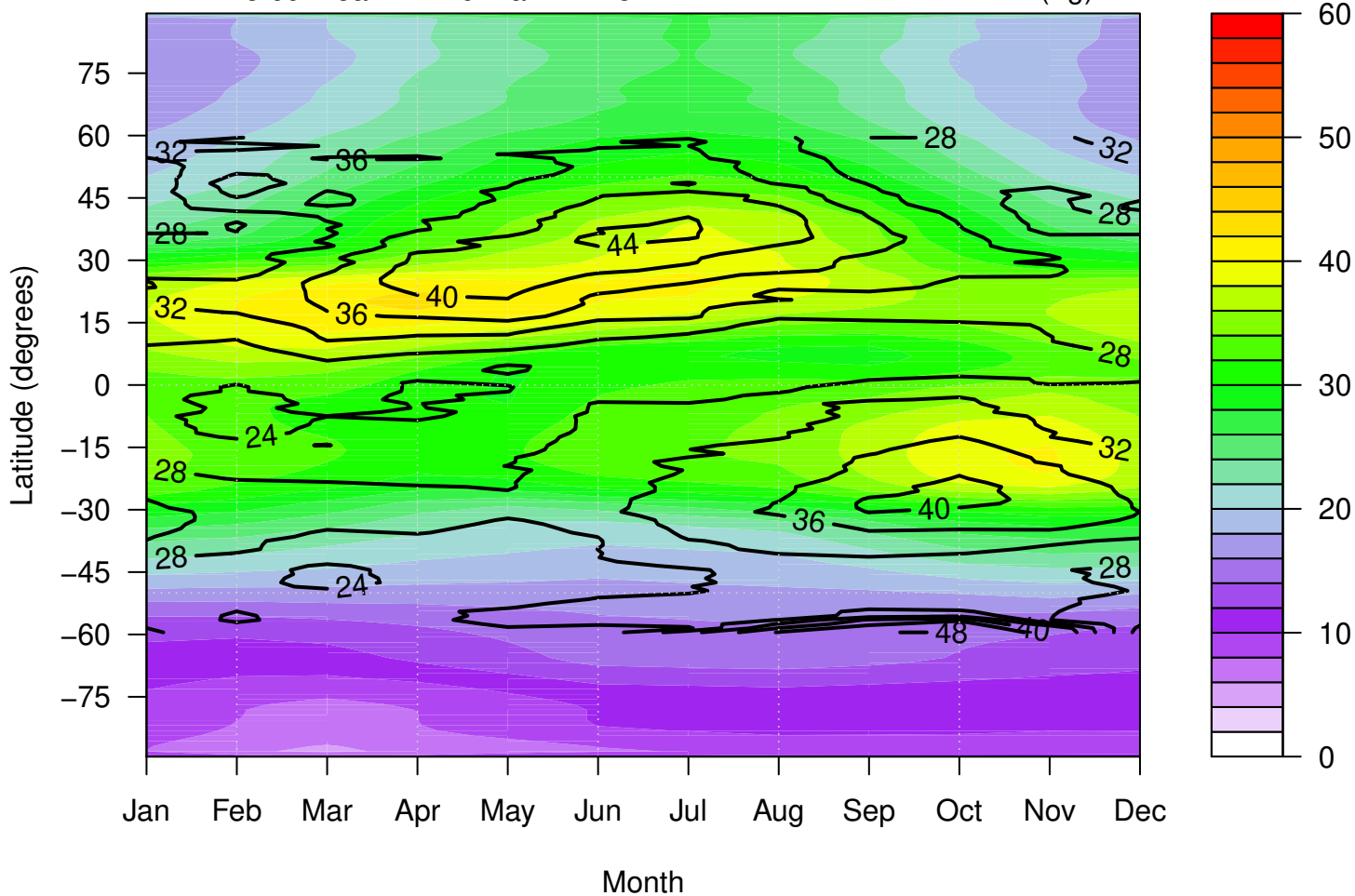
Burden (Tg) = 311



bo717 tropospheric O₃ column

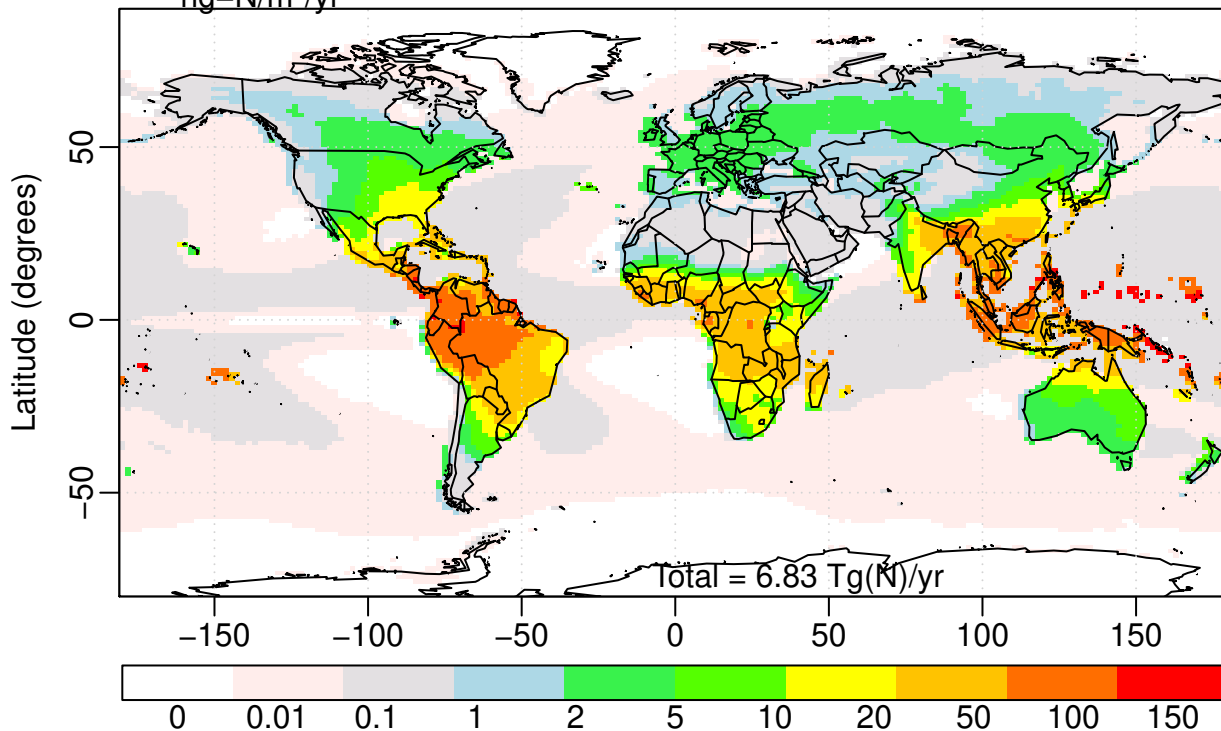
Min = 5.69 Mean = 24.9 Max = 42.5

Burden (Tg) = 312



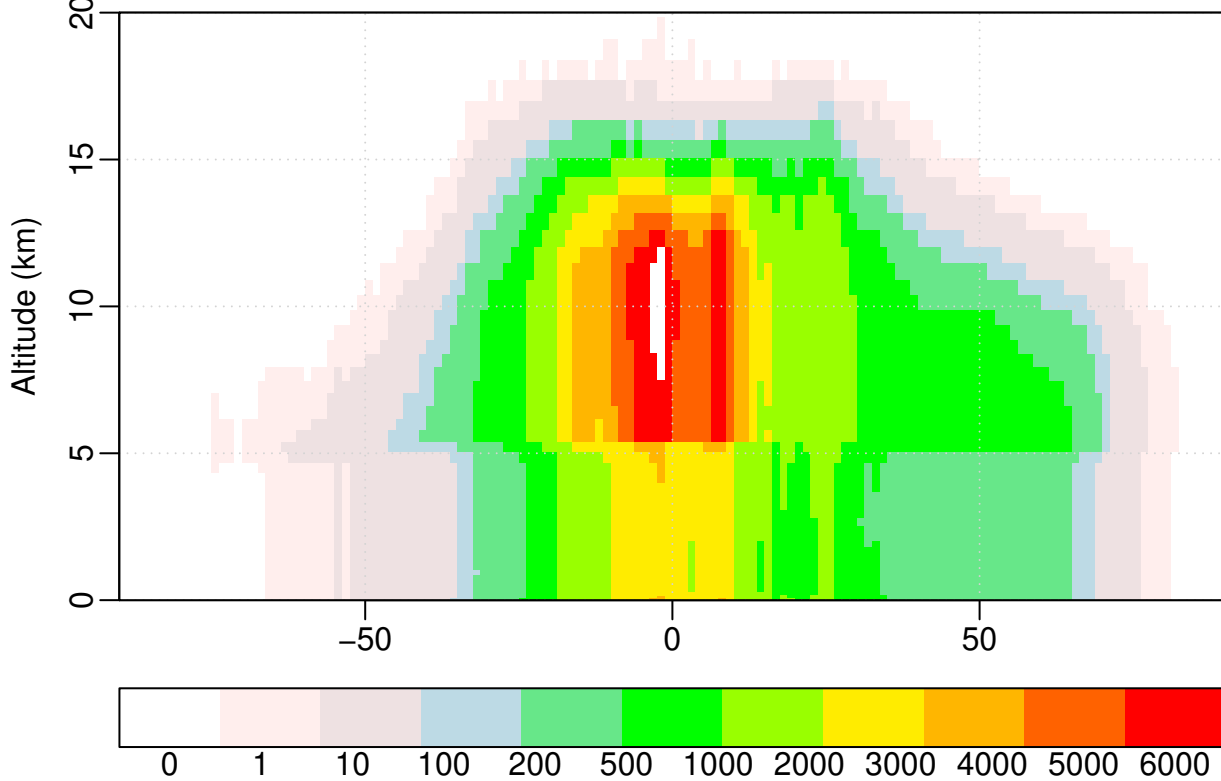
bk249 total column

ng-N/m²/yr



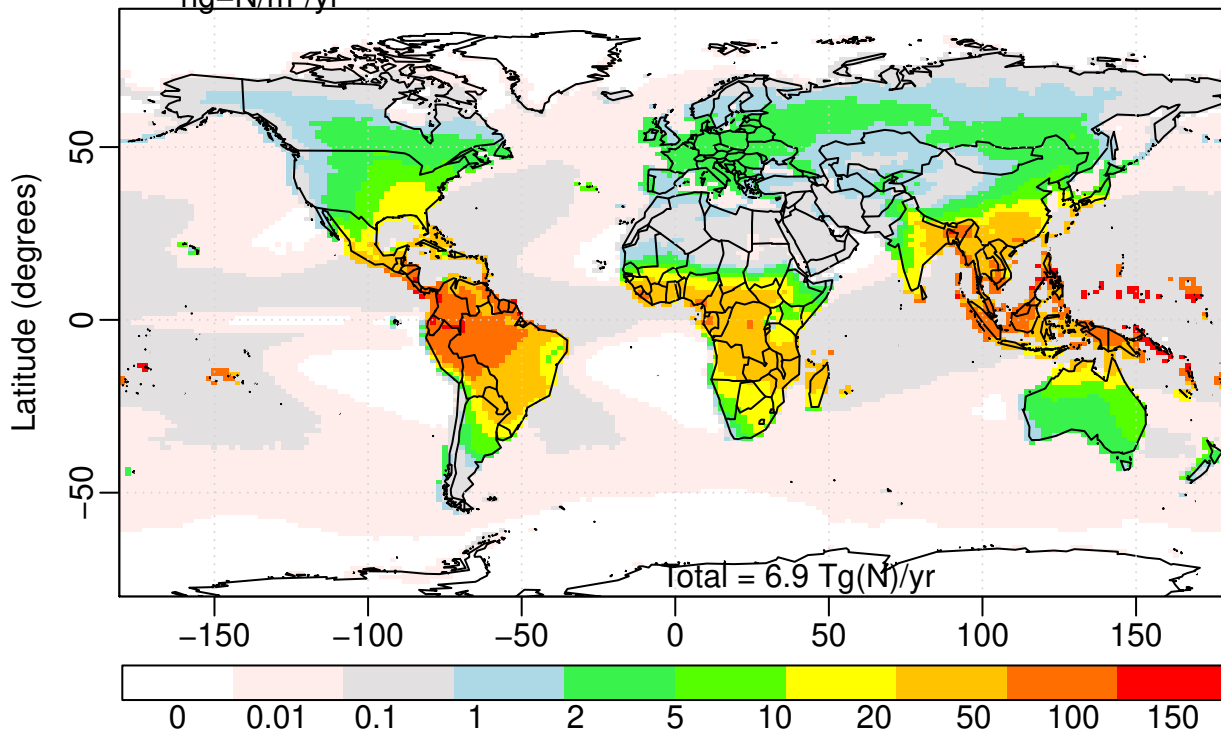
bk249 zonal mean

molecules cm⁻³ s⁻¹



bo717 total column

ng-N/m²/yr



bo717 zonal mean

molecules cm⁻³ s⁻¹

