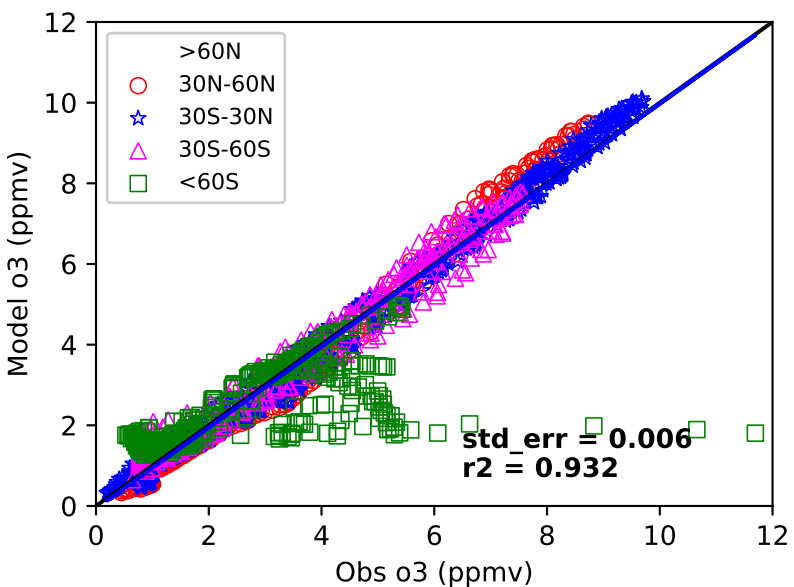
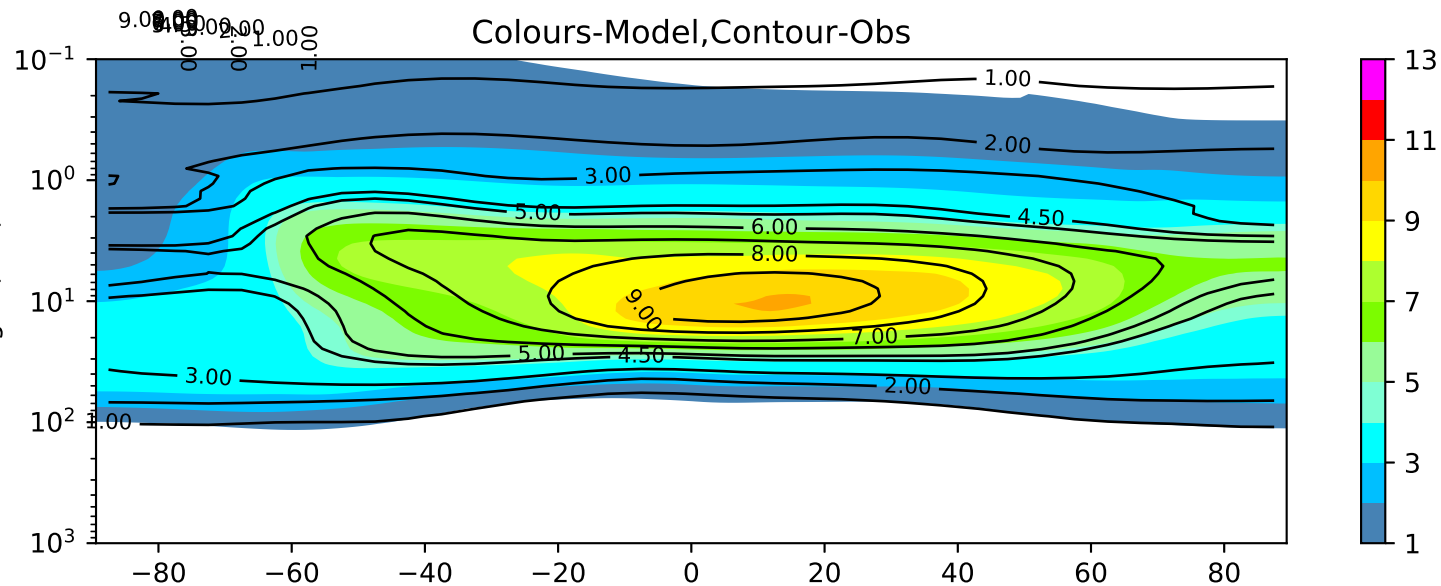
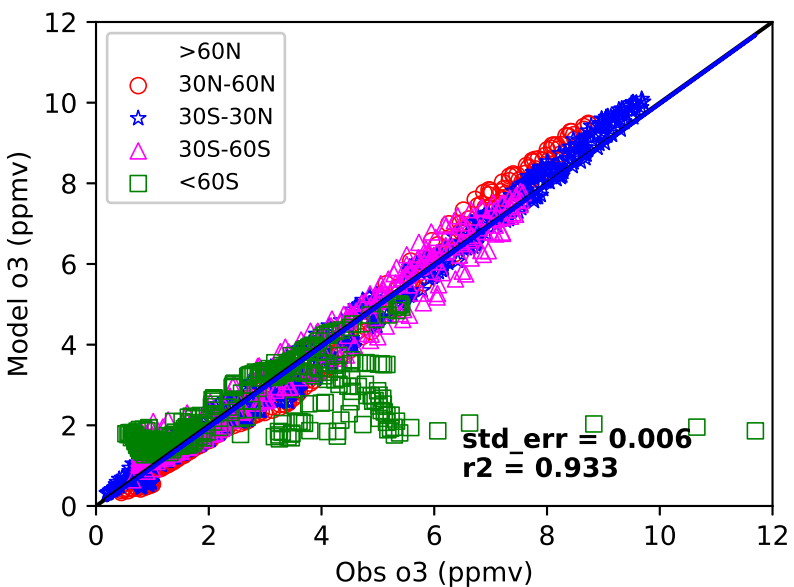
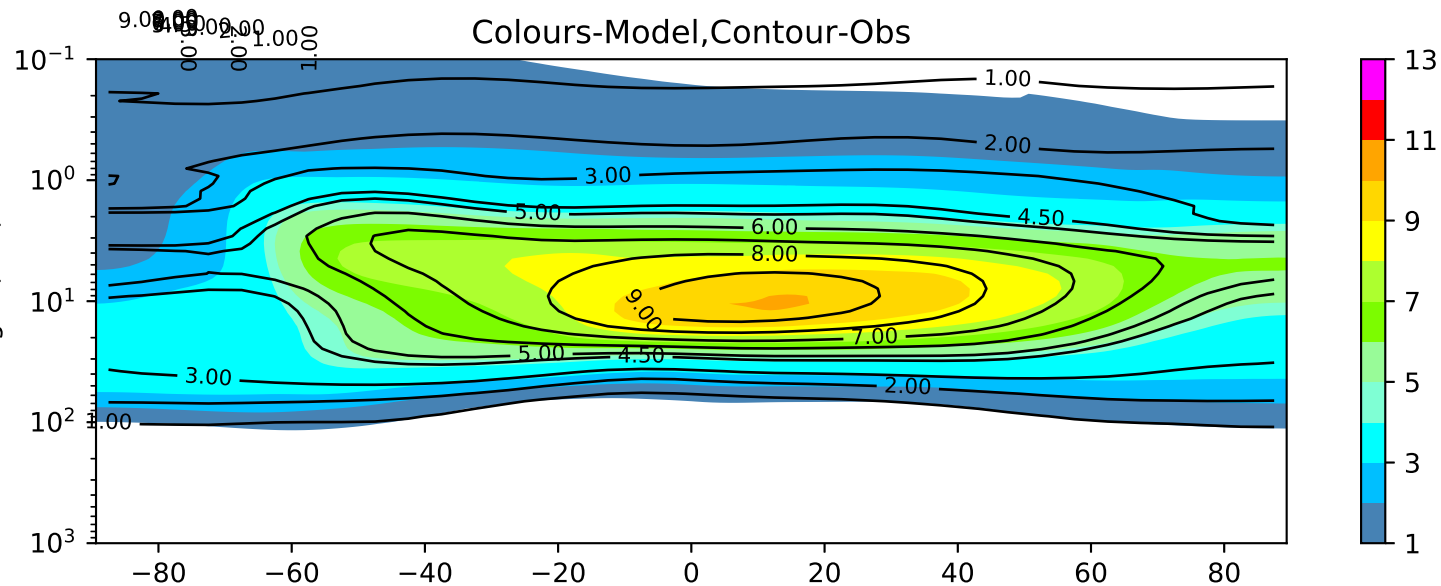


Colours-Model,Contour-Obs

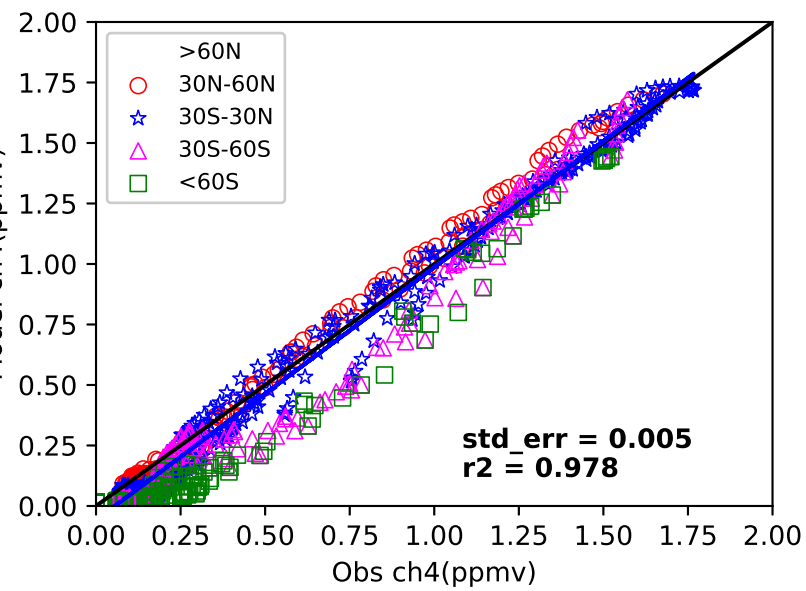
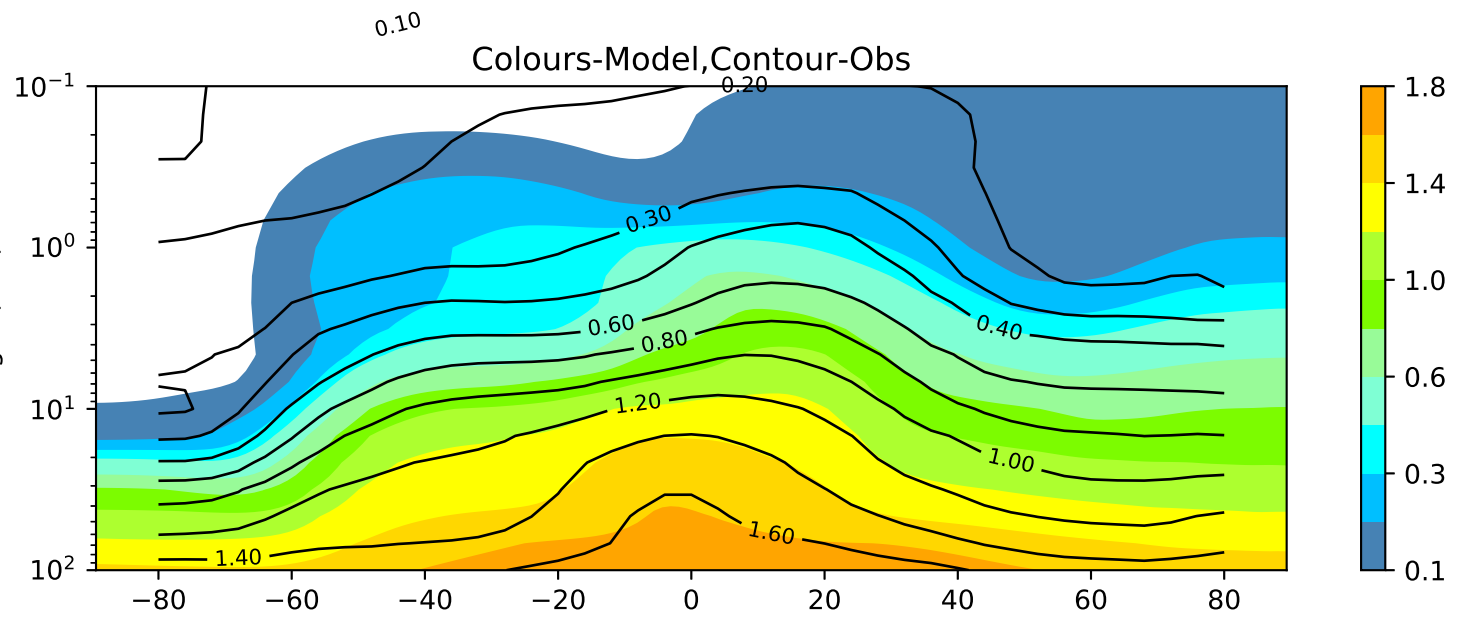


UKCA bs395 vs NIWA-CCMVal:
O3 (ppmv) Jul

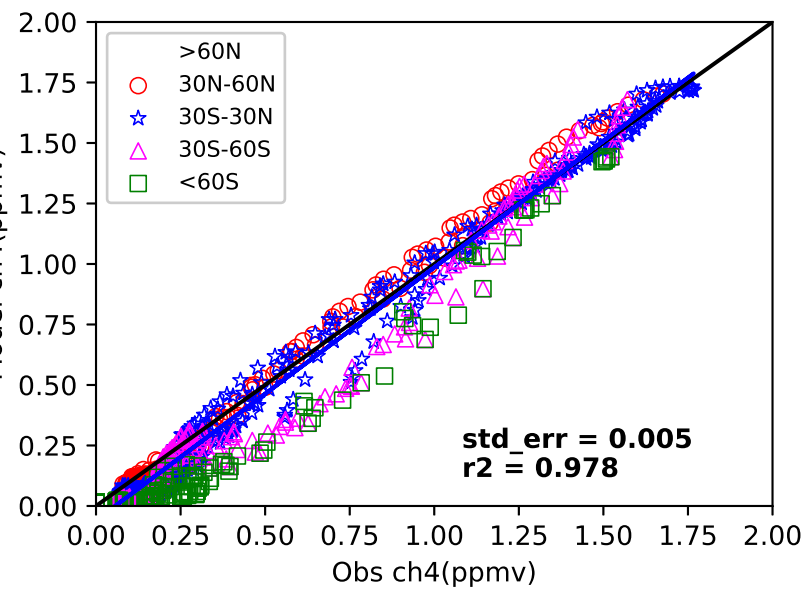
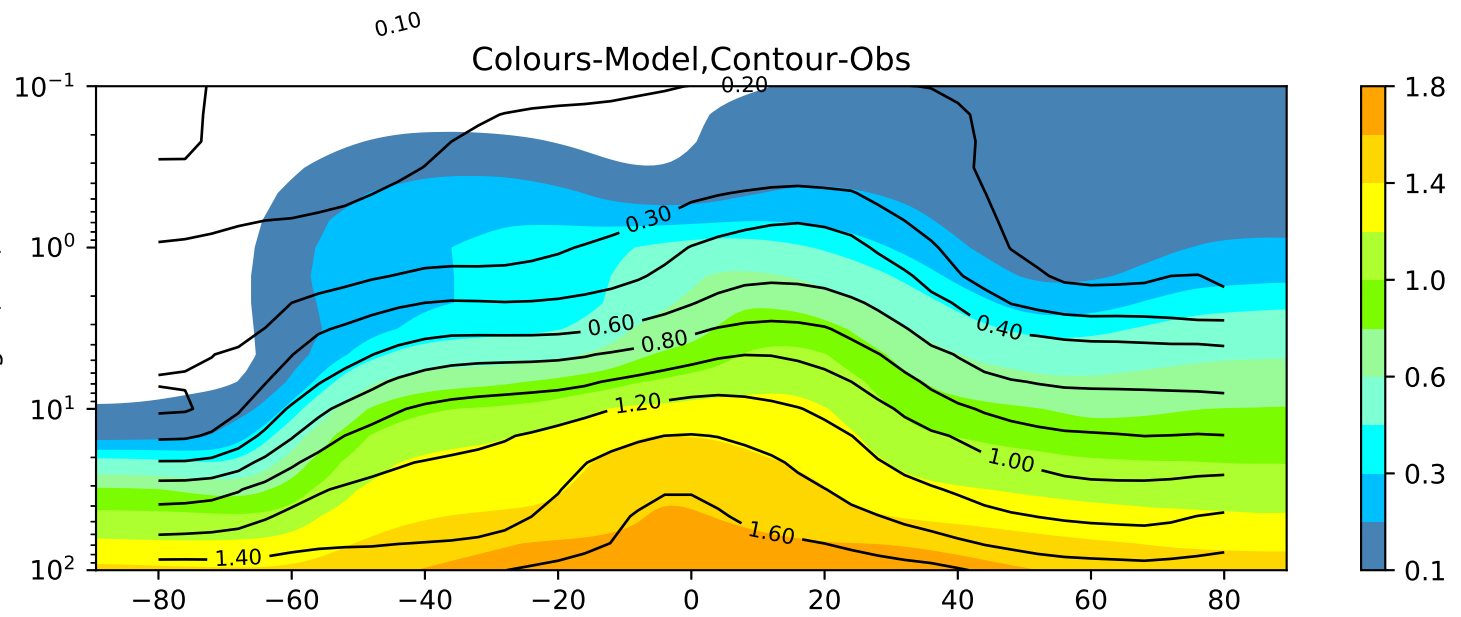
Colours-Model,Contour-Obs



UKCA bw489 vs NIWA-CCMVal:
O3 (ppmv) Jul



UKCA bs395 vs HALOE:
CH4 (ppmv) Jul

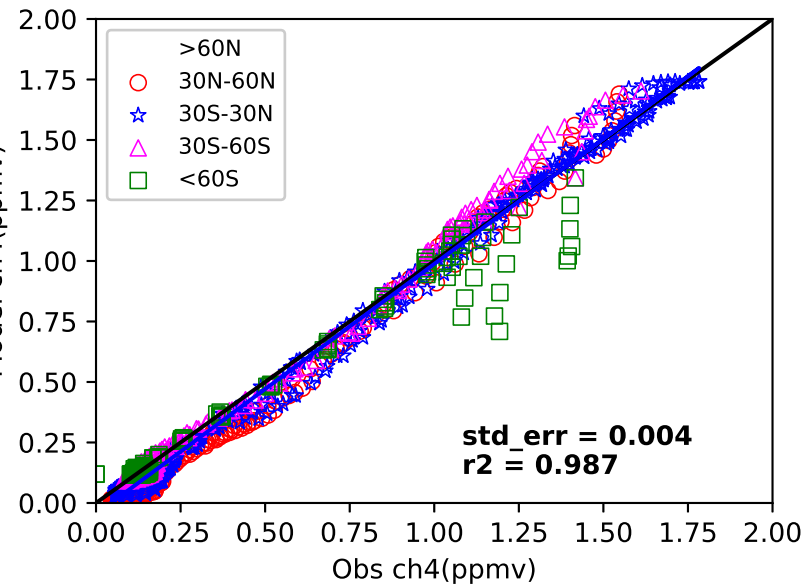
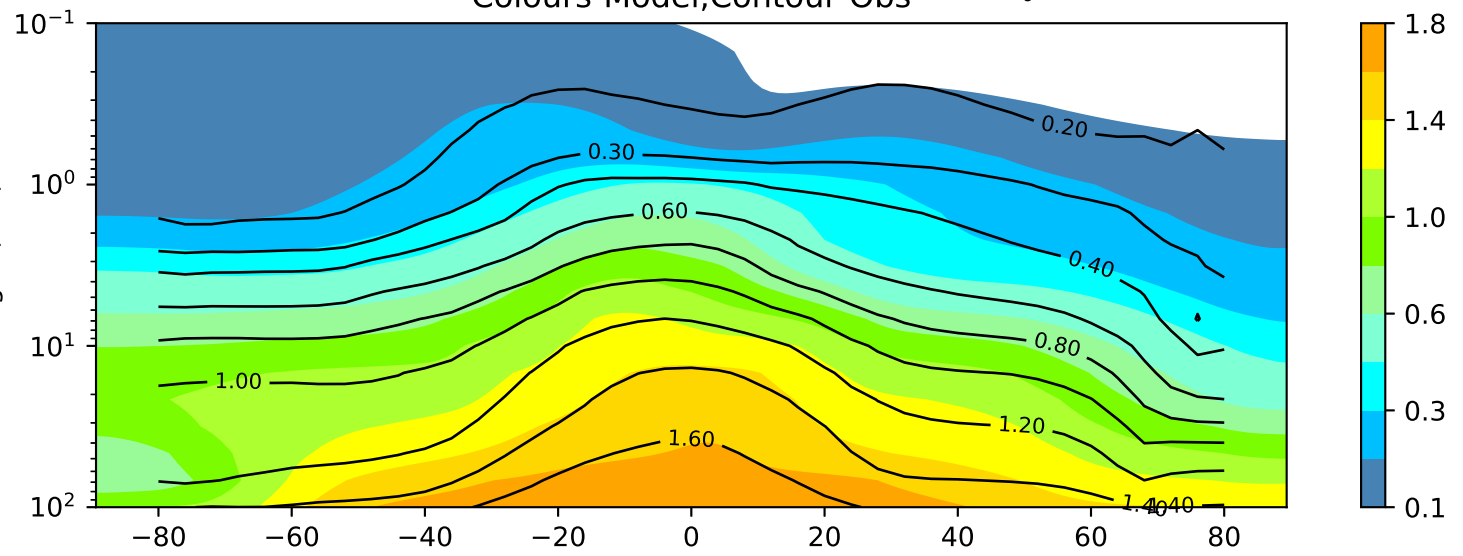


UKCA bw489 vs HALOE:
CH4 (ppmv) Jul

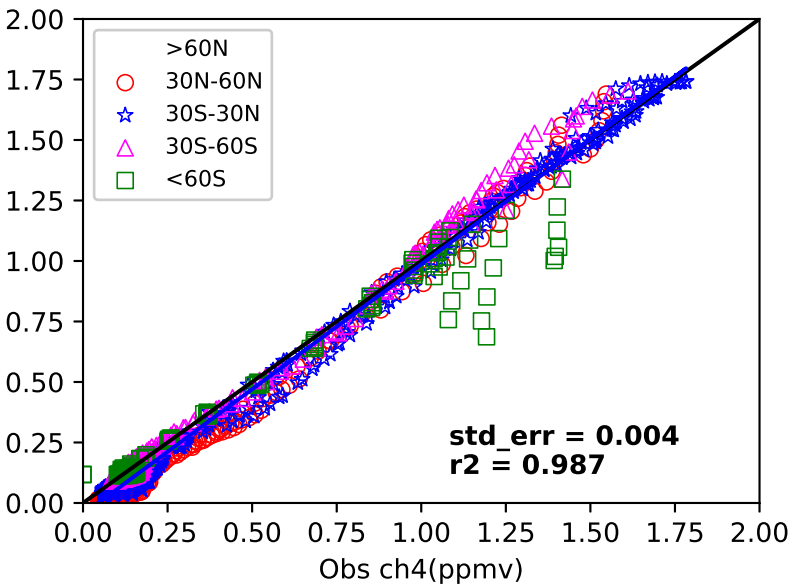
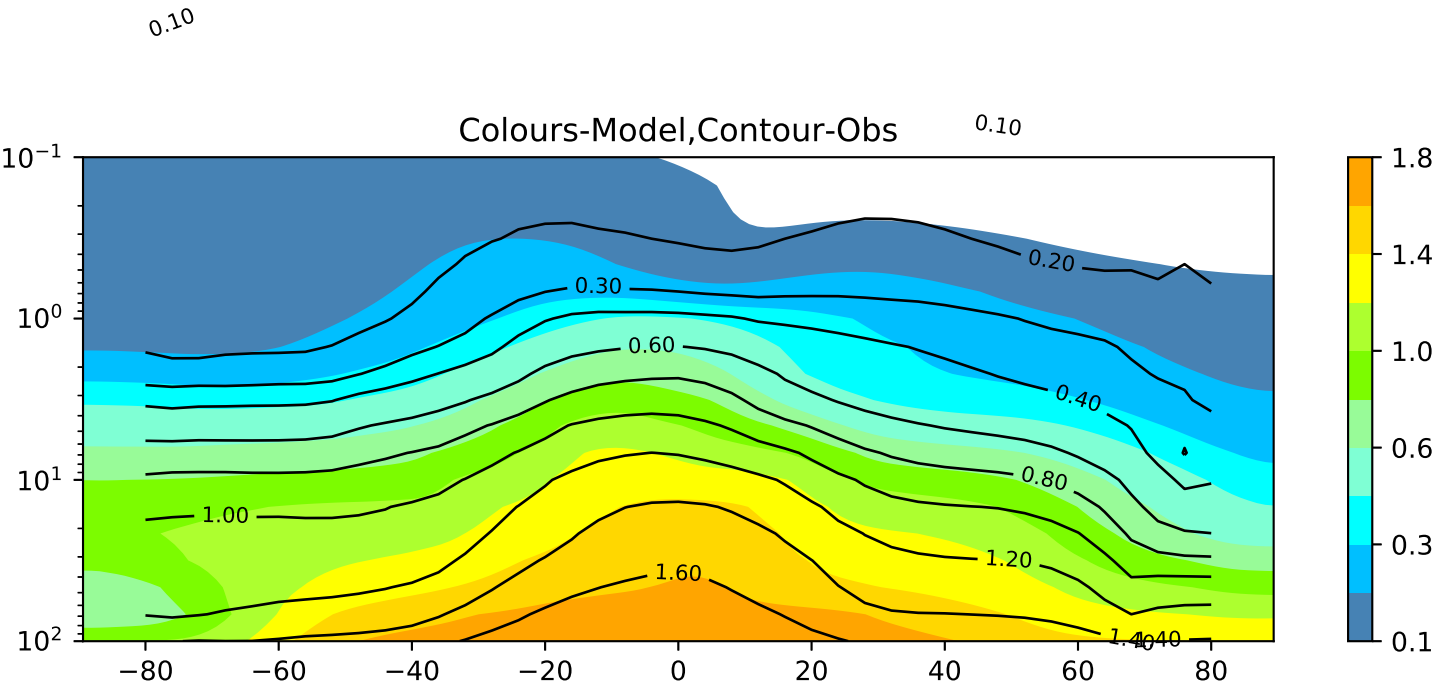
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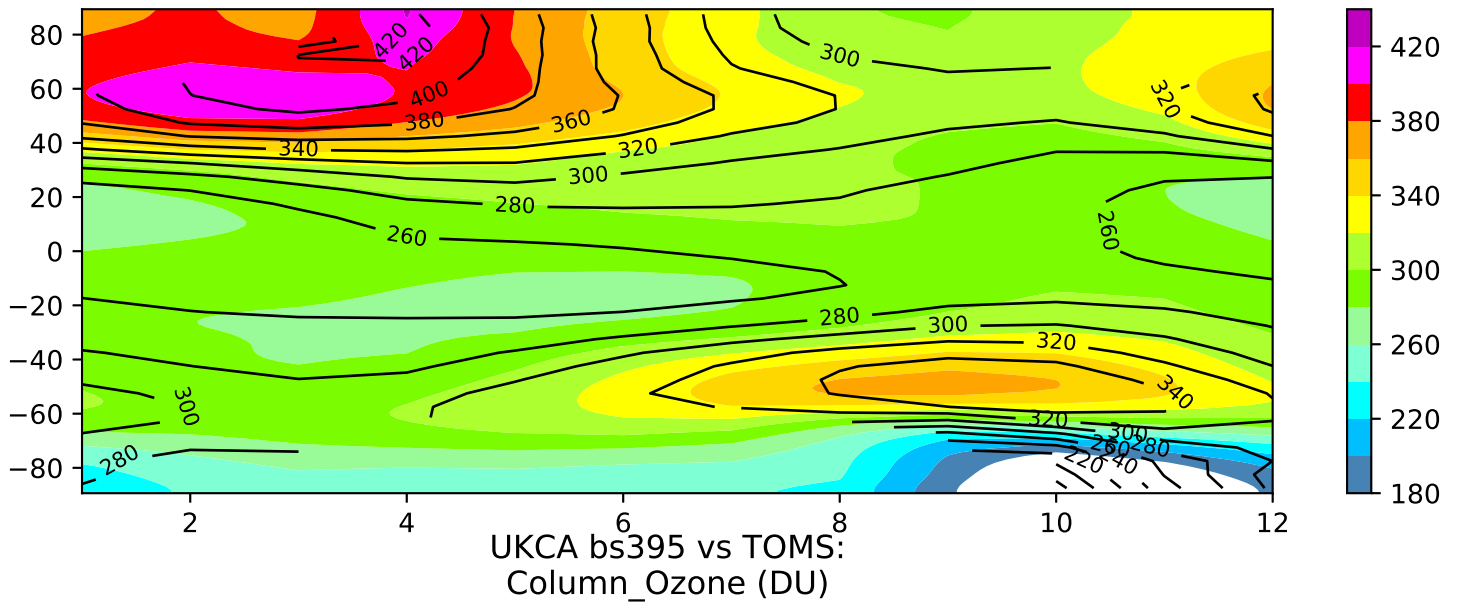
Colours-Model,Contour-Obs

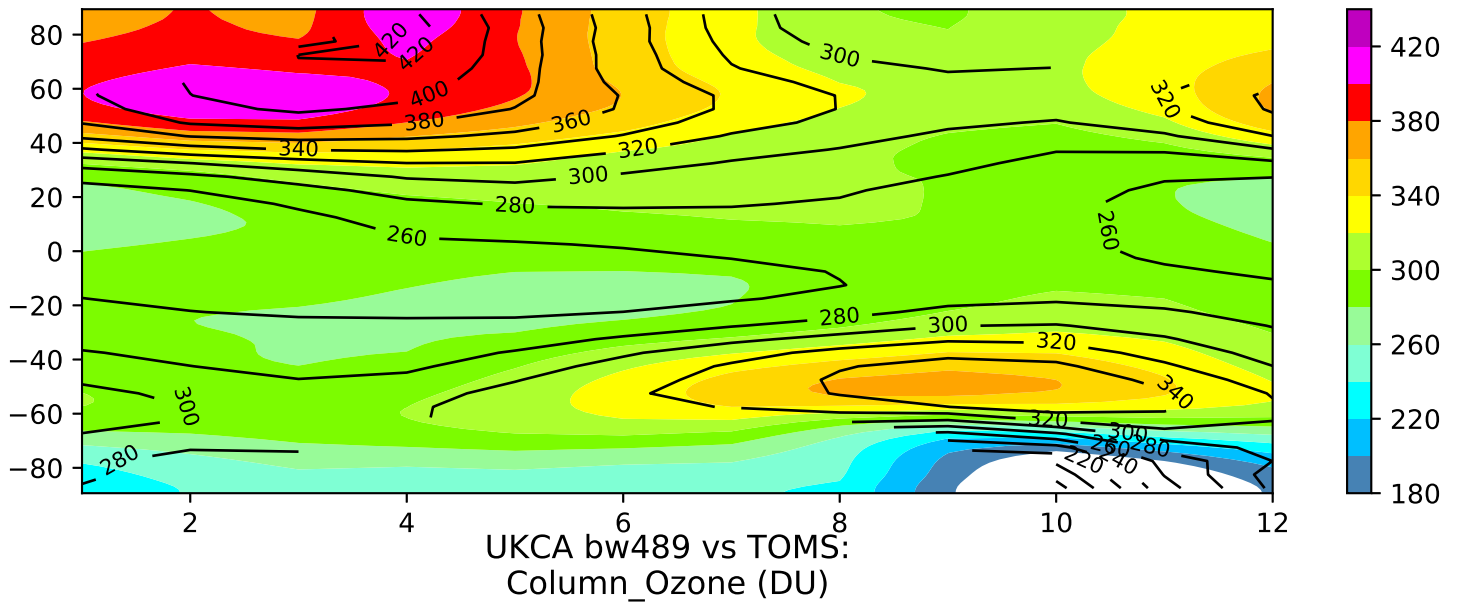
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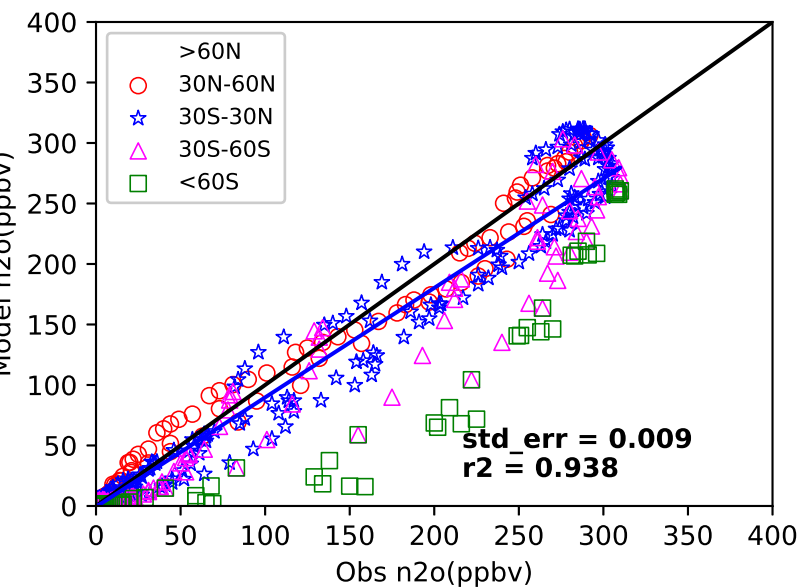
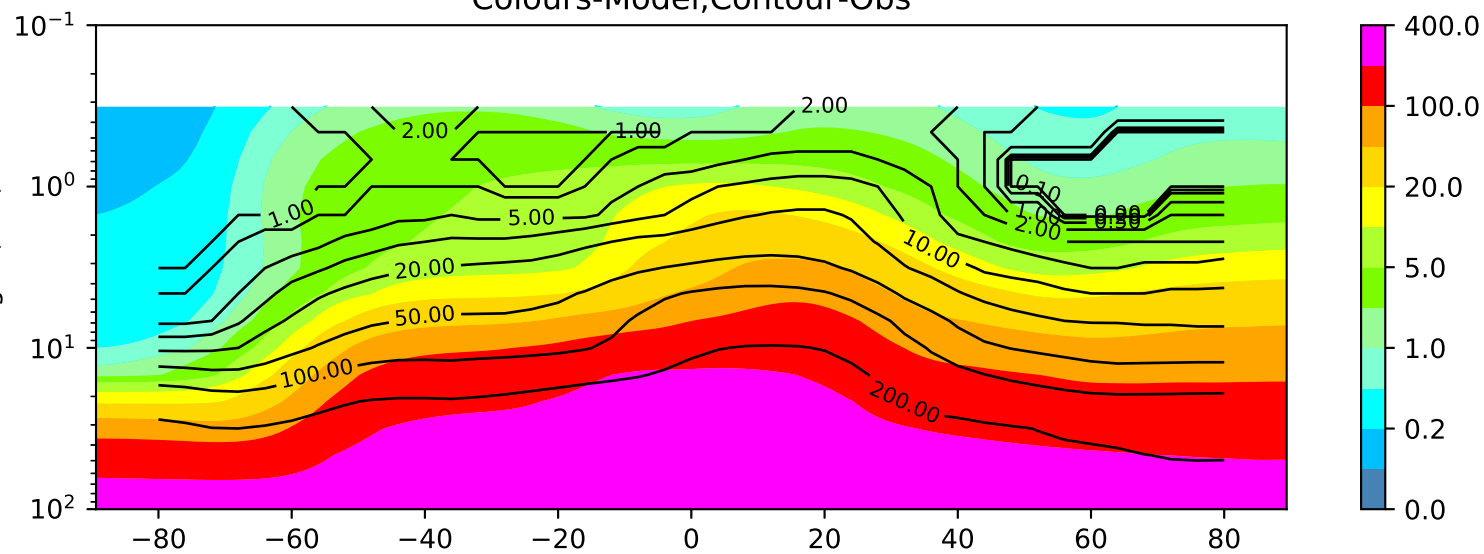
UKCA bs395 vs HALOE:
CH4 (ppmv) Jan





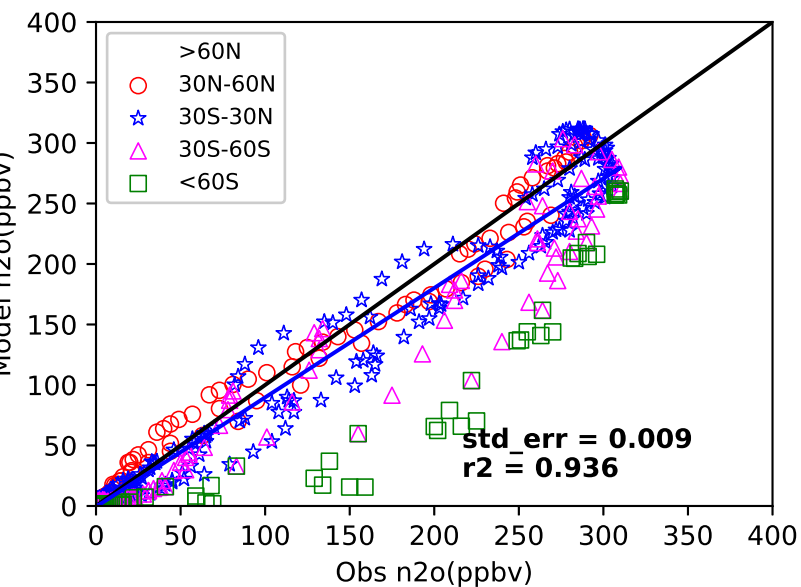
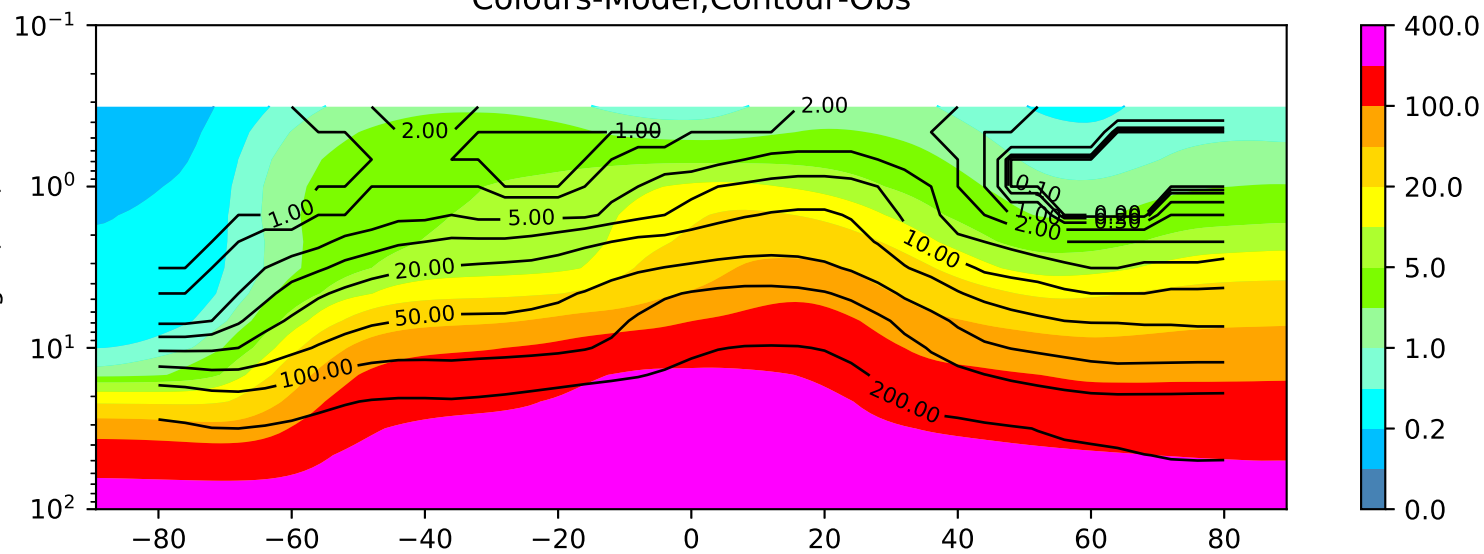


Colours-Model,Contour-Obs



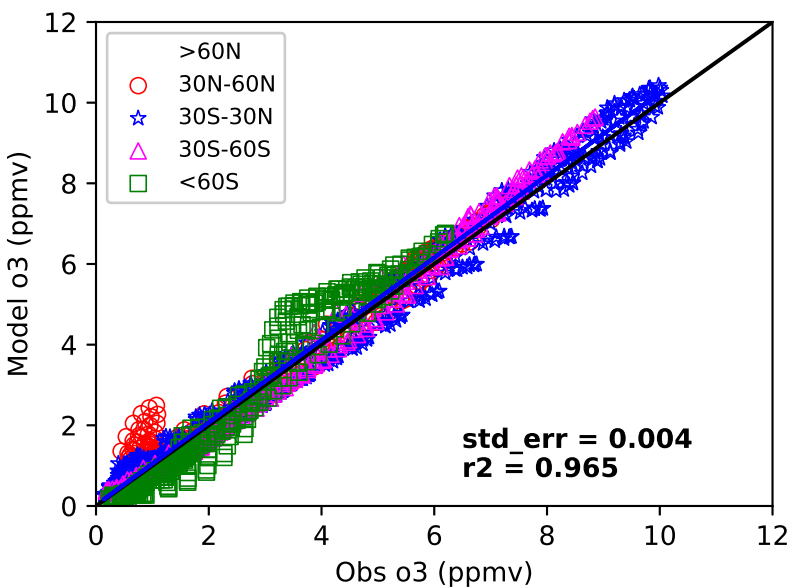
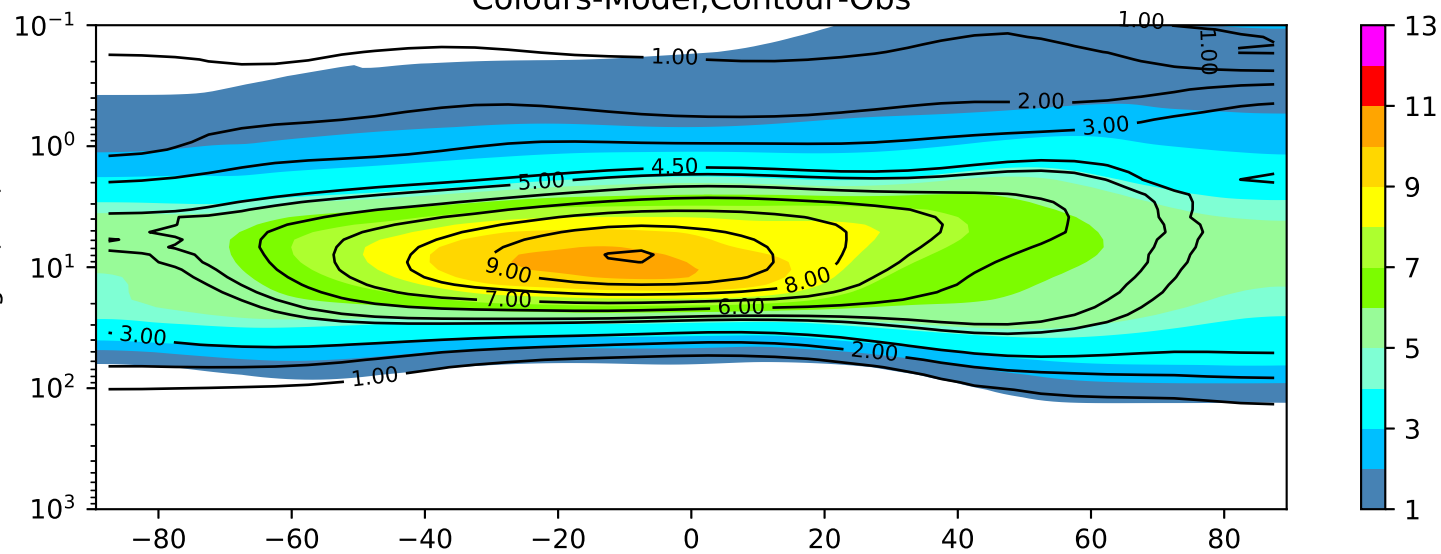
UKCA bs395 vs HALOE:
N₂O (ppmv) Jul

Colours-Model,Contour-Obs



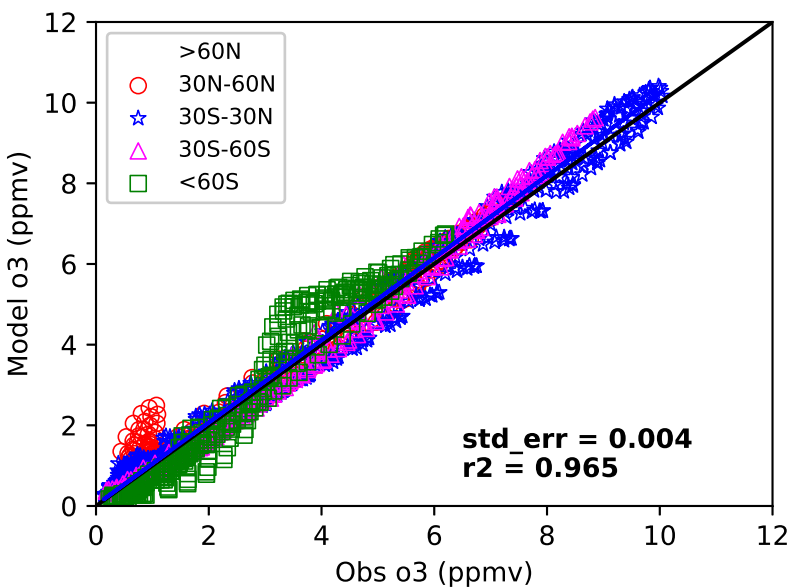
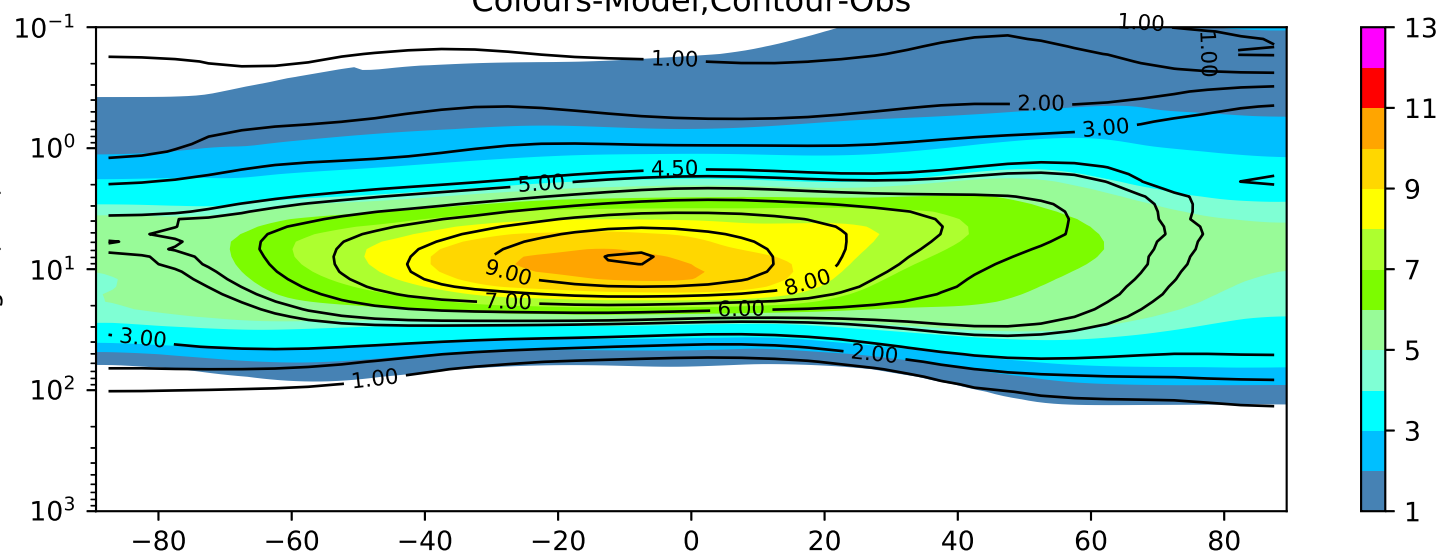
UKCA bw489 vs HALOE:
N₂O (ppmv) Jul

Colours-Model,Contour-Obs



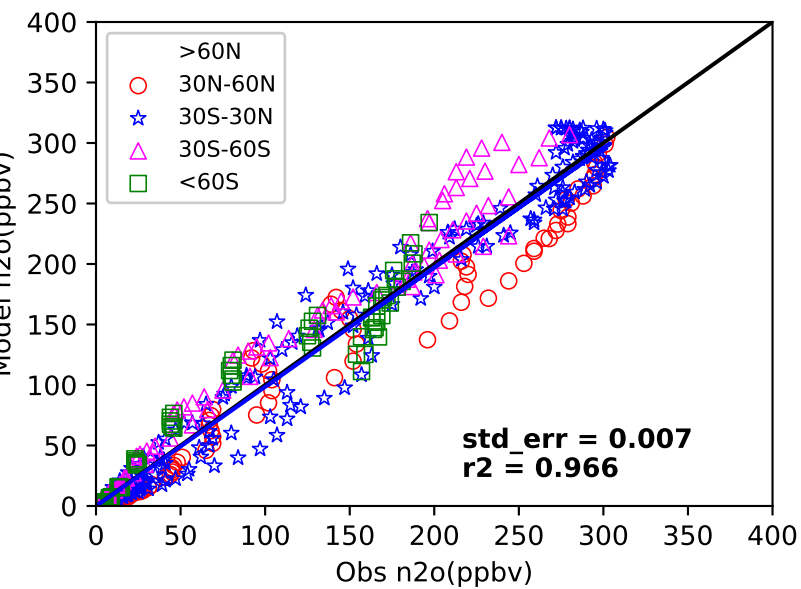
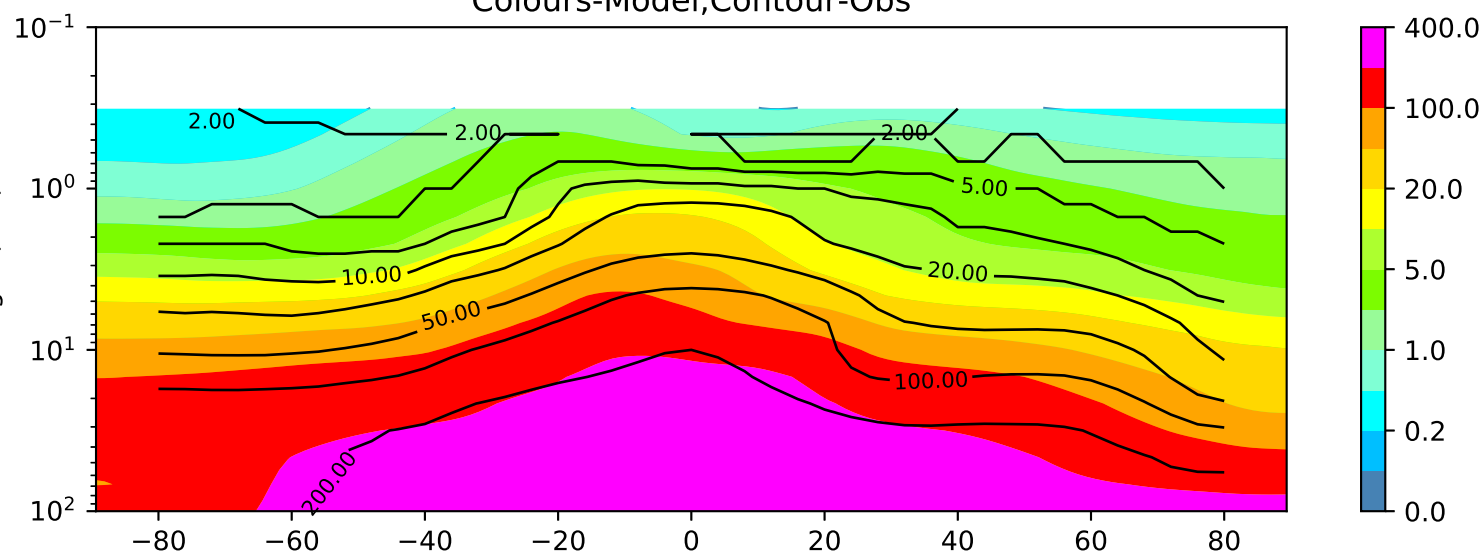
UKCA bs395 vs NIWA-CCMVal:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



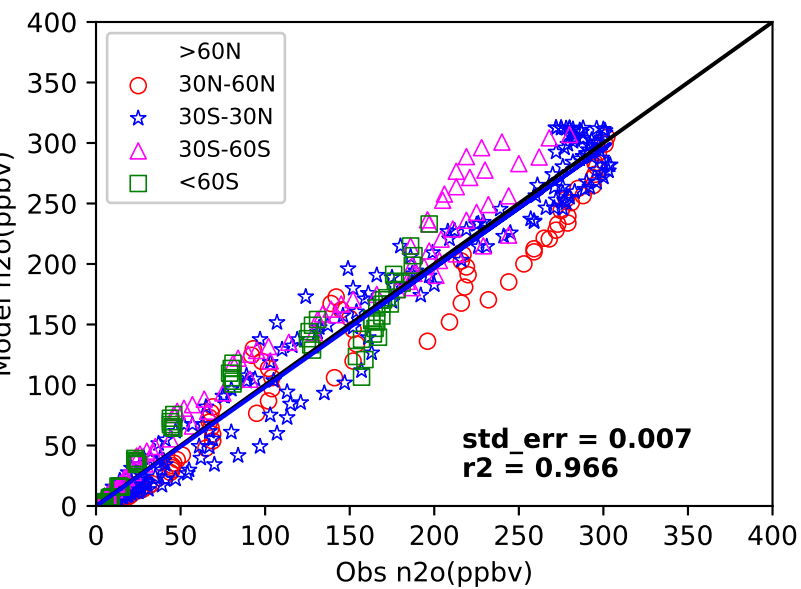
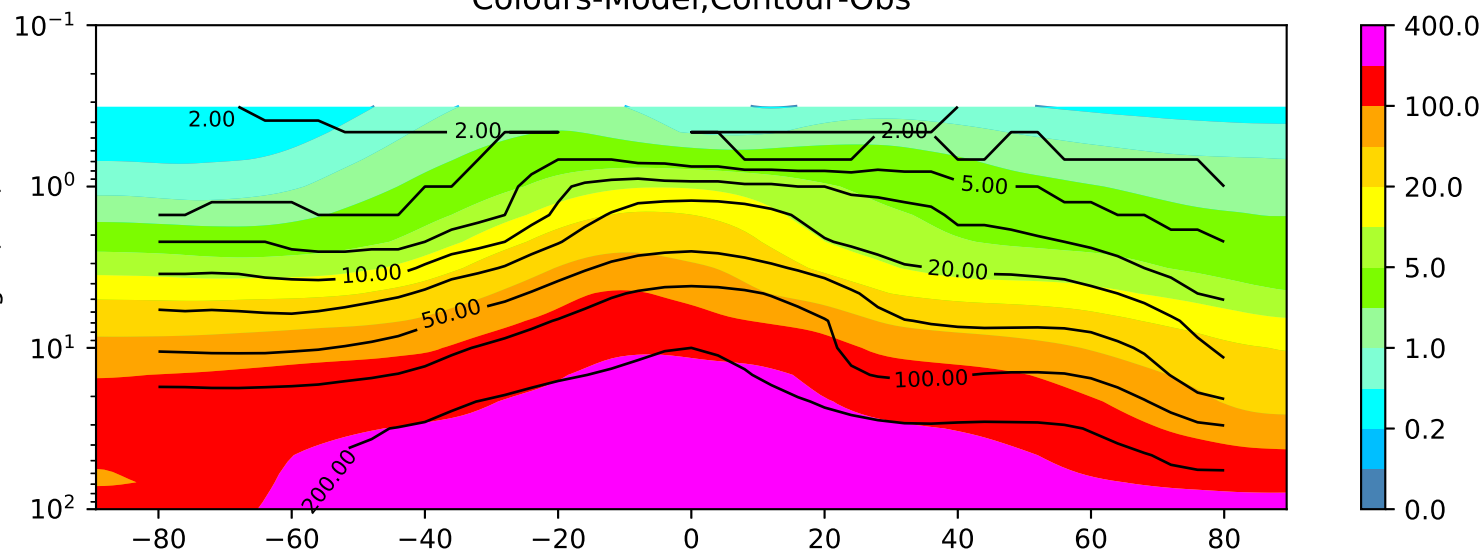
UKCA bw489 vs NIWA-CCMVal:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



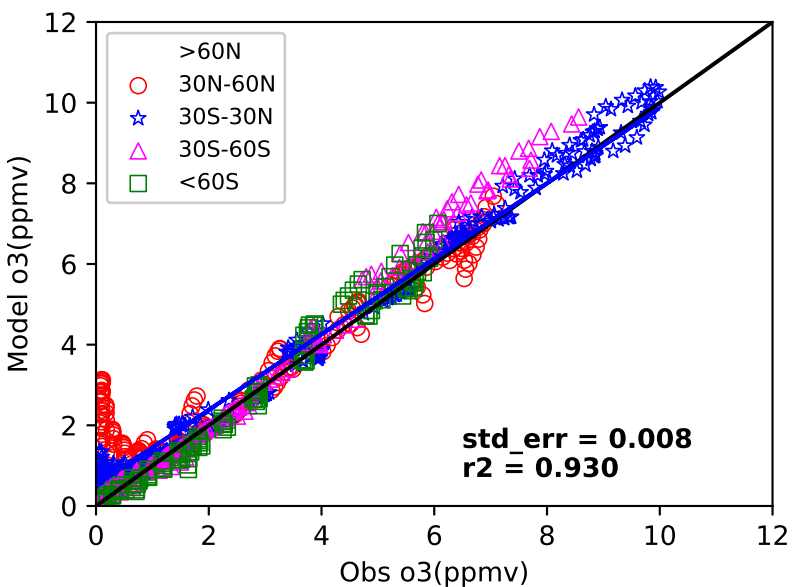
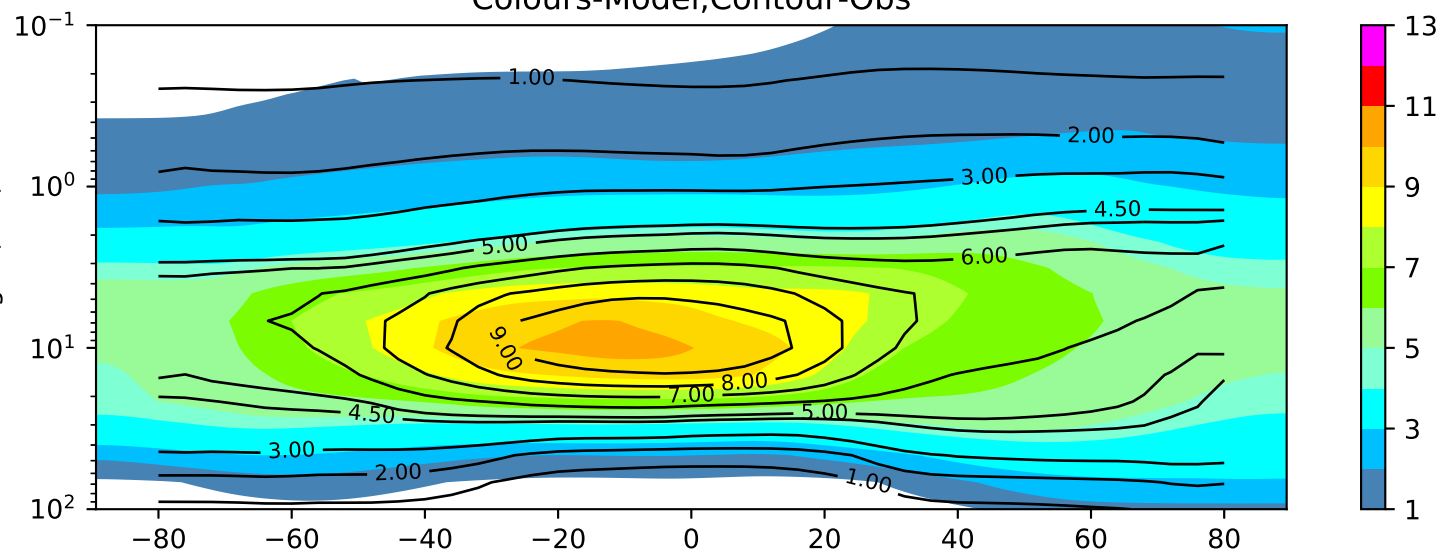
UKCA bs395 vs HALOE:
N2O (ppmv) Jan

Colours-Model,Contour-Obs



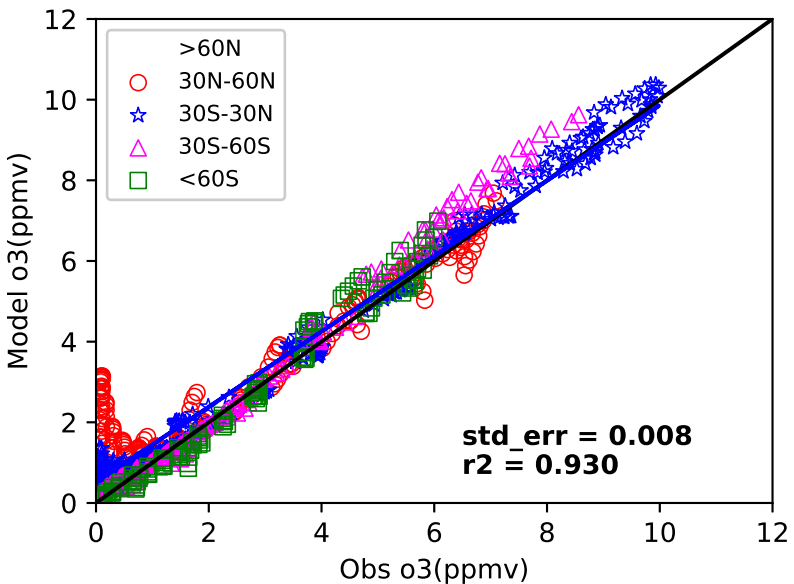
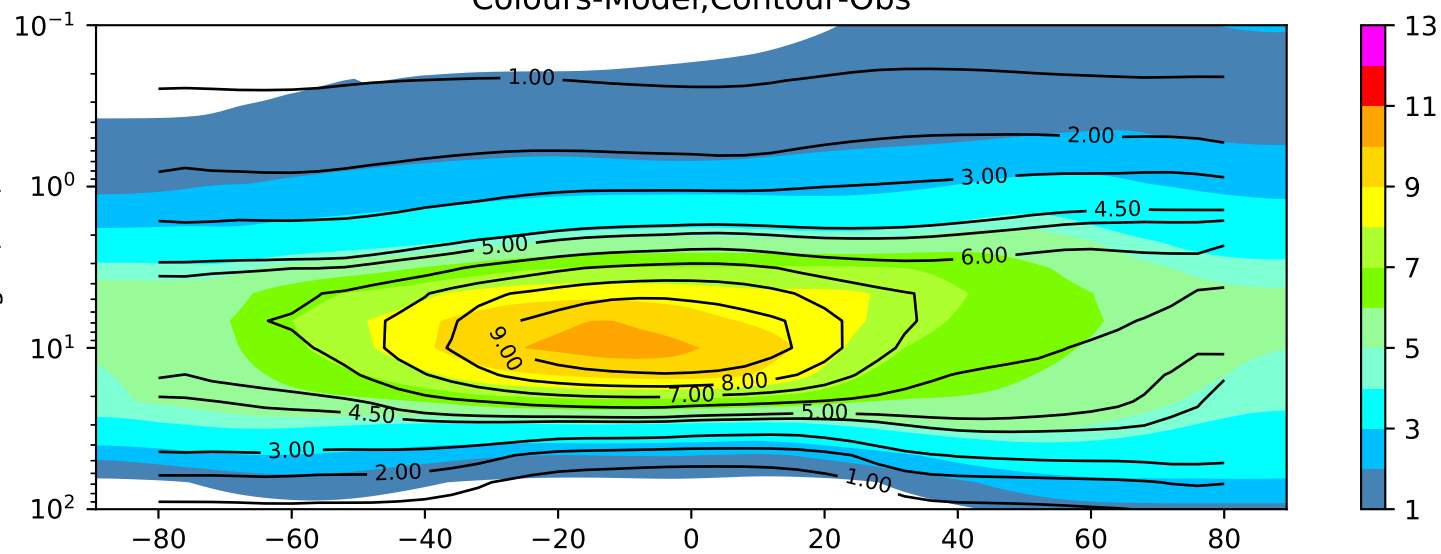
UKCA bw489 vs HALOE:
N₂O (ppmv) Jan

Colours-Model,Contour-Obs



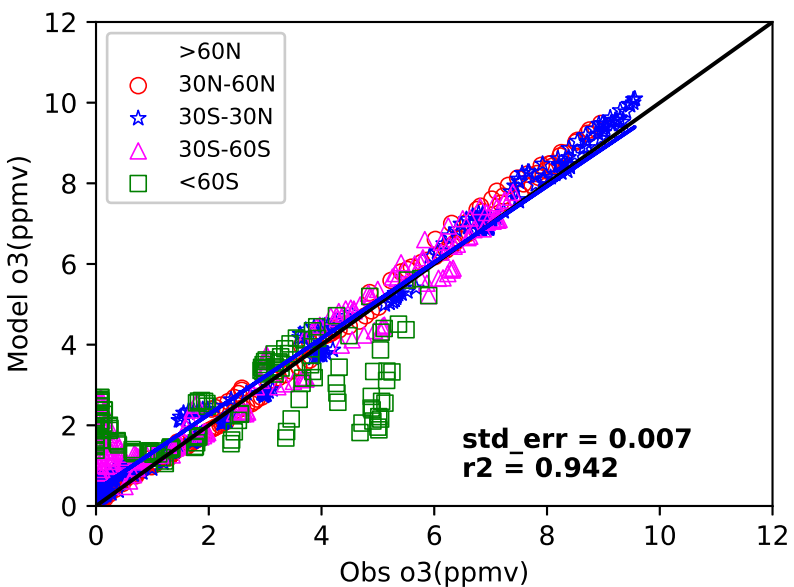
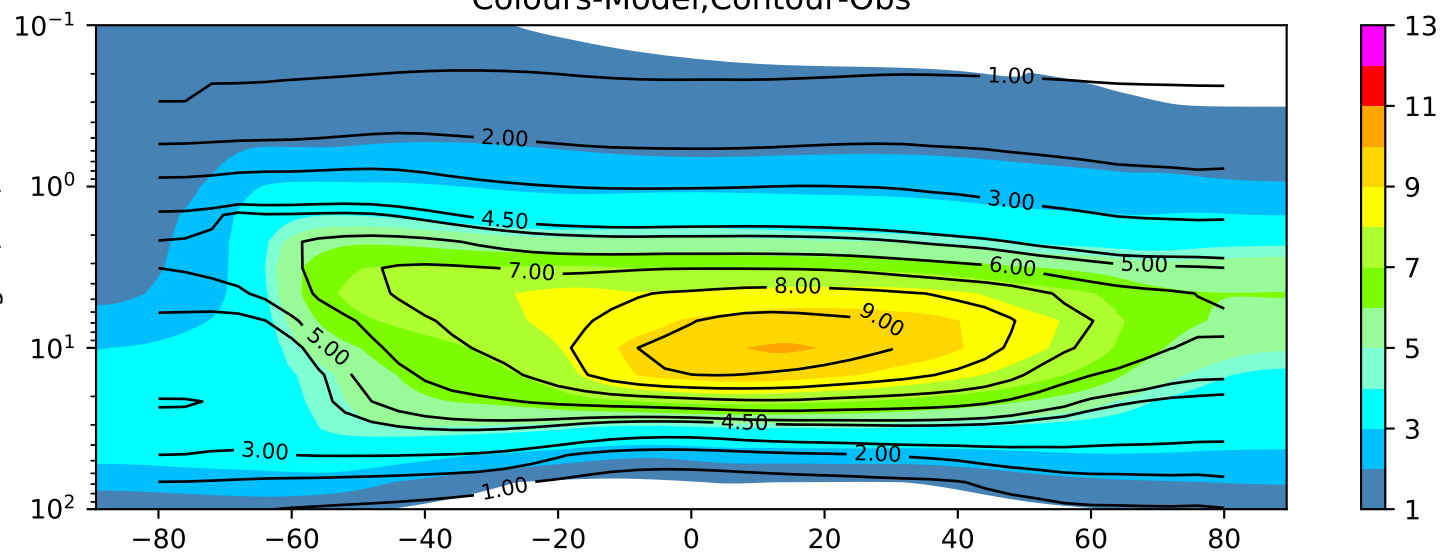
UKCA bs395 vs HALOE:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



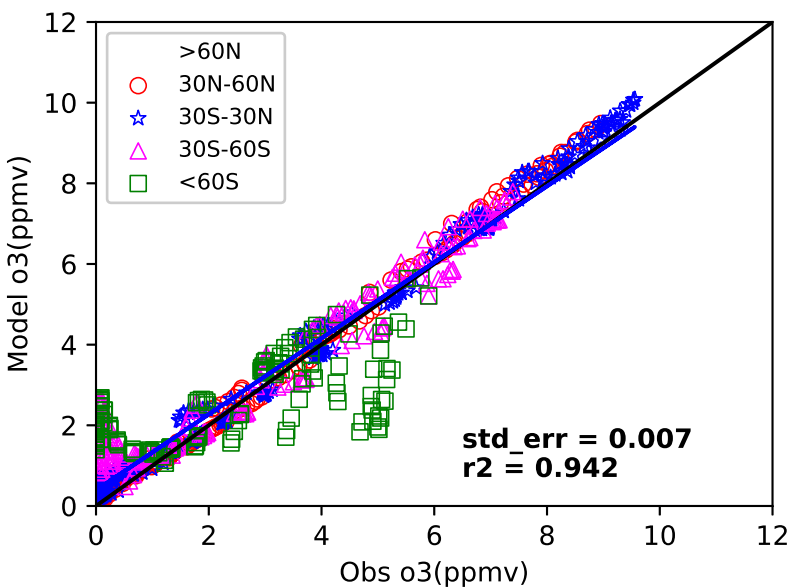
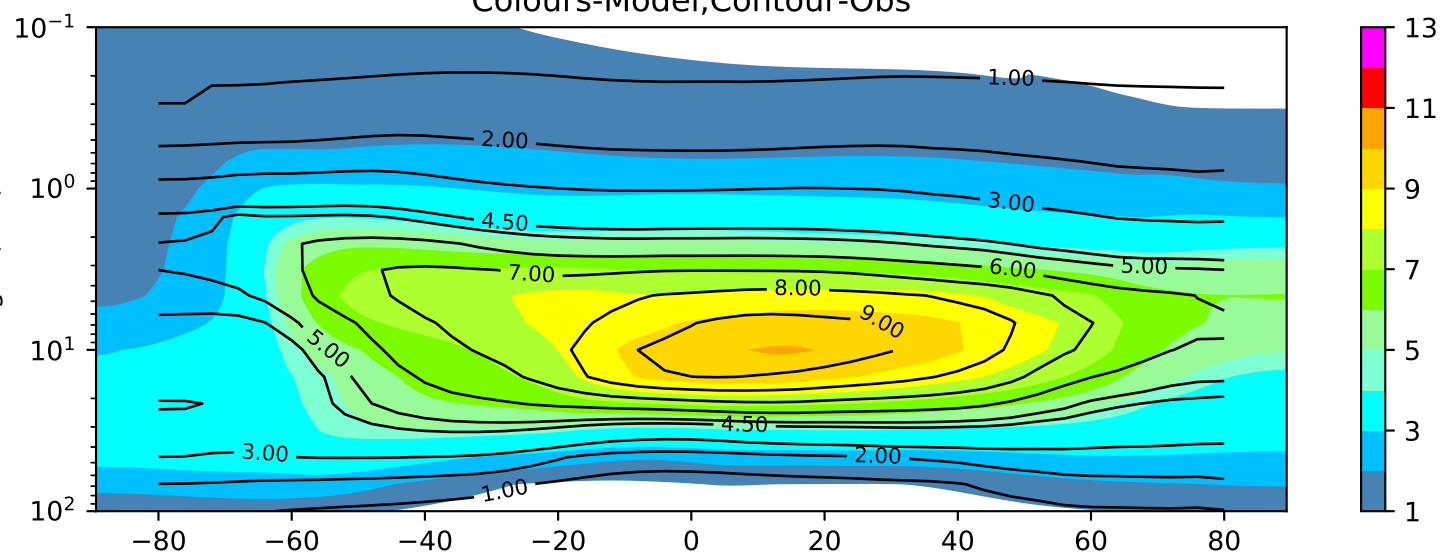
UKCA bw489 vs HALOE:
O₃ (ppmv) Jan

Colours-Model,Contour-Obs



UKCA bs395 vs HALOE:
O3 (ppmv) Jul

Colours-Model,Contour-Obs

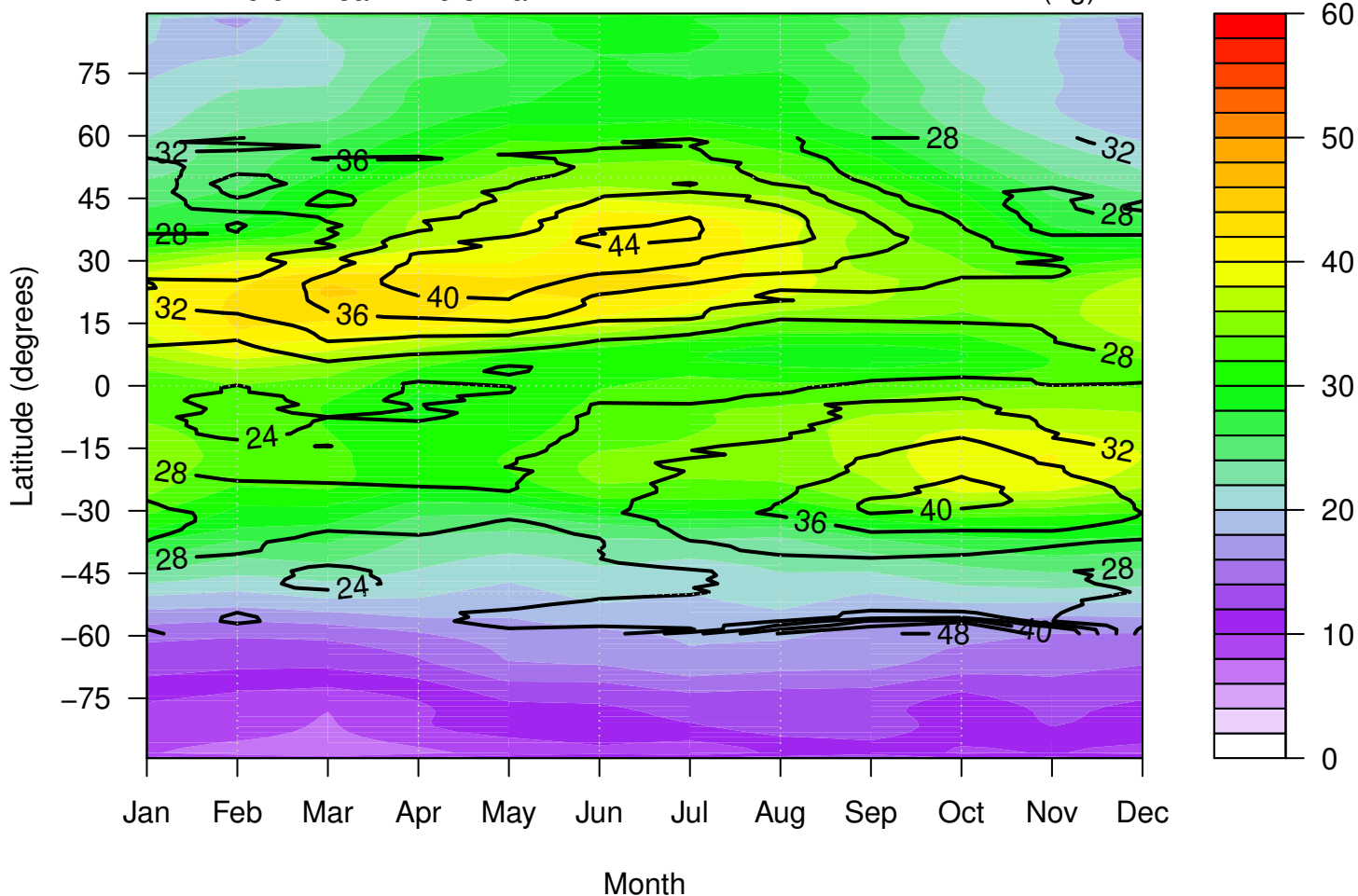


UKCA bw489 vs HALOE:
O3 (ppmv) Jul

bs395 tropospheric O₃ column

Min = 6.62 Mean = 26.8 Max = 44.2

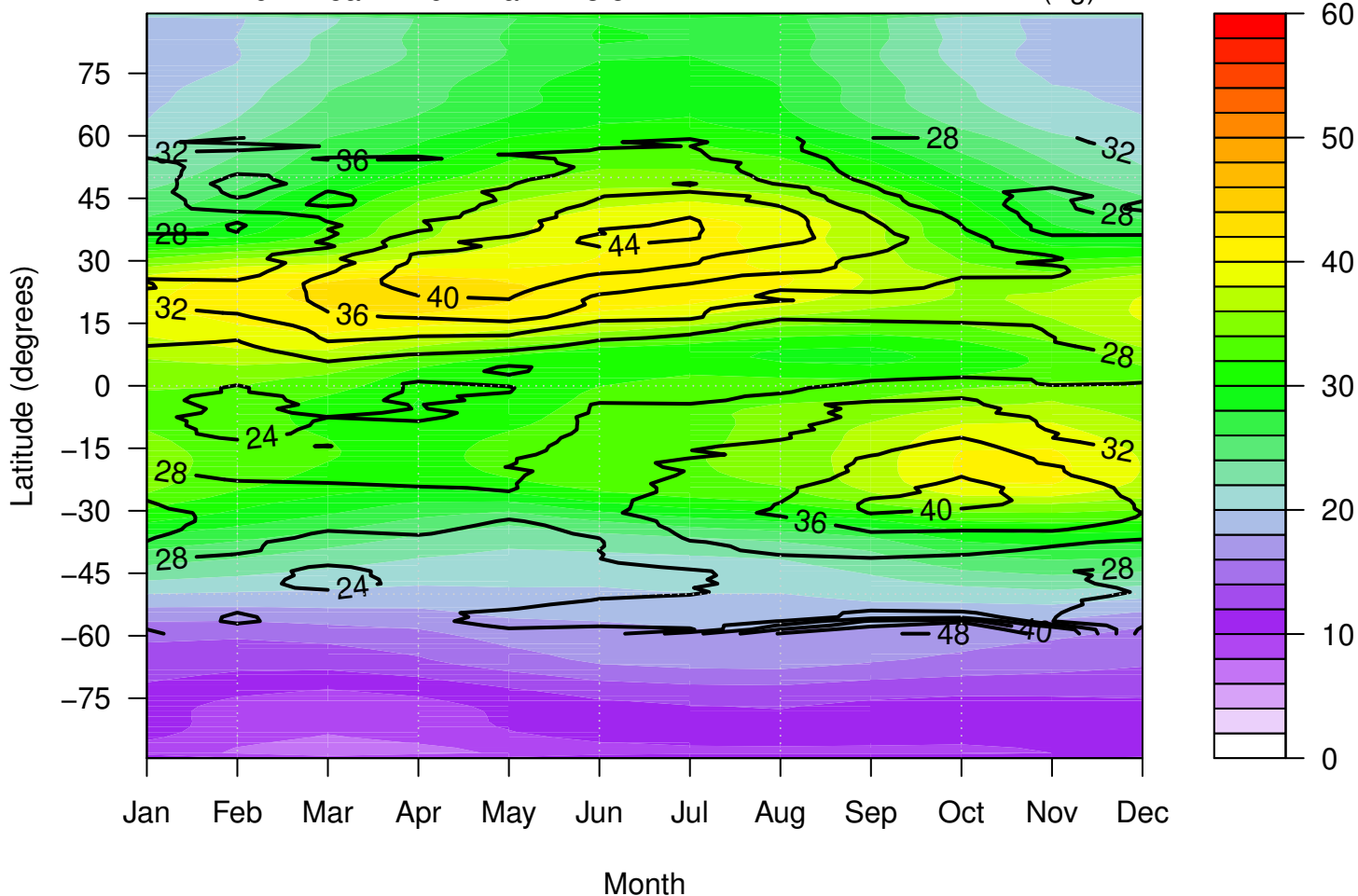
Burden (Tg) = 330



bw489 tropospheric O₃ column

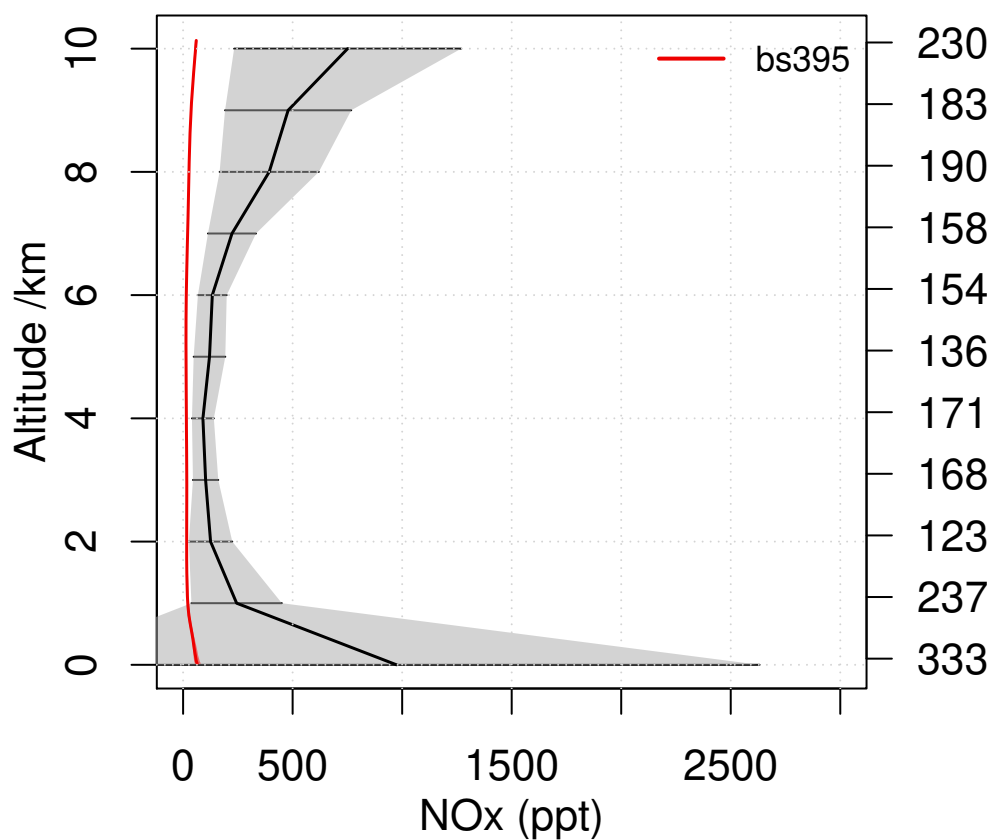
Min = 6.7 Mean = 26.7 Max = 43.8

Burden (Tg) = 329

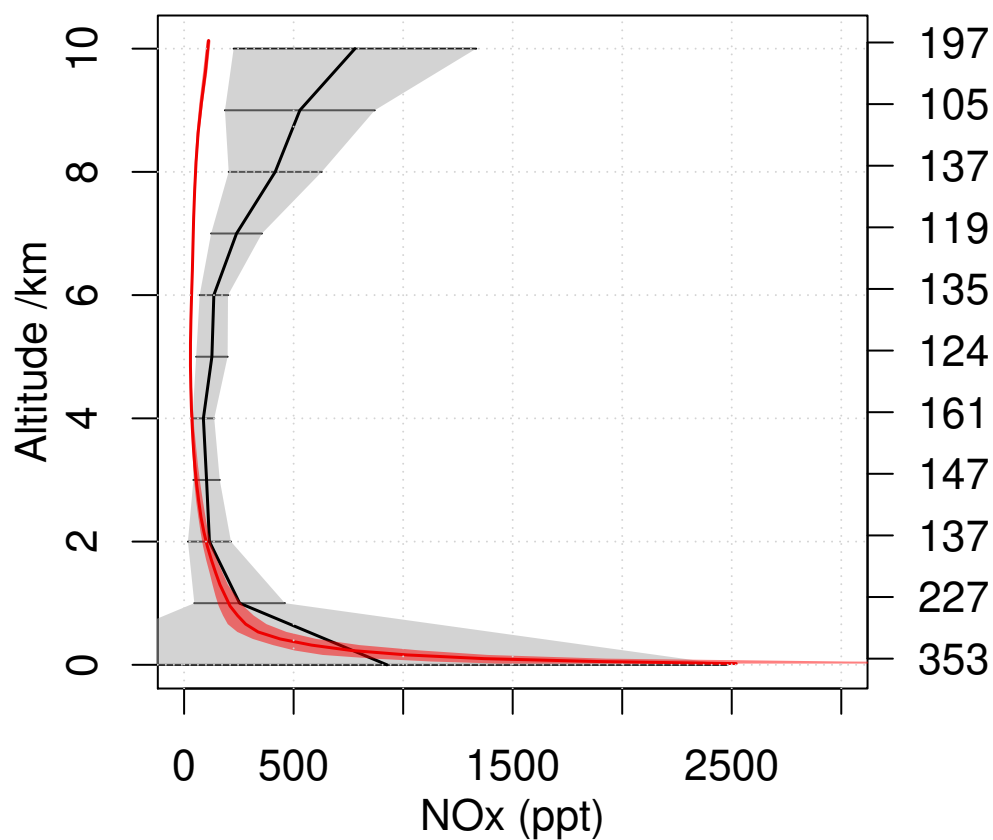


Emmons NOx comparison

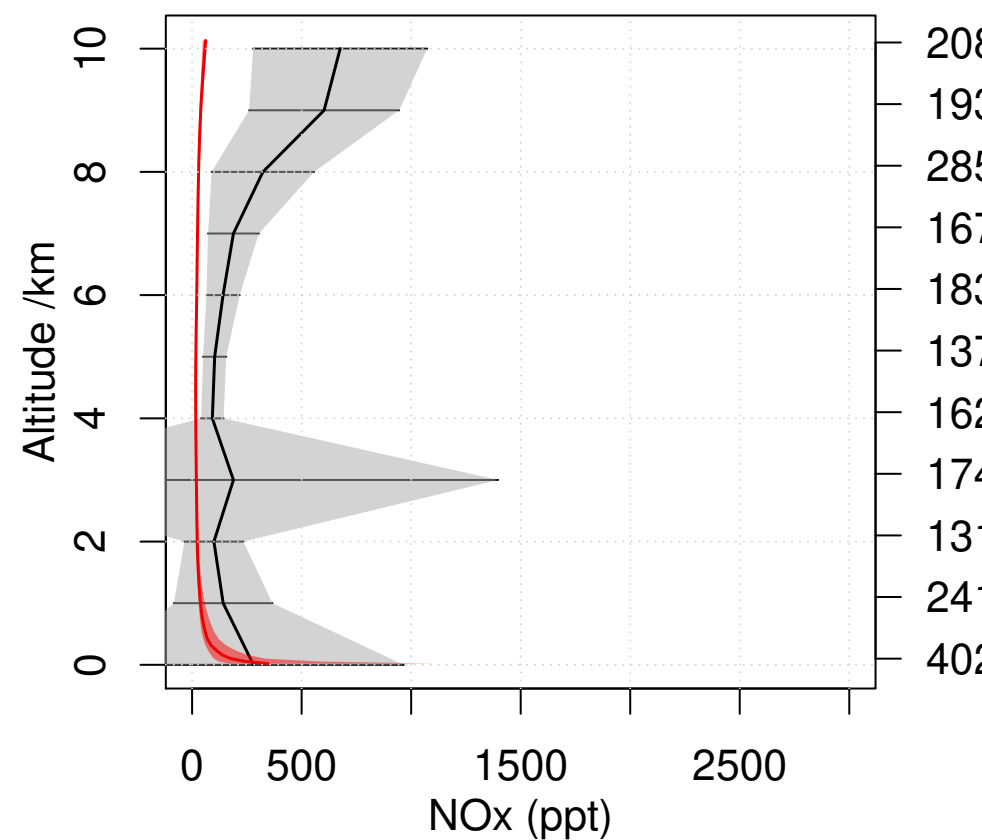
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



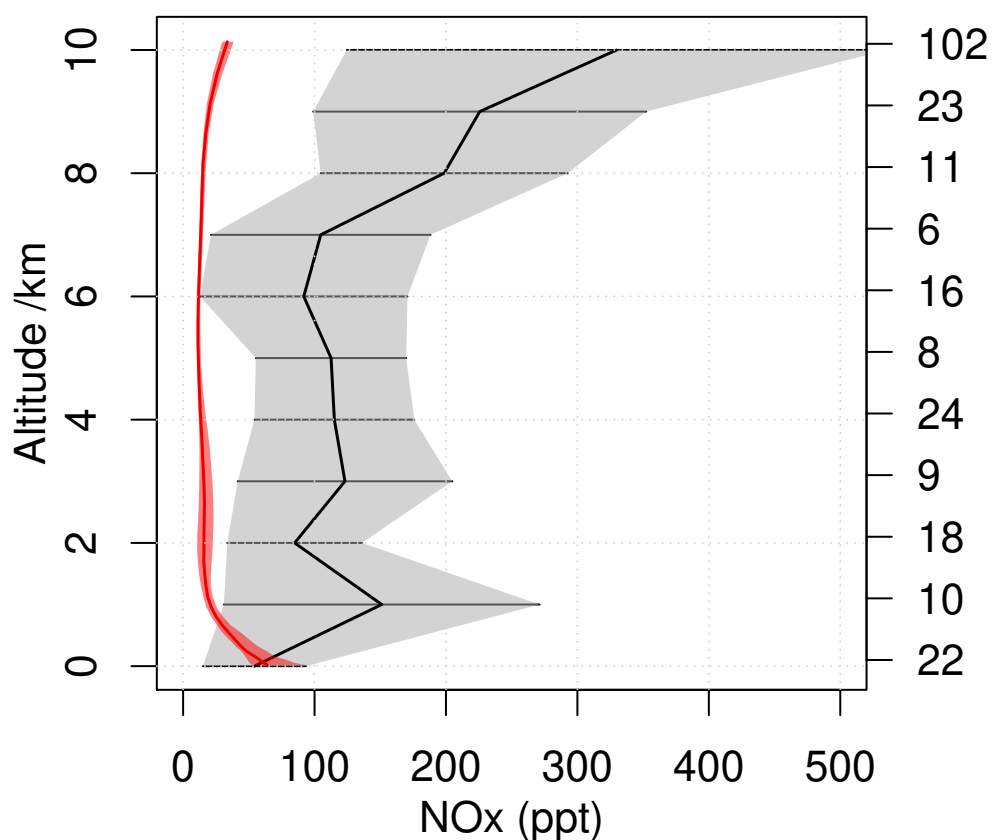
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



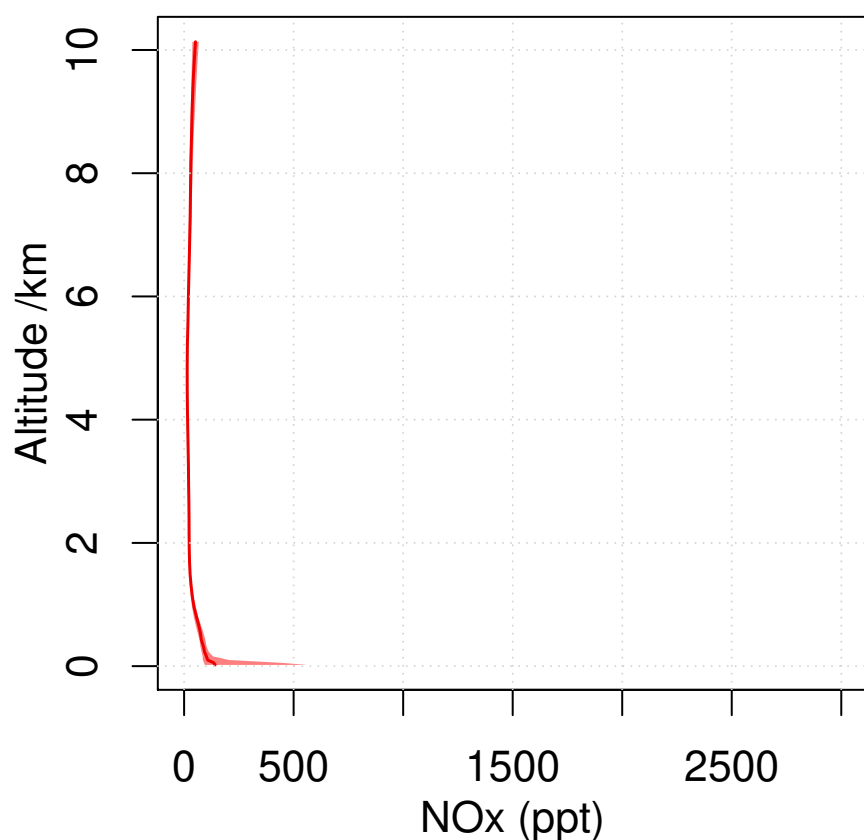
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



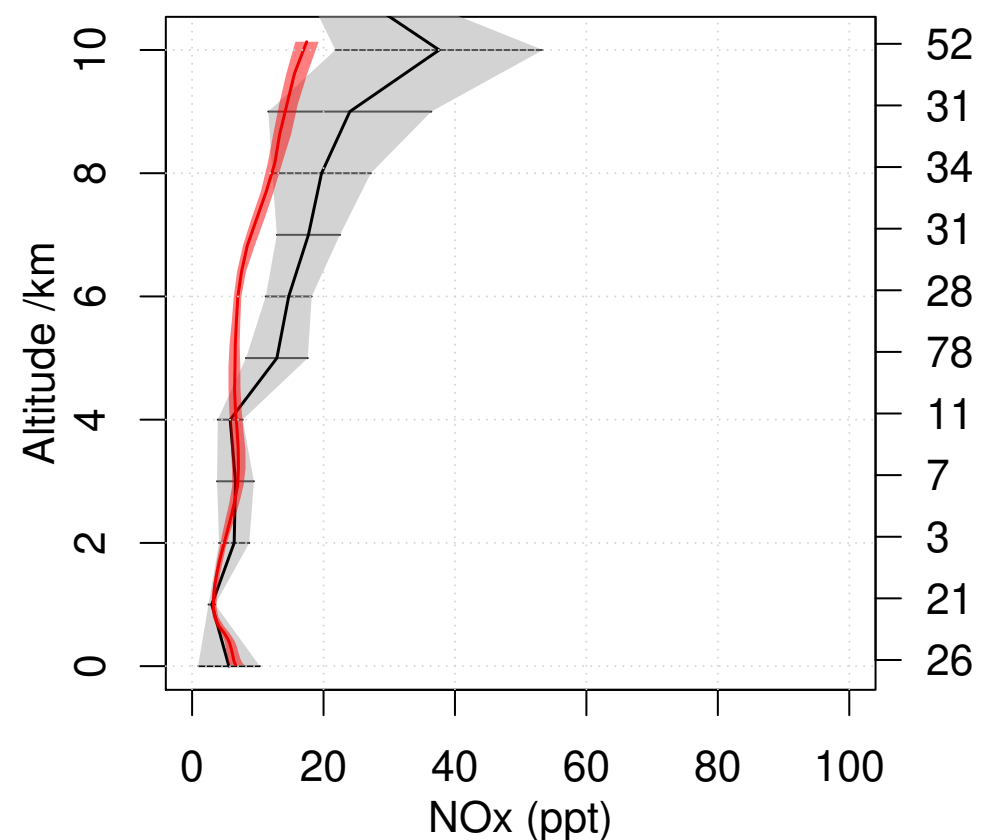
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



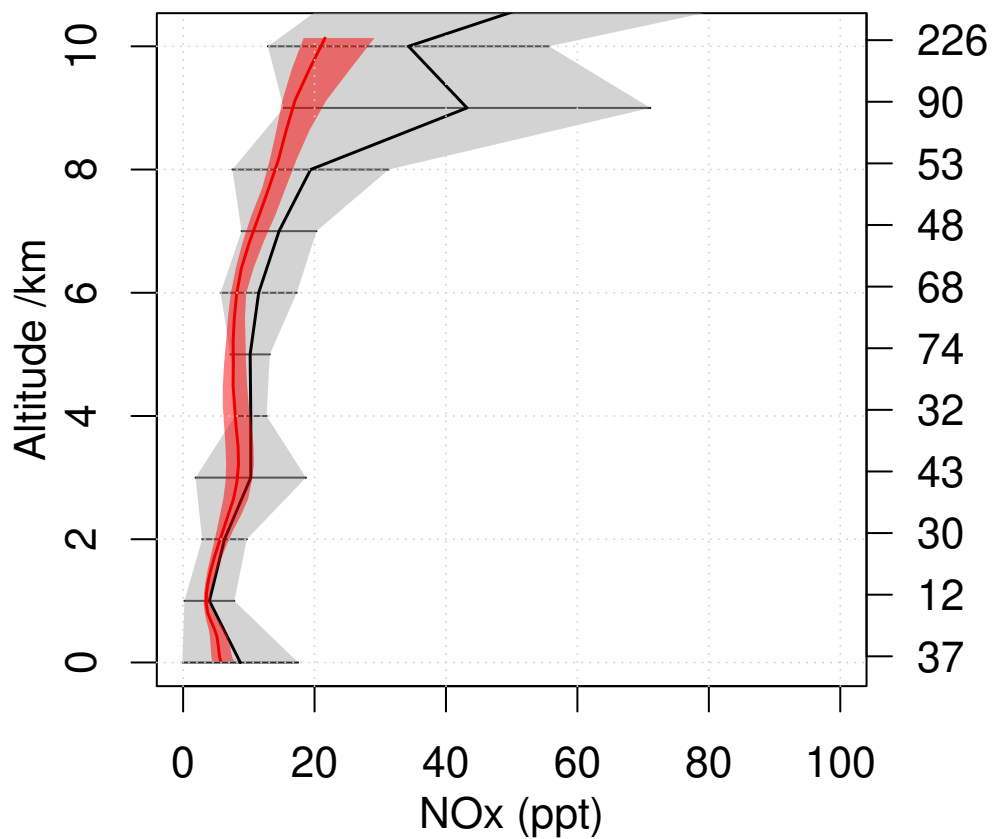
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



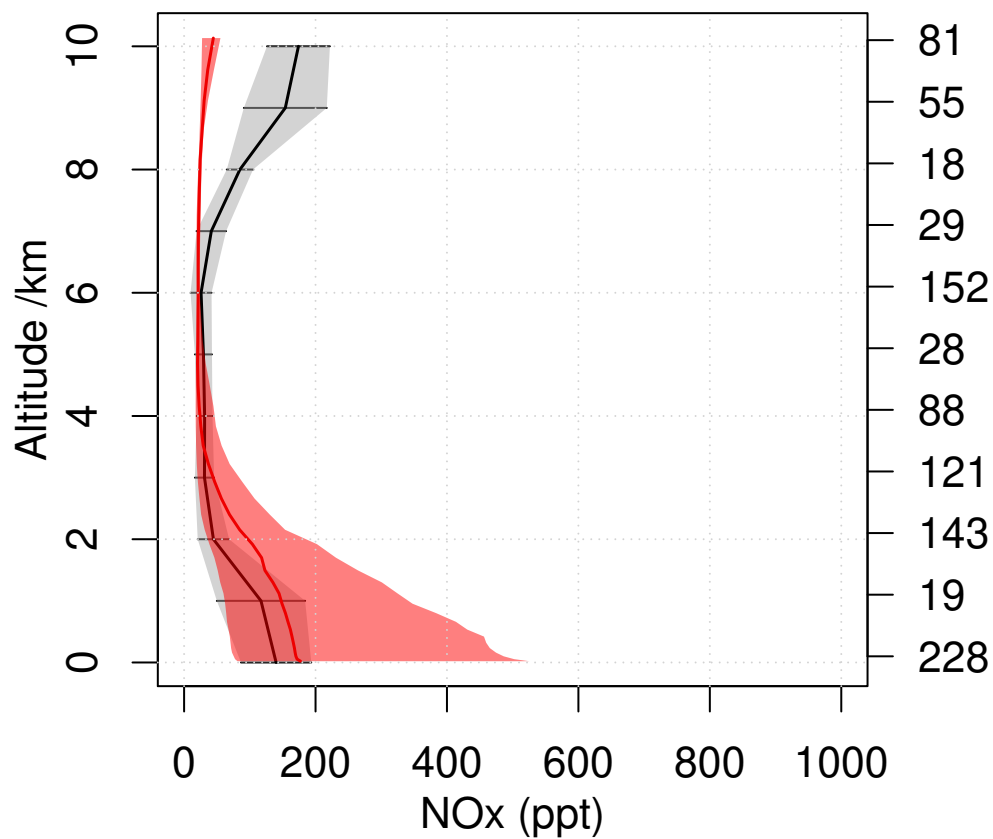
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



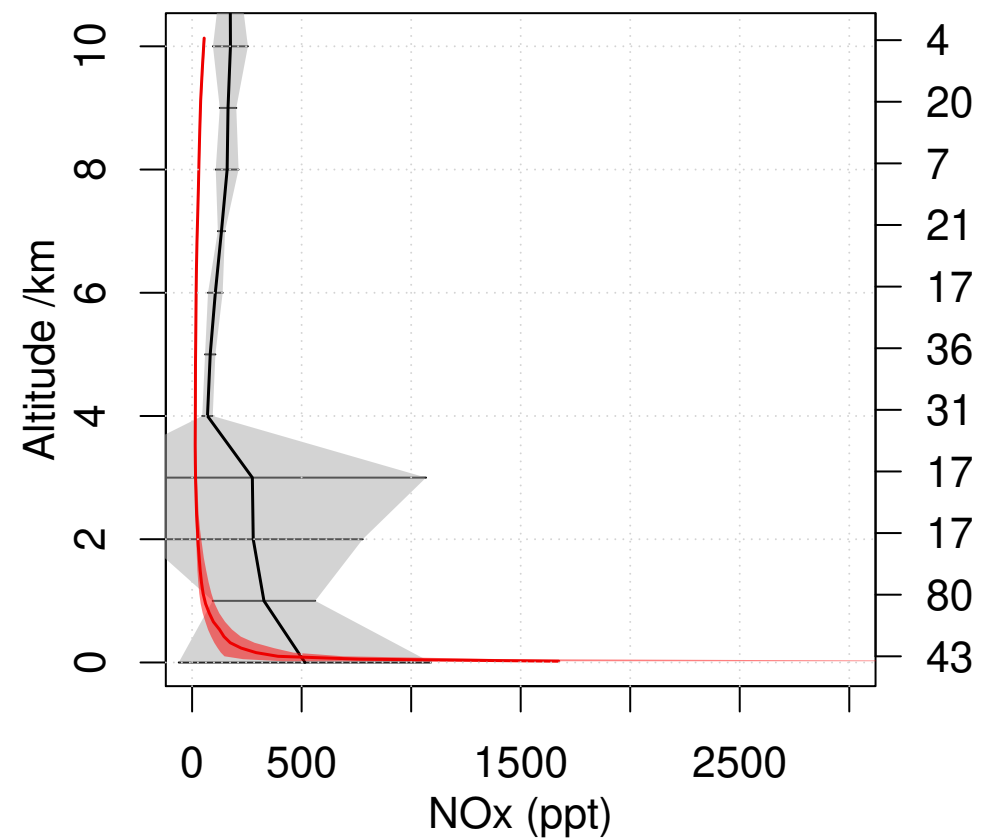
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



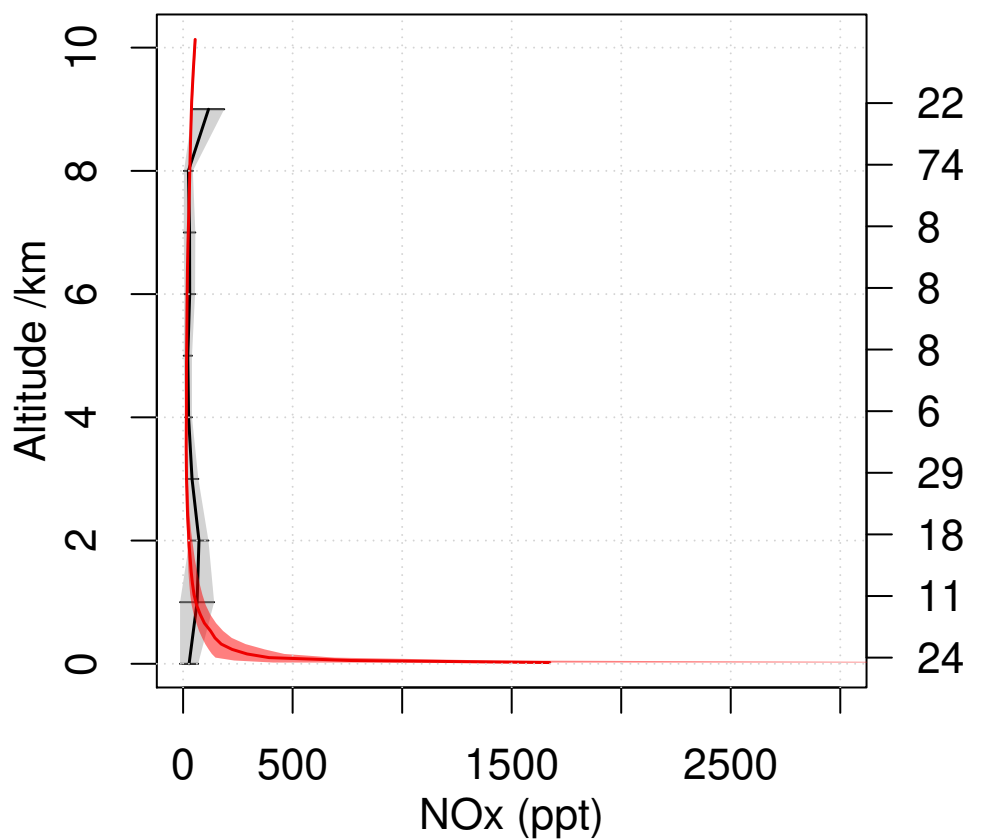
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



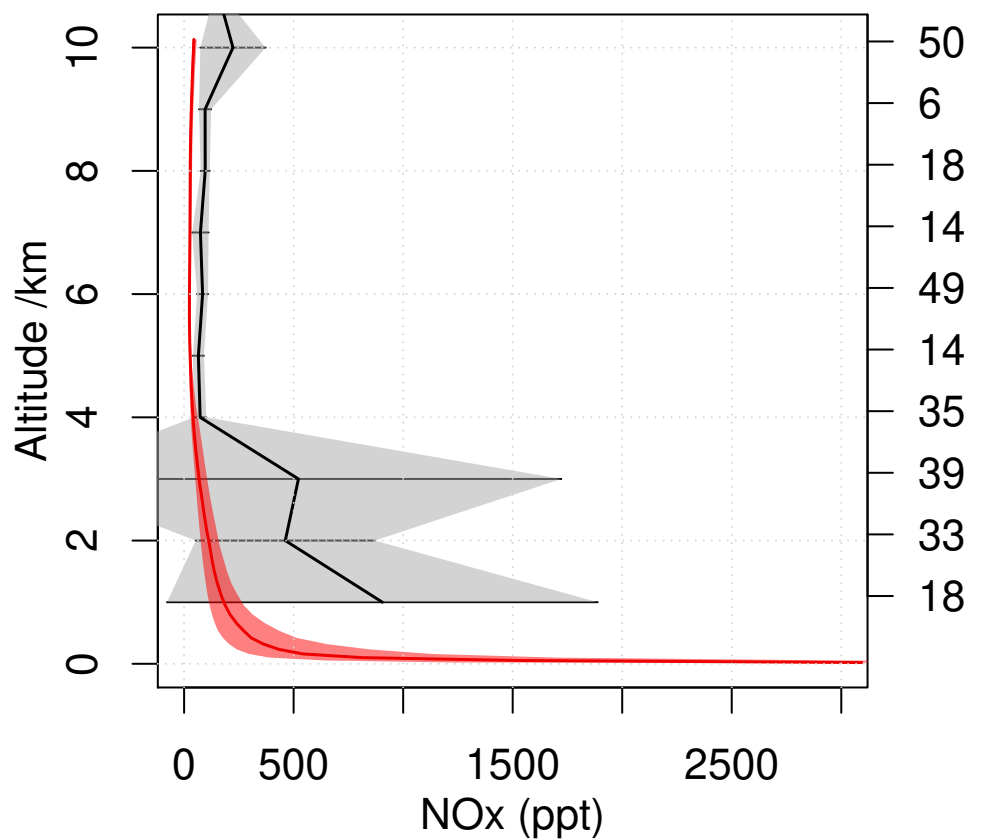
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



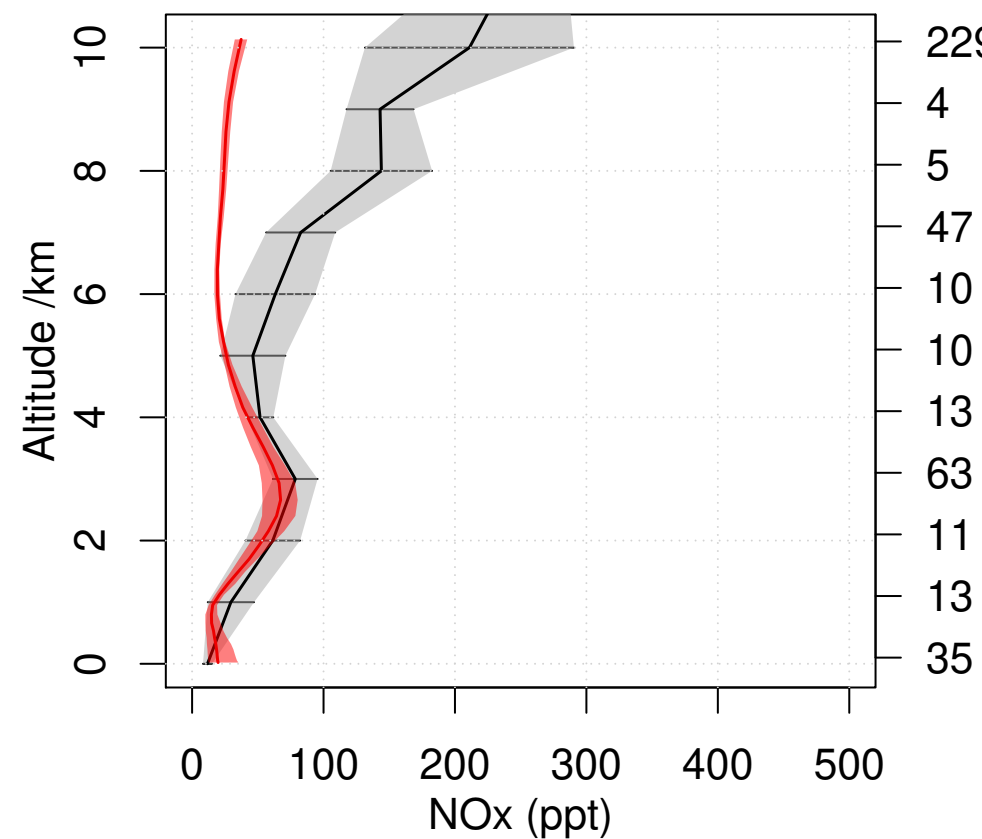
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

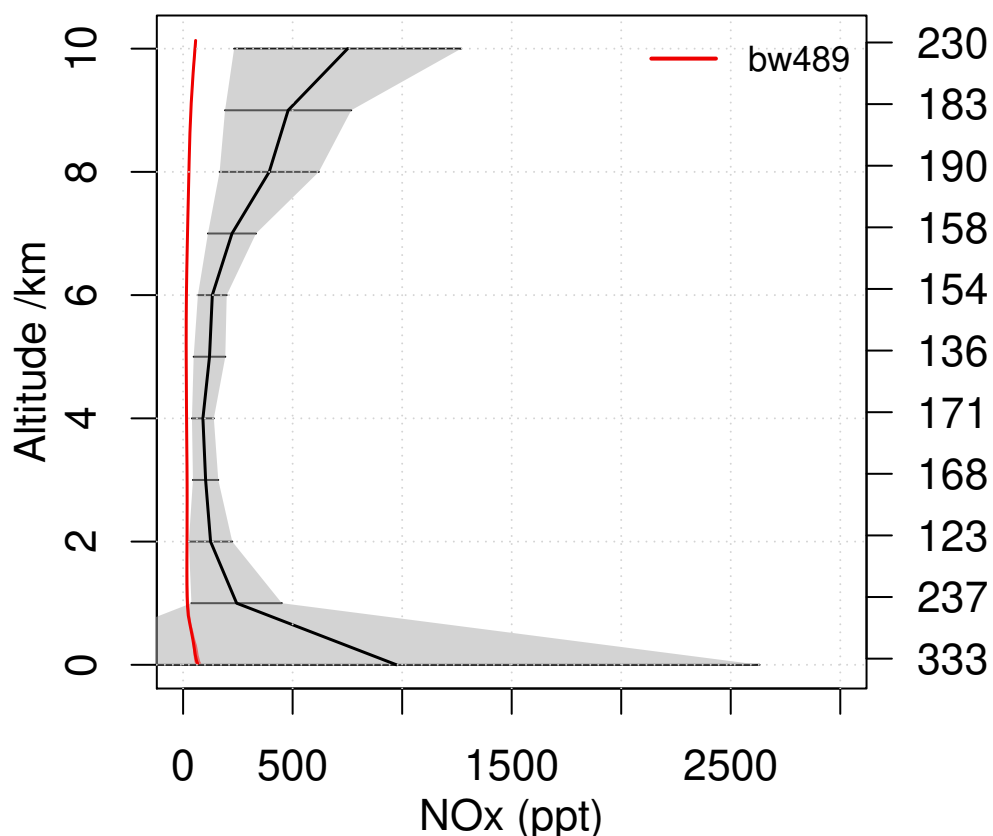


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

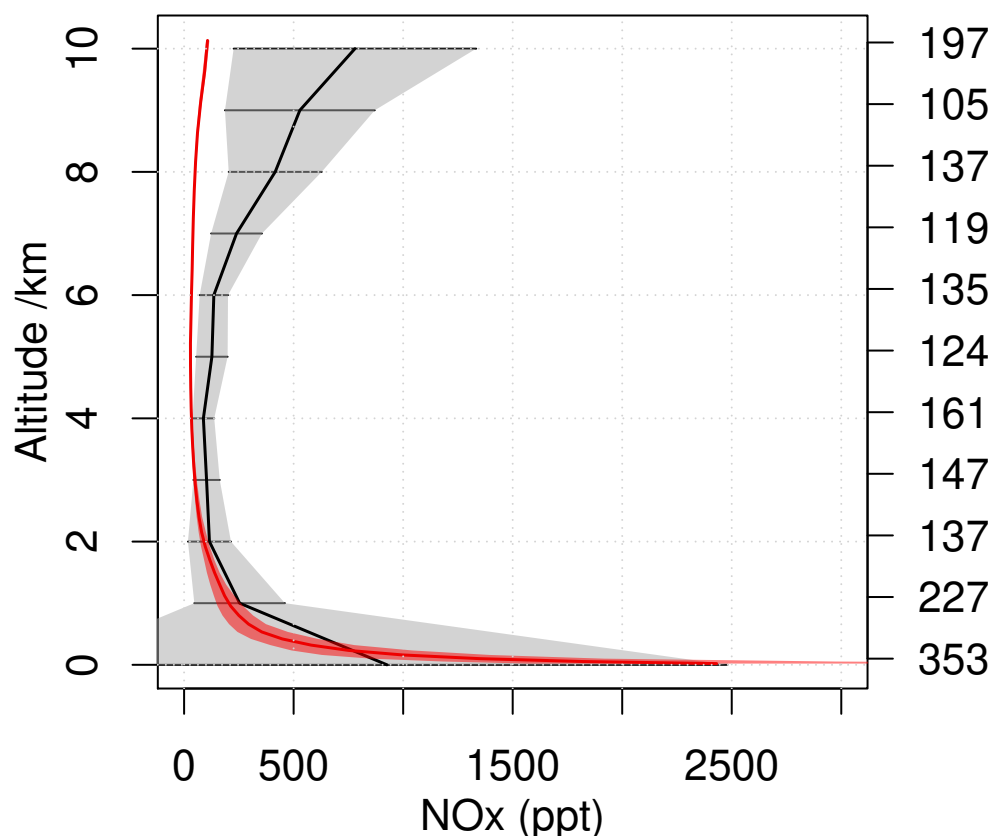


Emmons NOx comparison

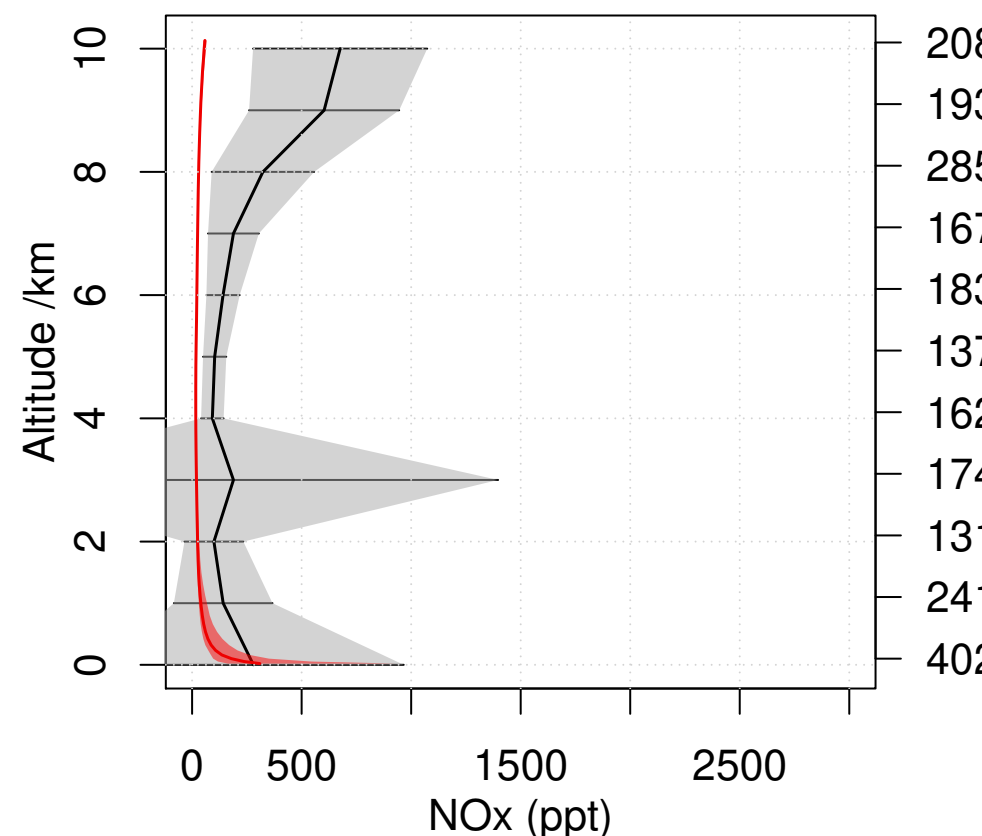
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



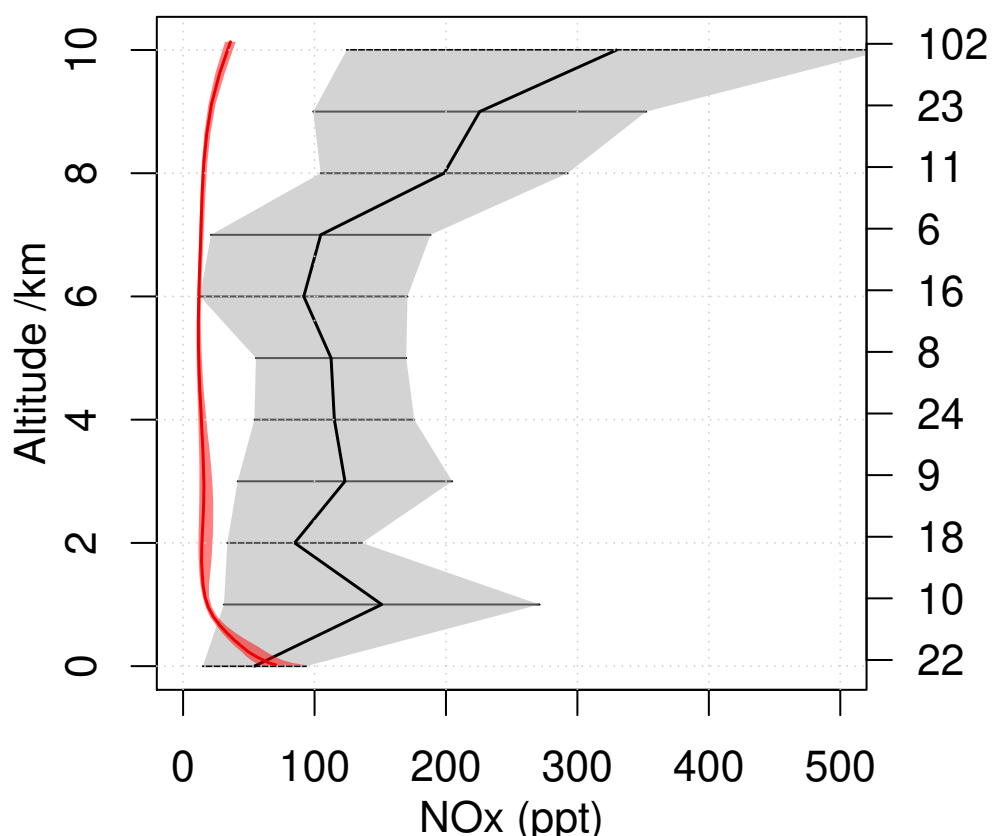
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



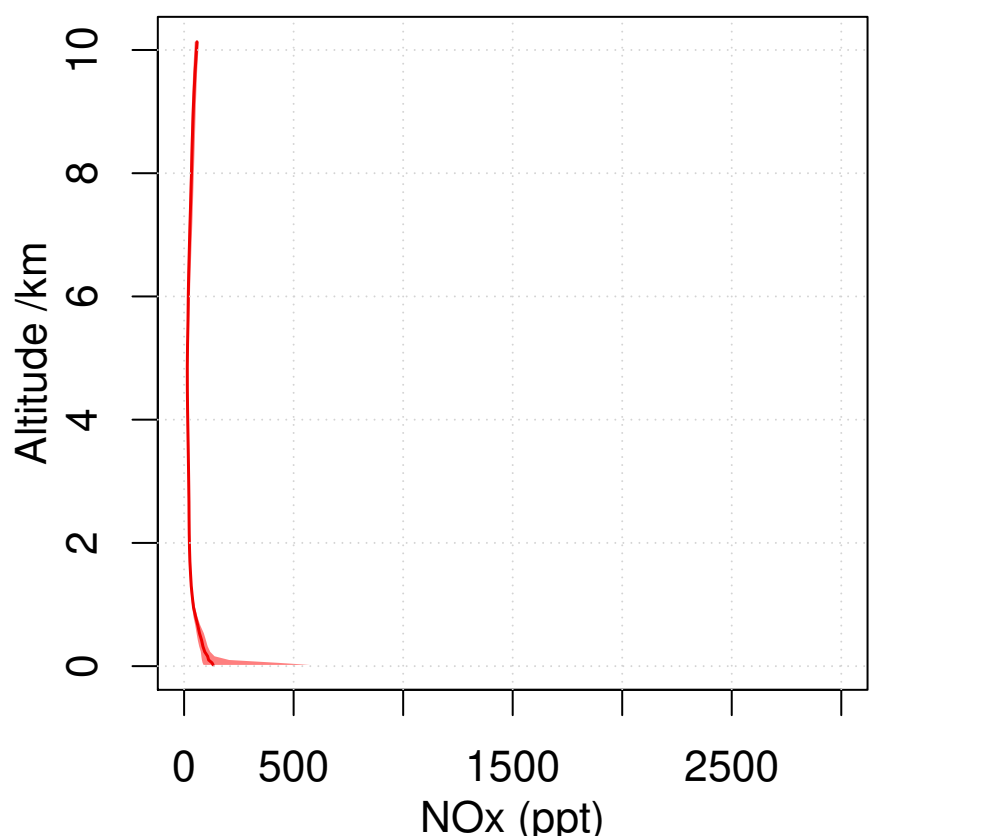
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



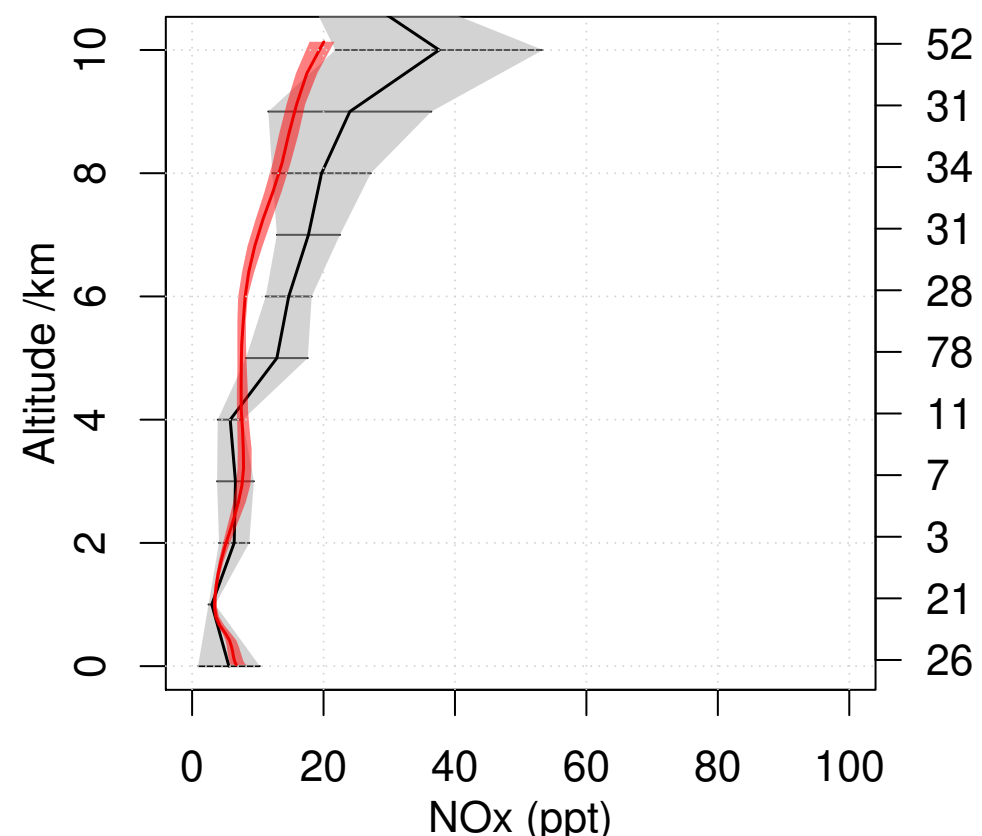
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



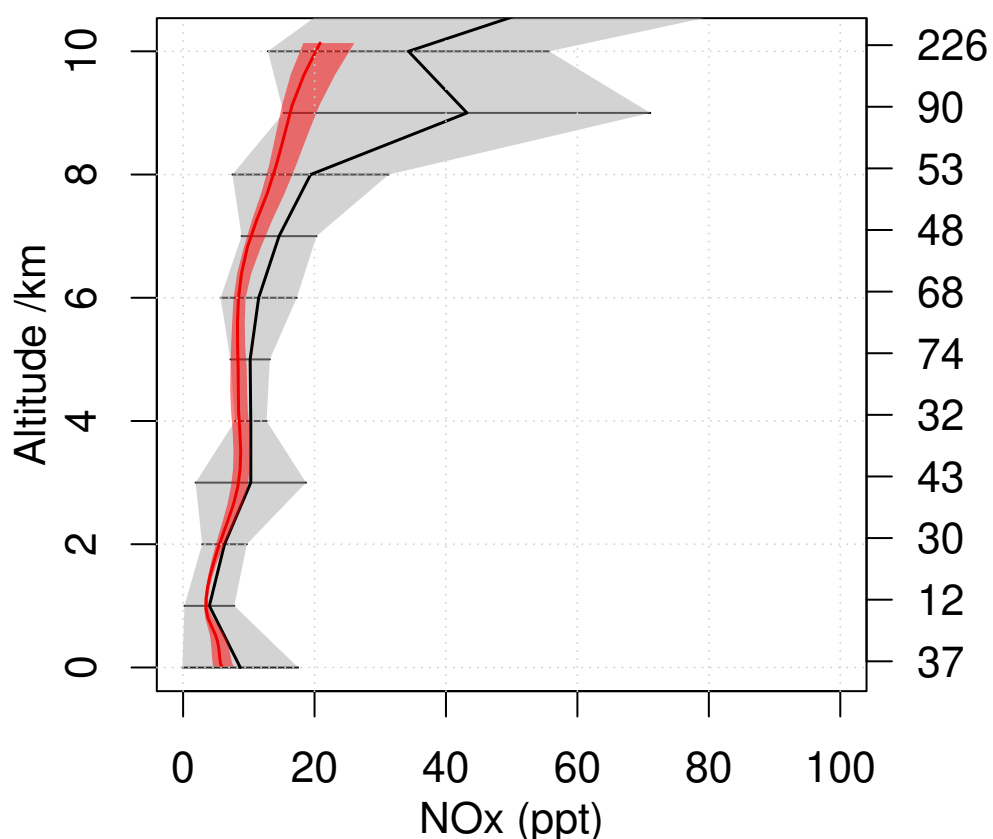
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



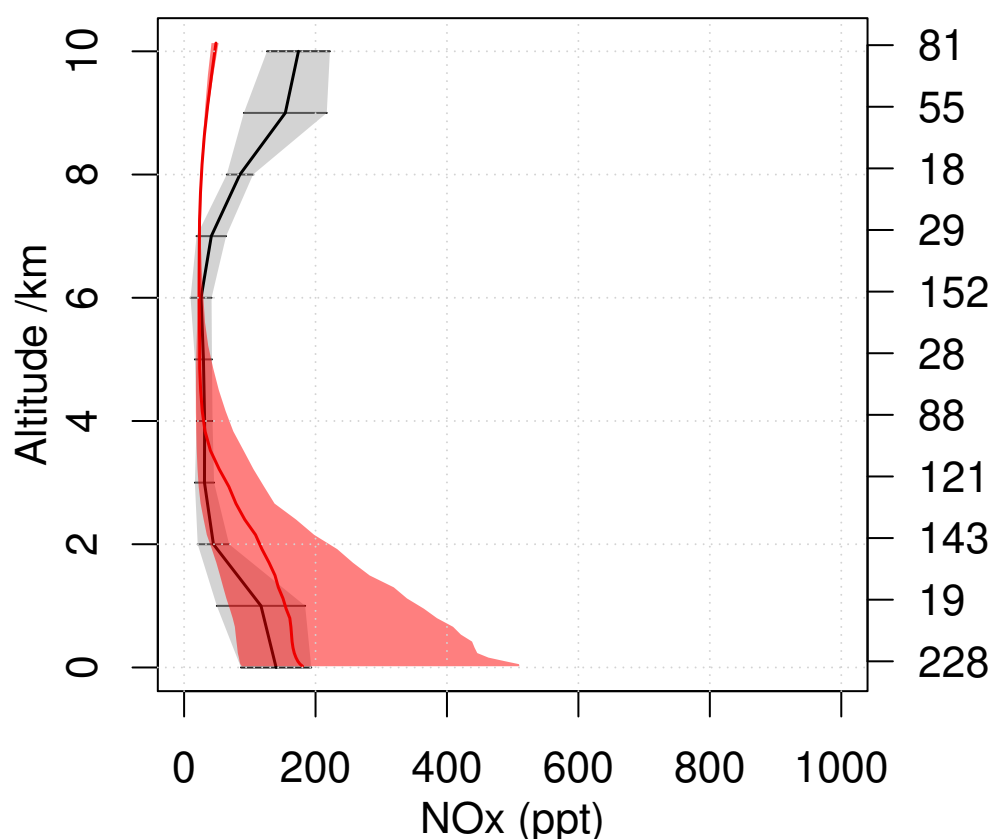
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



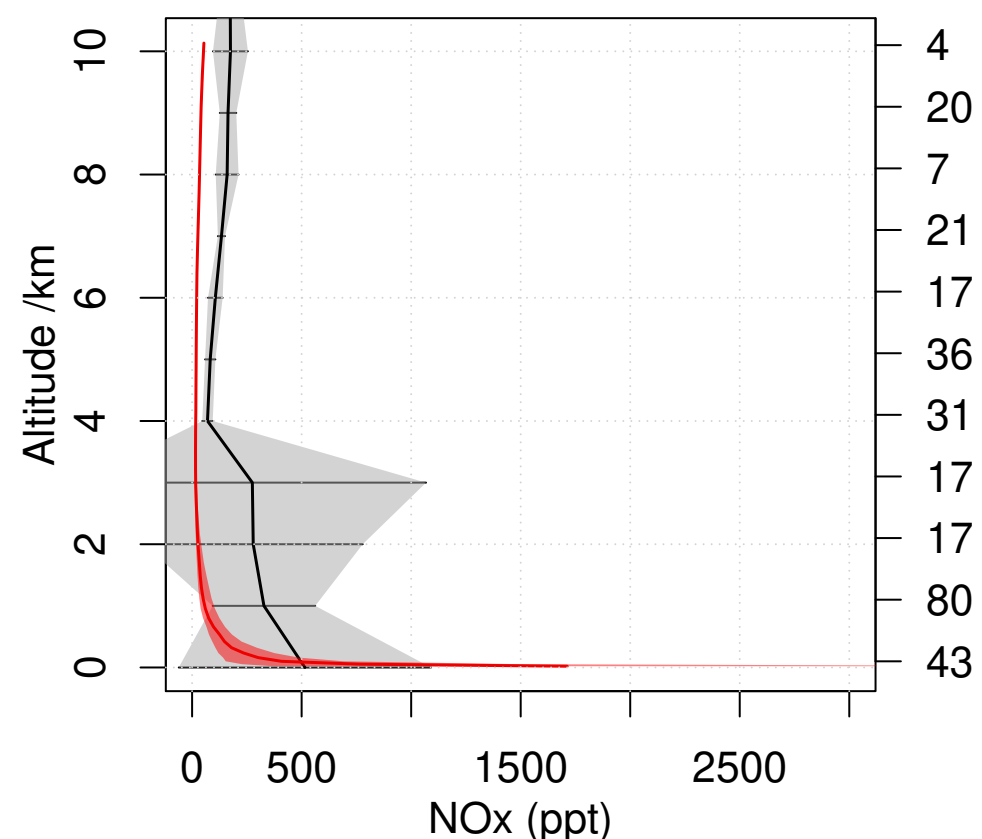
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



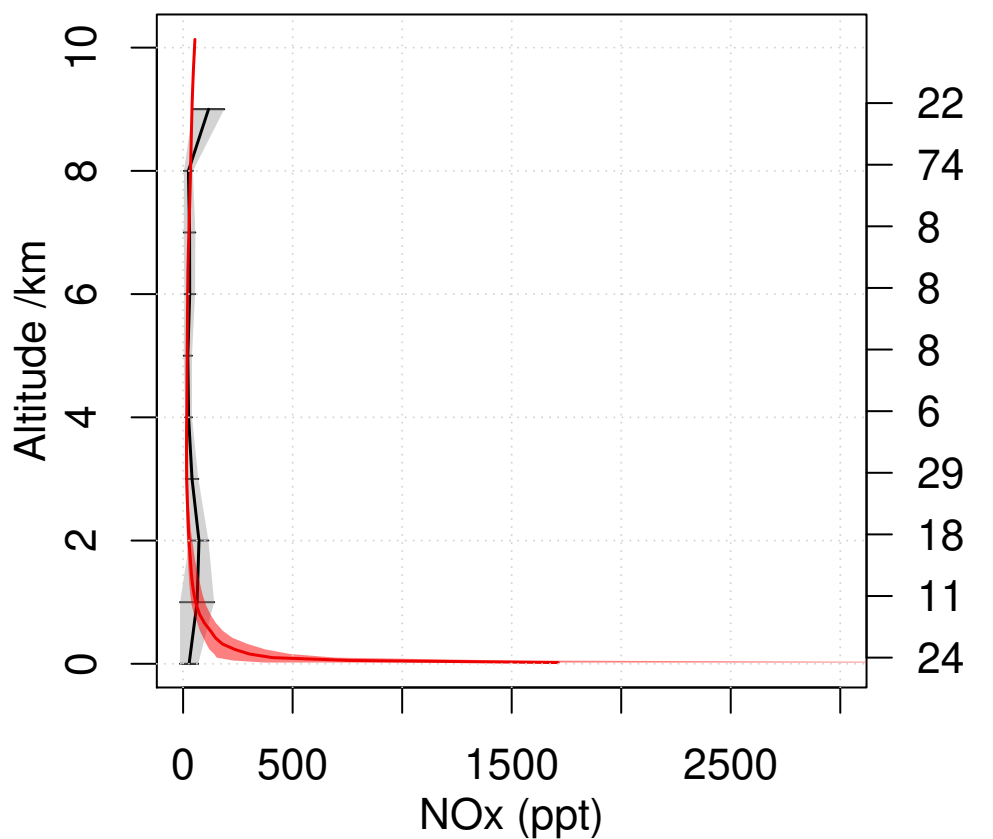
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



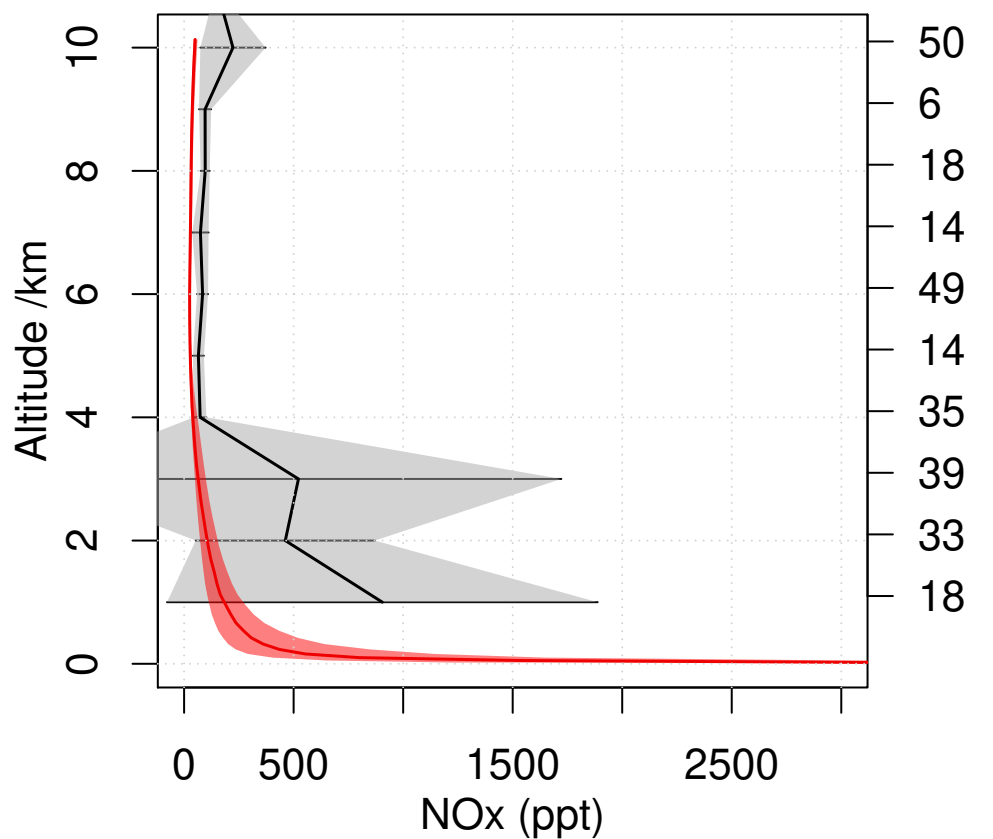
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



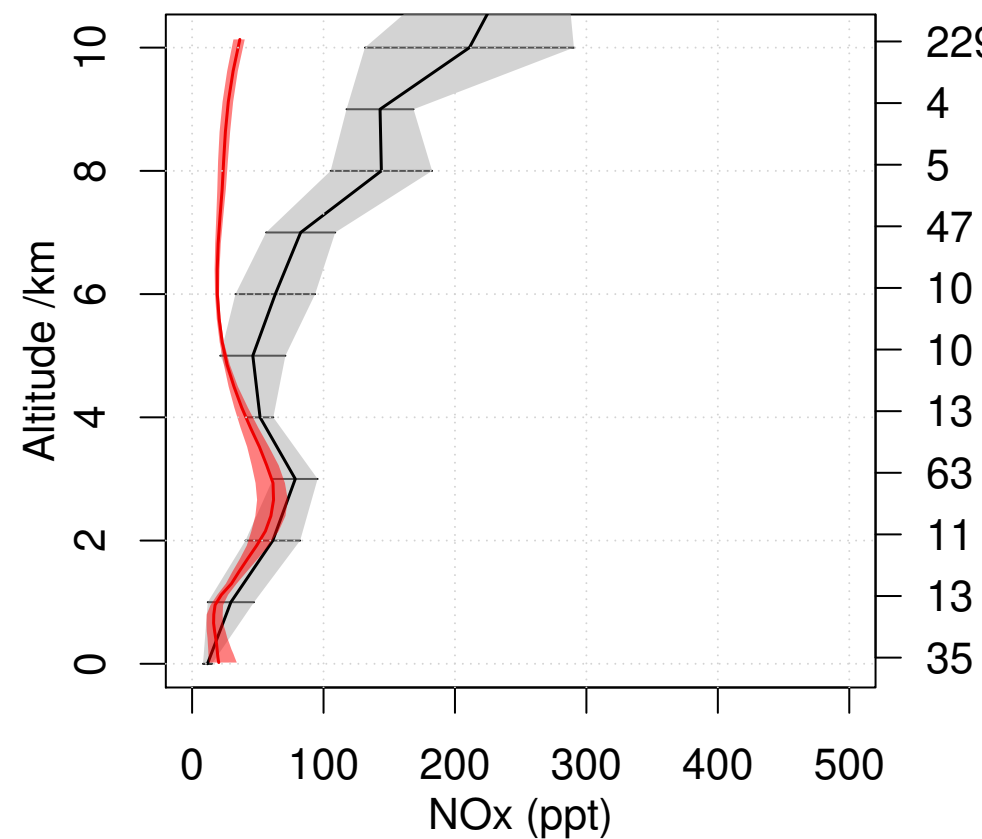
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

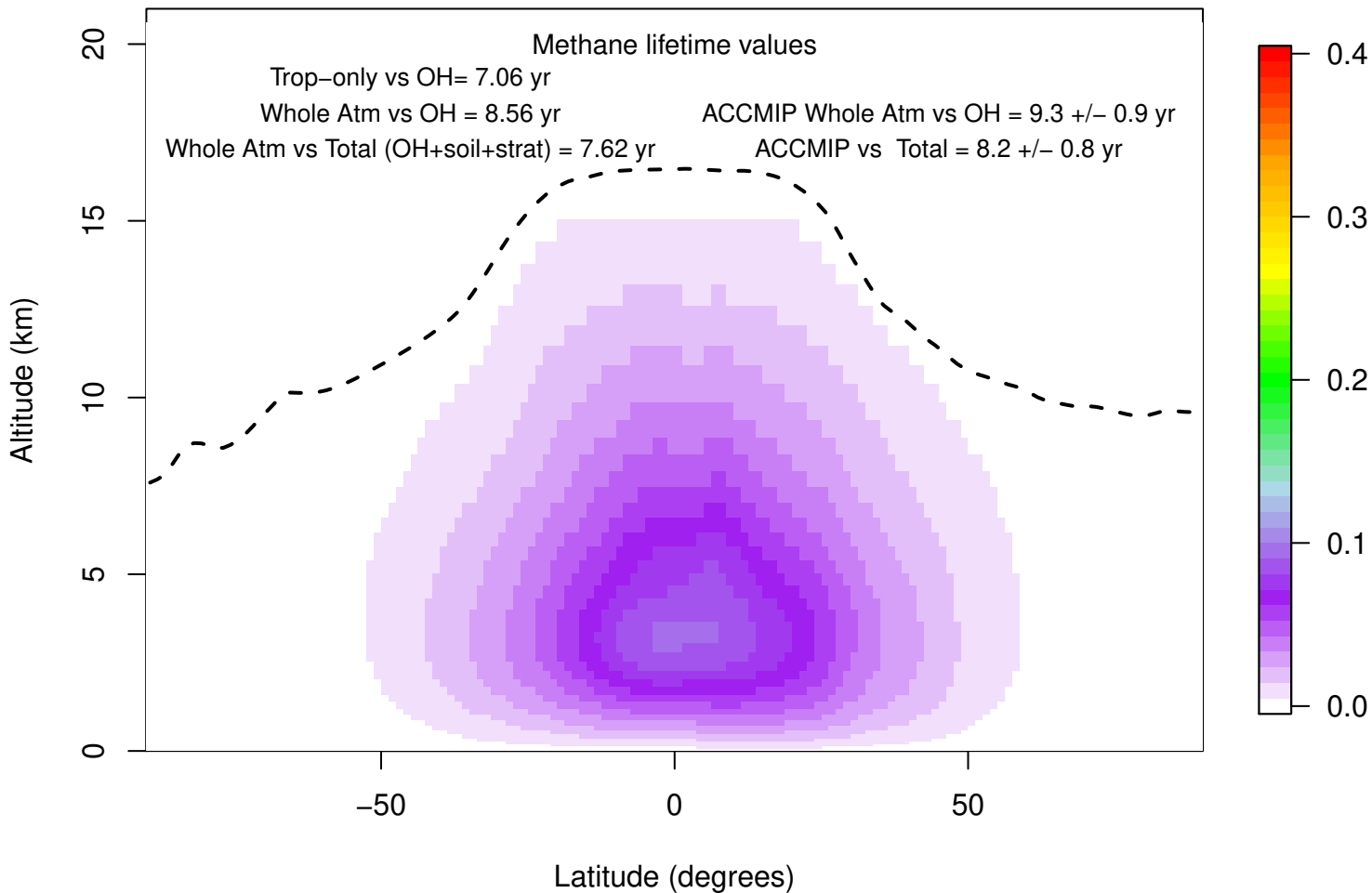


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10



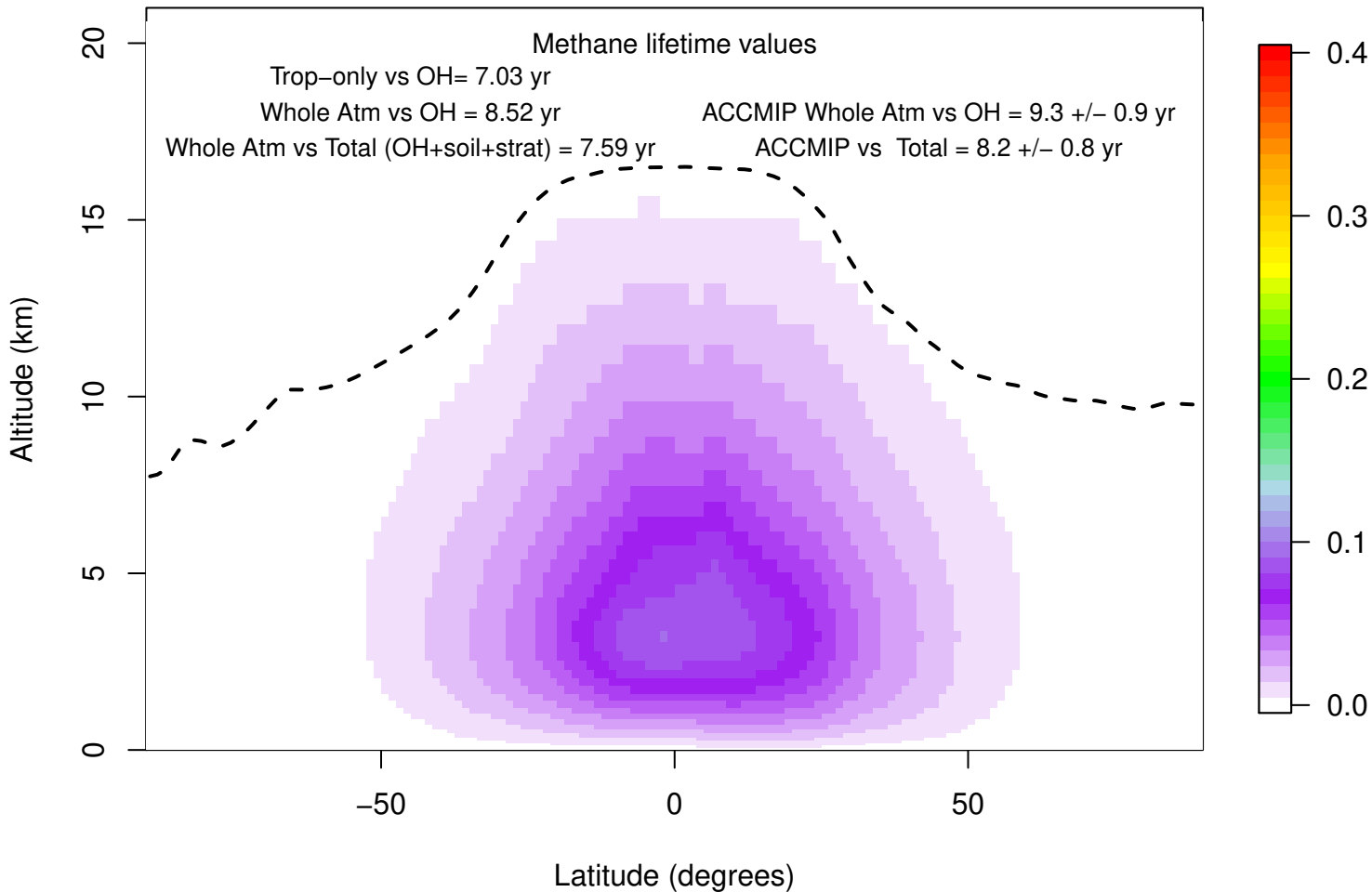
UKCA bs395

% CH₄ + OH flux (moles cm⁻³ s⁻¹)

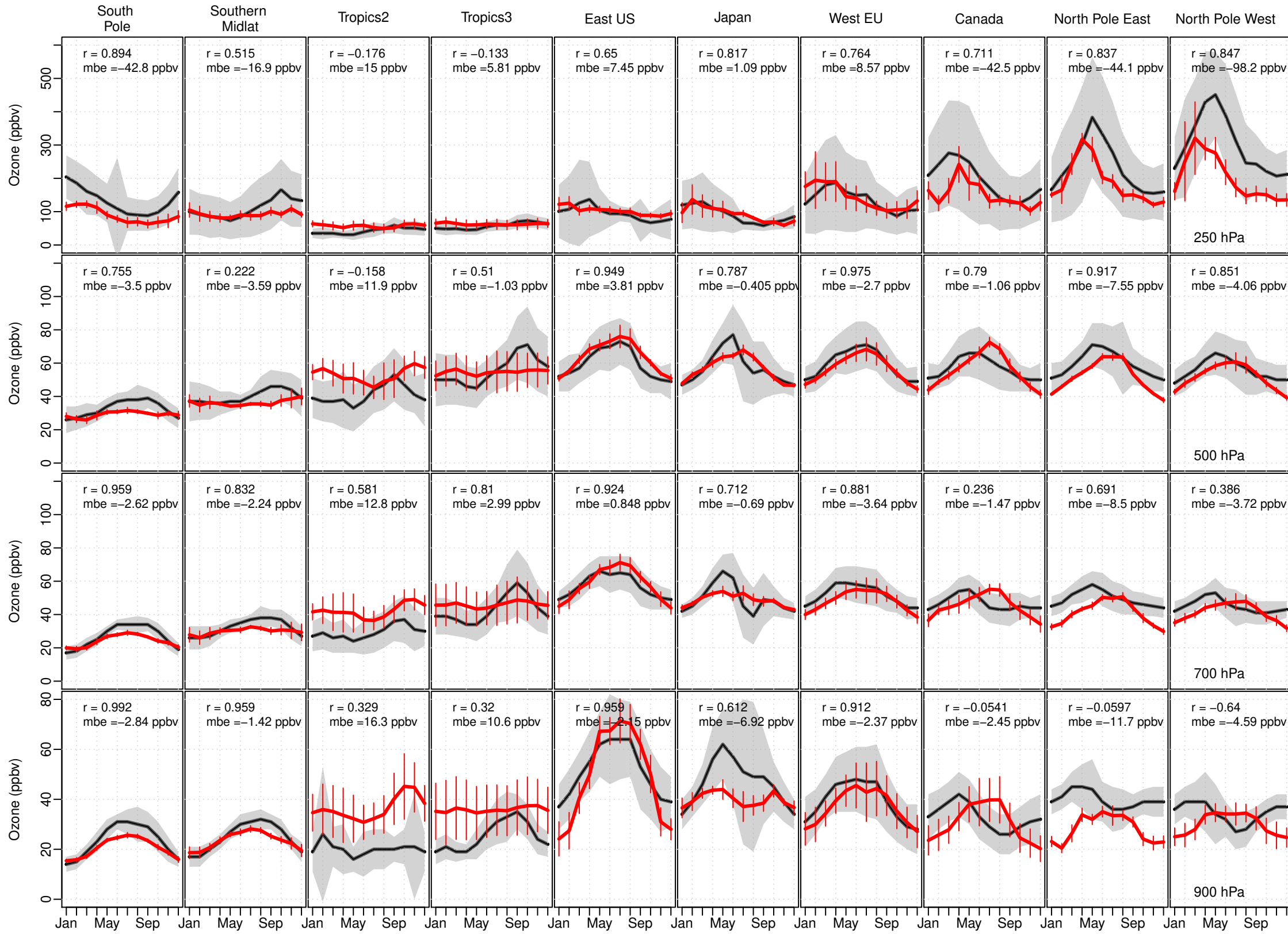


UKCA bw489

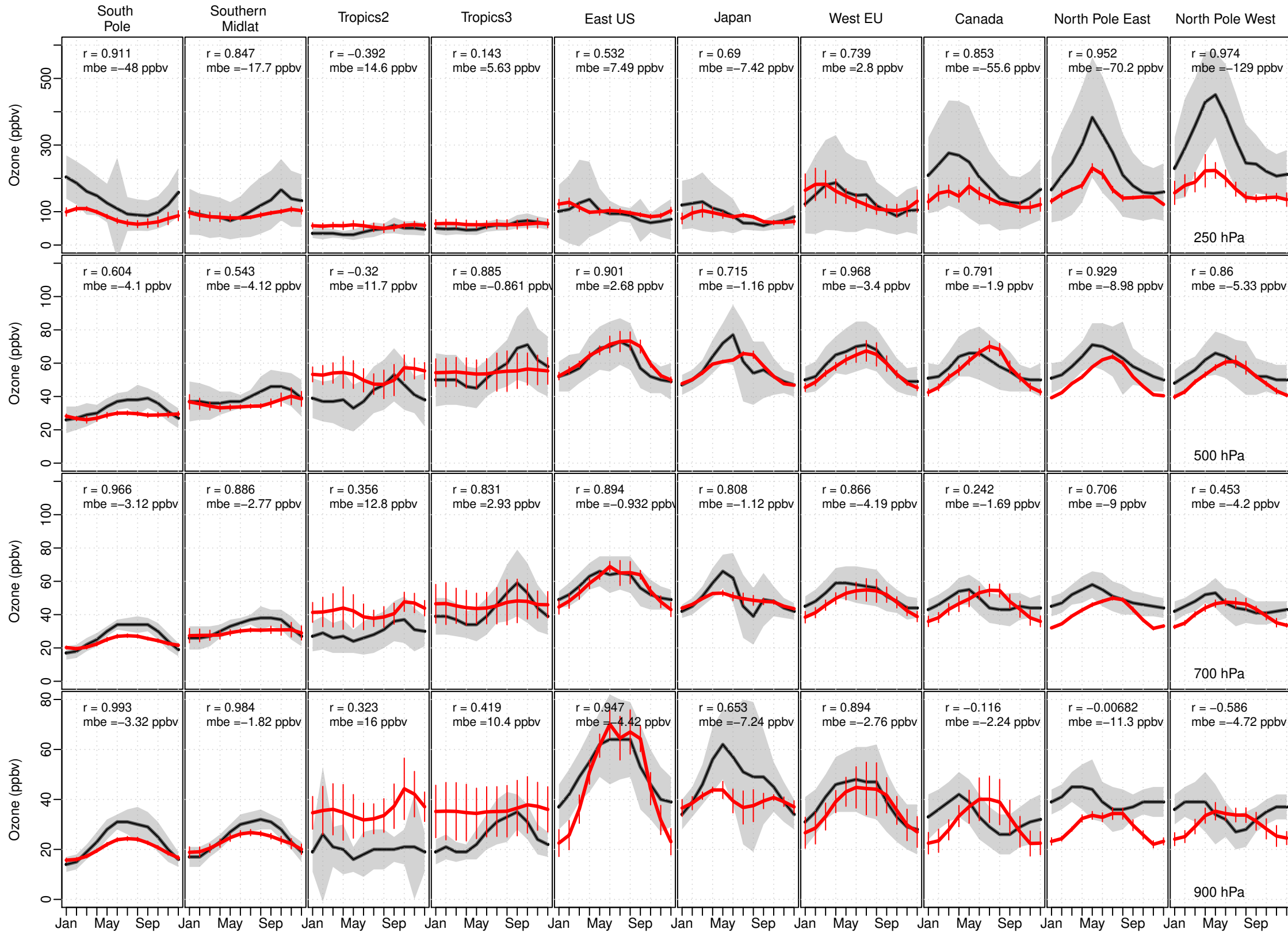
% CH₄ + OH flux (moles cm⁻³ s⁻¹)



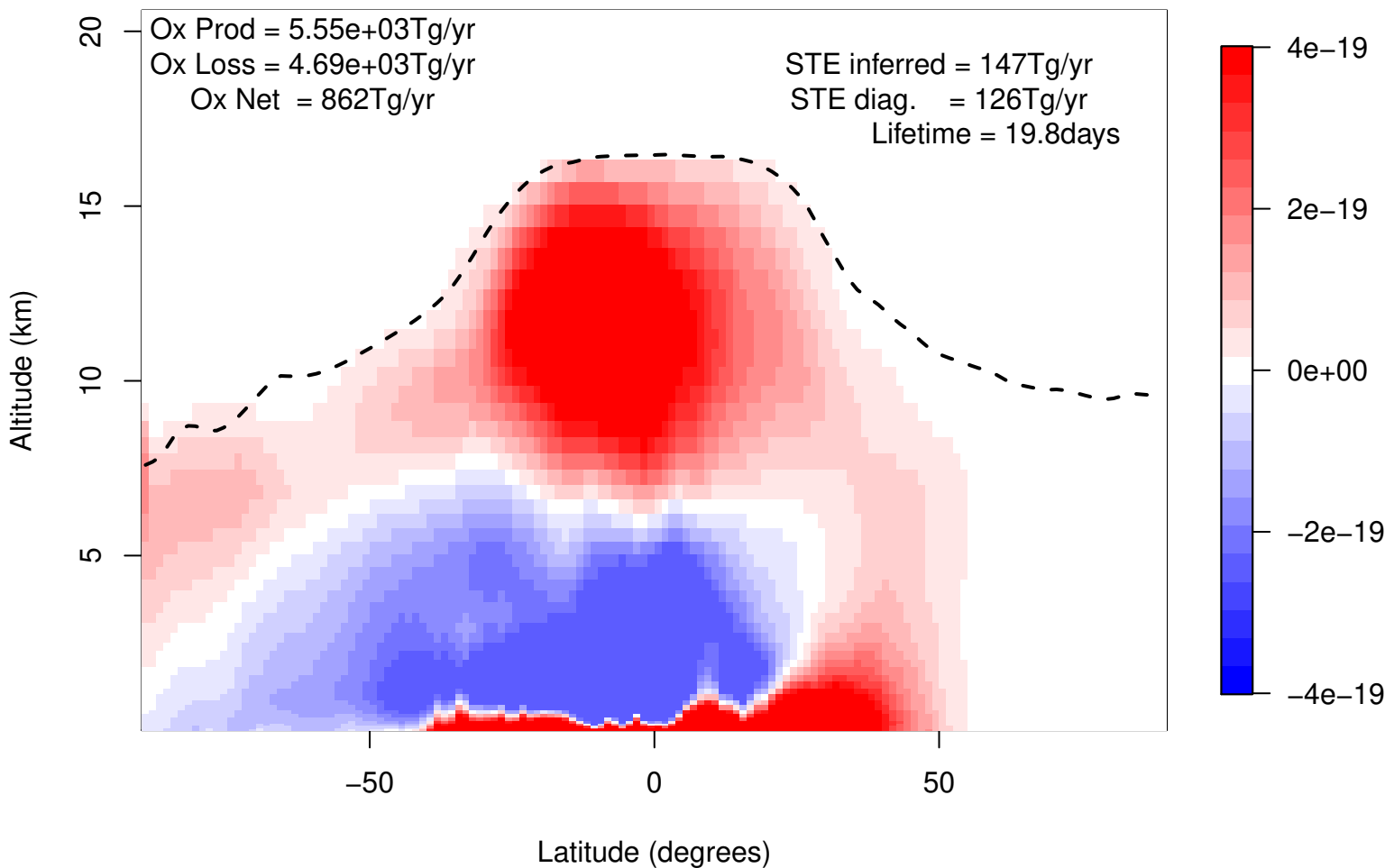
bs395 TiImes ozone sonde comparison



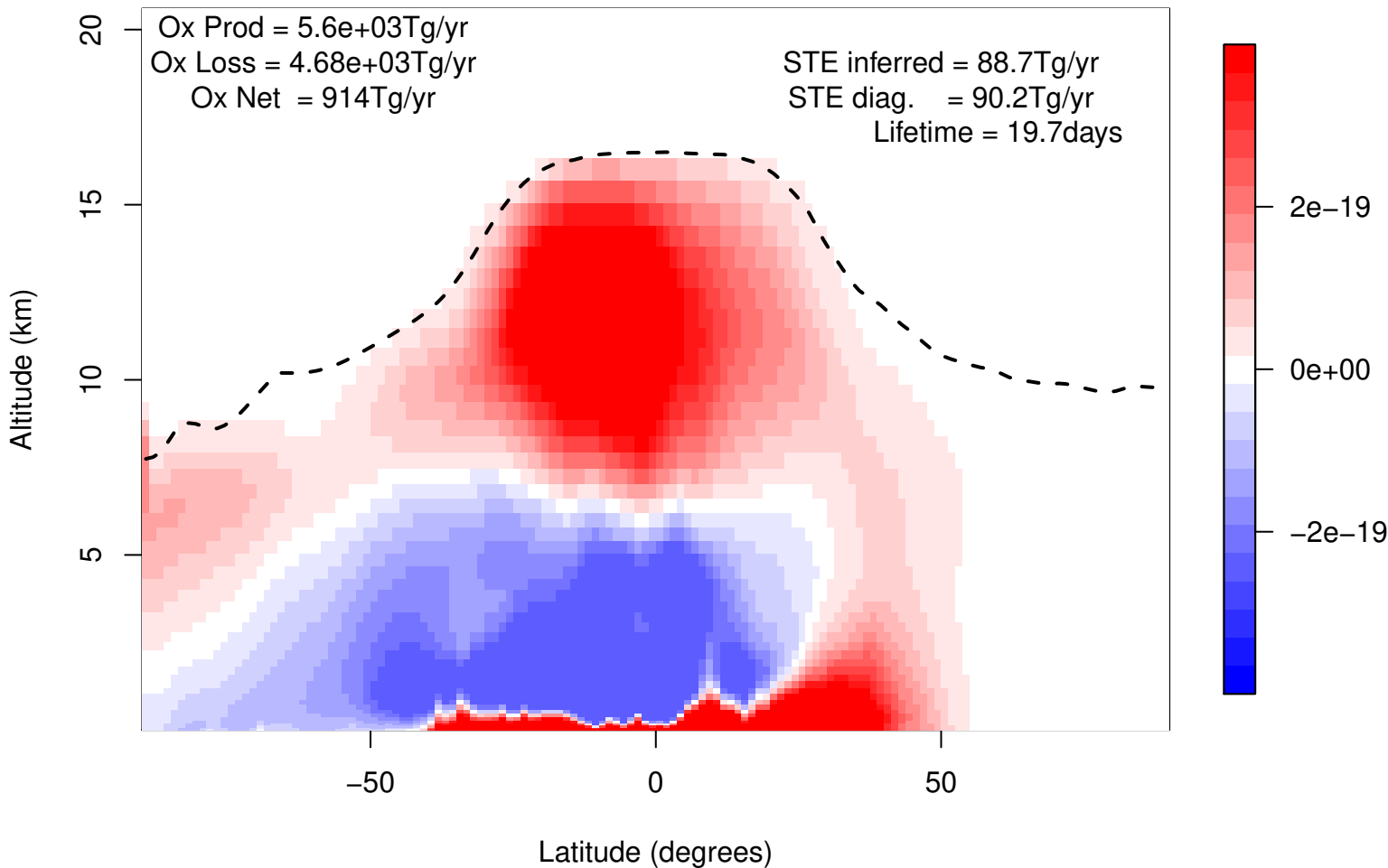
bw489 Tilmes ozone sonde comparison



UKCA bs395 Ox Net Chemical Production

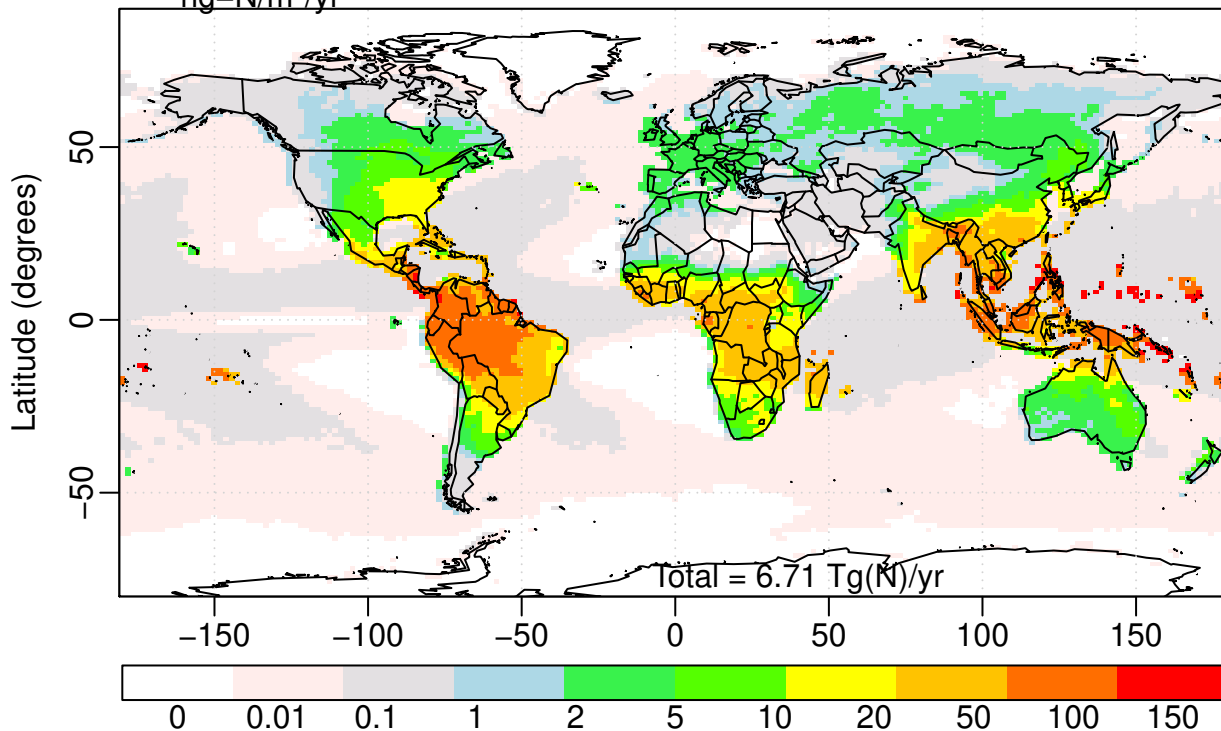


UKCA bw489 Ox Net Chemical Production



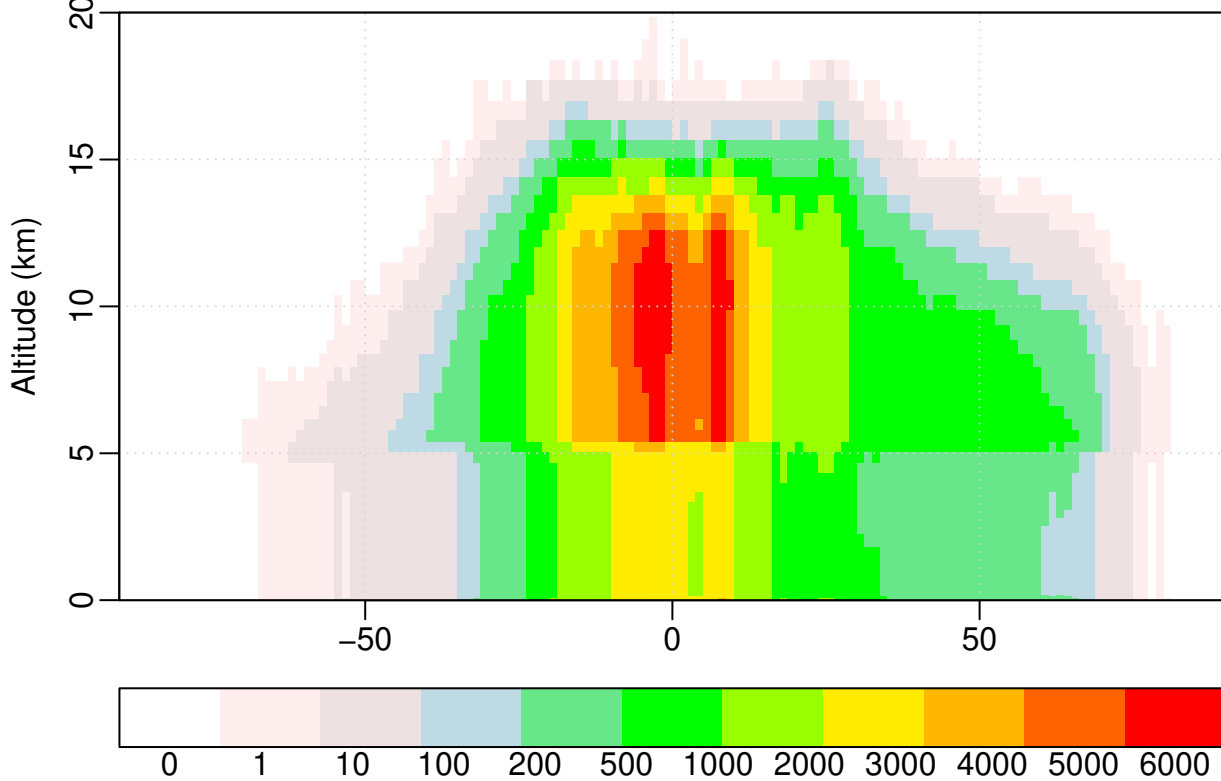
bs395 total column

ng-N/m²/yr



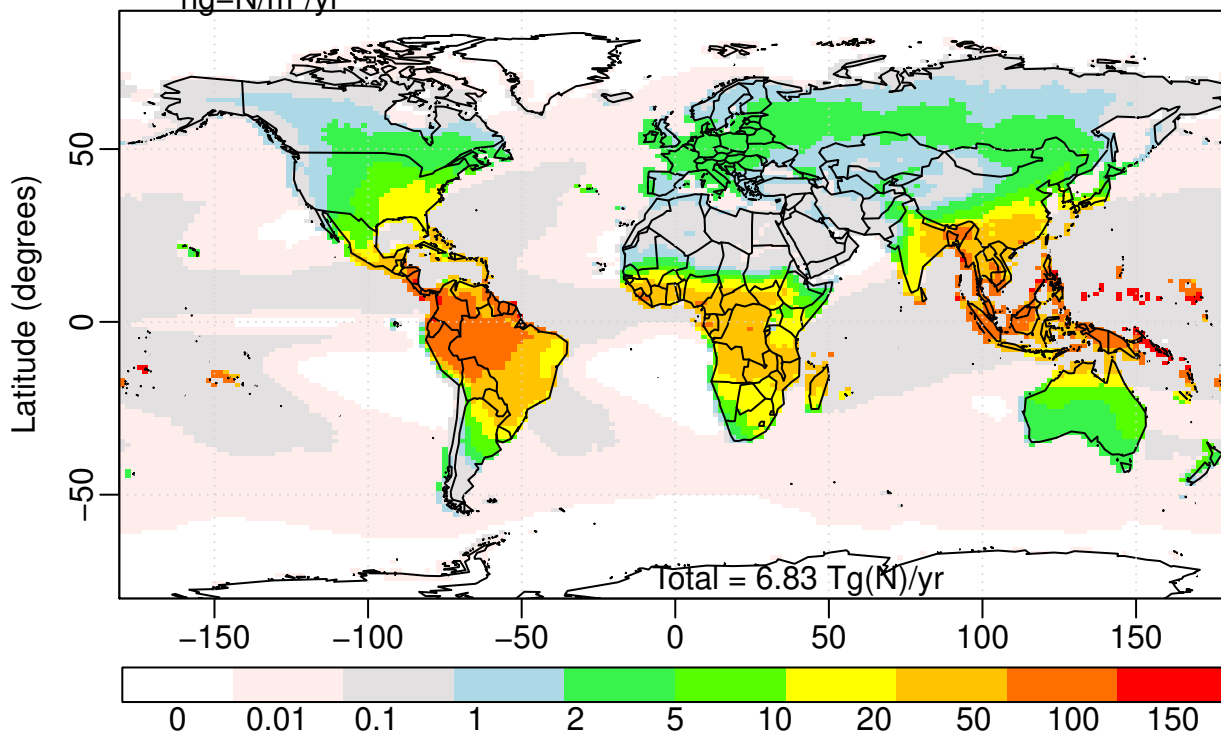
bs395 zonal mean

molecules cm⁻³ s⁻¹



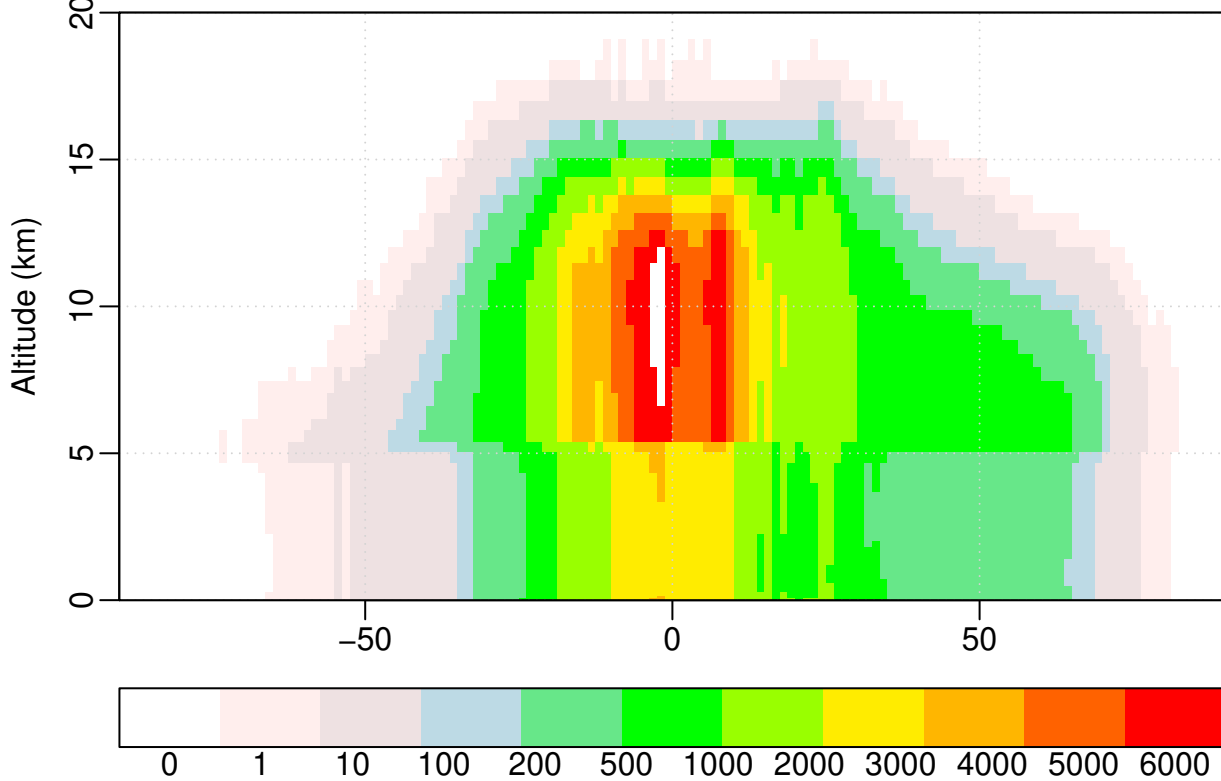
bw489 total column

ng-N/m²/yr



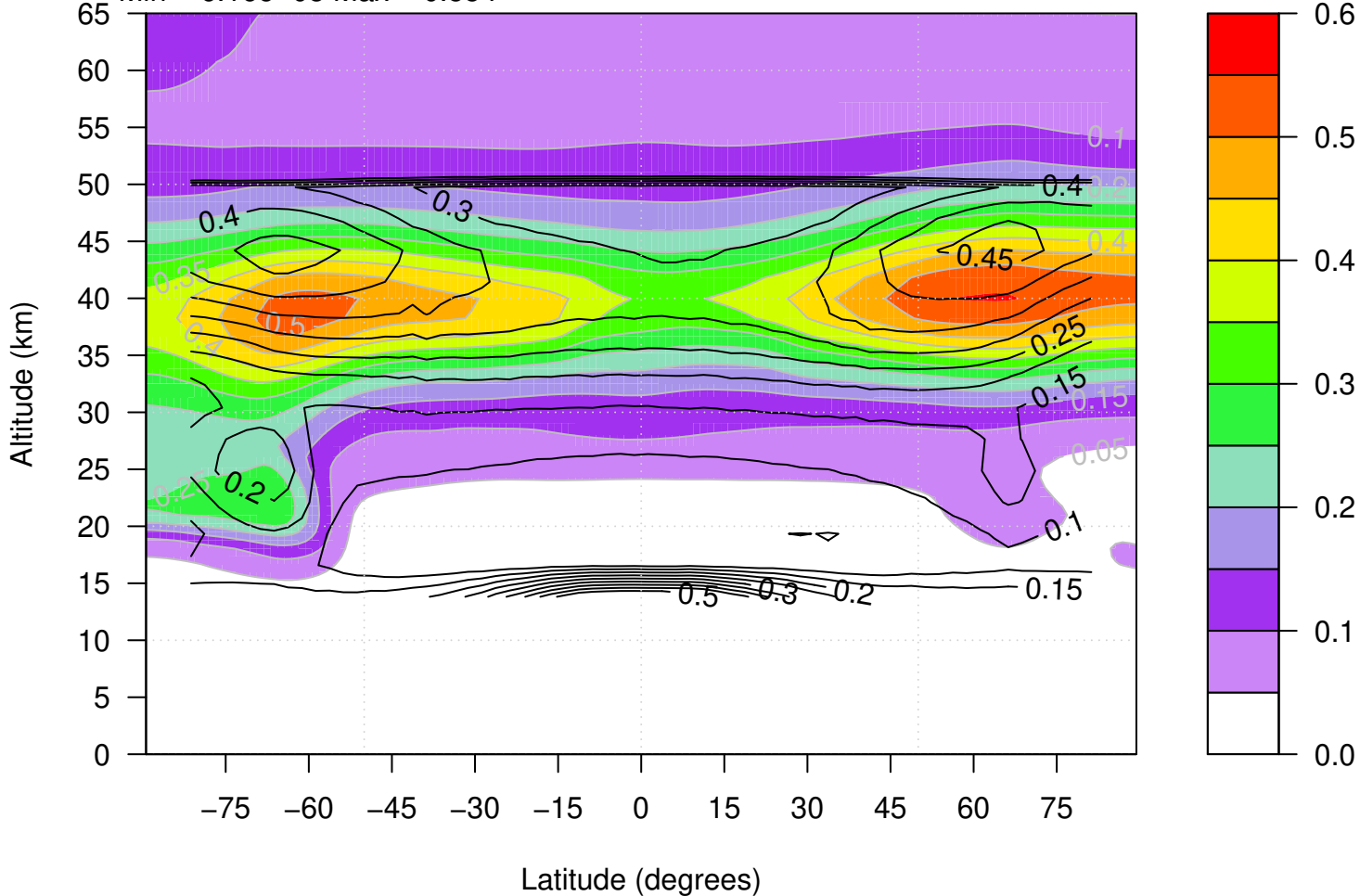
bw489 zonal mean

molecules cm⁻³ s⁻¹



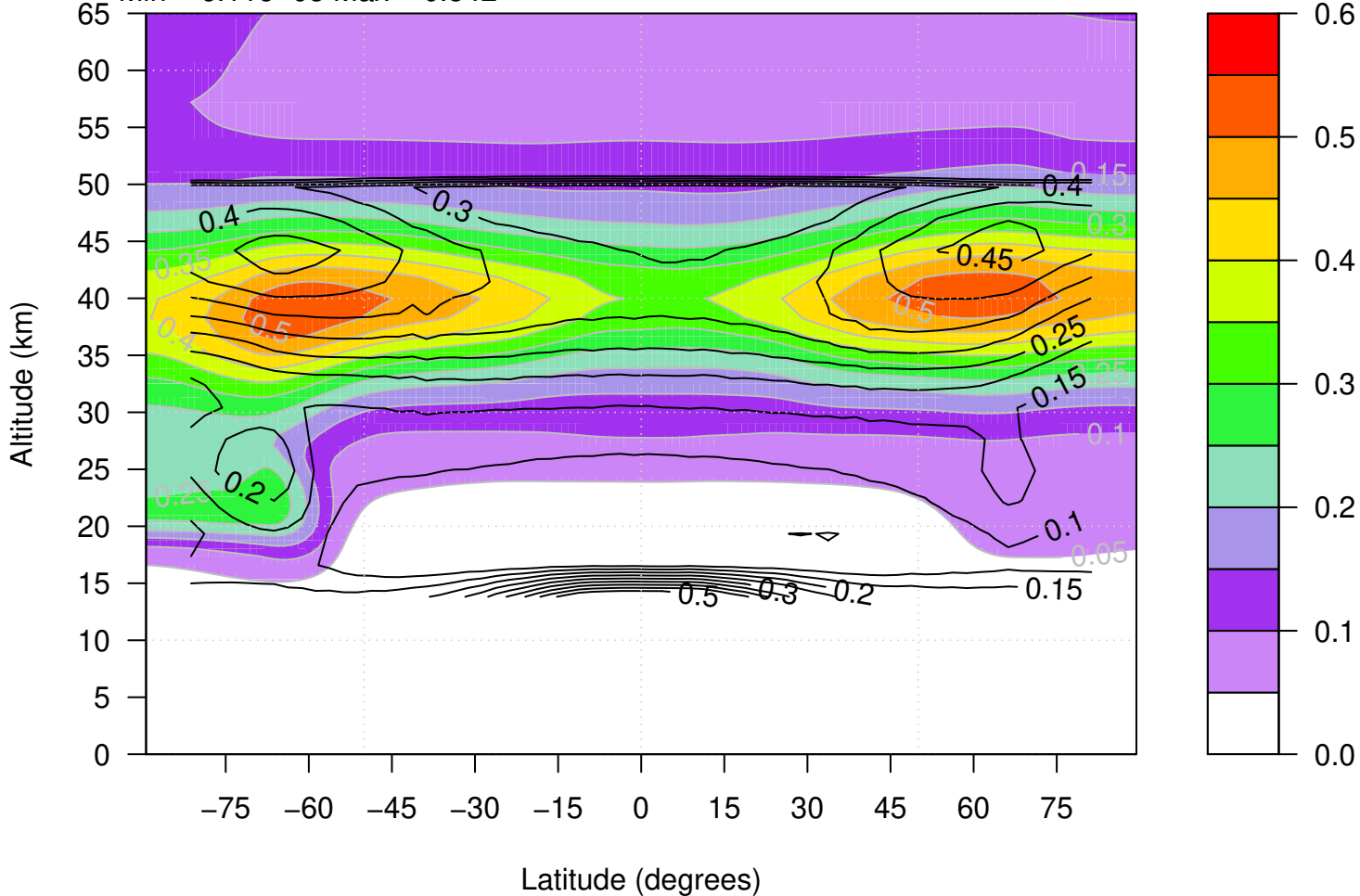
MLS – UKCA bs395 ClO comparison

Min = 6.16×10^{-8} Max = 0.554



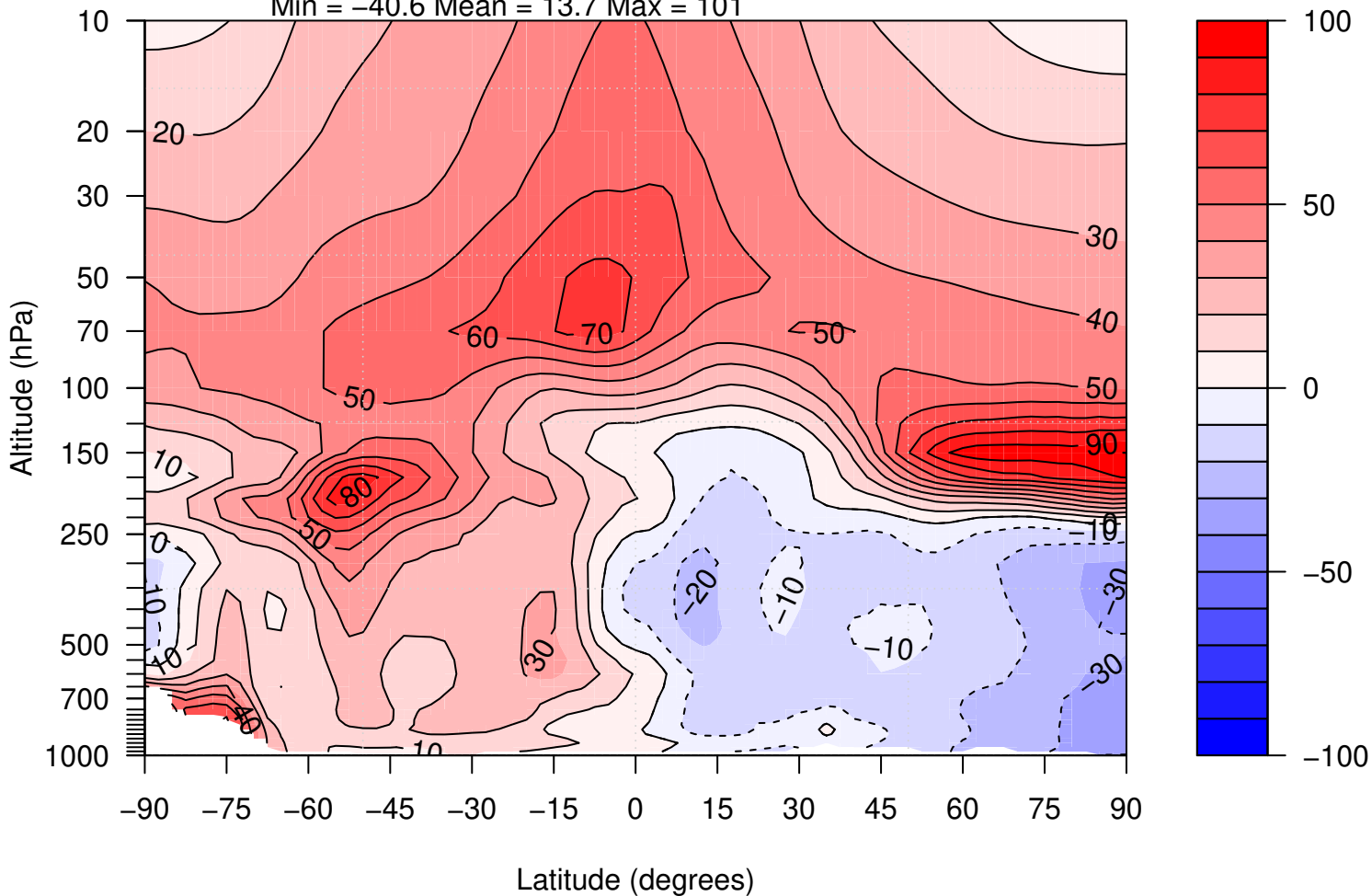
MLS – UKCA bw489 ClO comparison

Min = 6.11×10^{-8} Max = 0.542



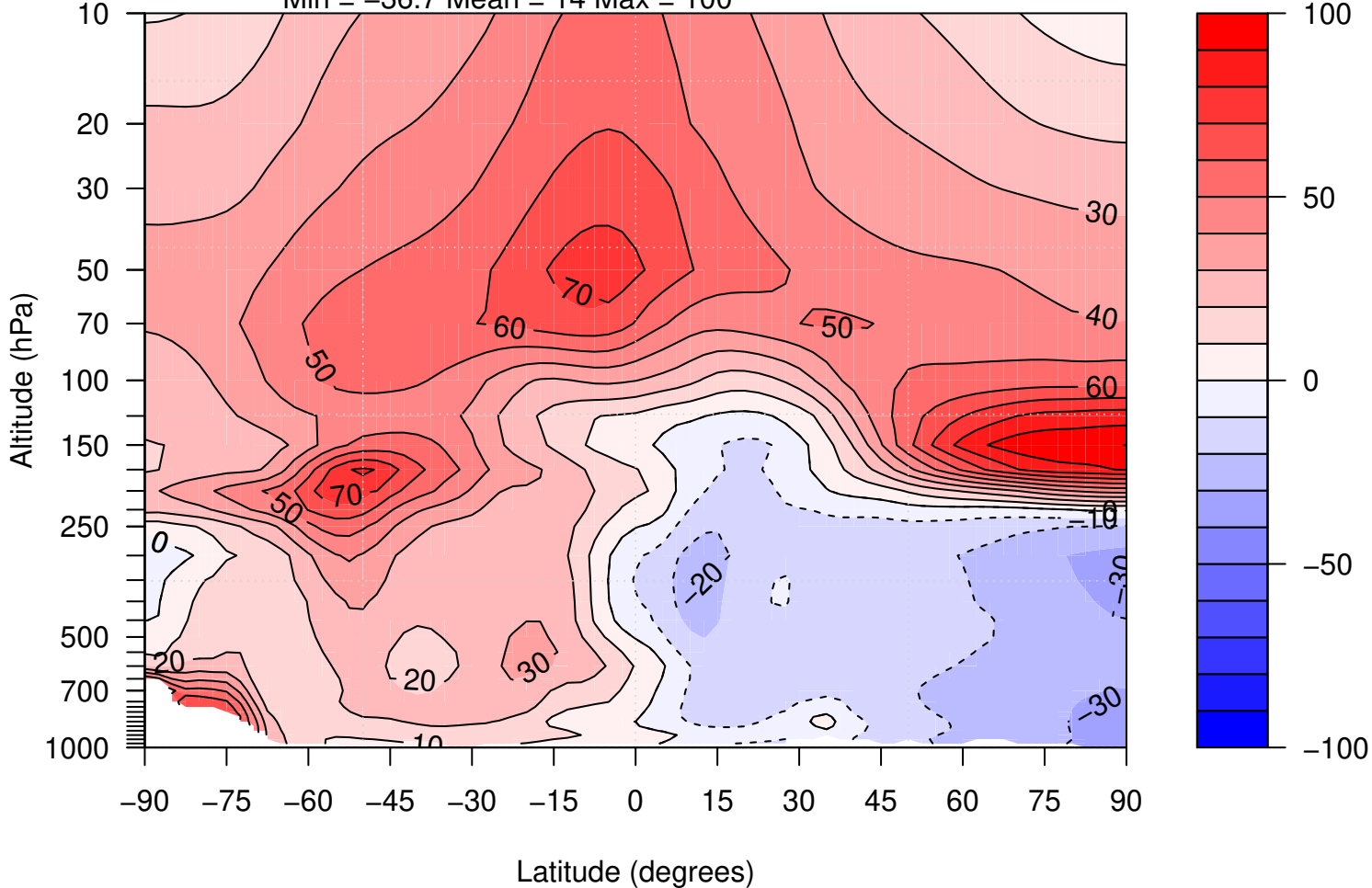
bs395 – ERA Q bias

Min = -40.6 Mean = 13.7 Max = 101



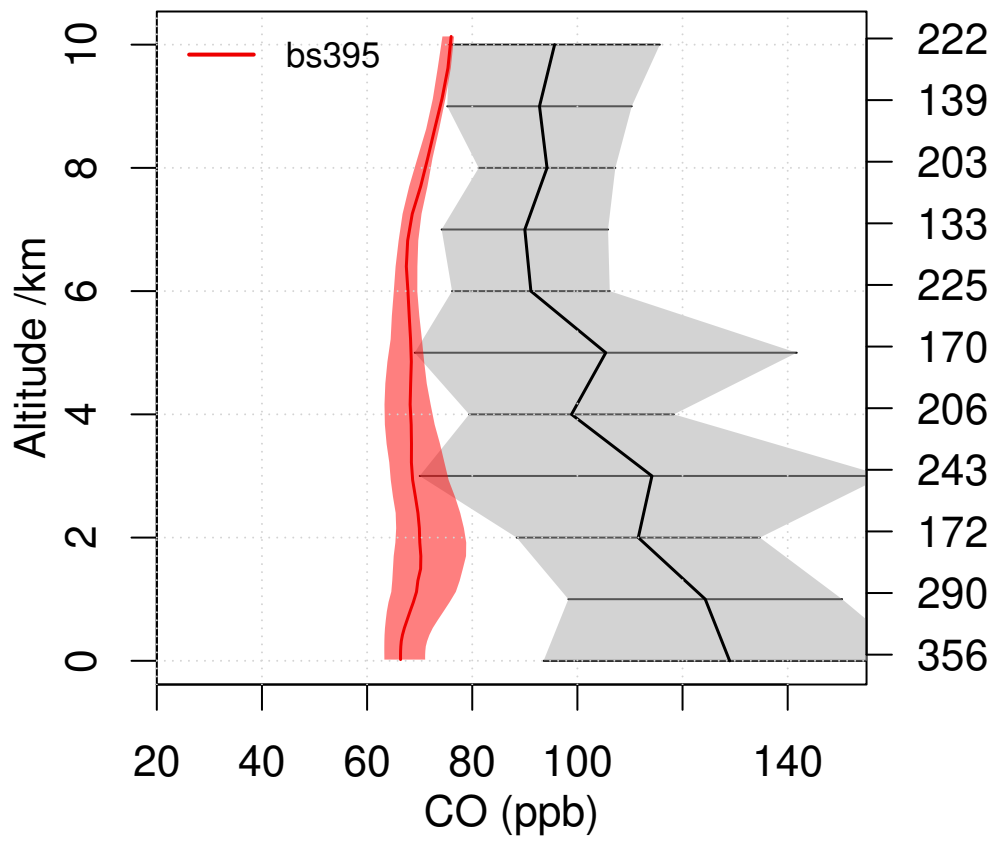
bw489 – ERA Q bias

Min = -36.7 Mean = 14 Max = 100

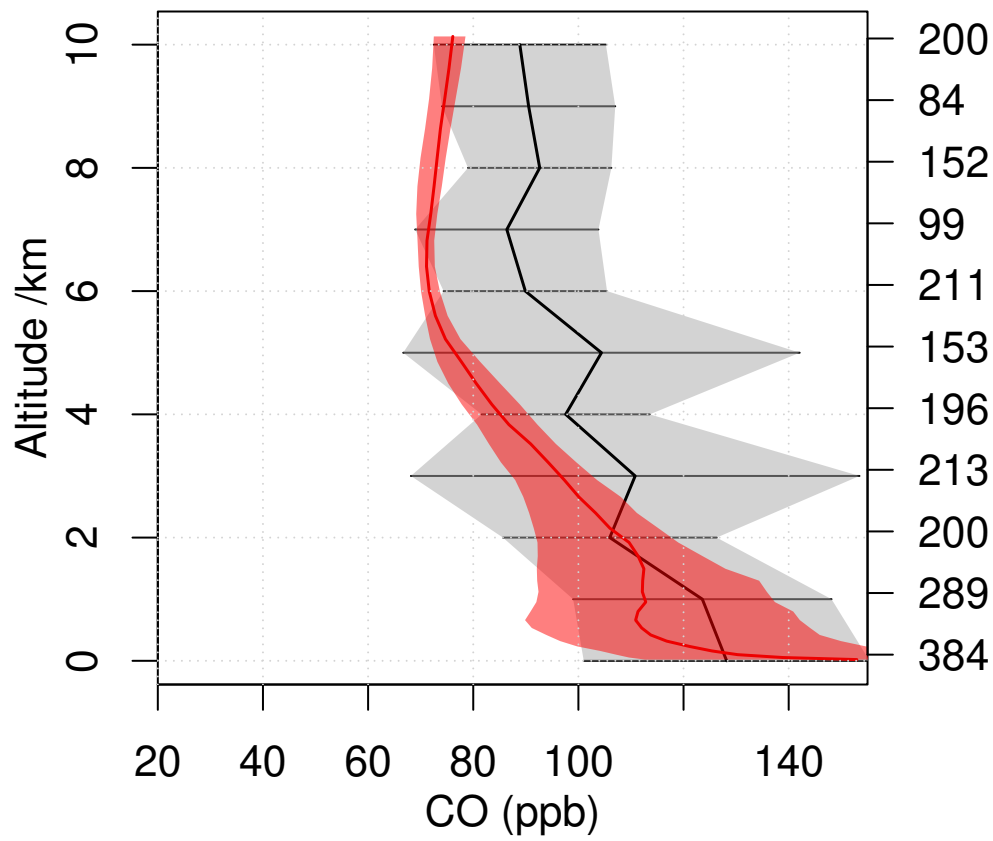


Emmons CO comparison

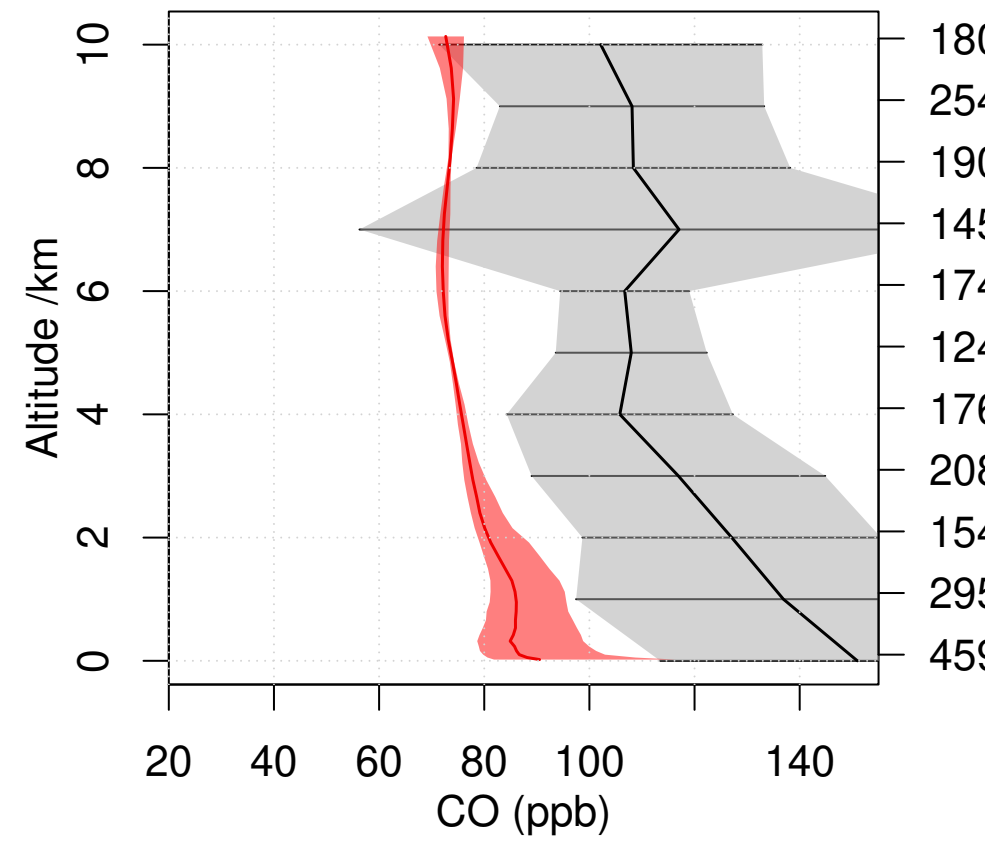
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



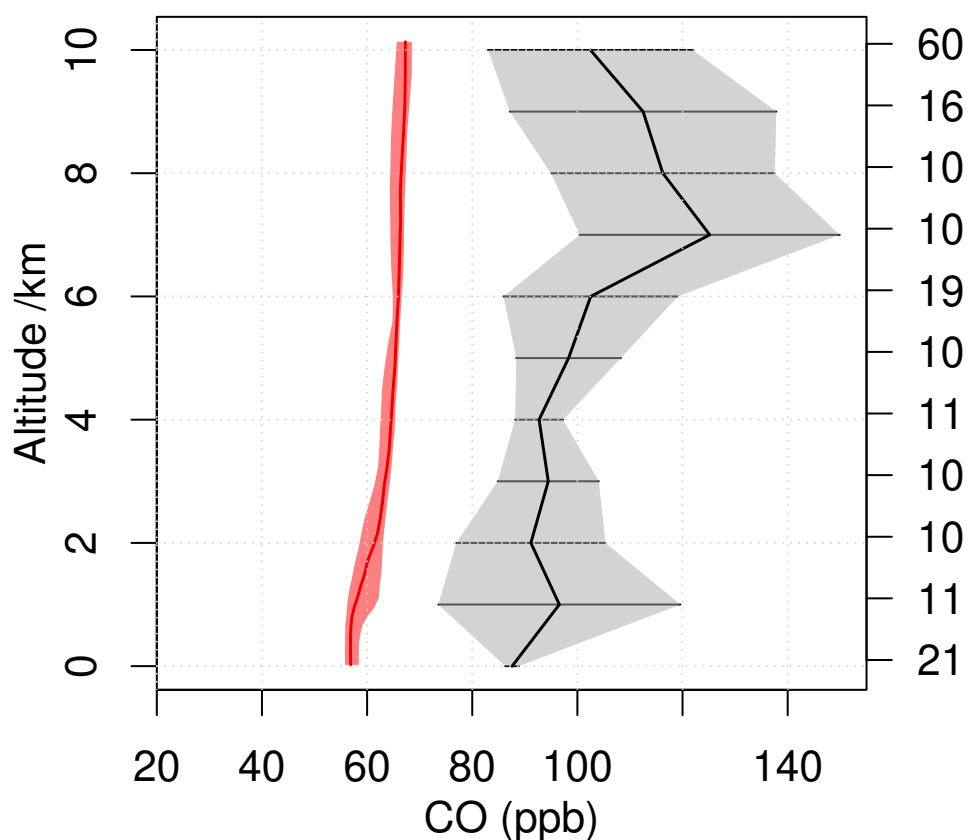
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



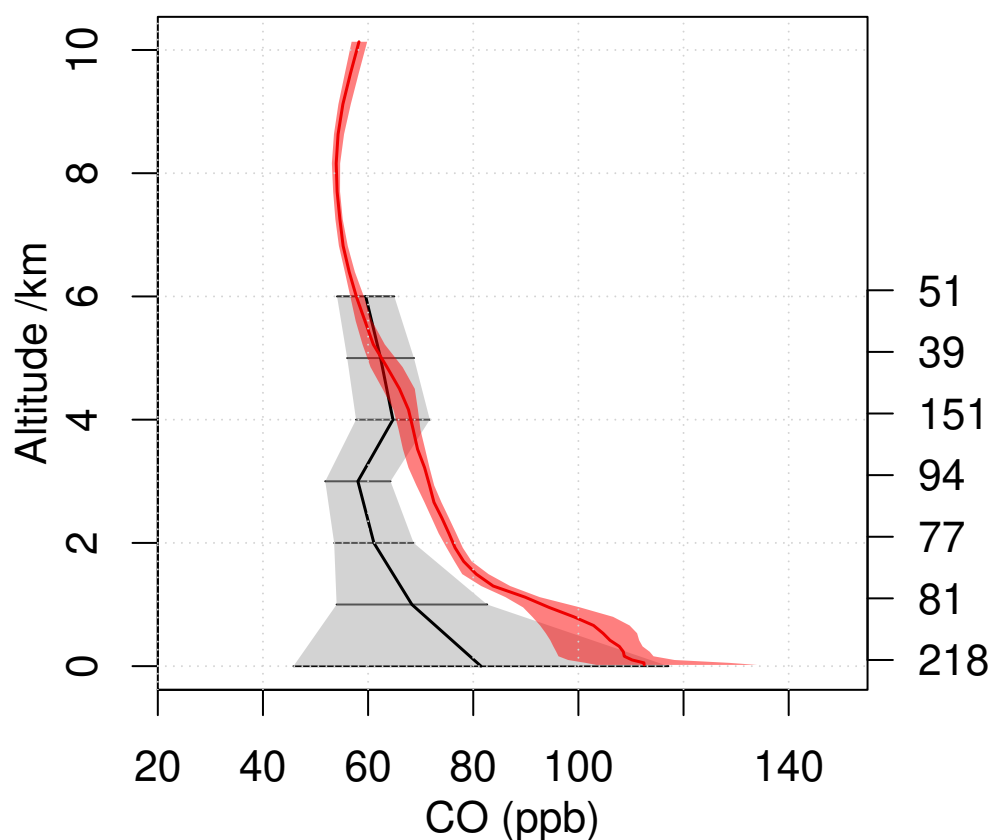
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



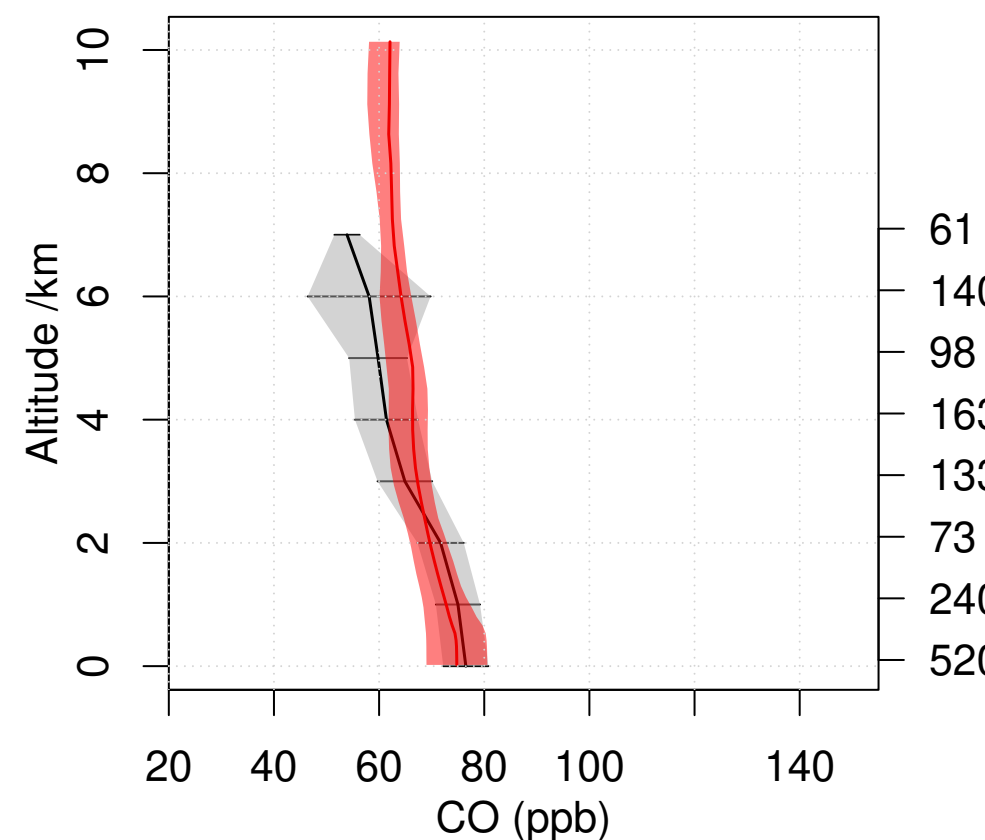
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



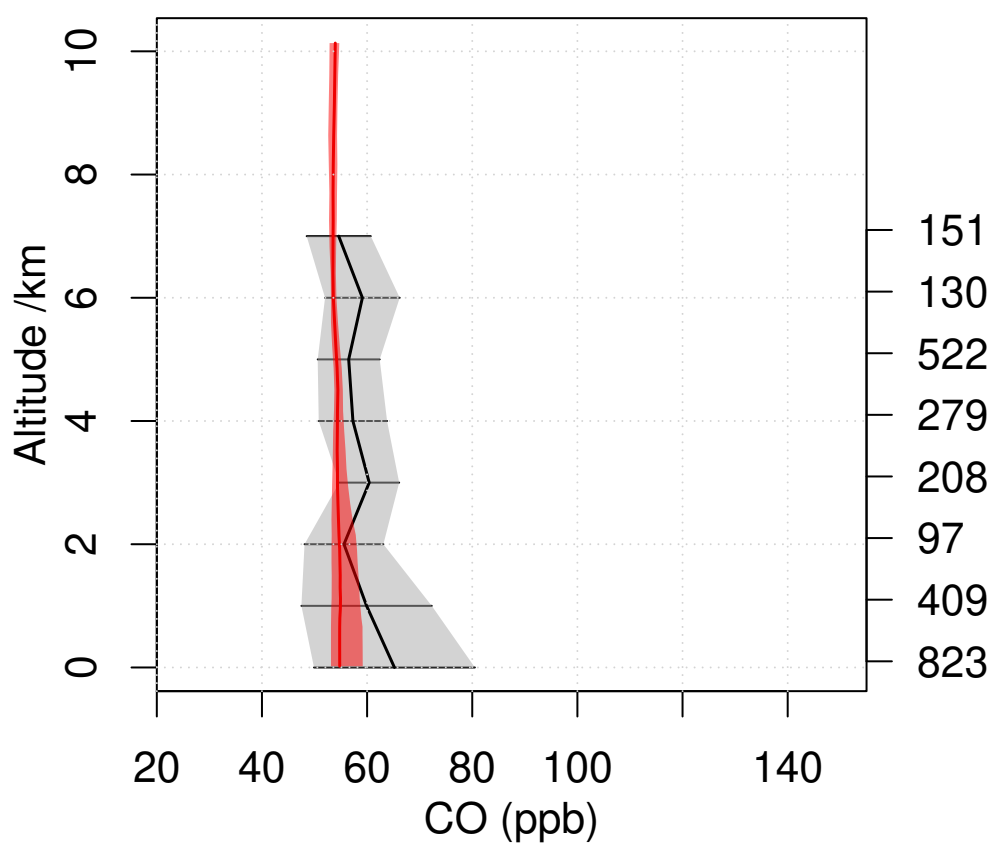
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



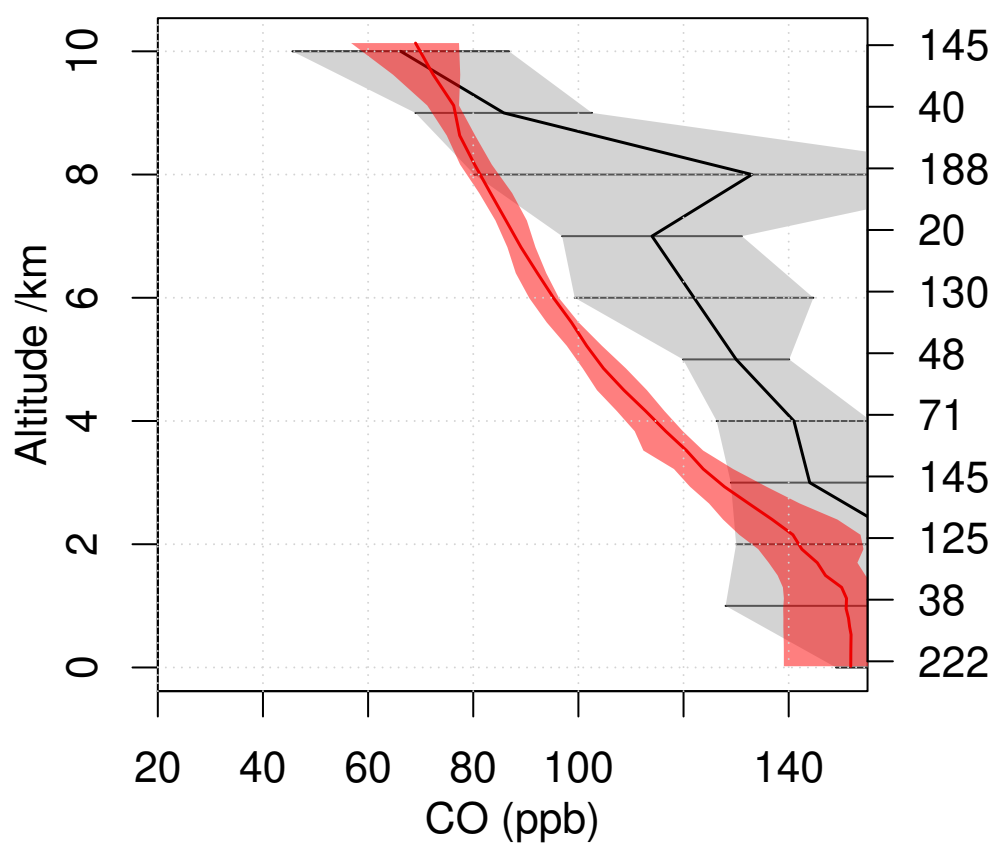
PEM-Tropics-B Christmas-Island 1999 0
Lat 0 – 10 Lon 200 – 220



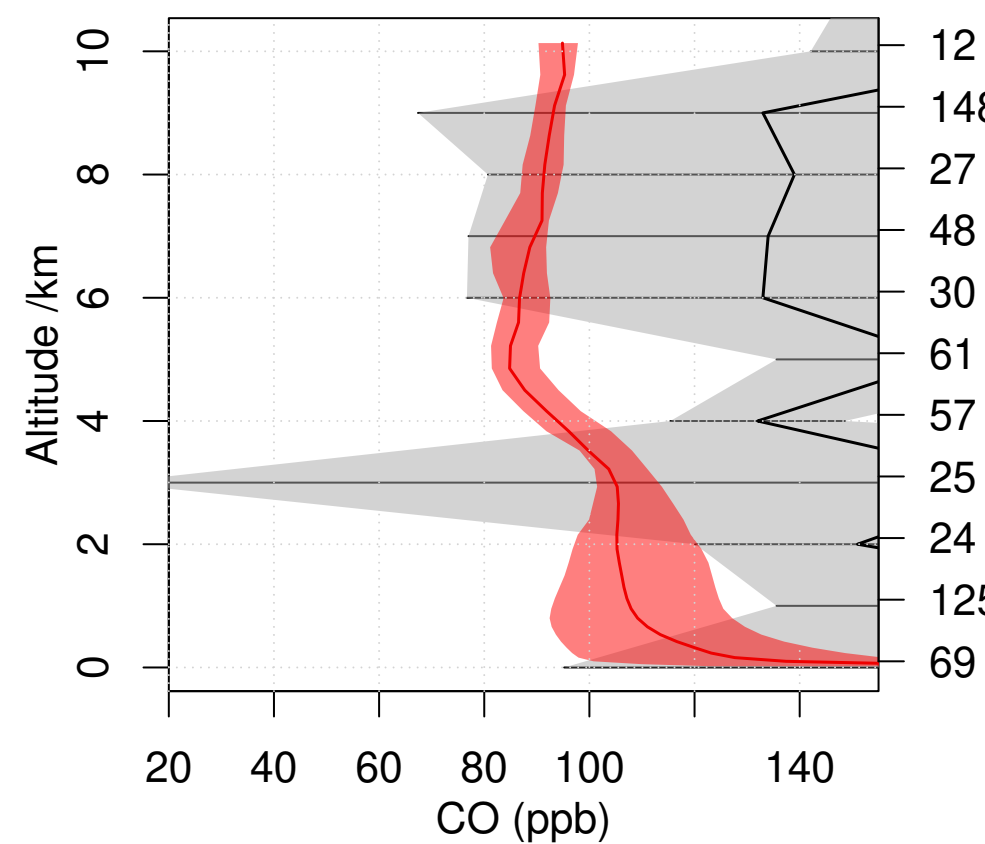
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



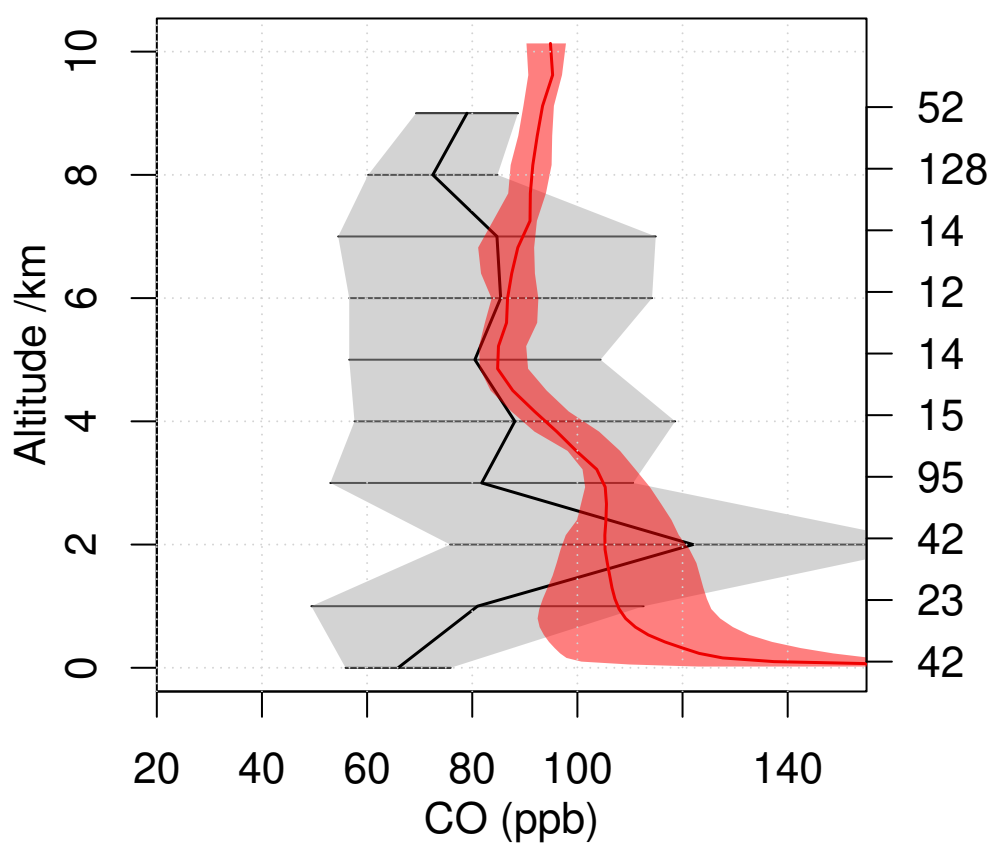
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



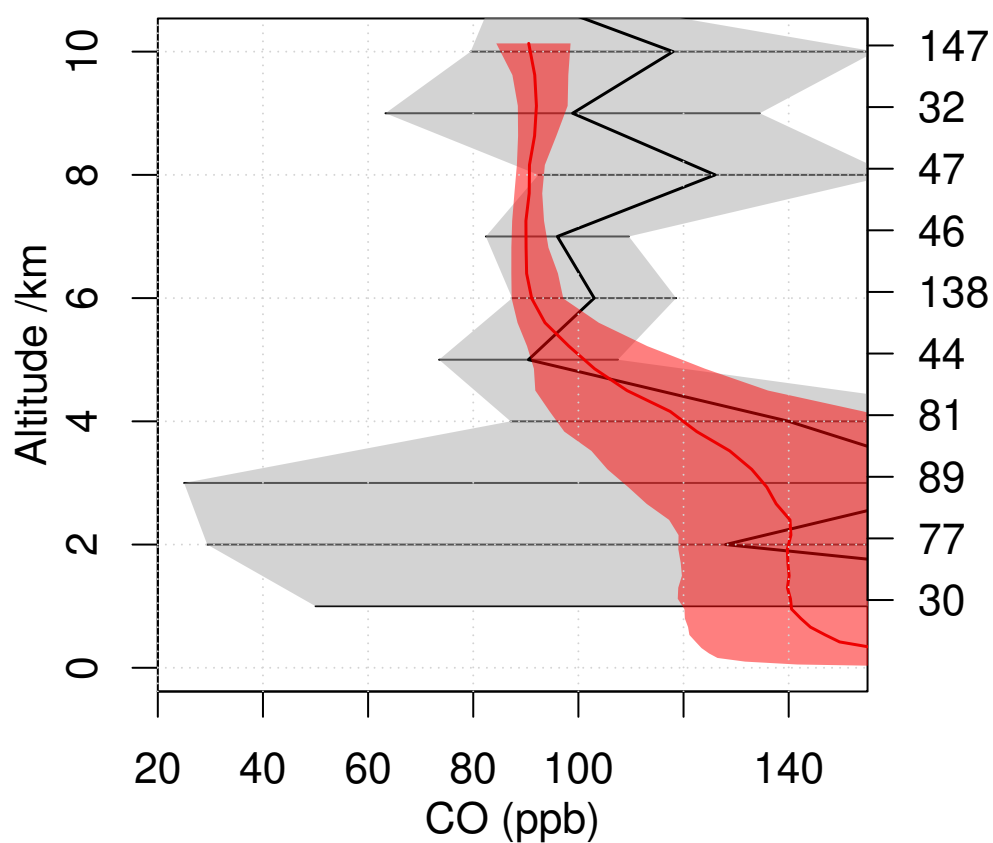
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



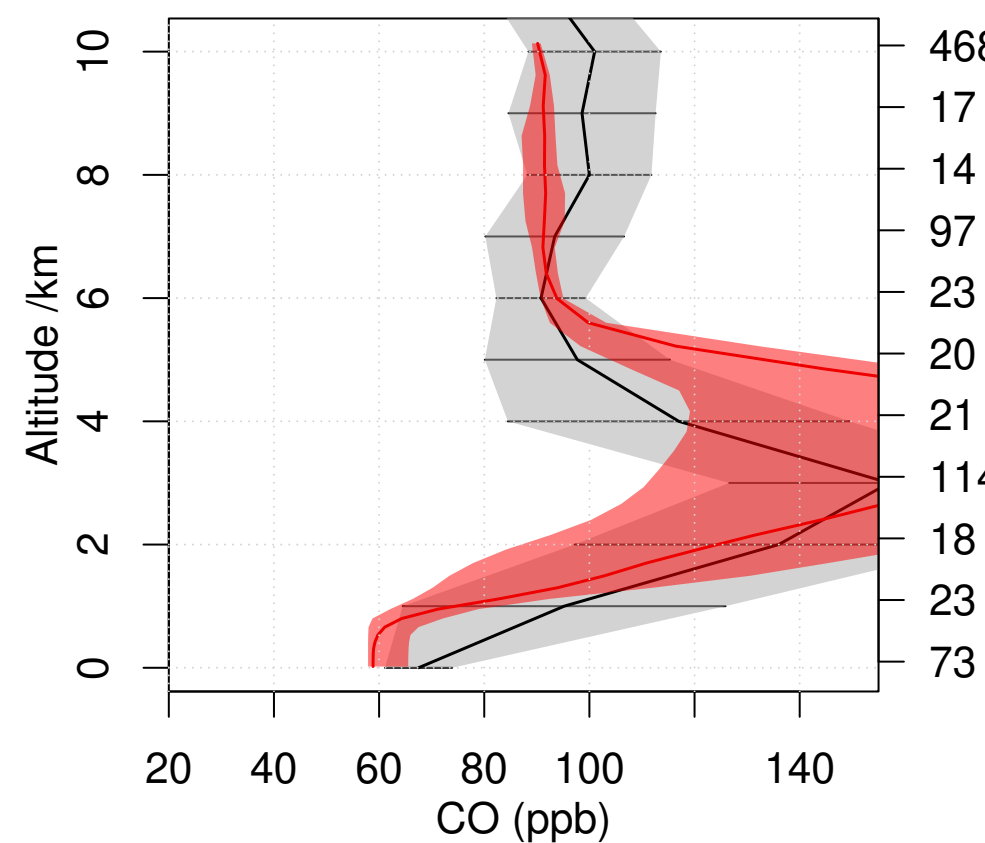
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

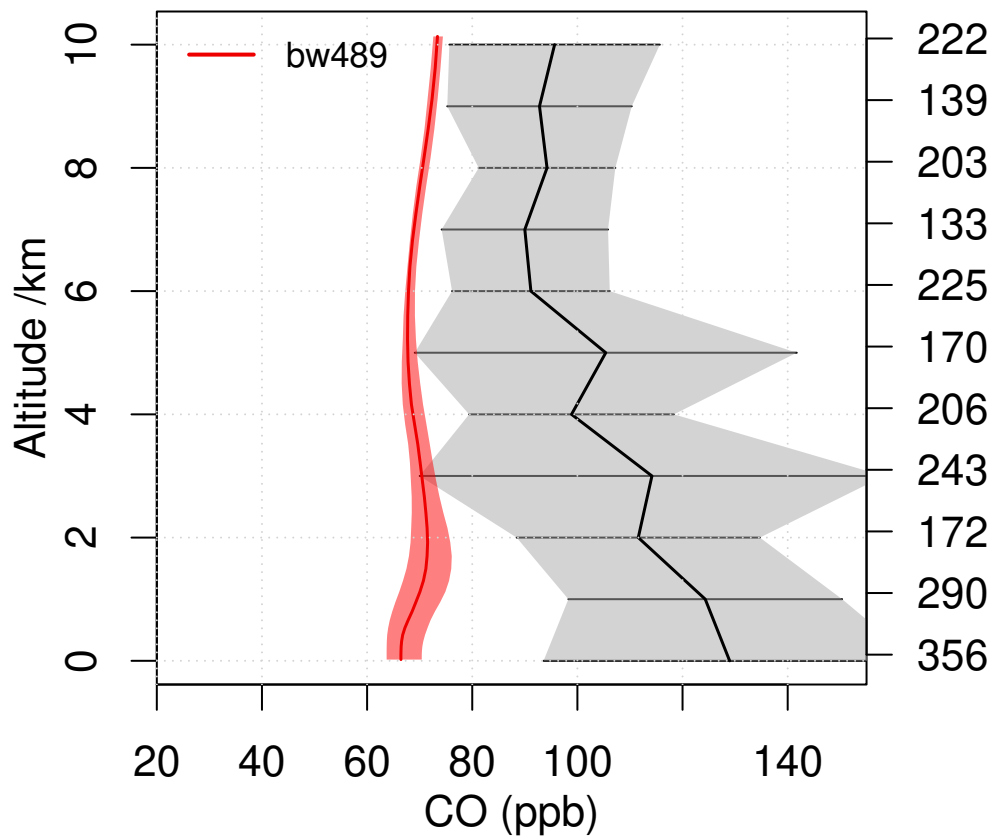


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

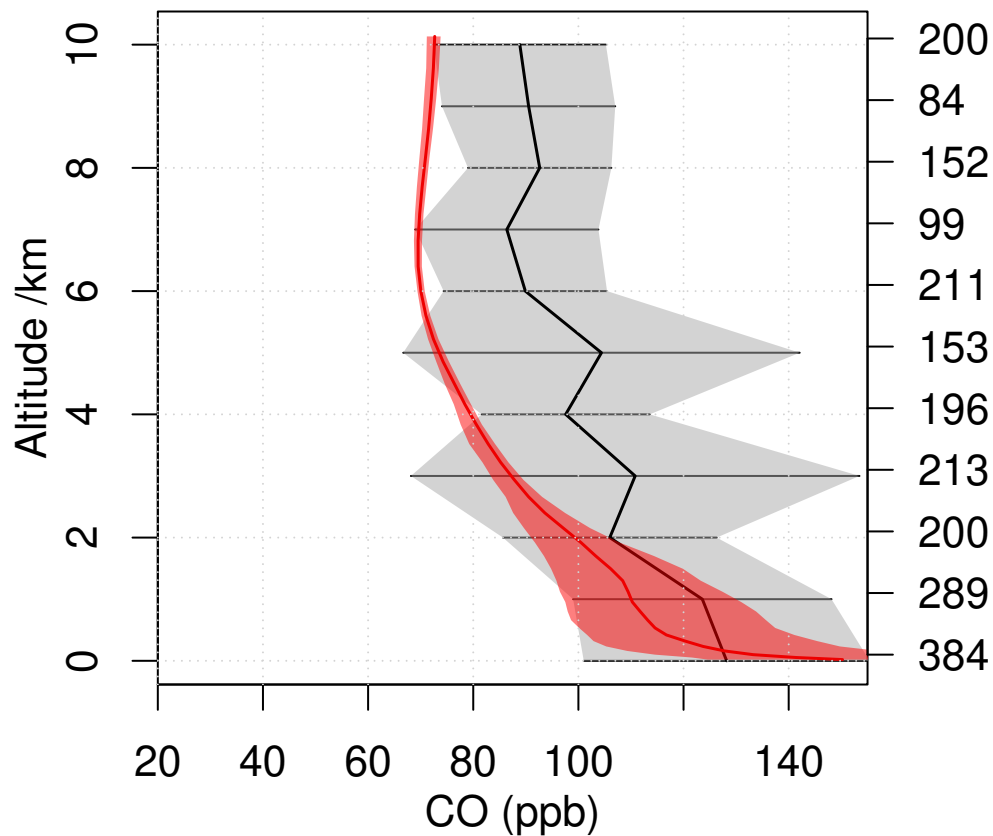


Emmons CO comparison

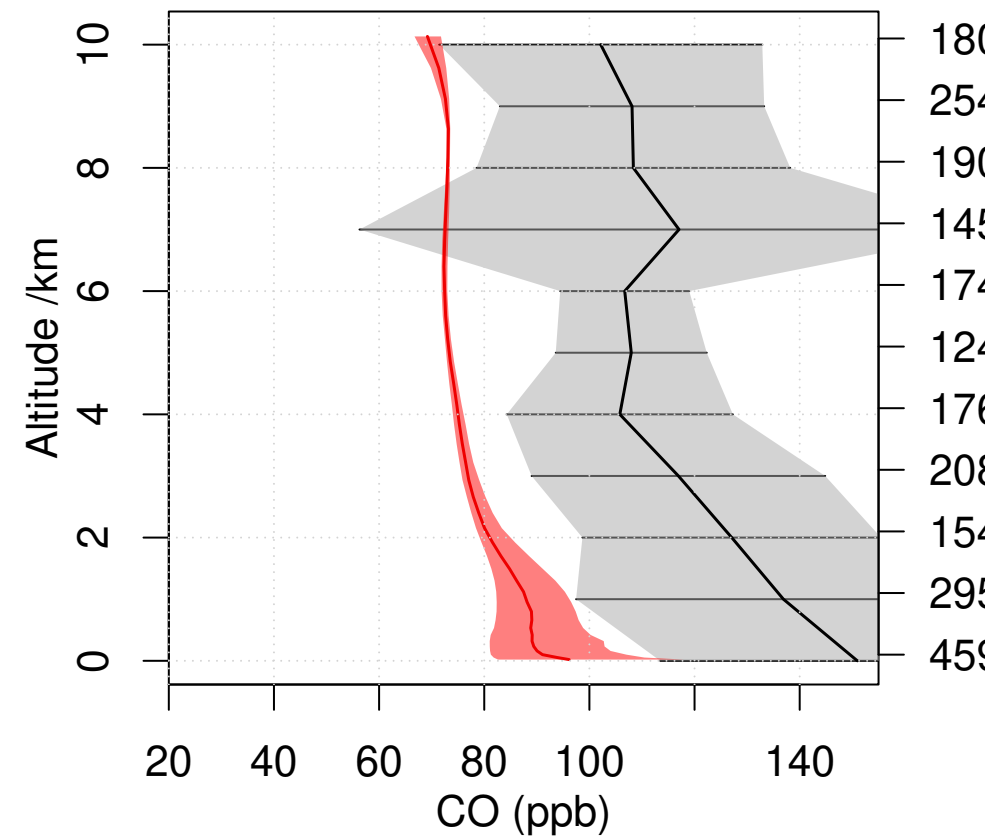
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



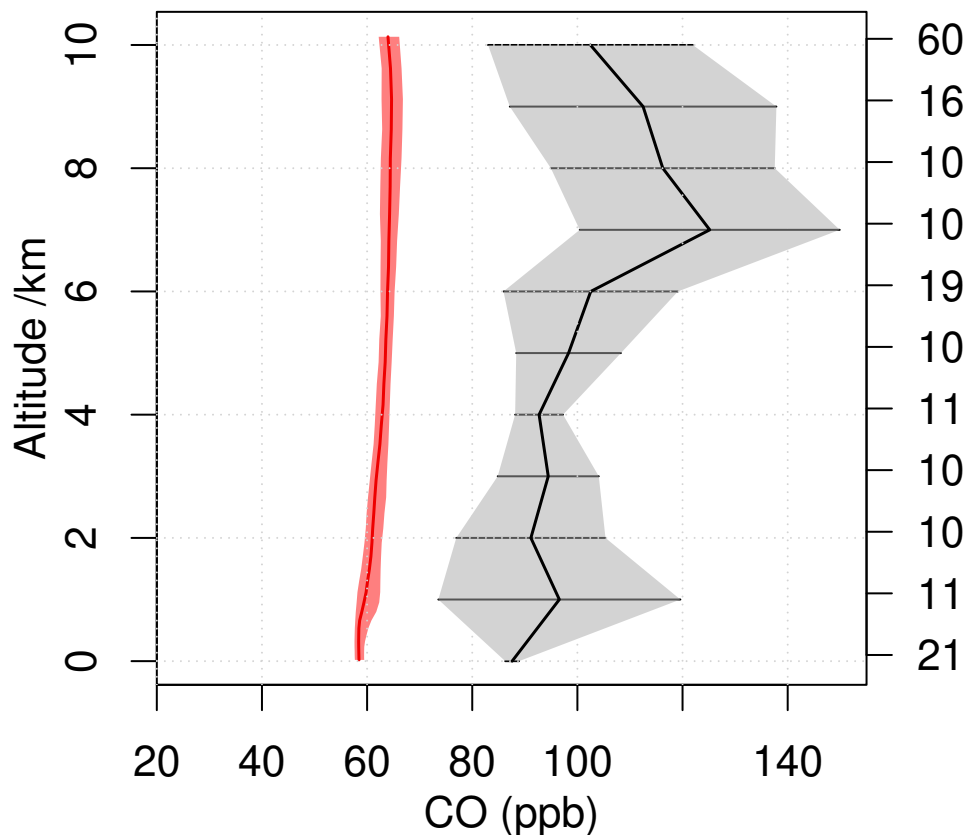
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



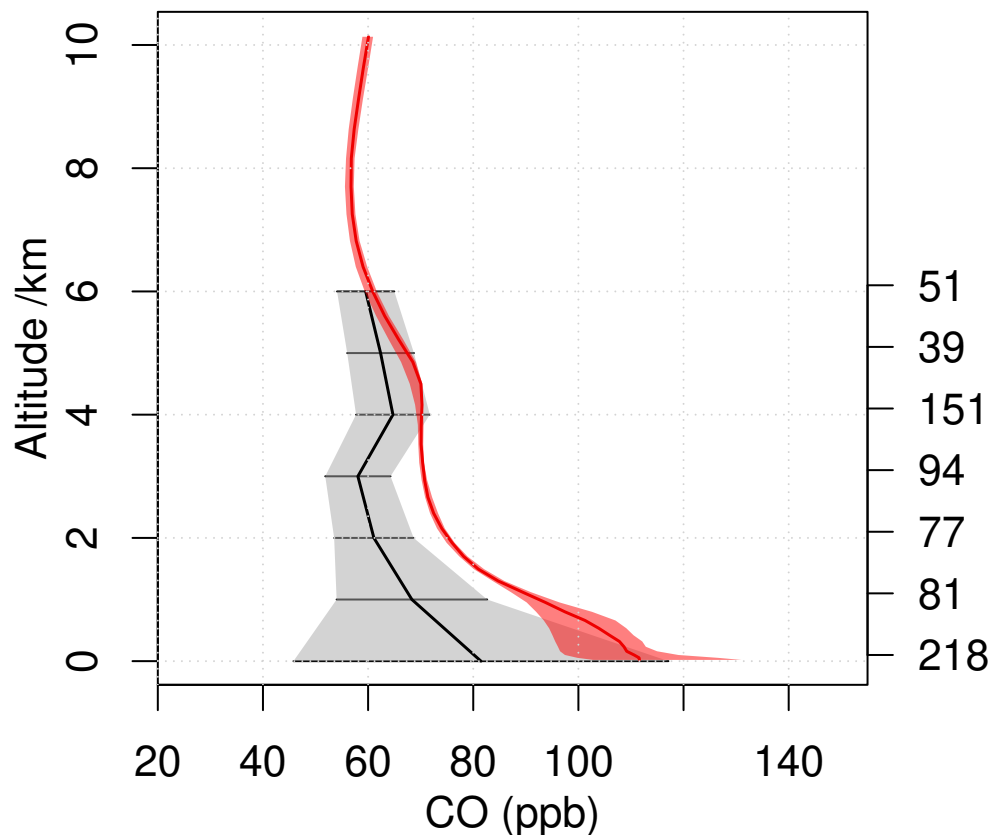
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



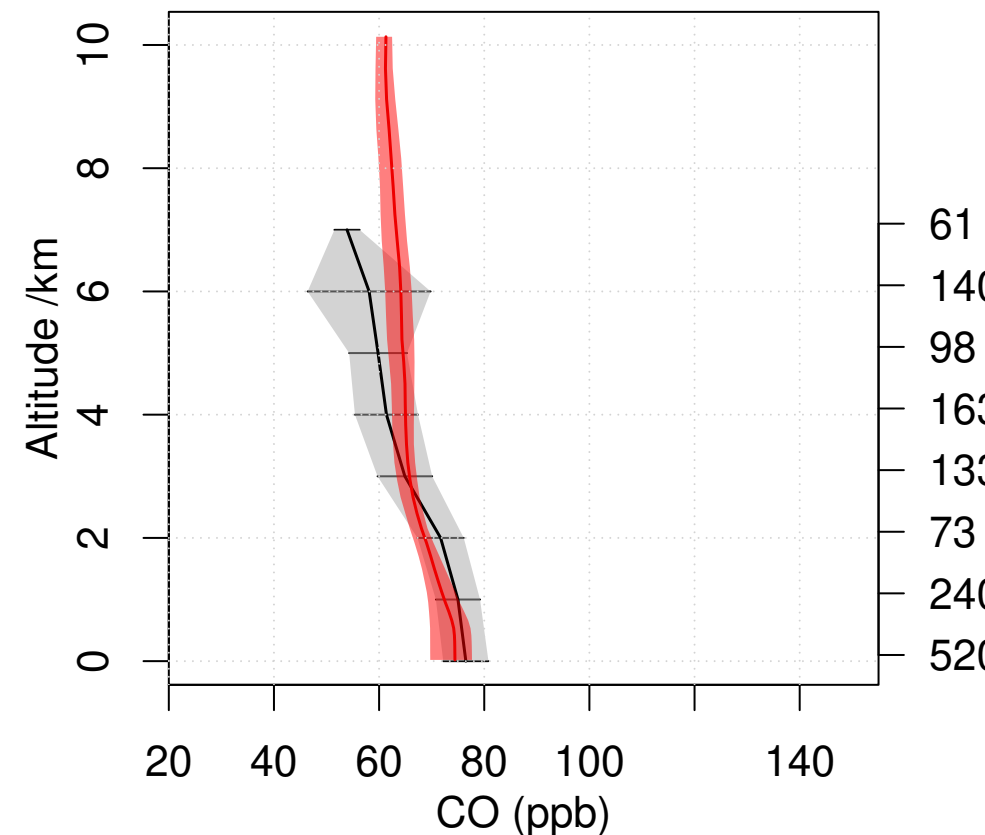
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



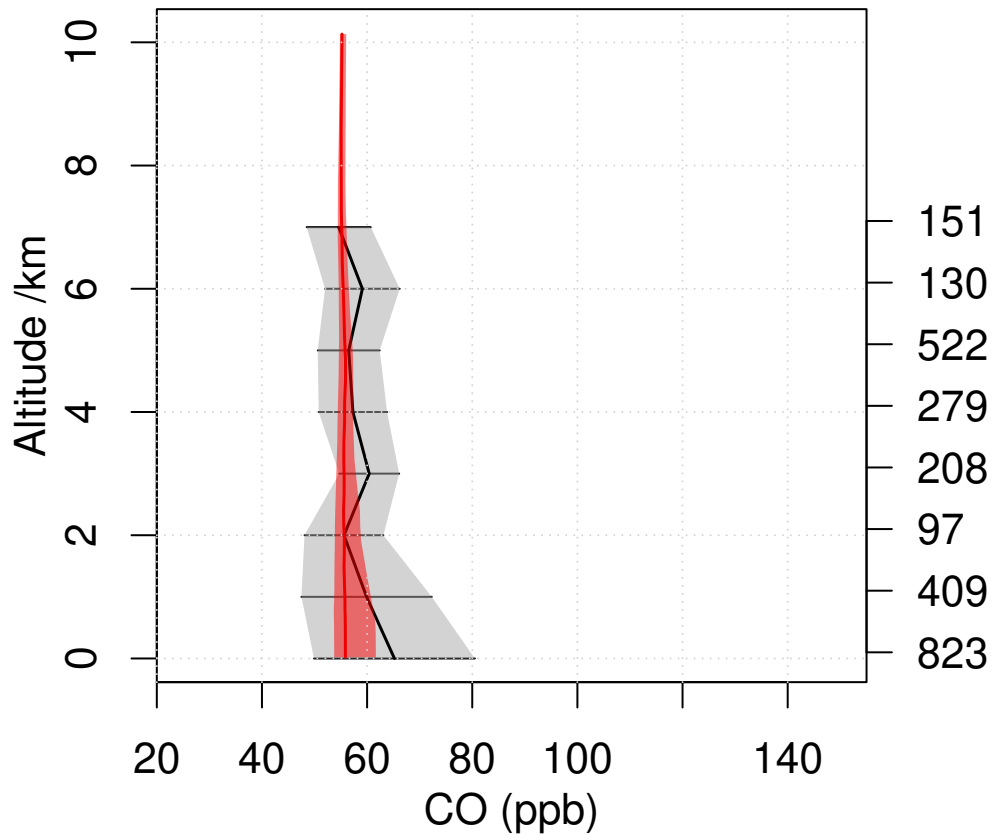
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



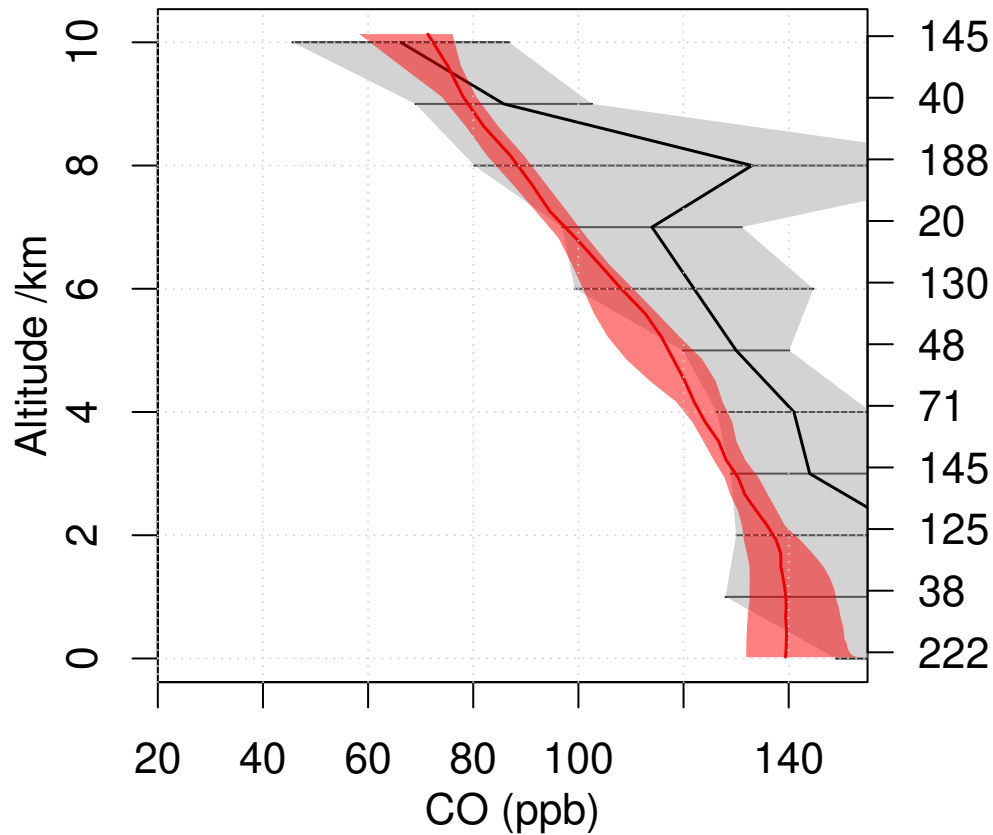
PEM-Tropics-B Christmas-Island 1999 0
Lat 0 – 10 Lon 200 – 220



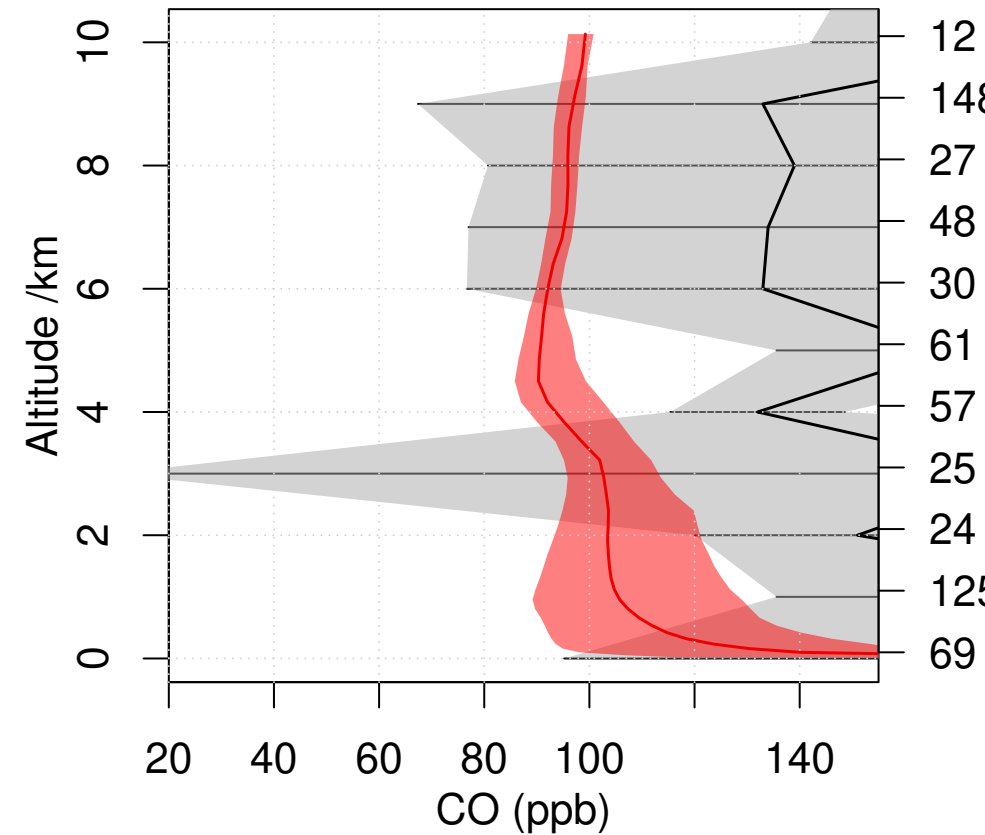
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



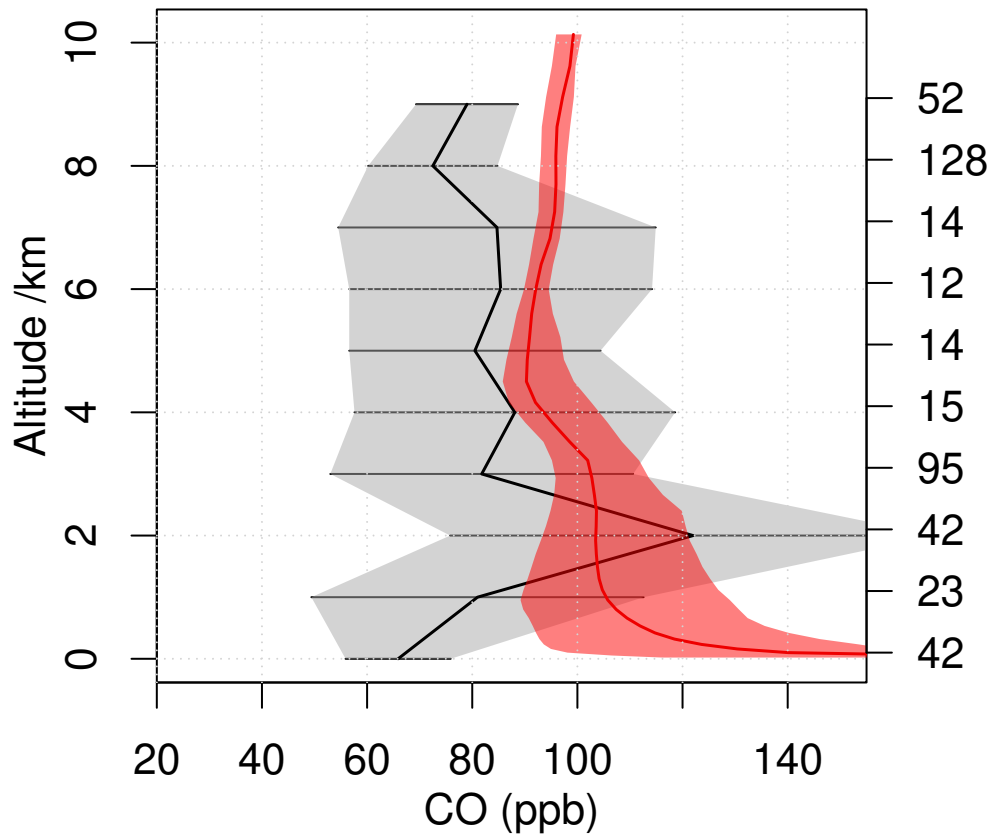
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



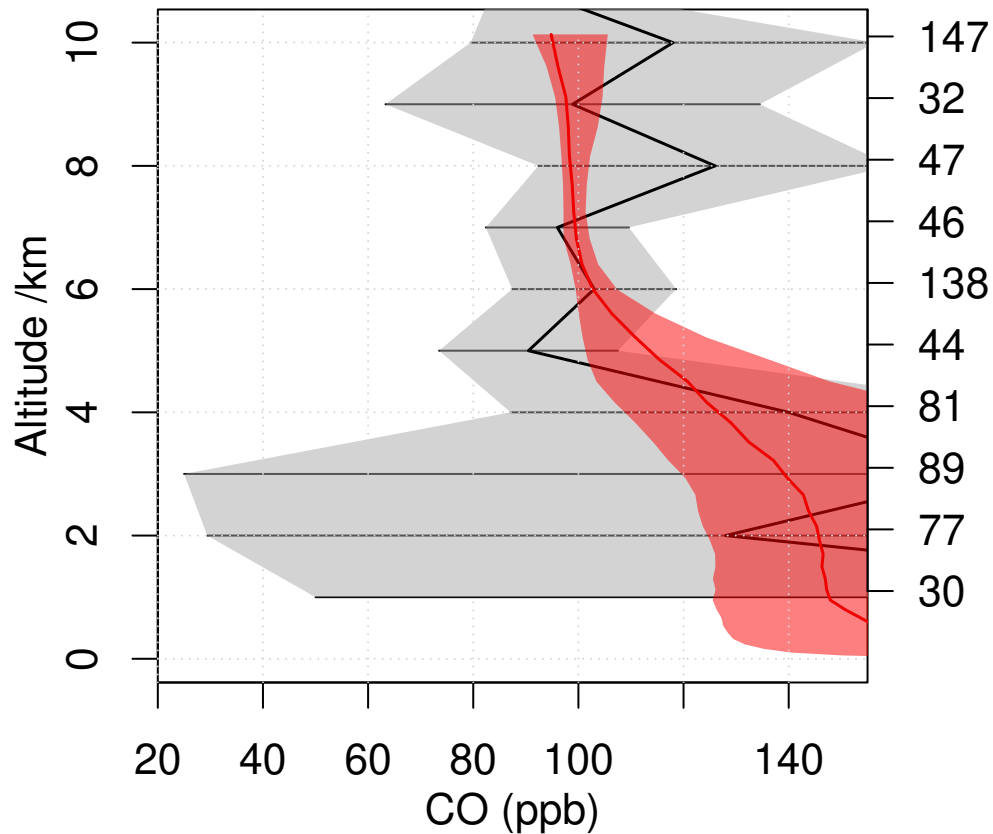
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



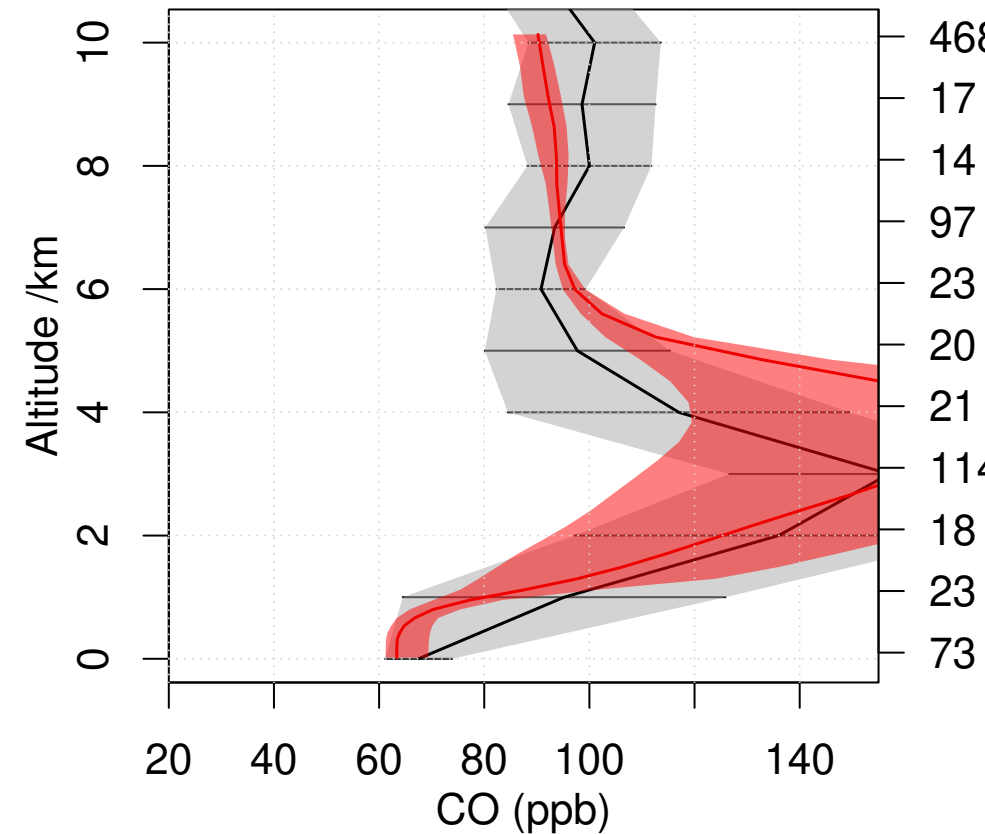
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



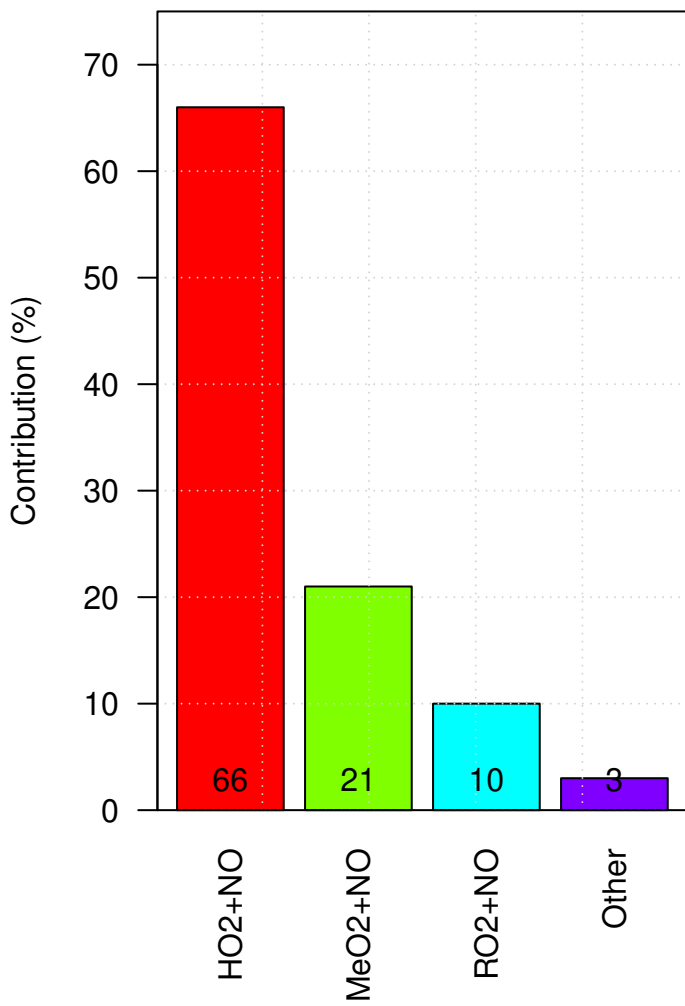
TRACE-A S-Africa 1992 09
Lat -25 – -5 Lon 15 – 35



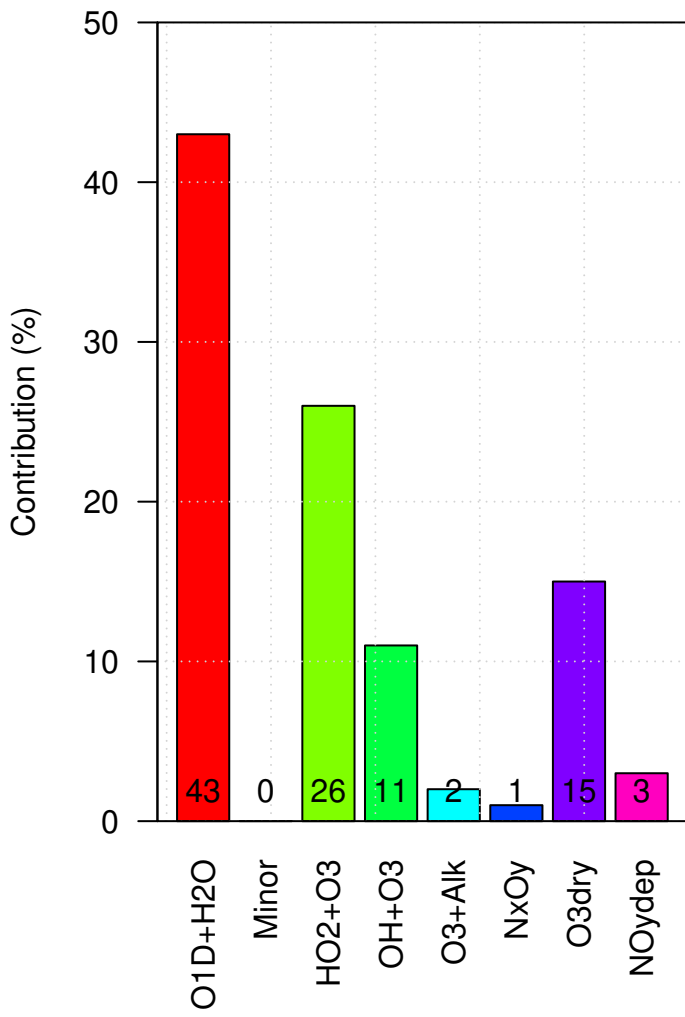
TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10



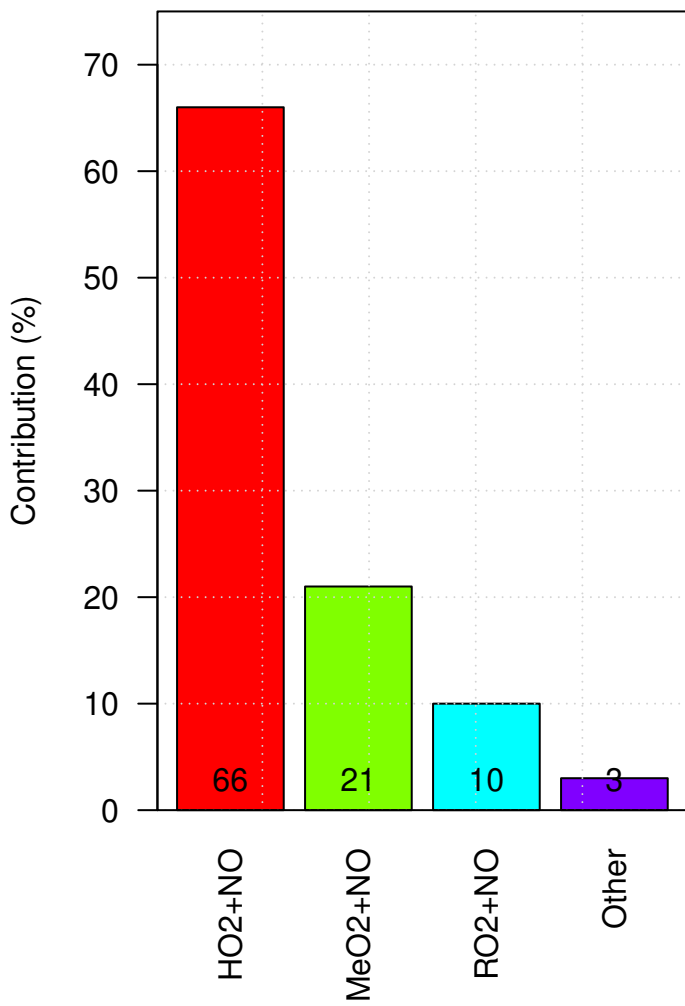
bs395 Production of Tropospheric Ox



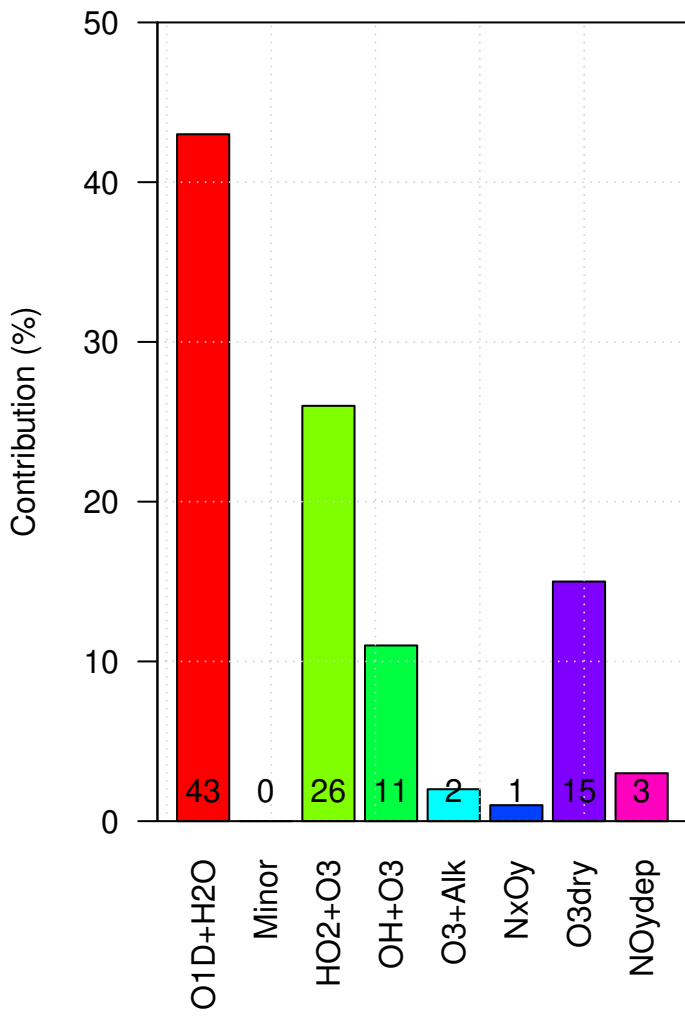
bs395 Loss of Tropospheric Ox

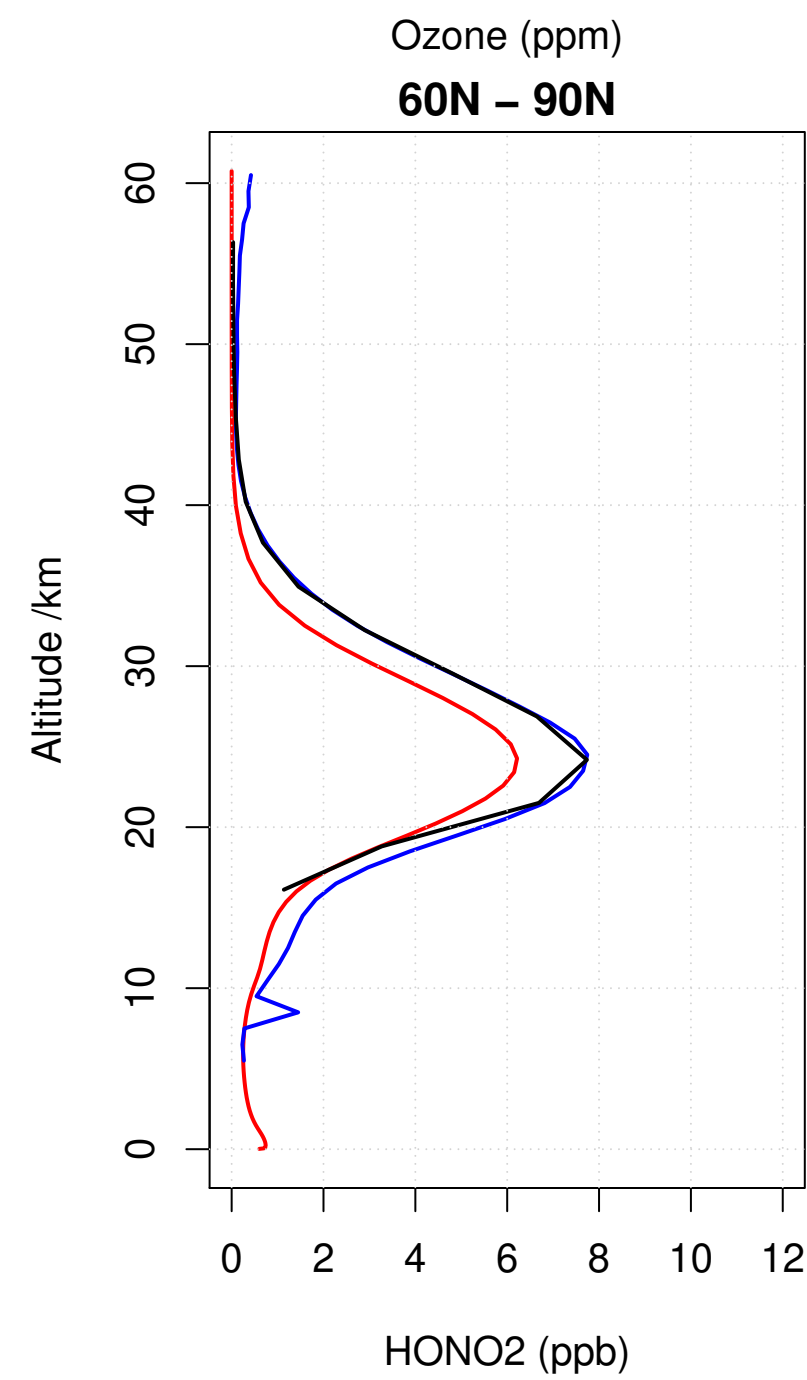
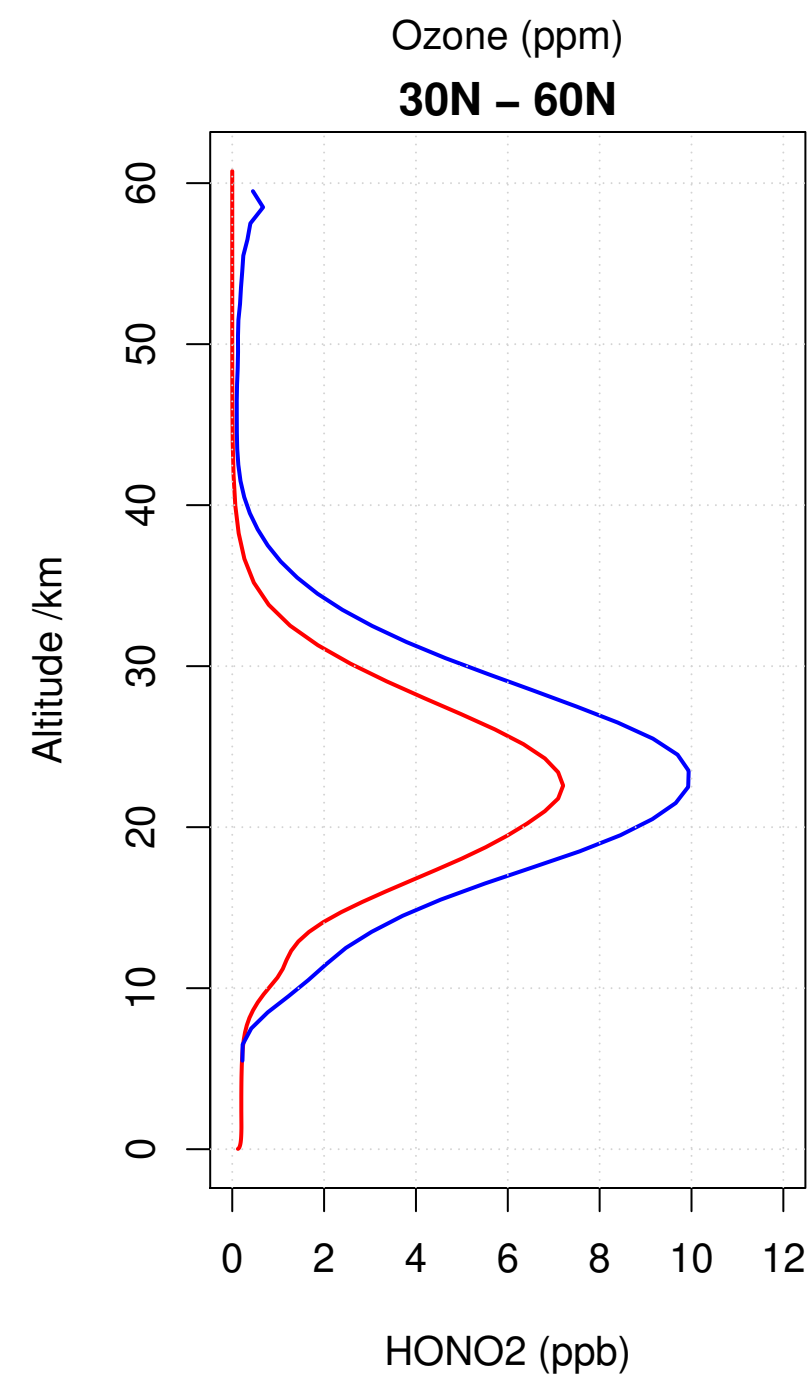
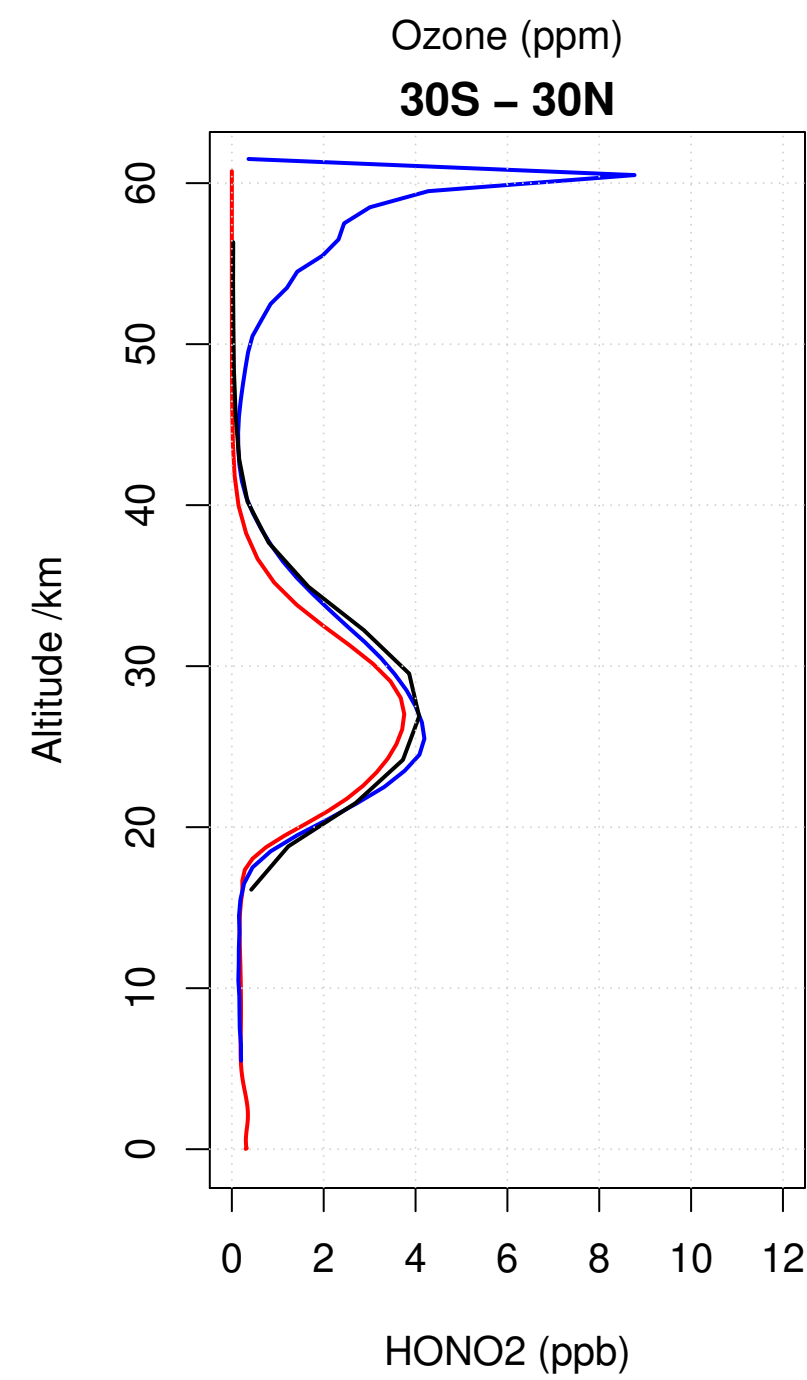
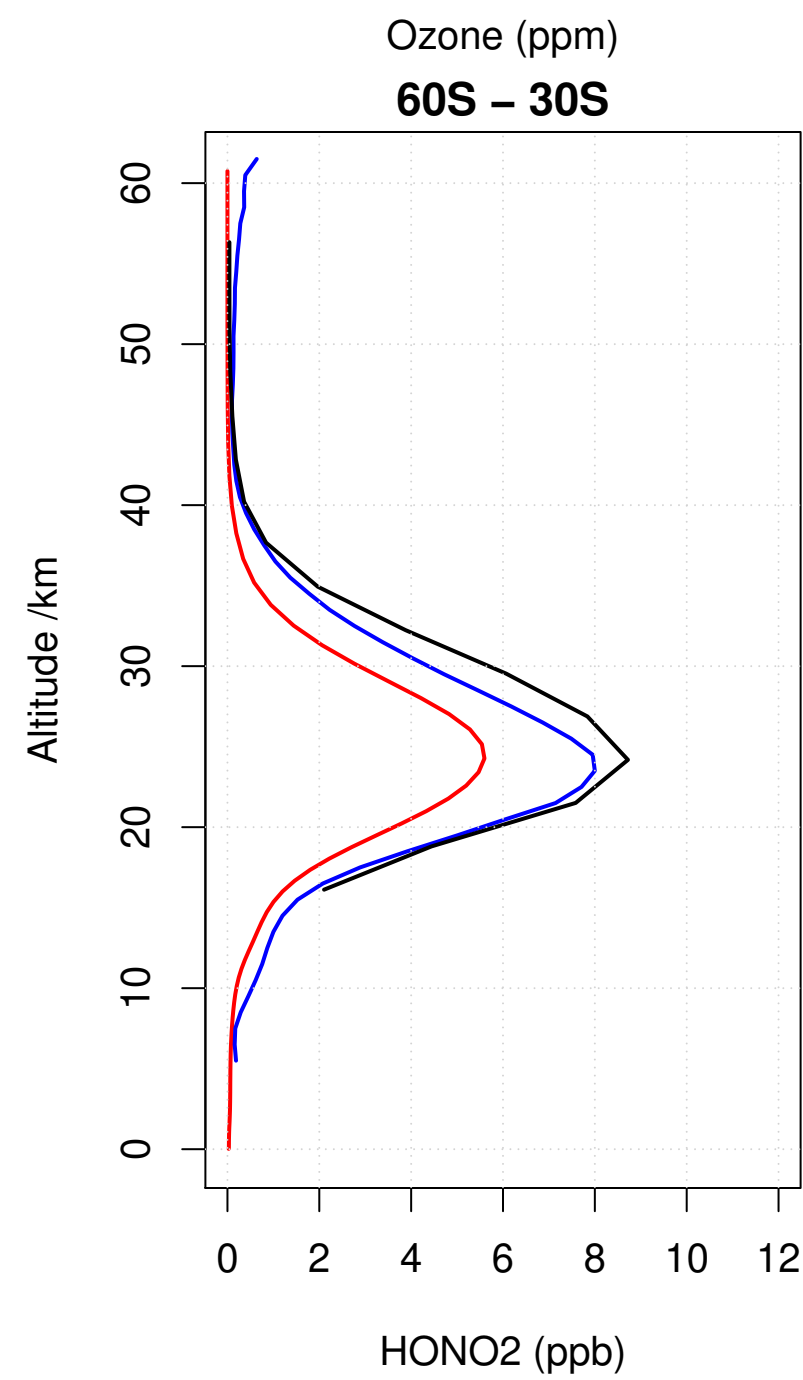
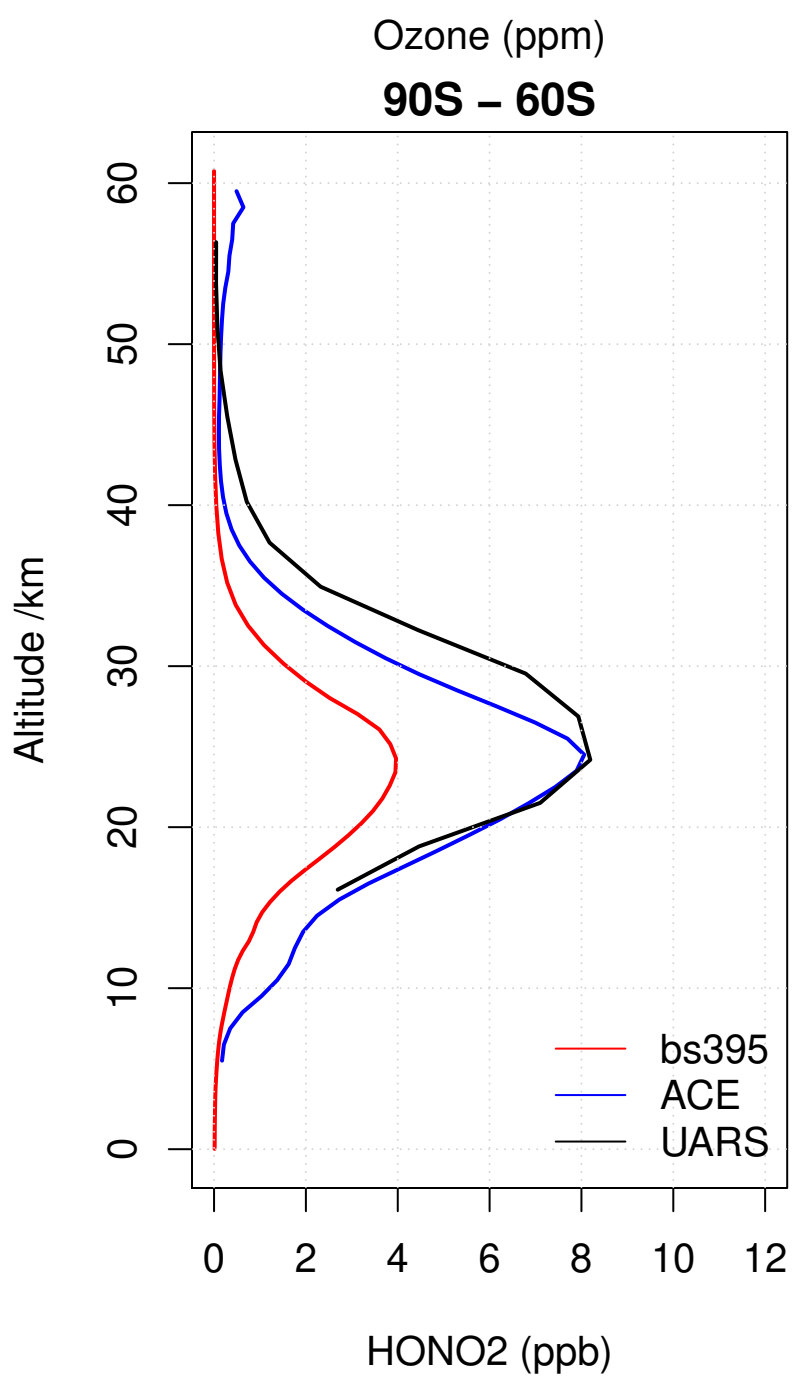
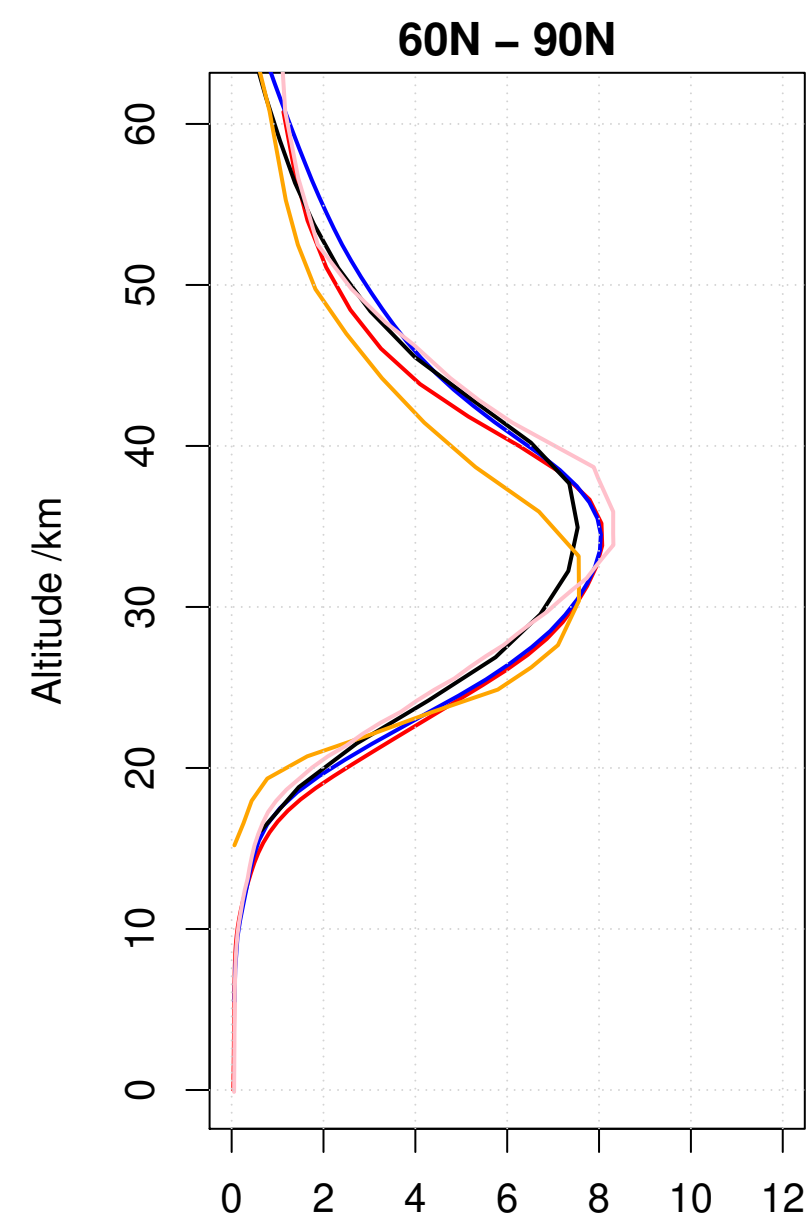
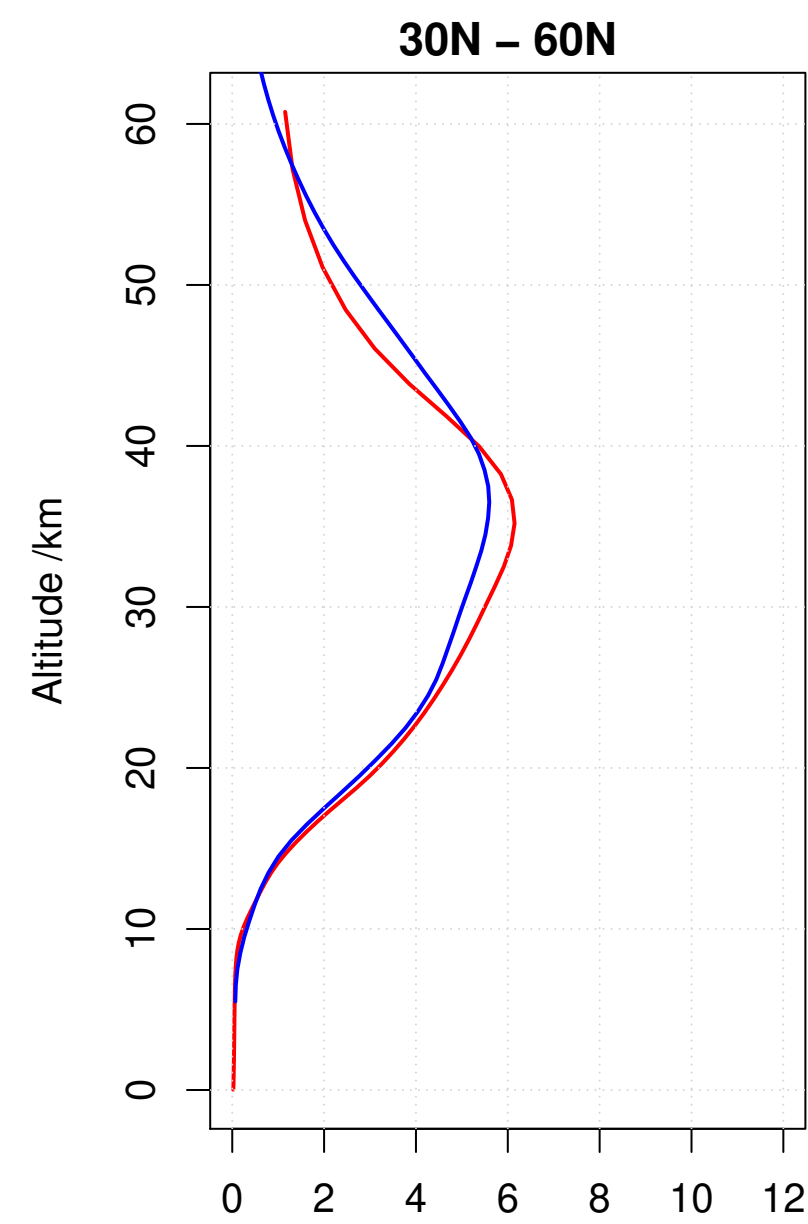
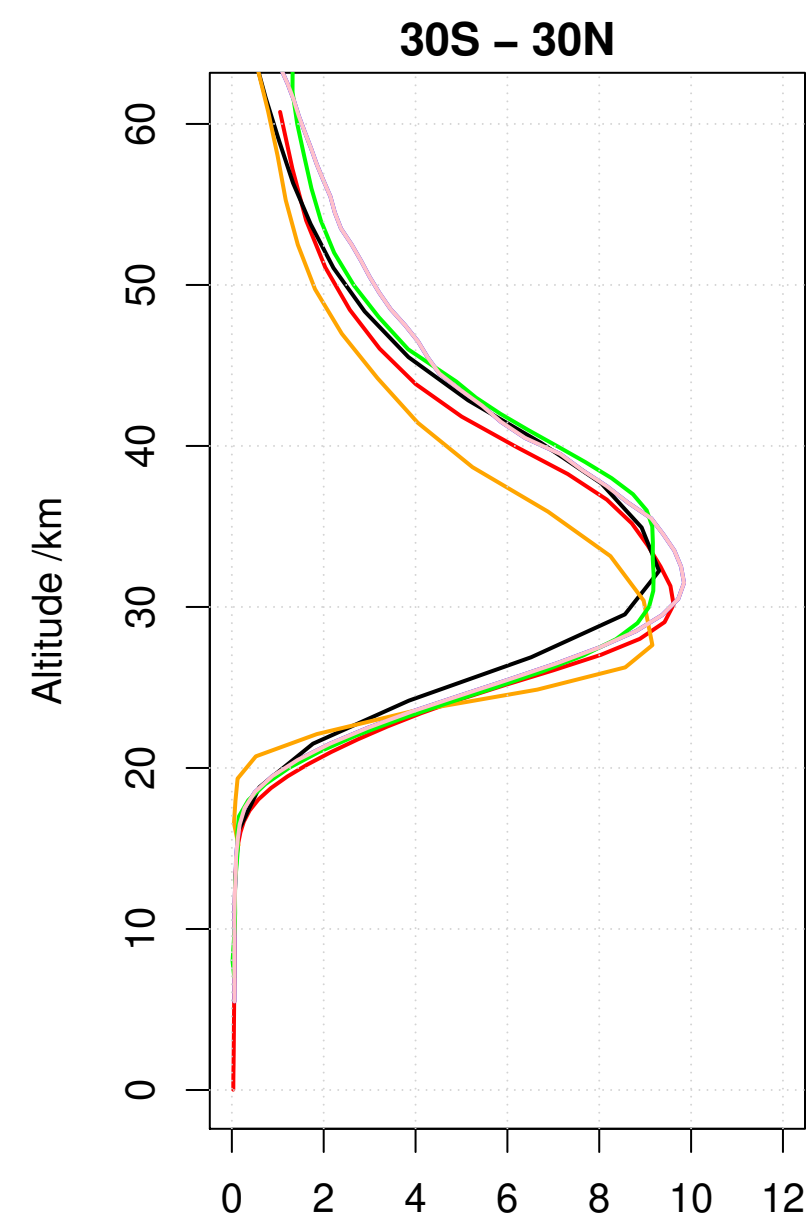
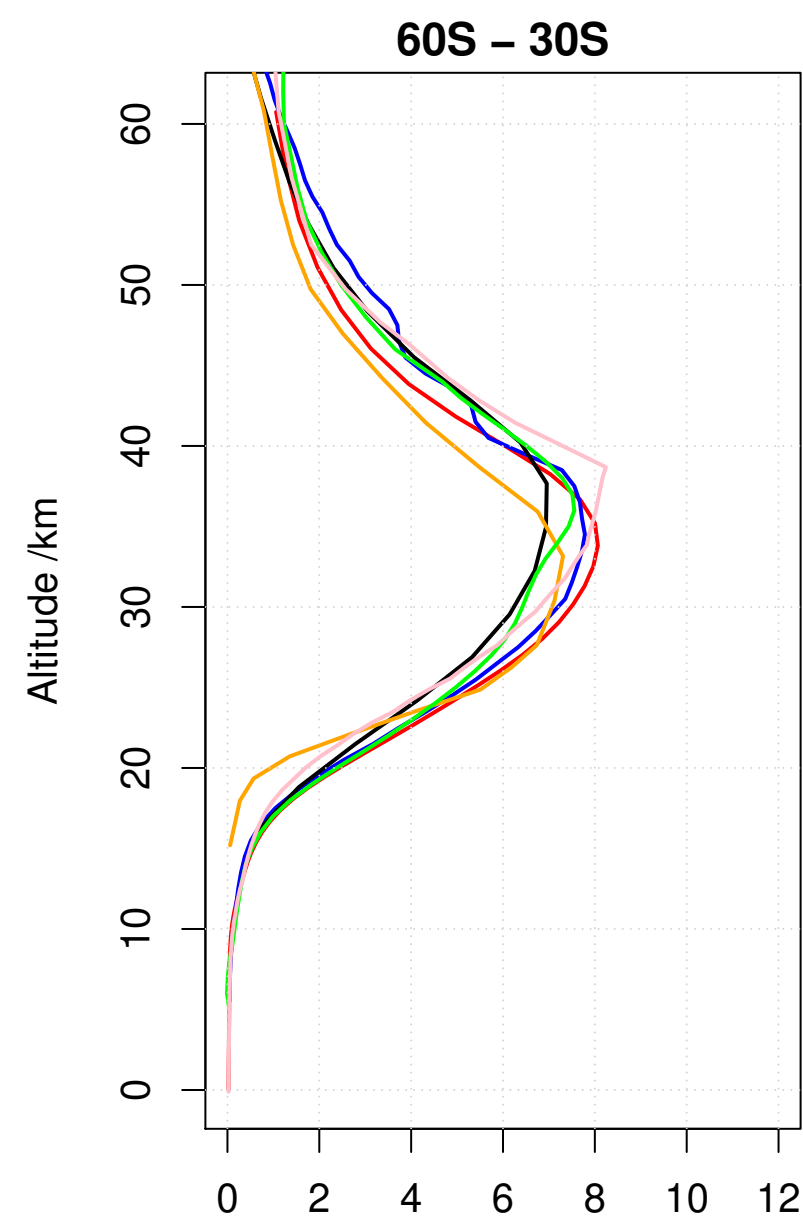
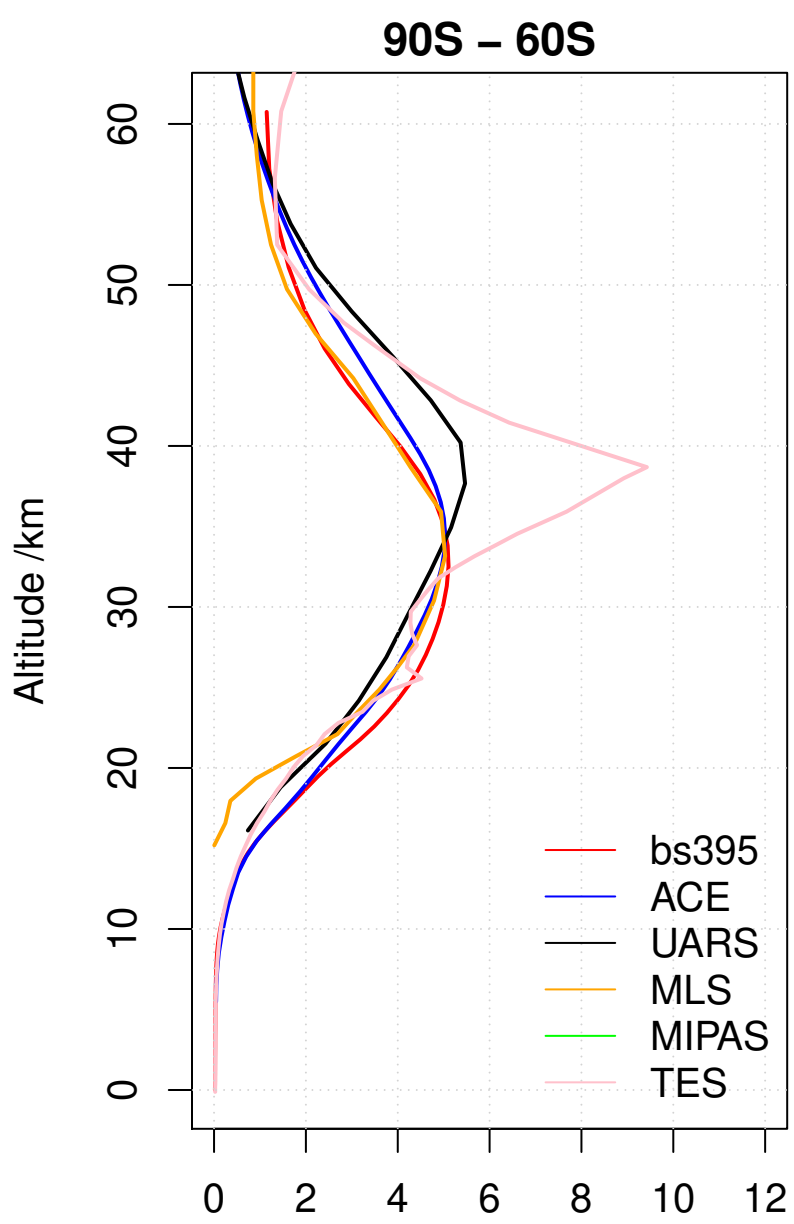


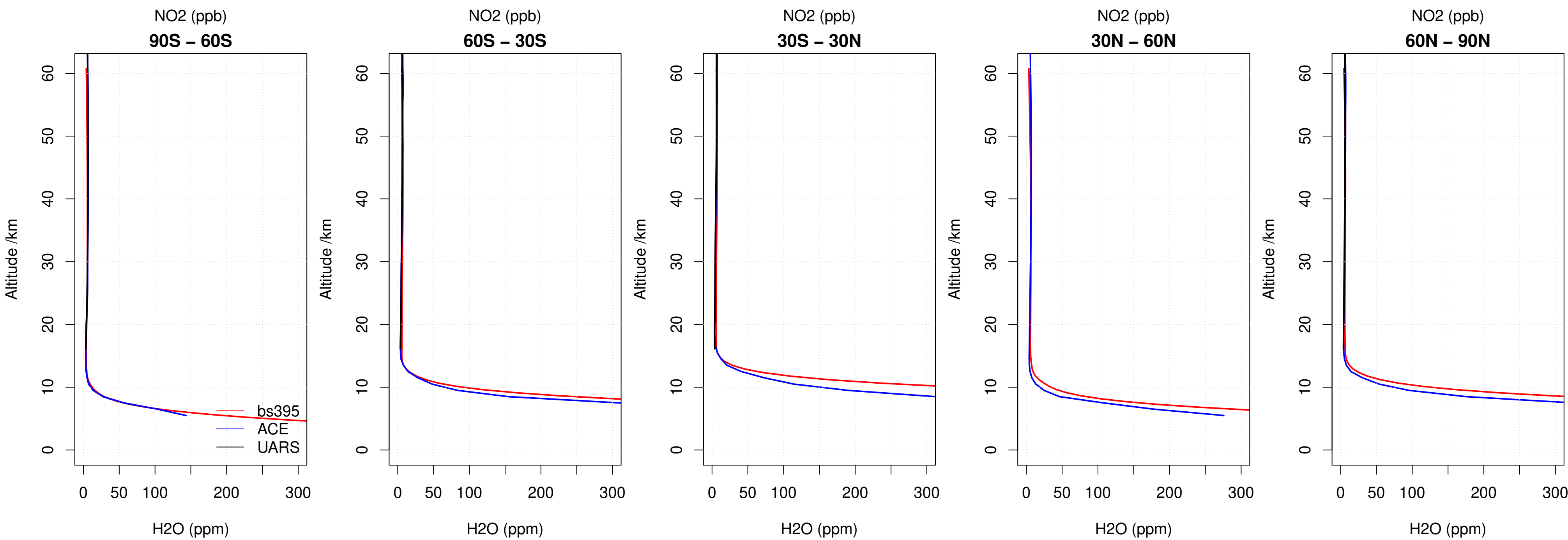
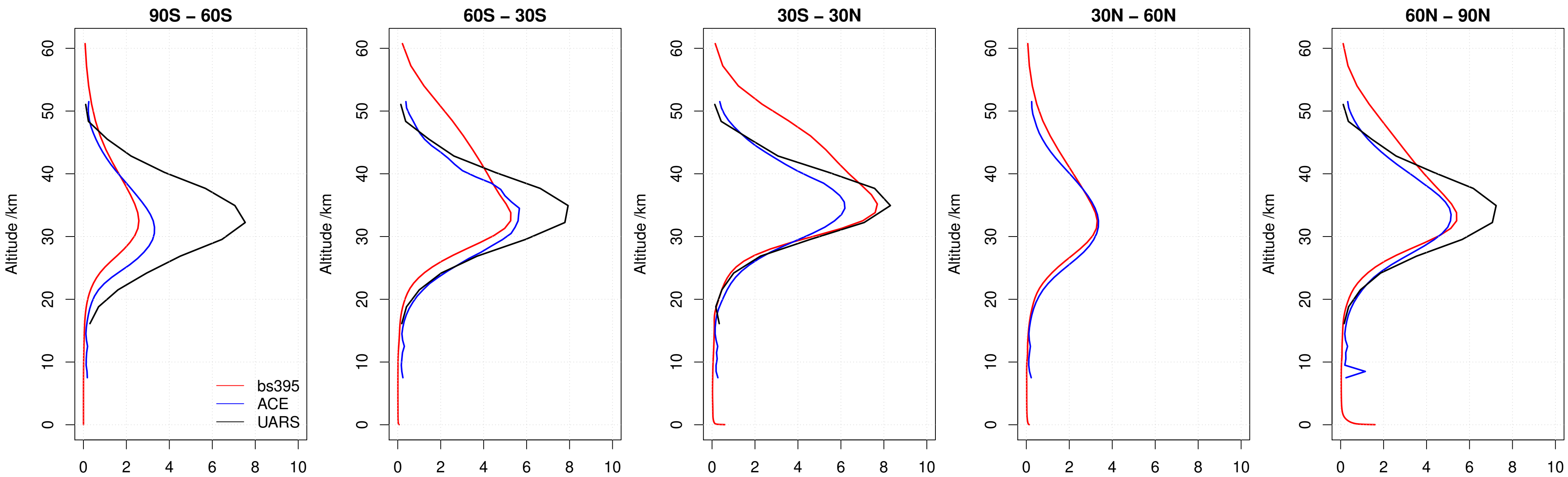
bw489 Production of Tropospheric Ox

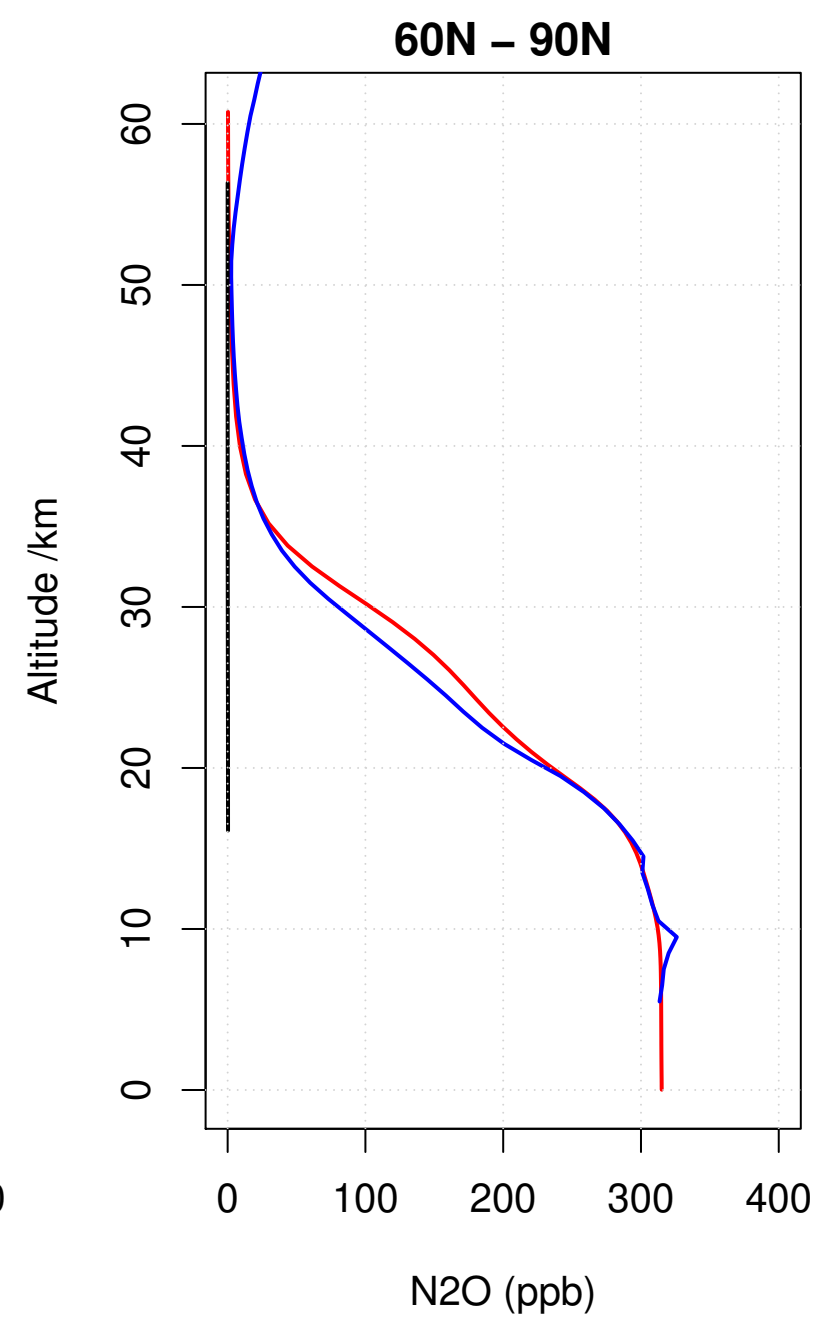
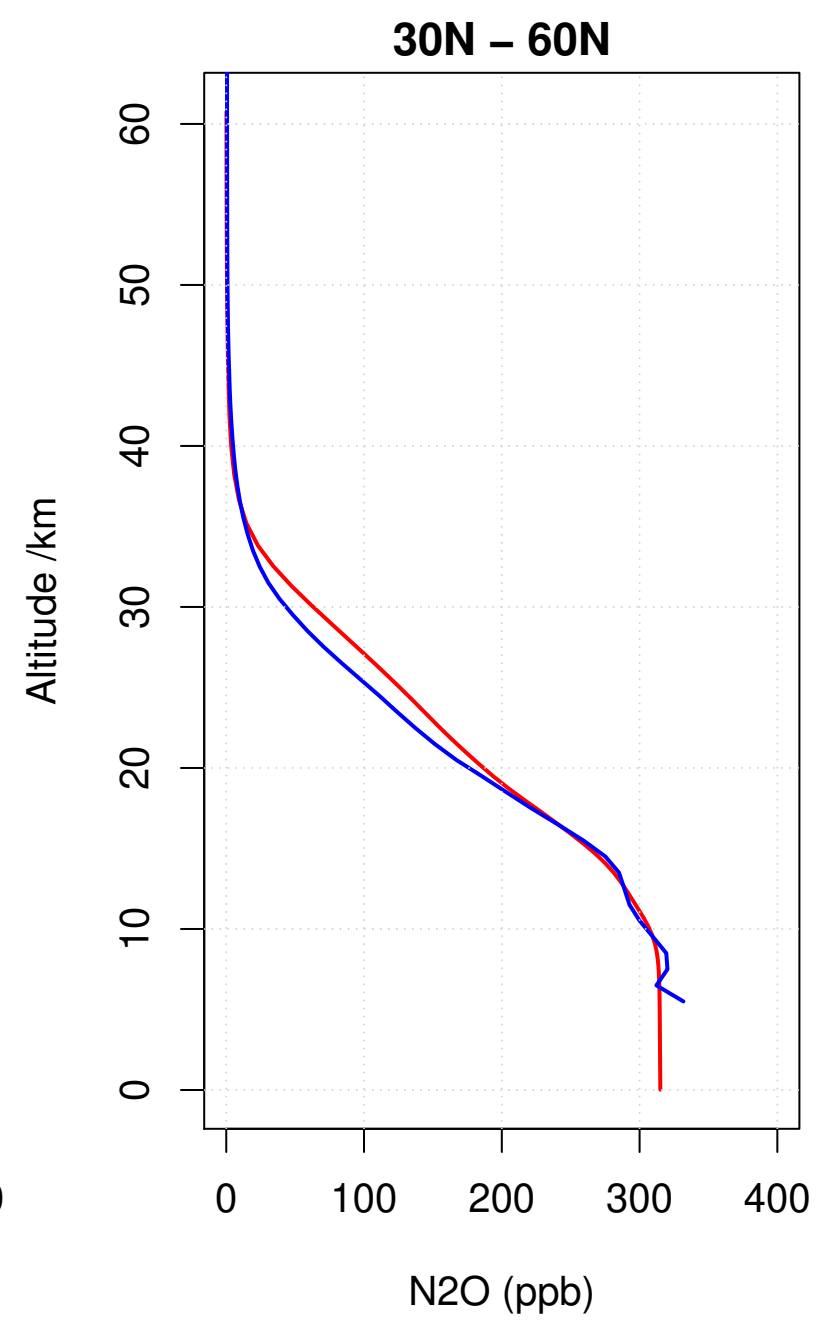
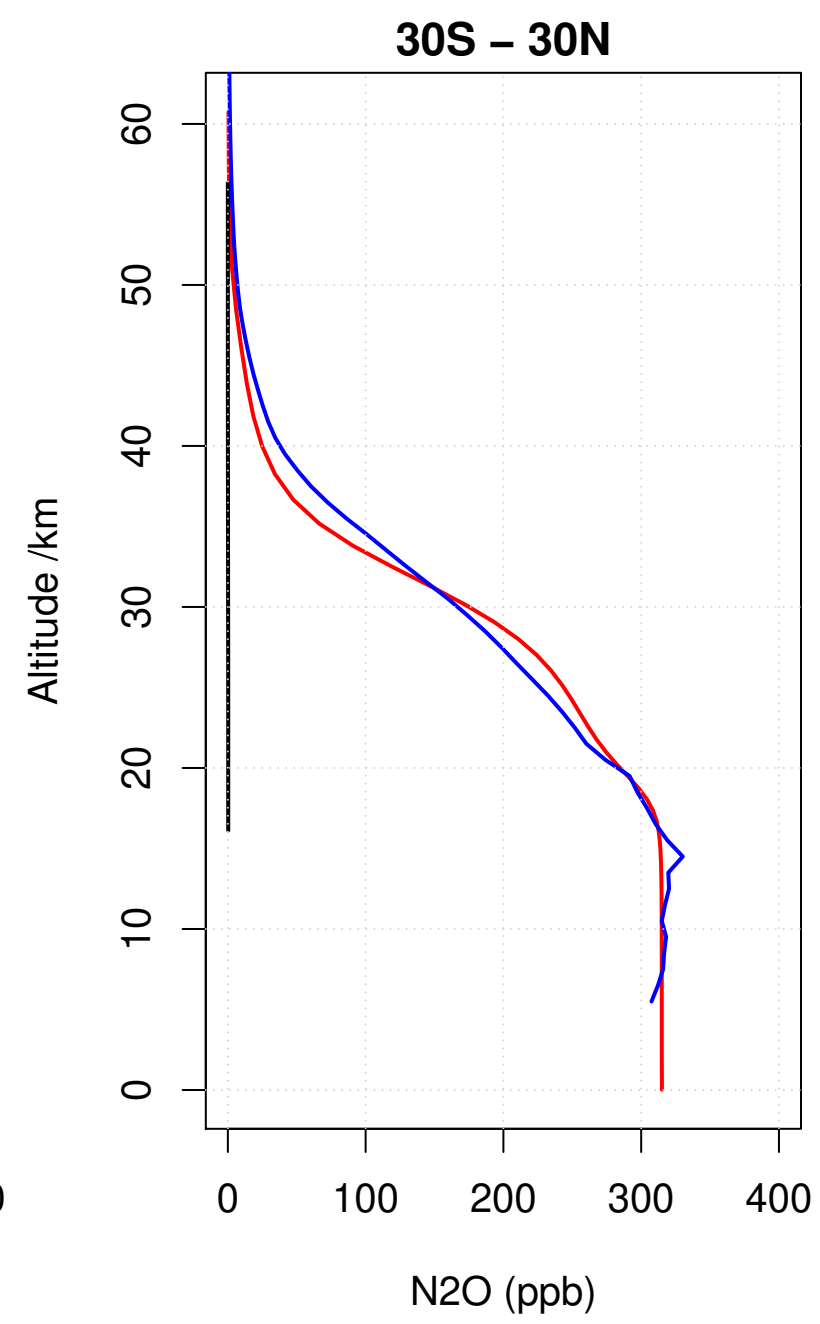
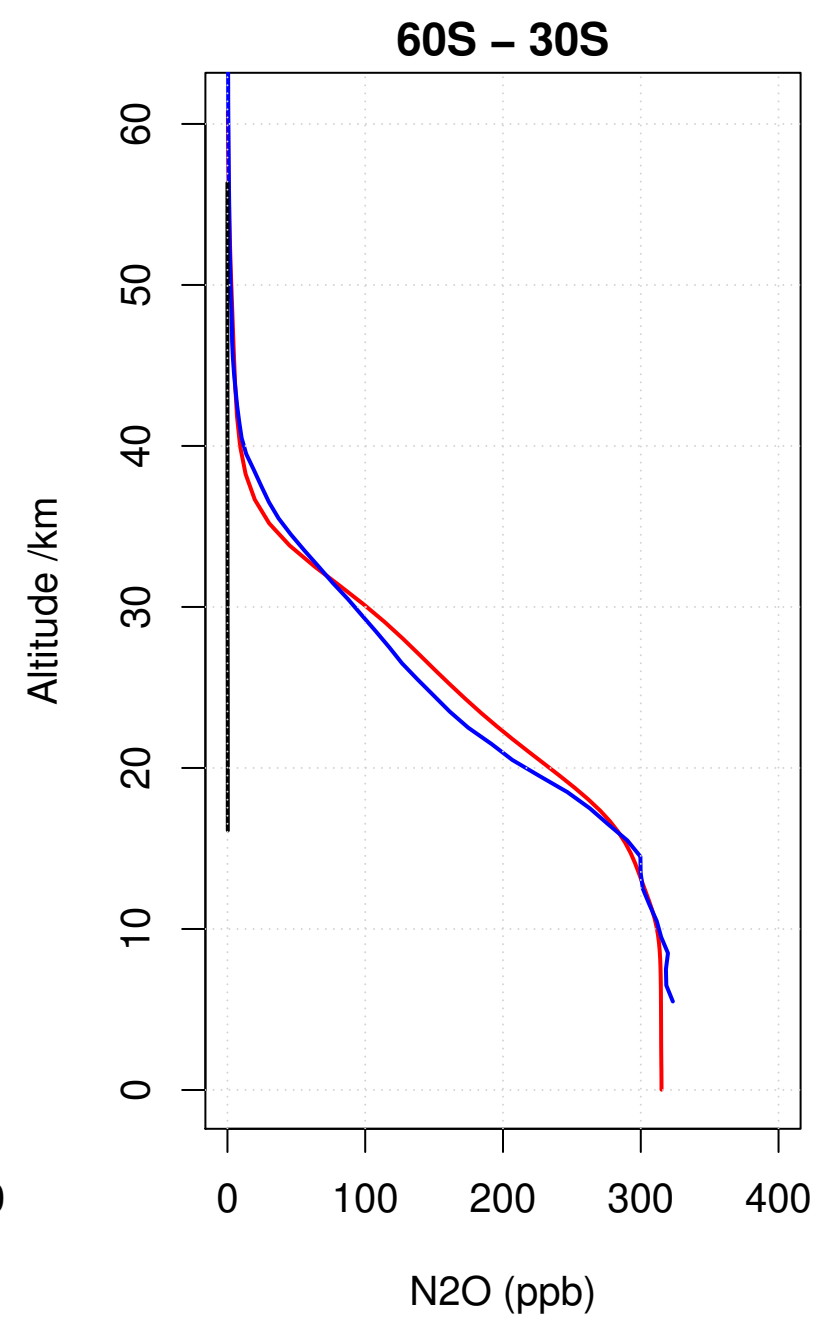
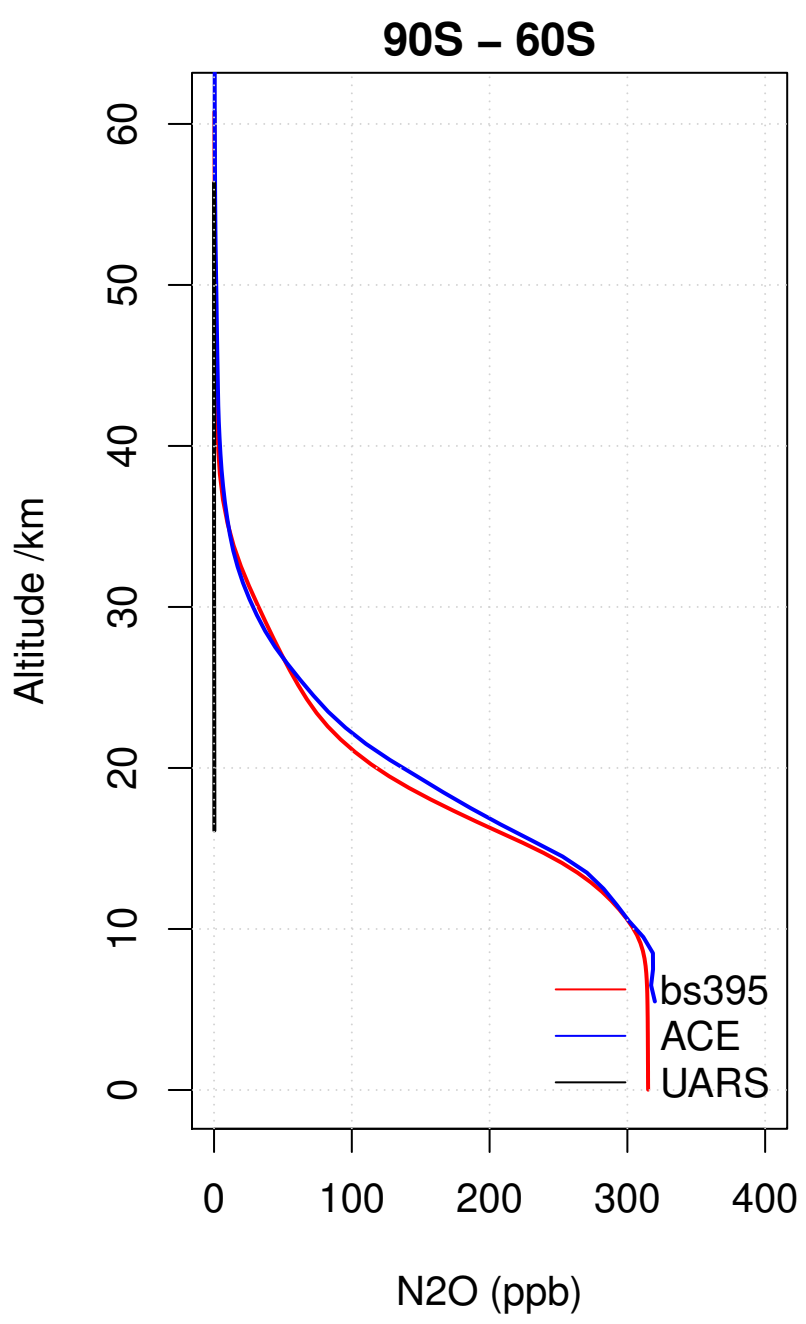


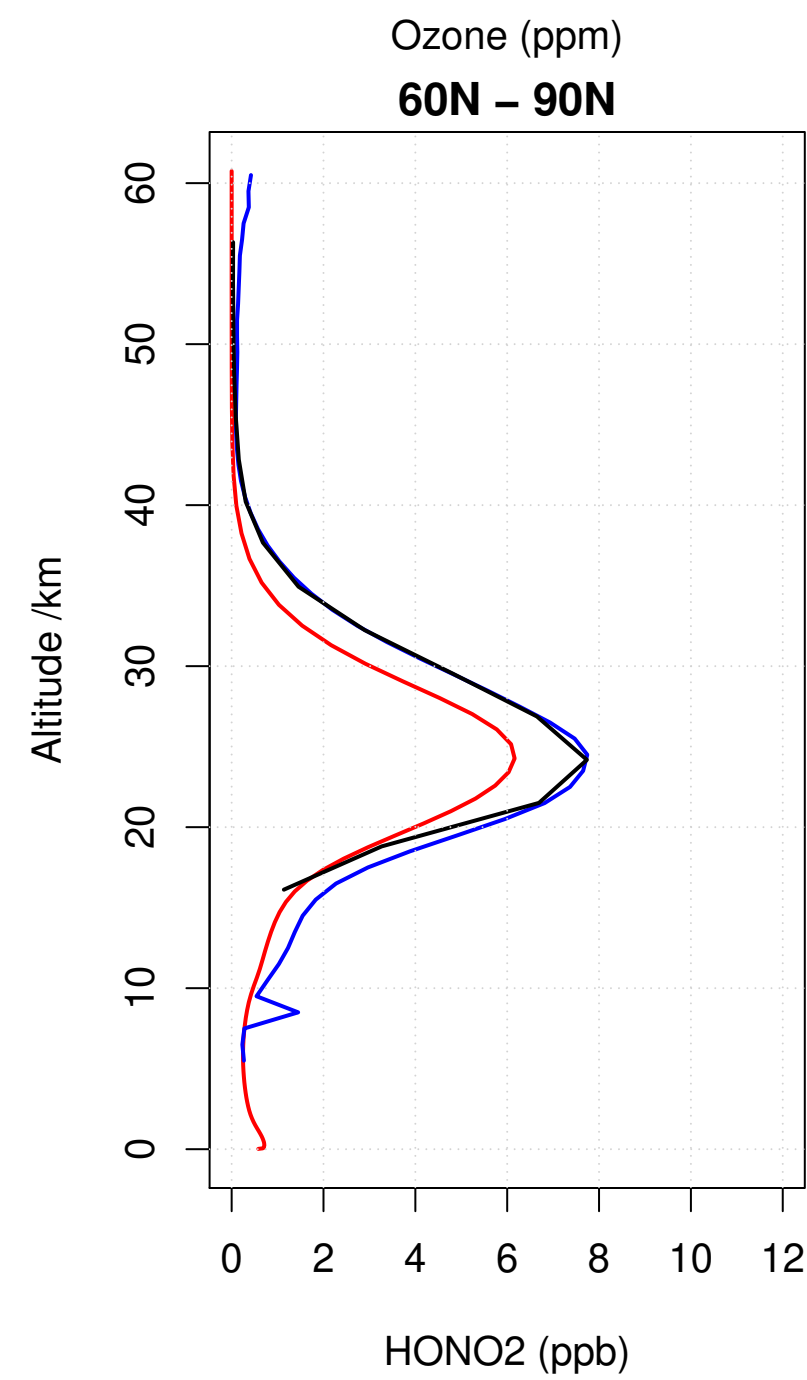
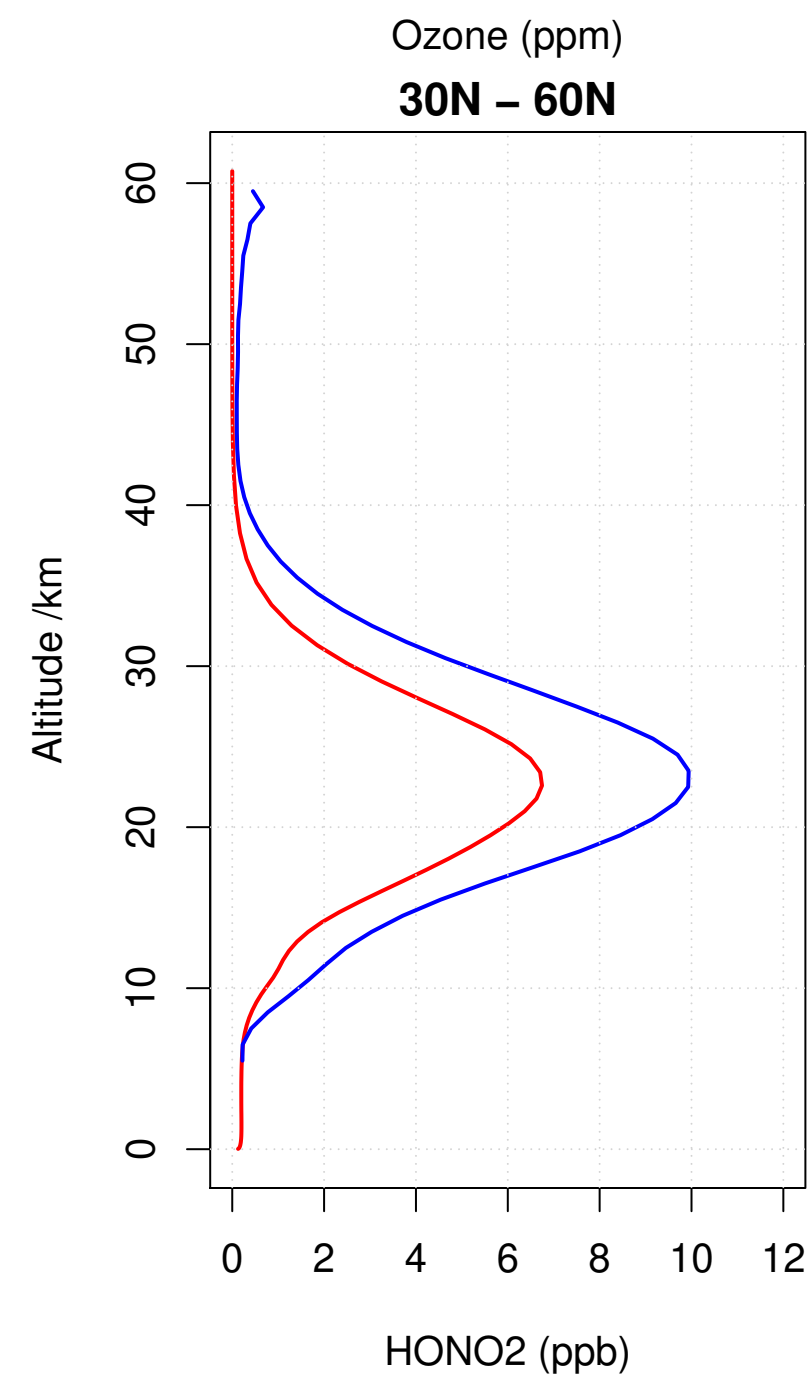
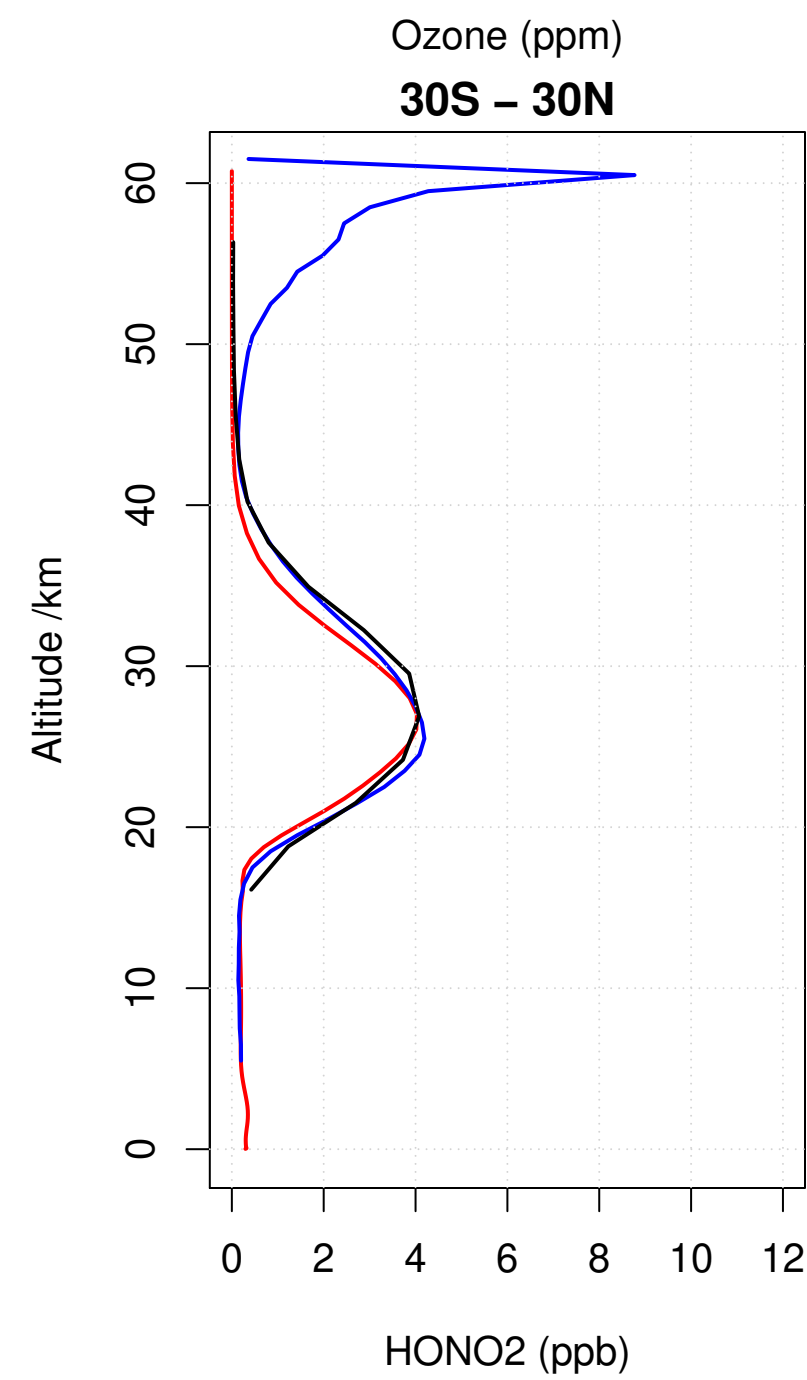
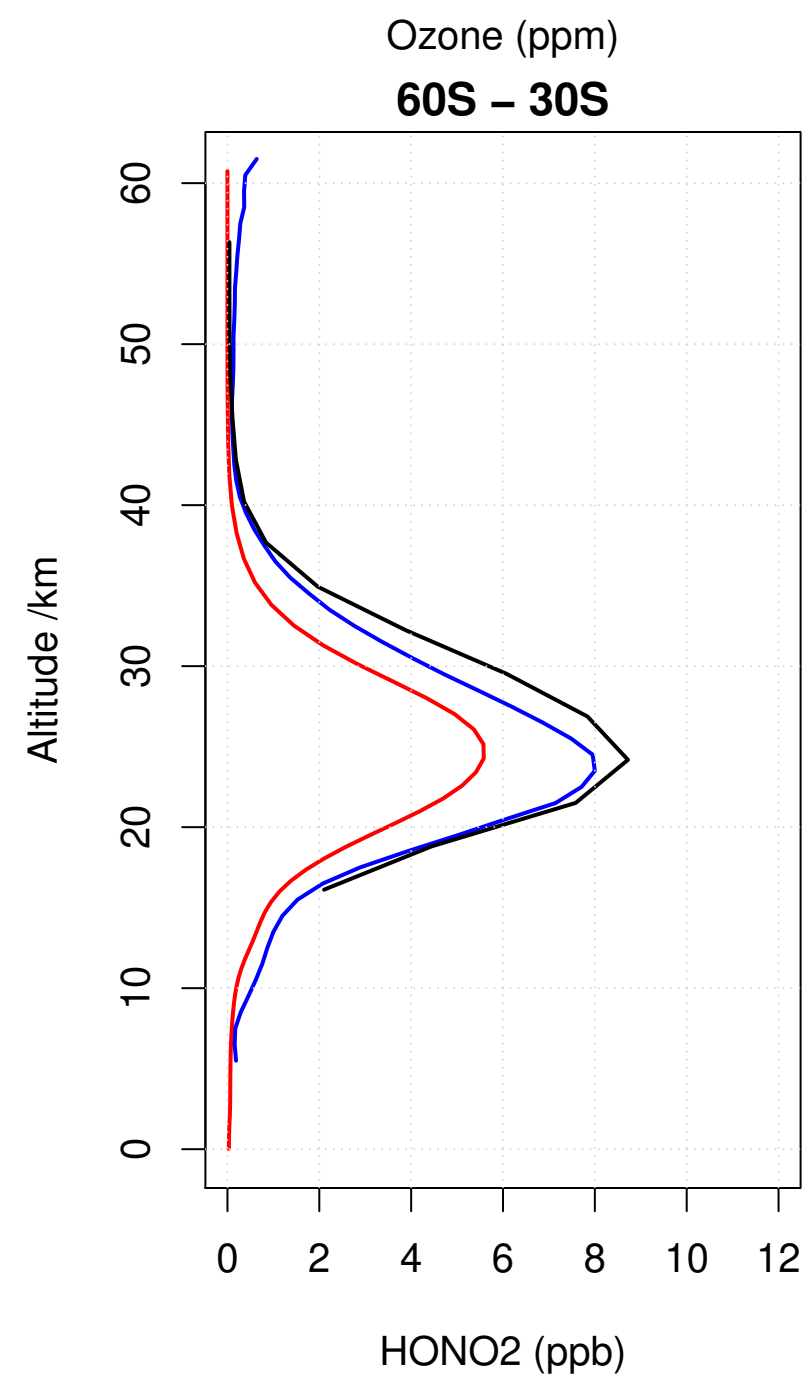
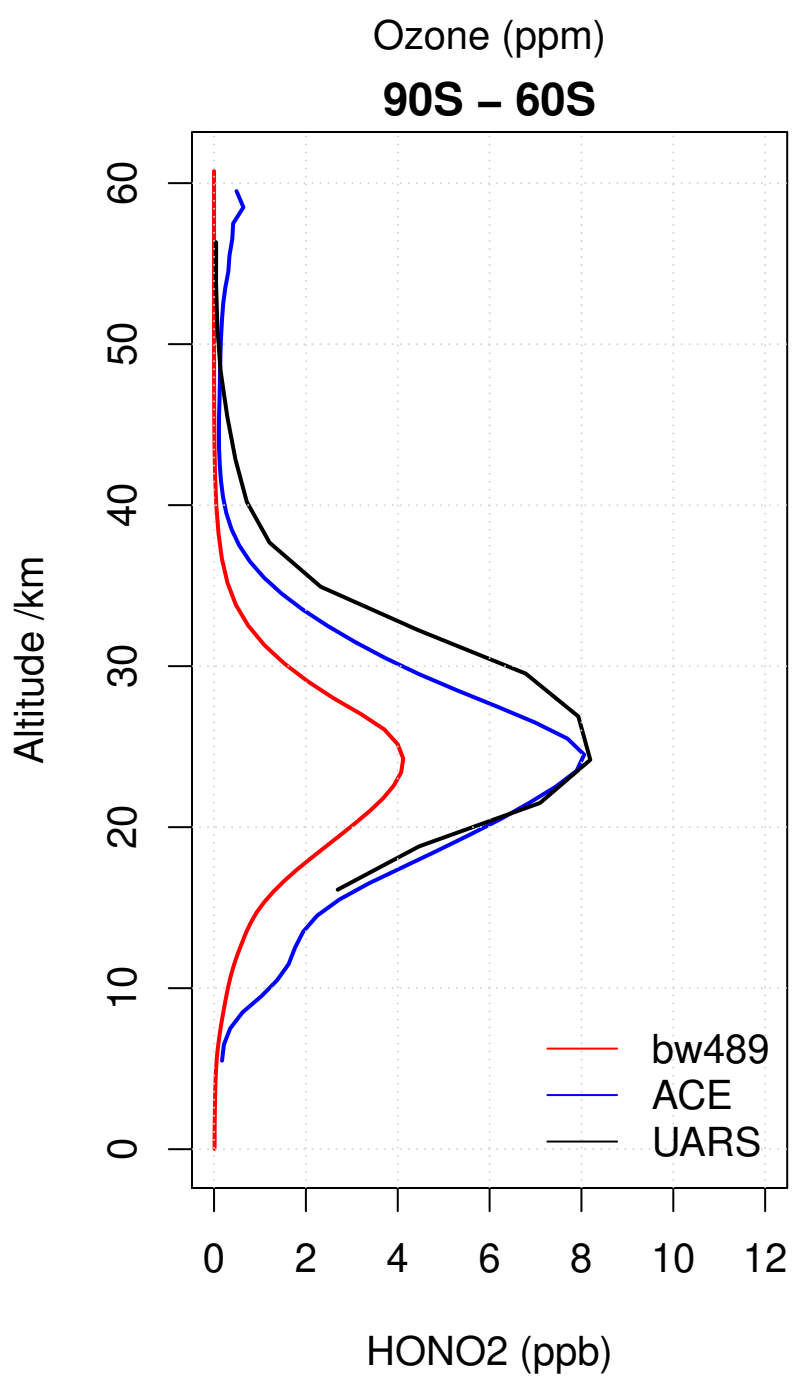
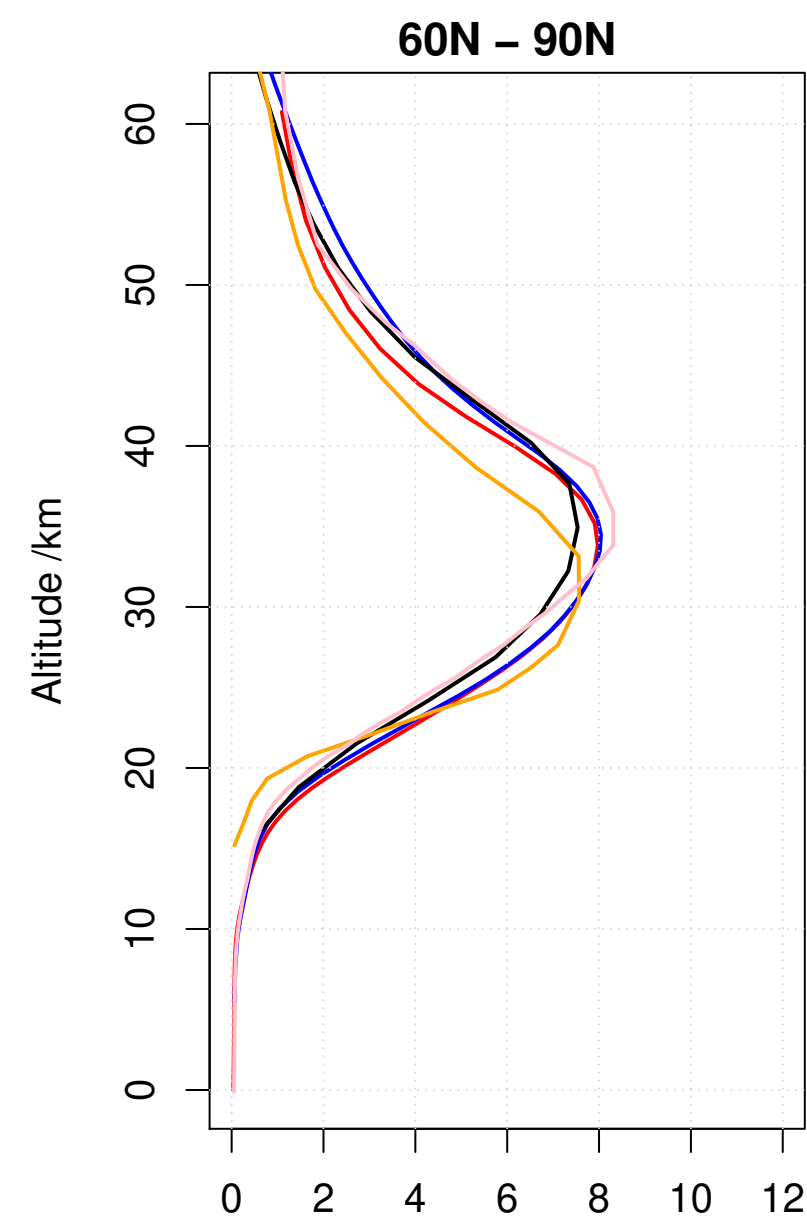
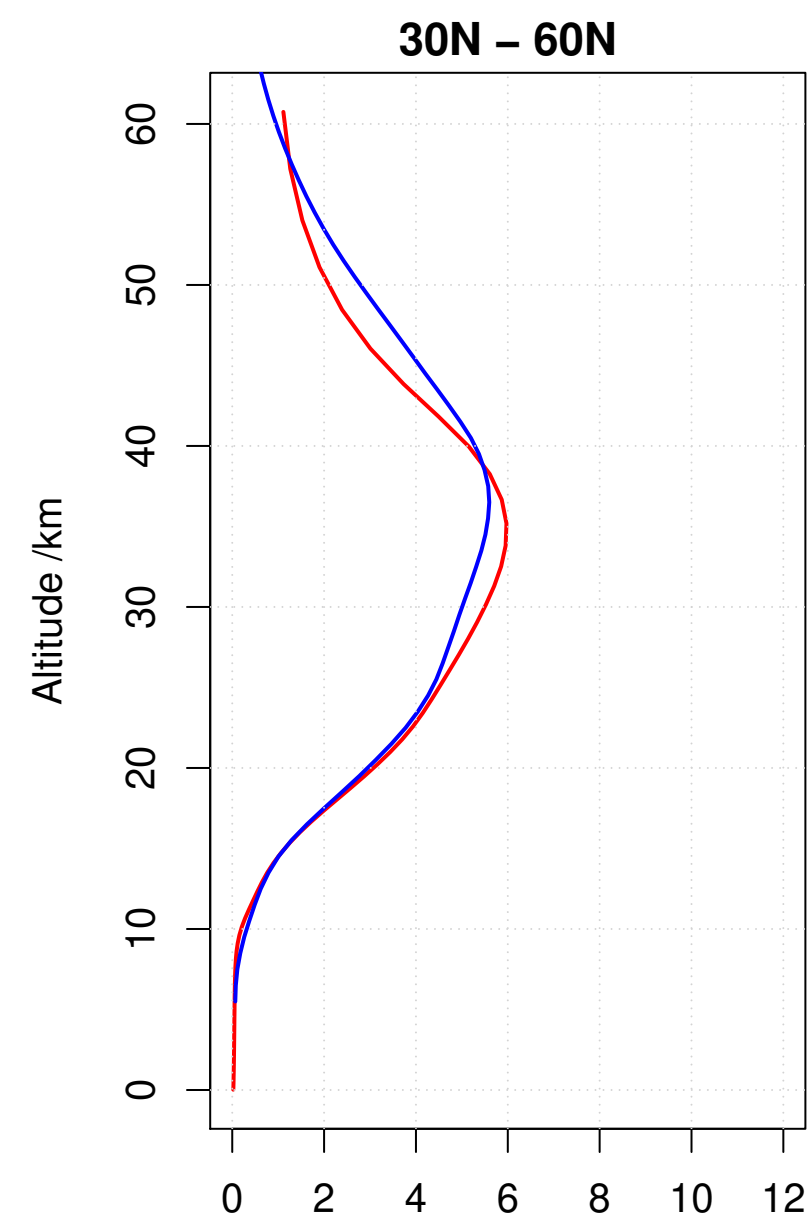
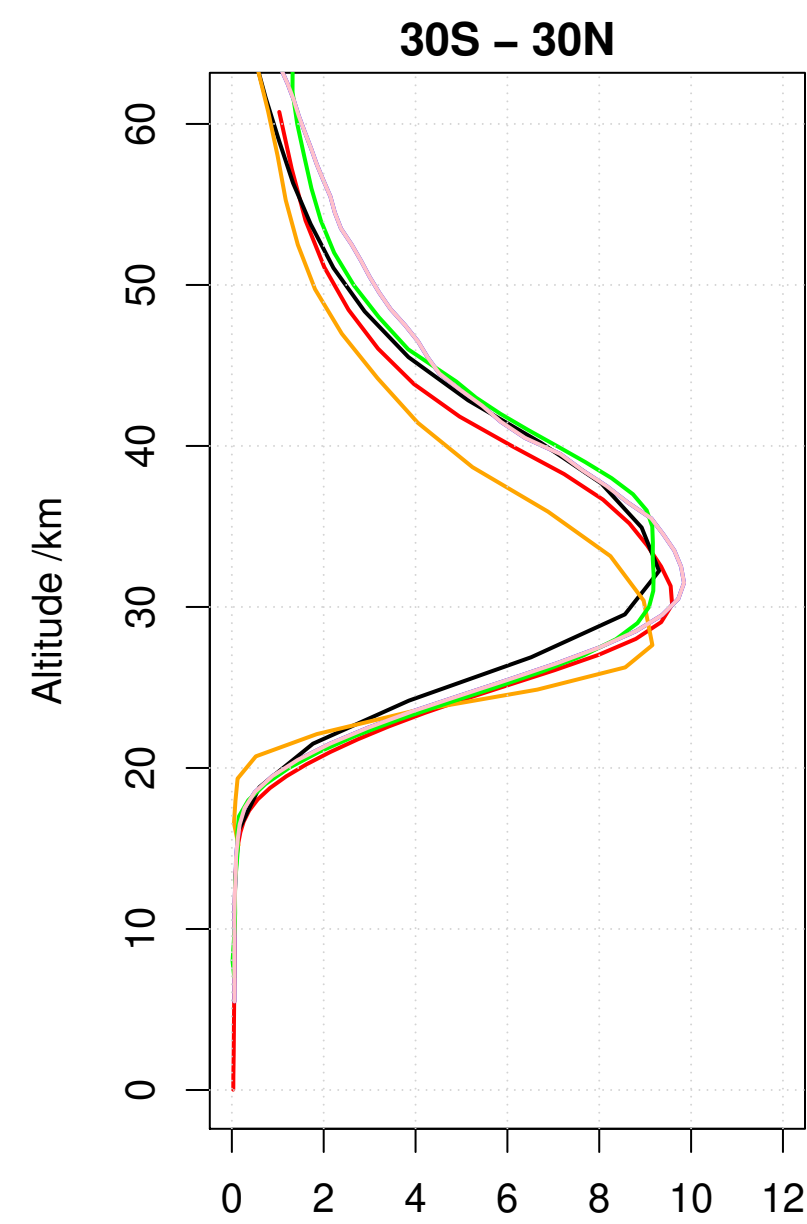
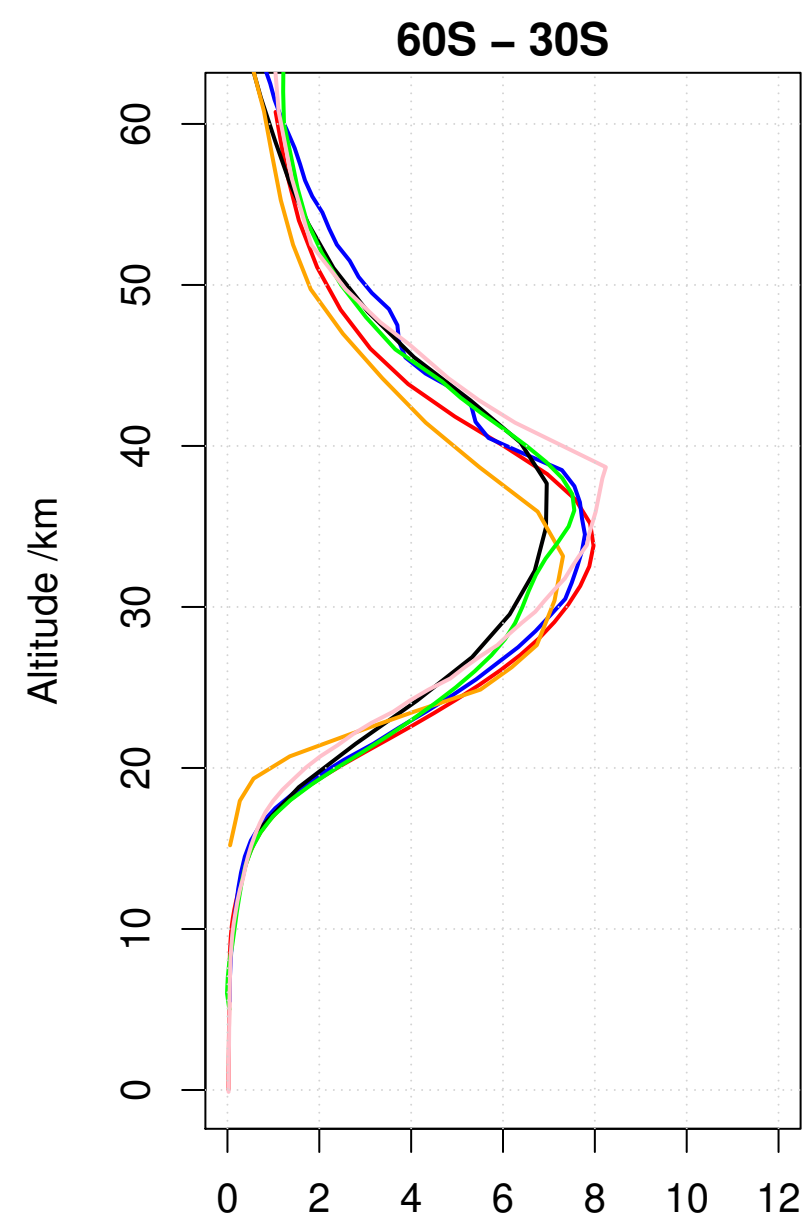
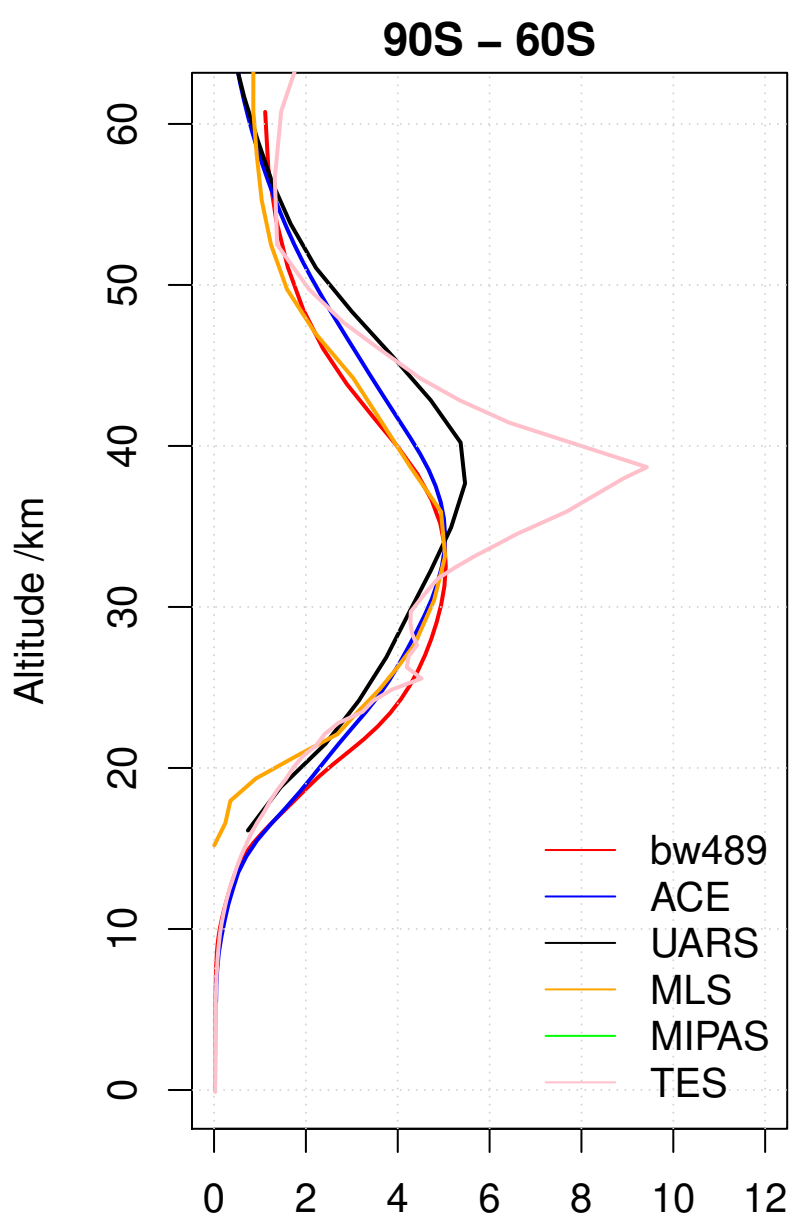
bw489 Loss of Tropospheric Ox

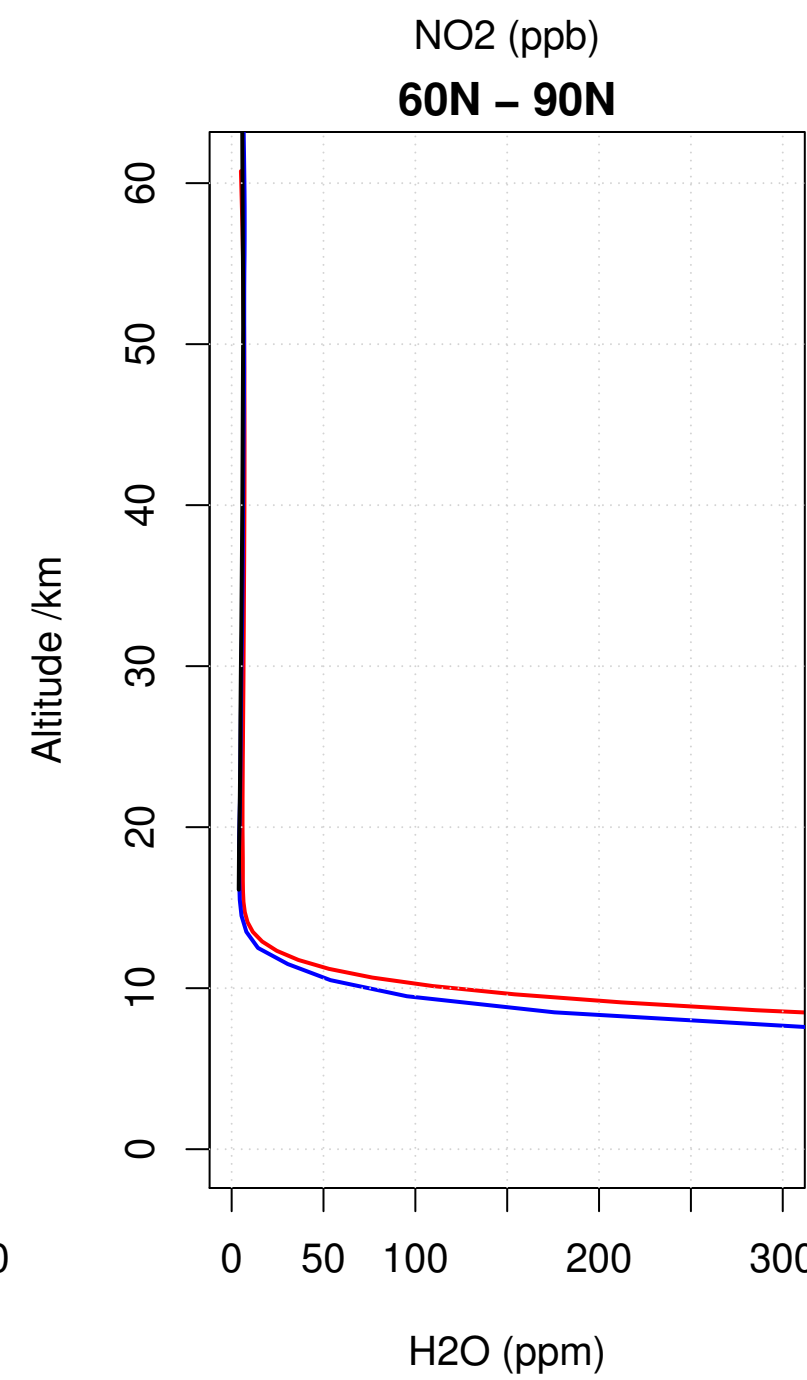
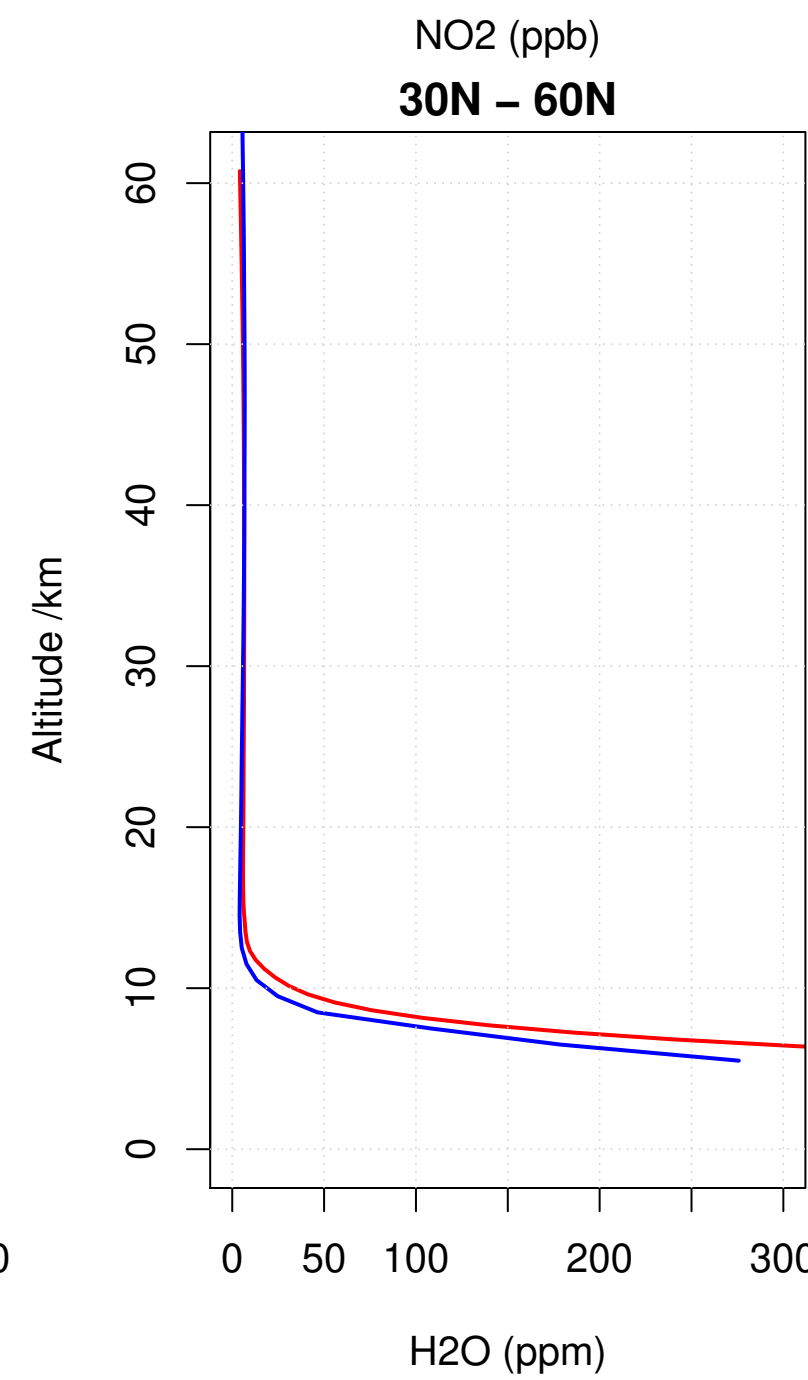
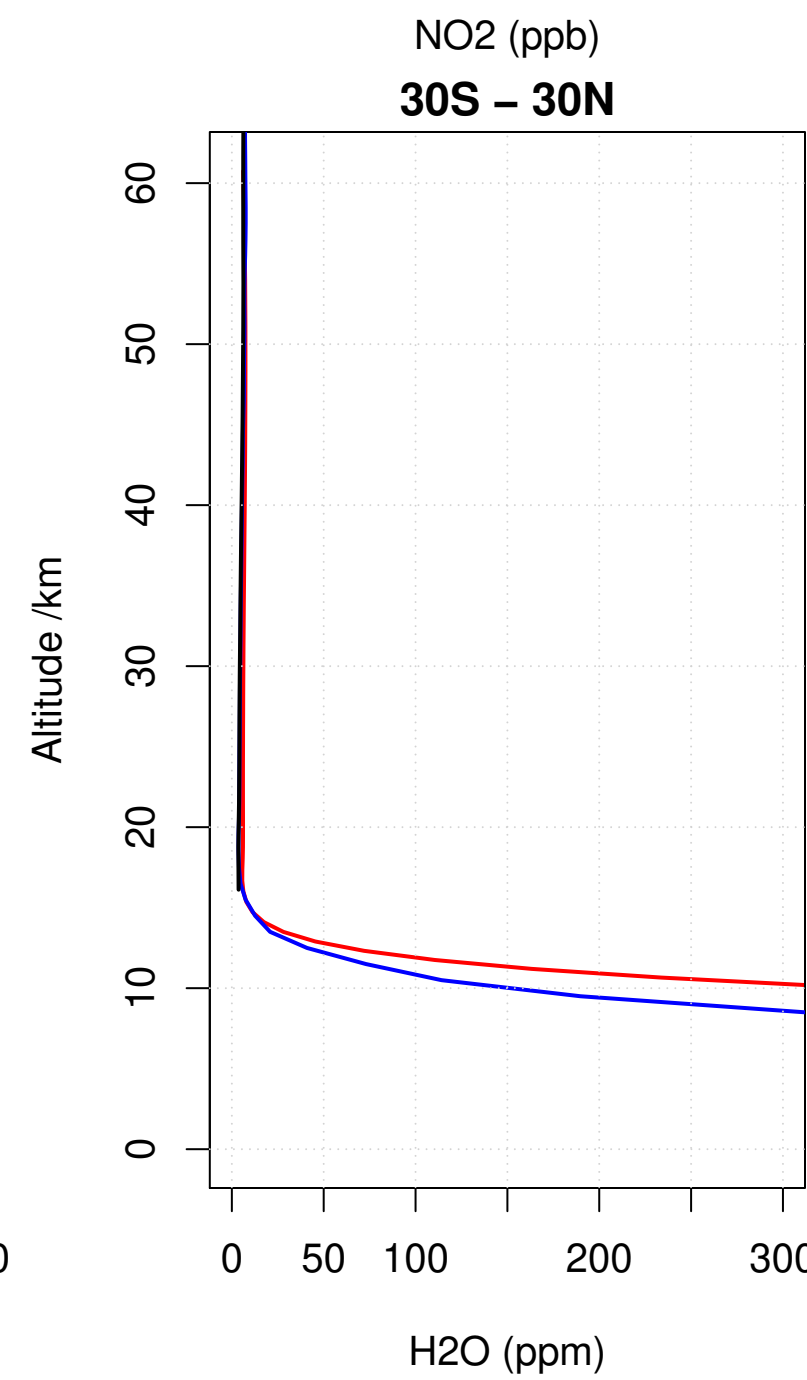
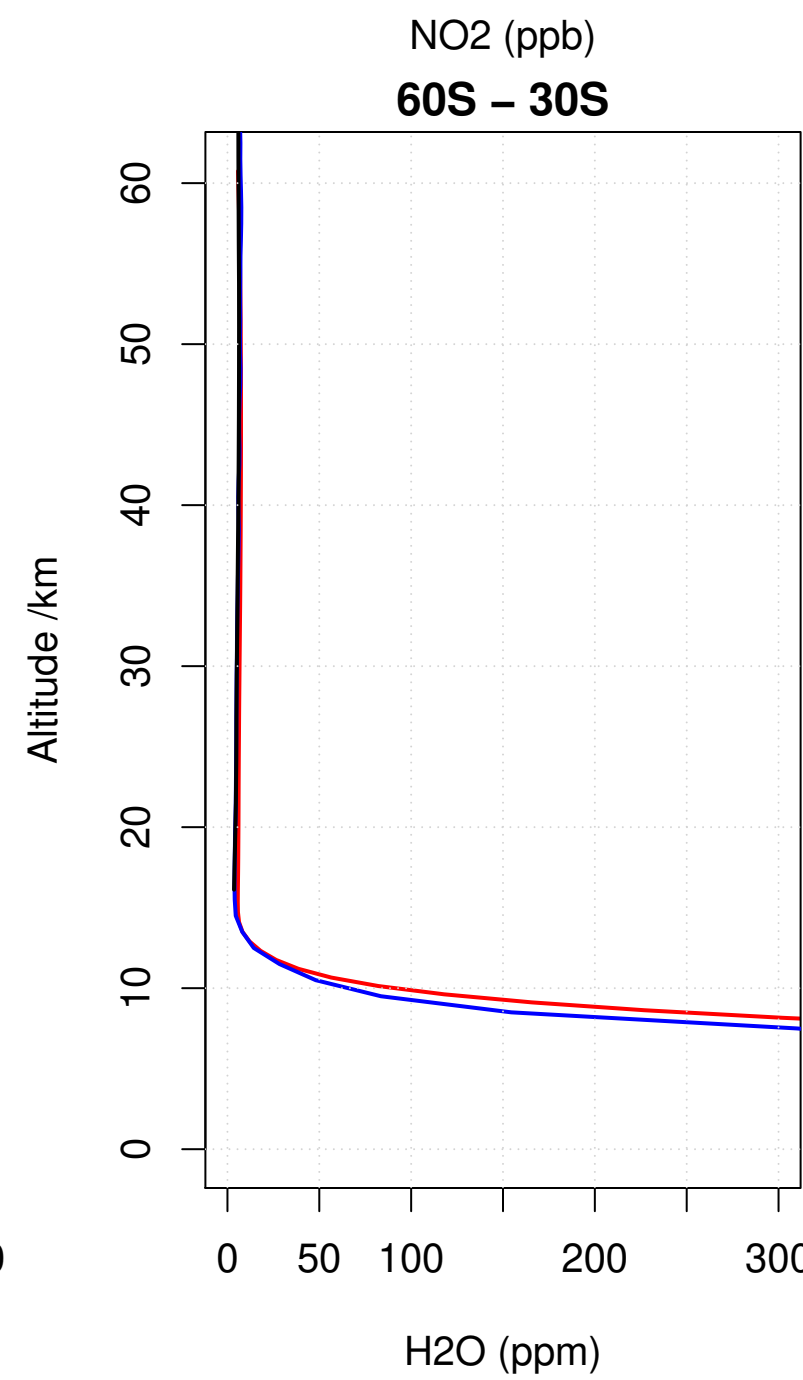
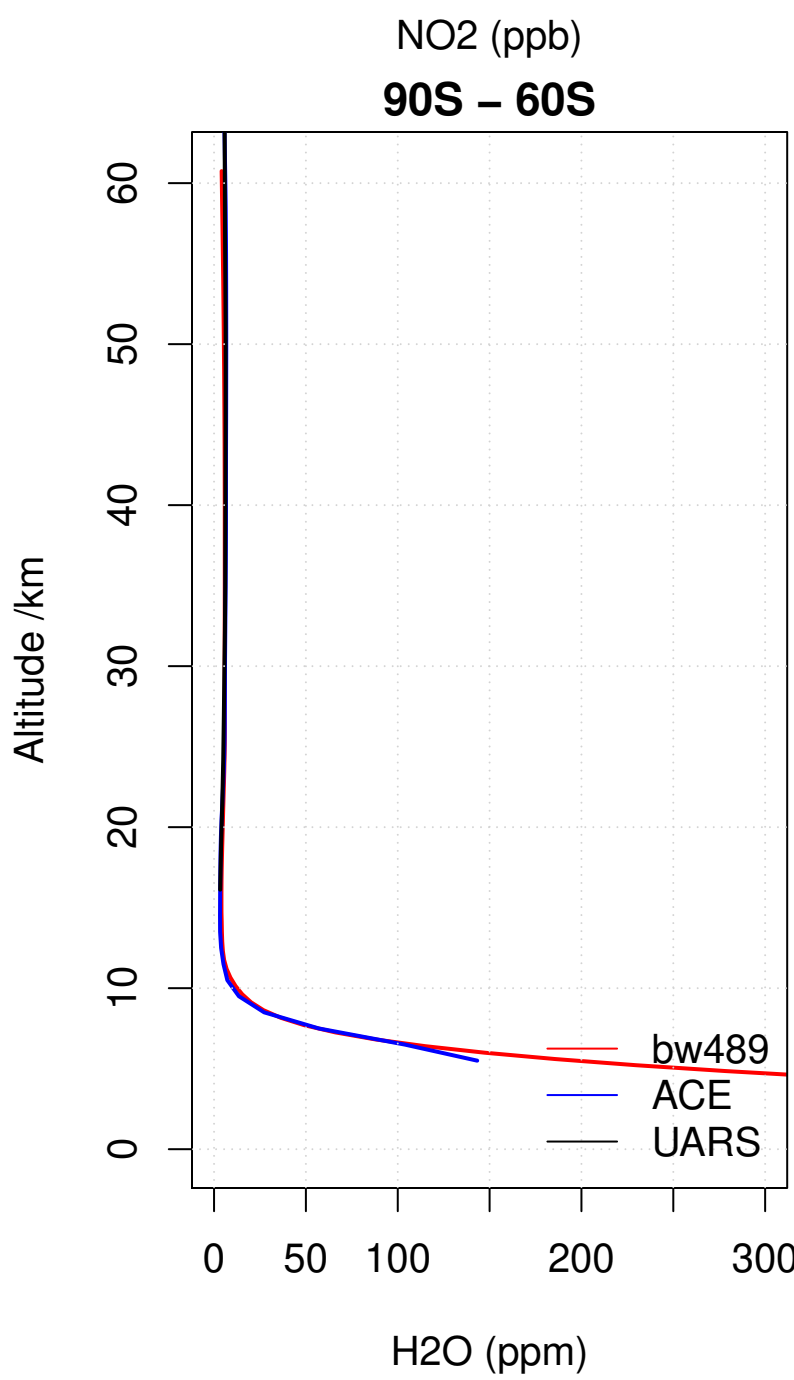
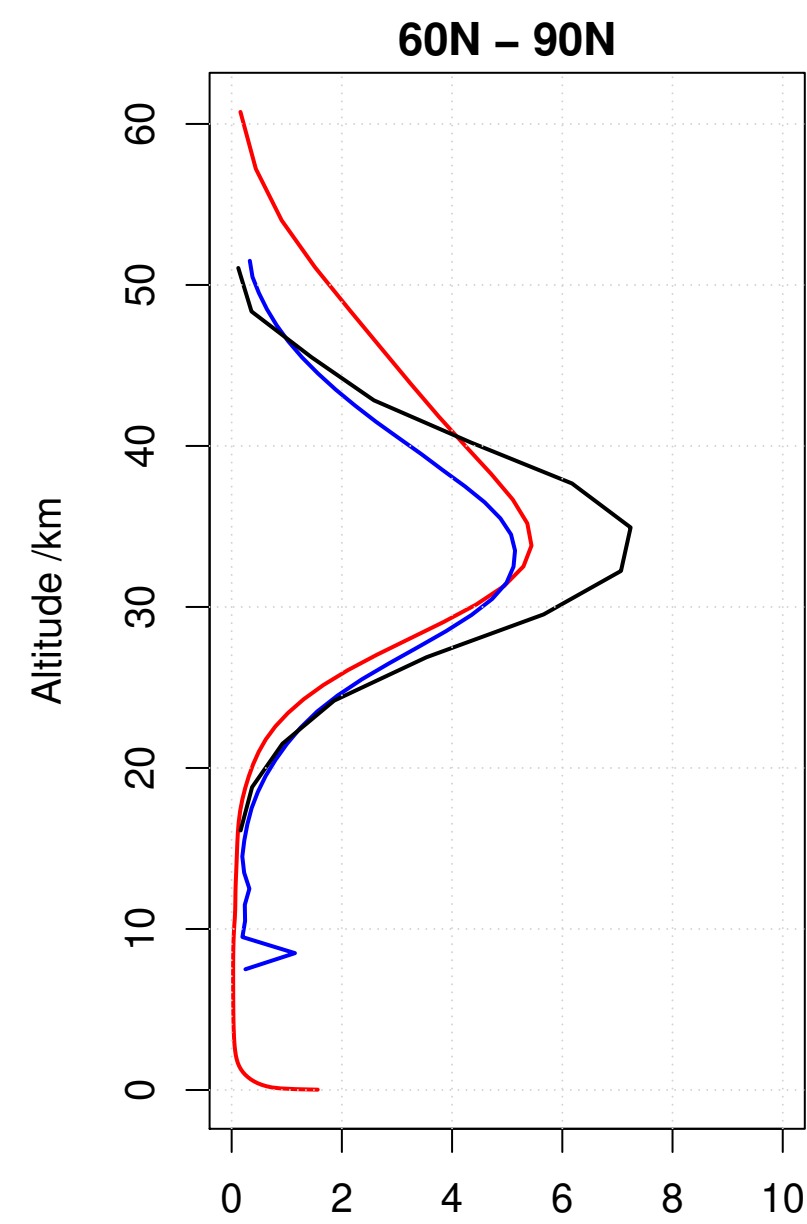
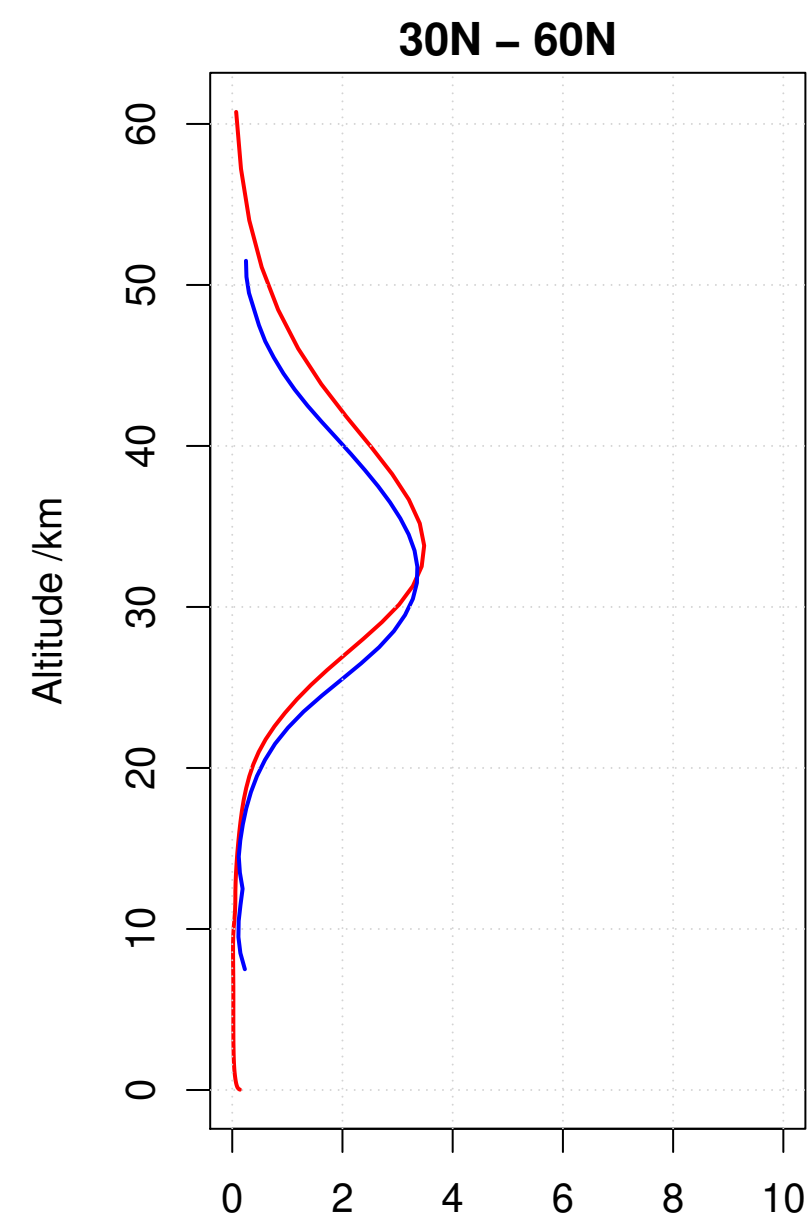
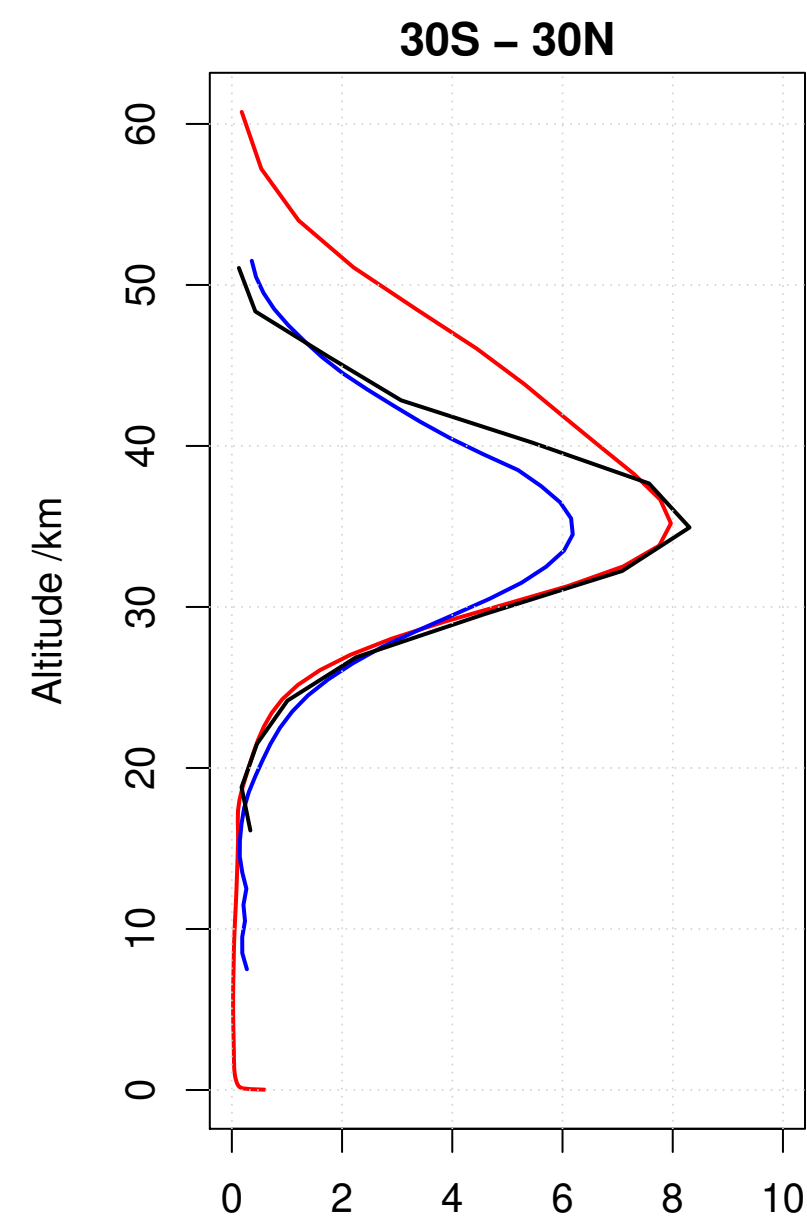
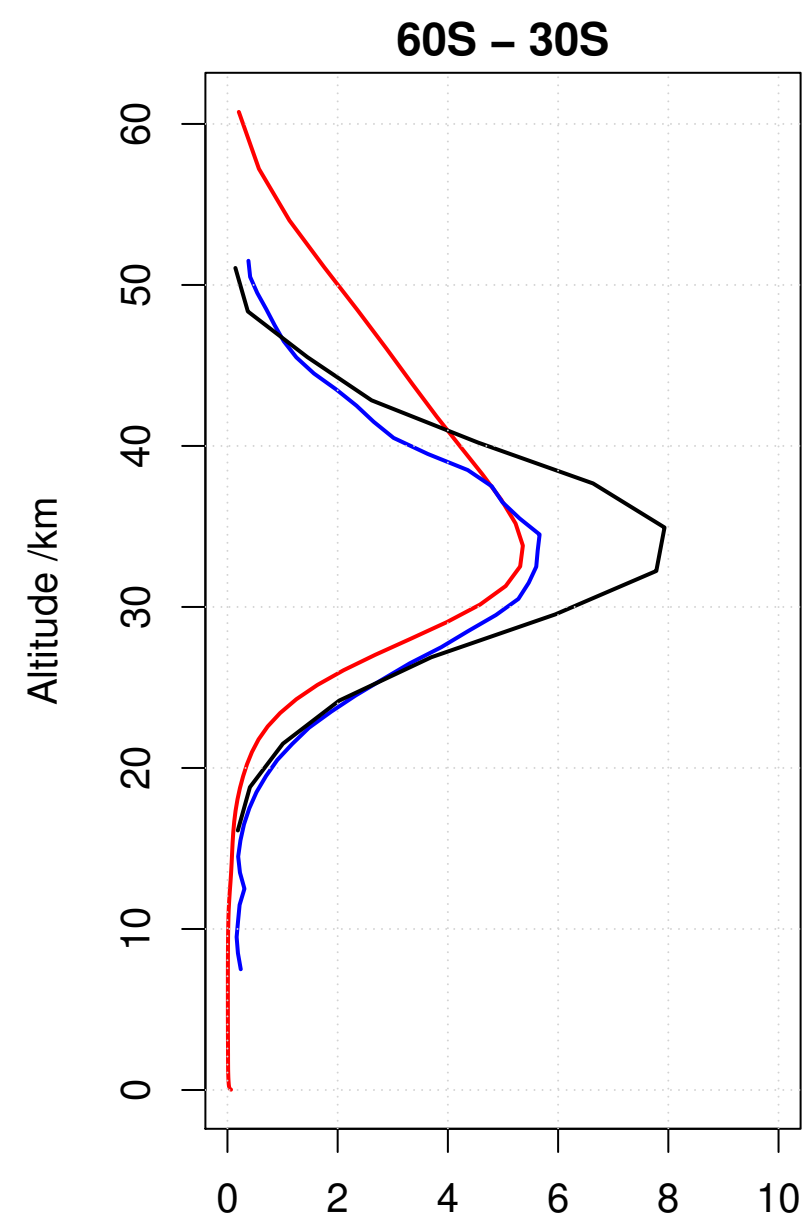
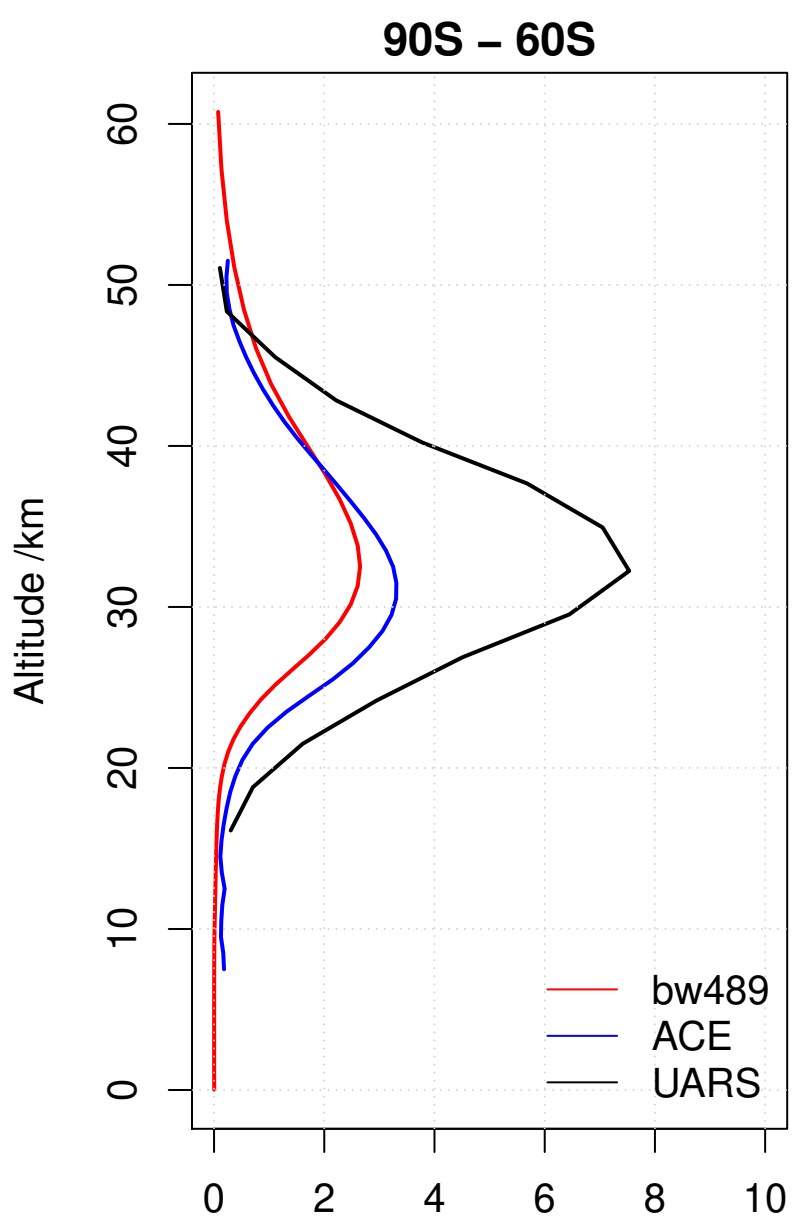


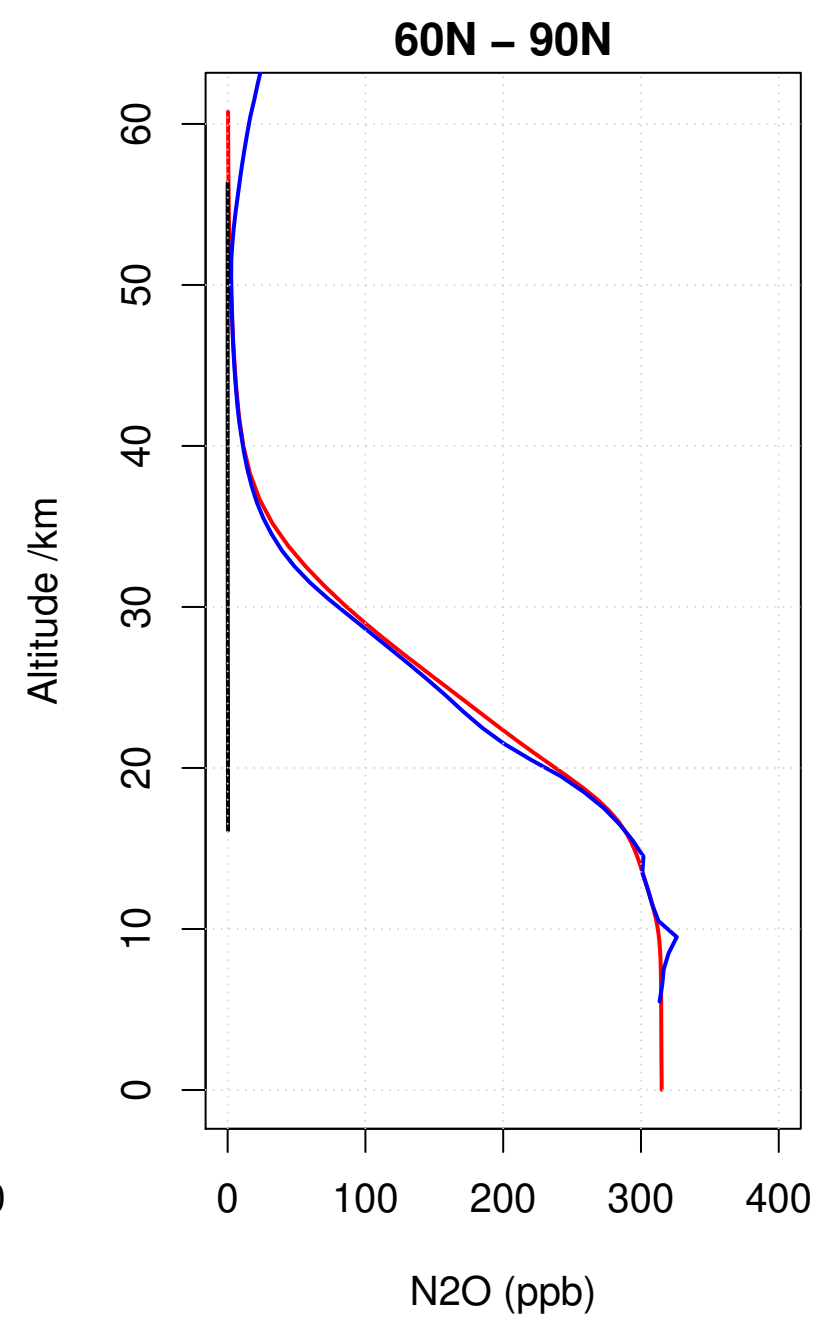
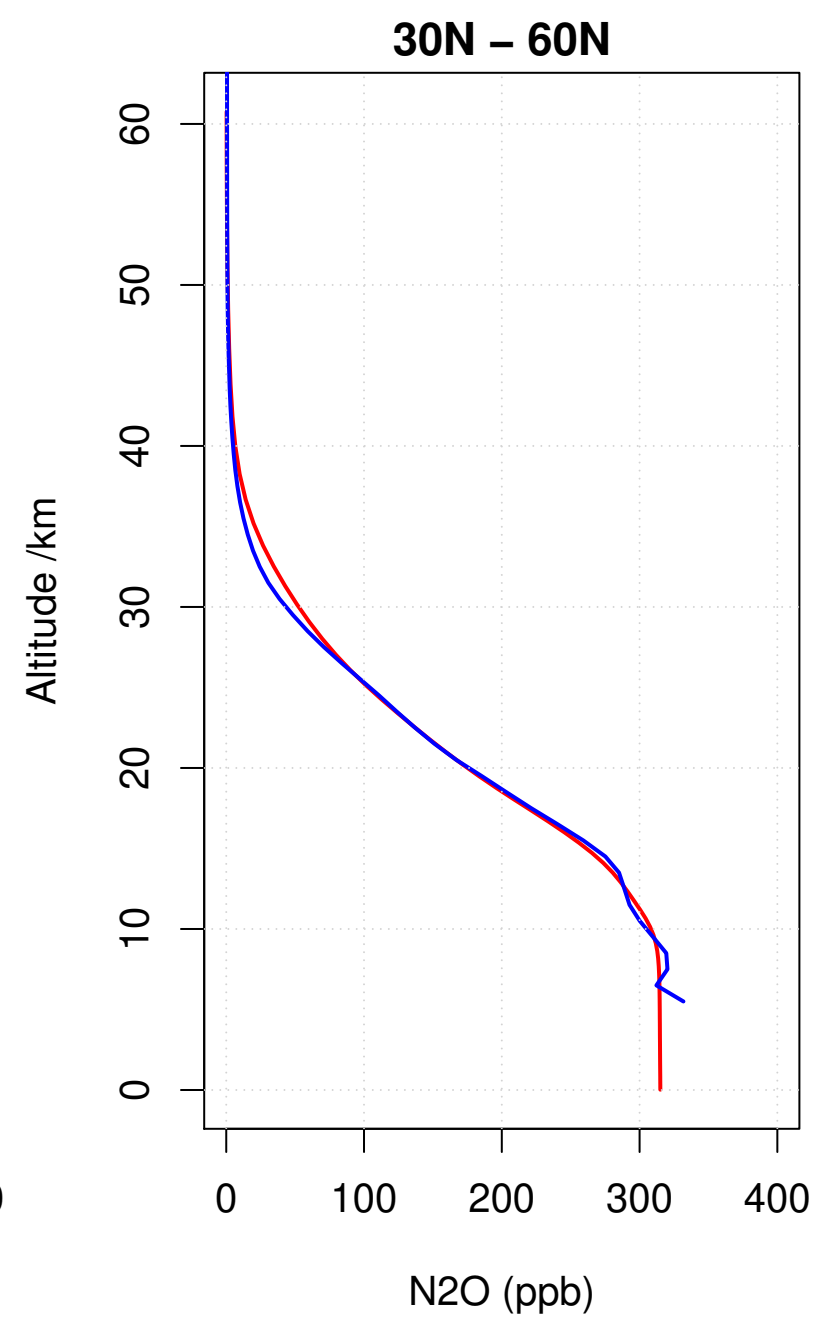
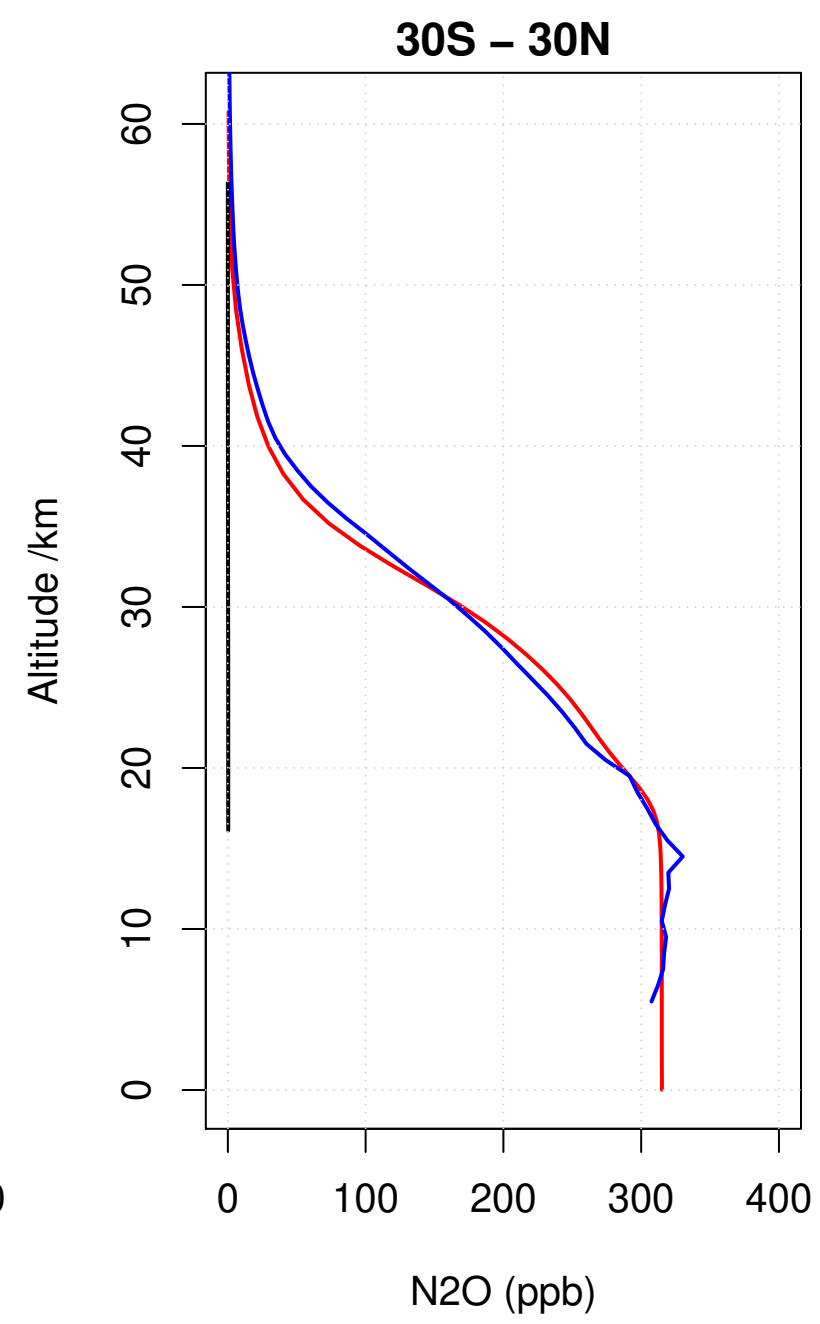
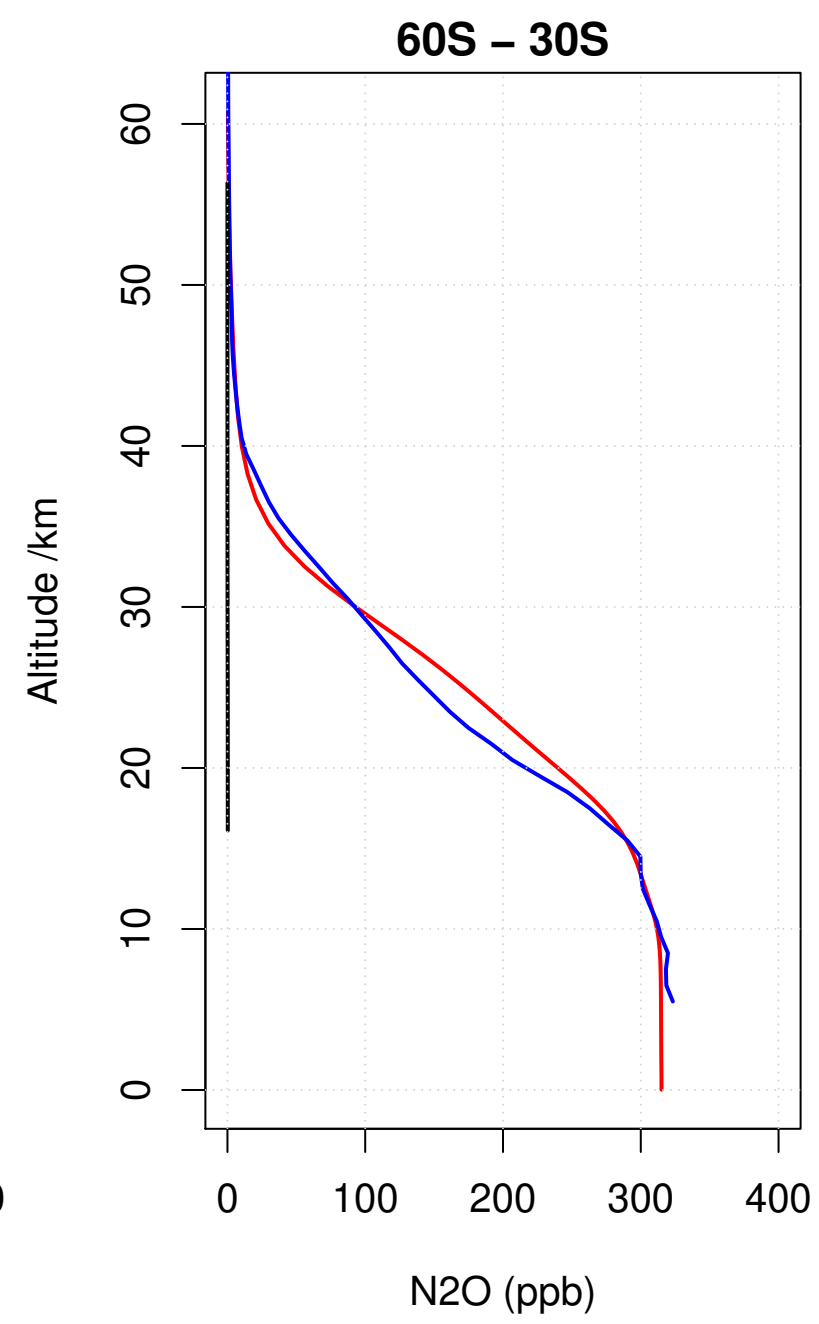
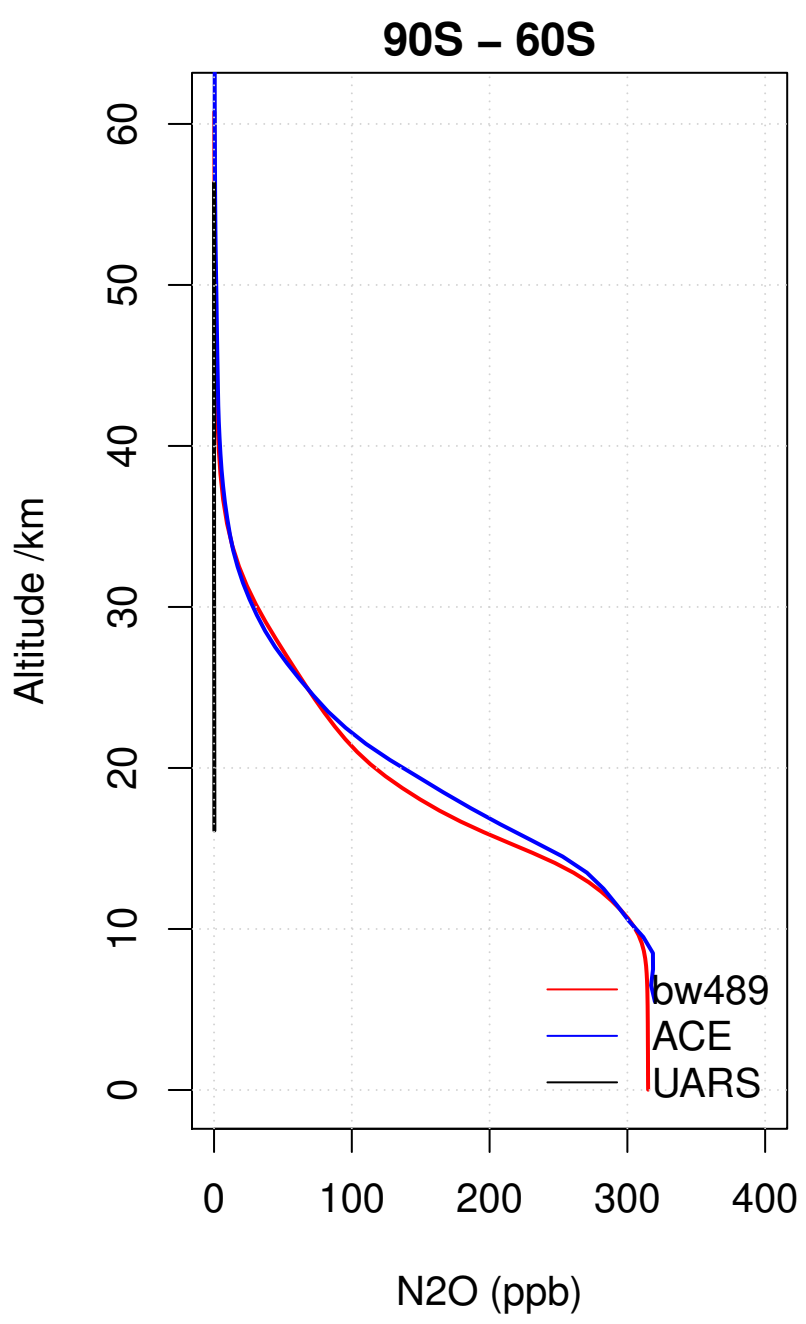






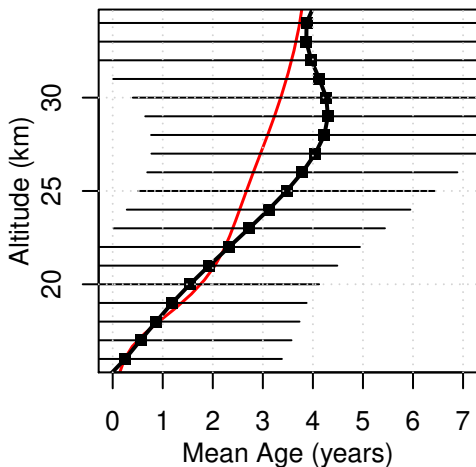




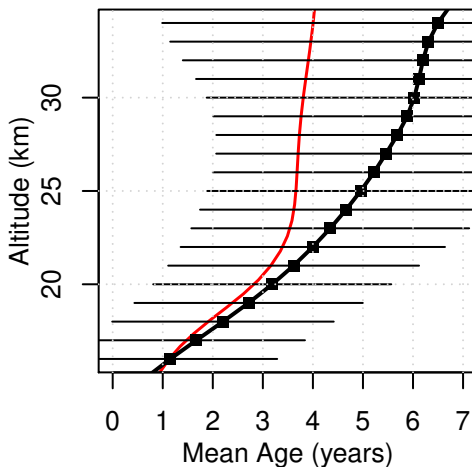


UKCA bs395 Mean Age of Air

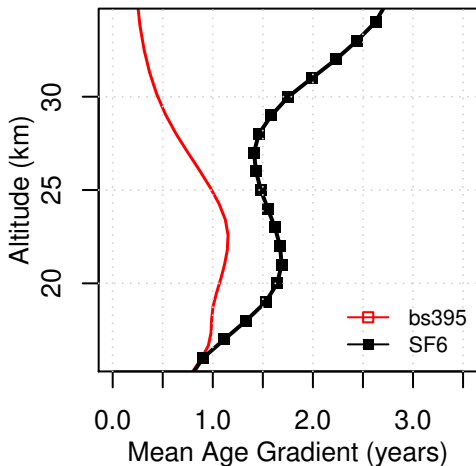
Tropical Mean Age Profile



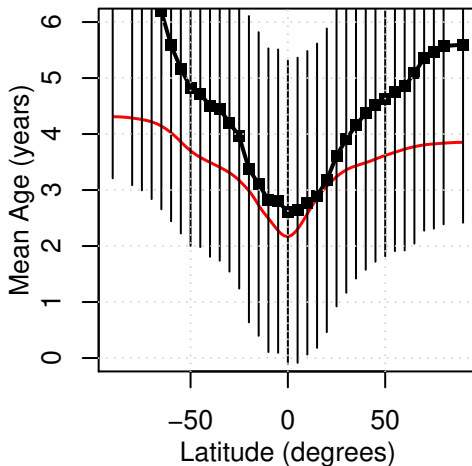
Midlatitude Mean Age Profile



Trop-Midlat Mean Age Gradient Prof

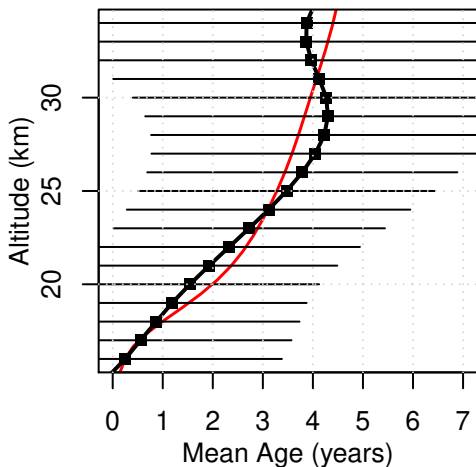


Mean Age, 23km (~50hPa)

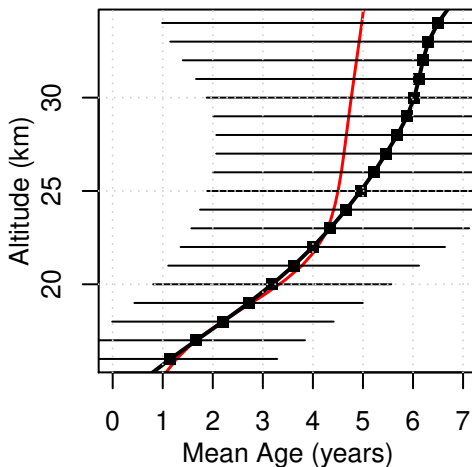


UKCA bw489 Mean Age of Air

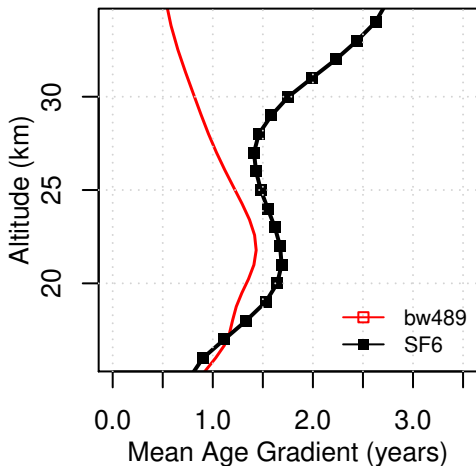
Tropical Mean Age Profile



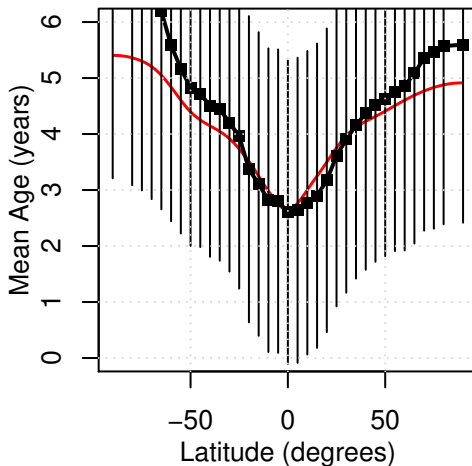
Midlatitude Mean Age Profile



Trop-Midlat Mean Age Gradient Prof



Mean Age, 23km (~50hPa)



UKCA bs395

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

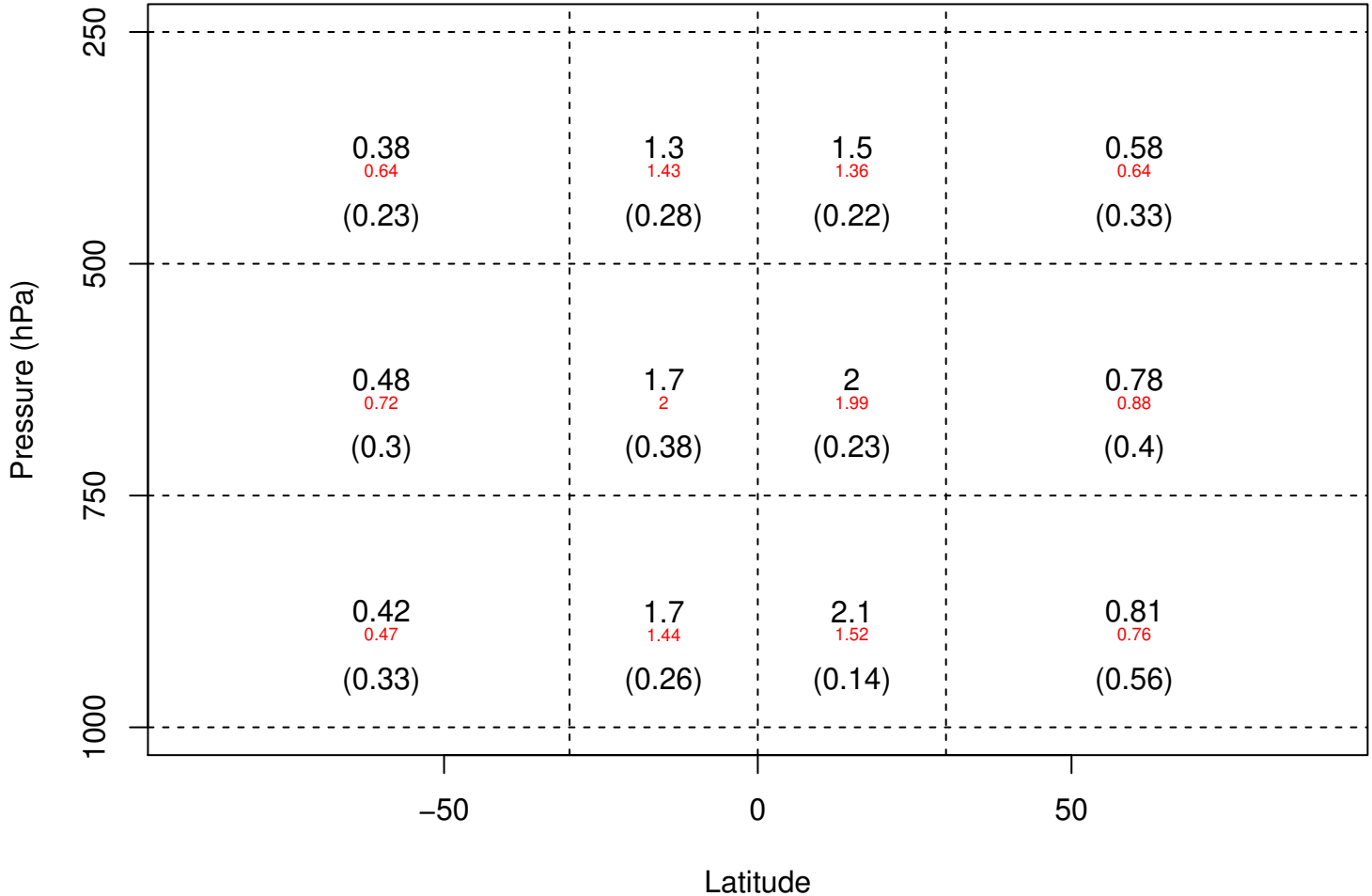
Mean OH= 1.21×10^6 molec/cm³

Red: Spivakovsky values

Values in (): Std dev

ACCMIP Multi-model Mean= $1.17 (+/- 0.1) \times 10^6$ molec/cm³

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



UKCA bw489

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

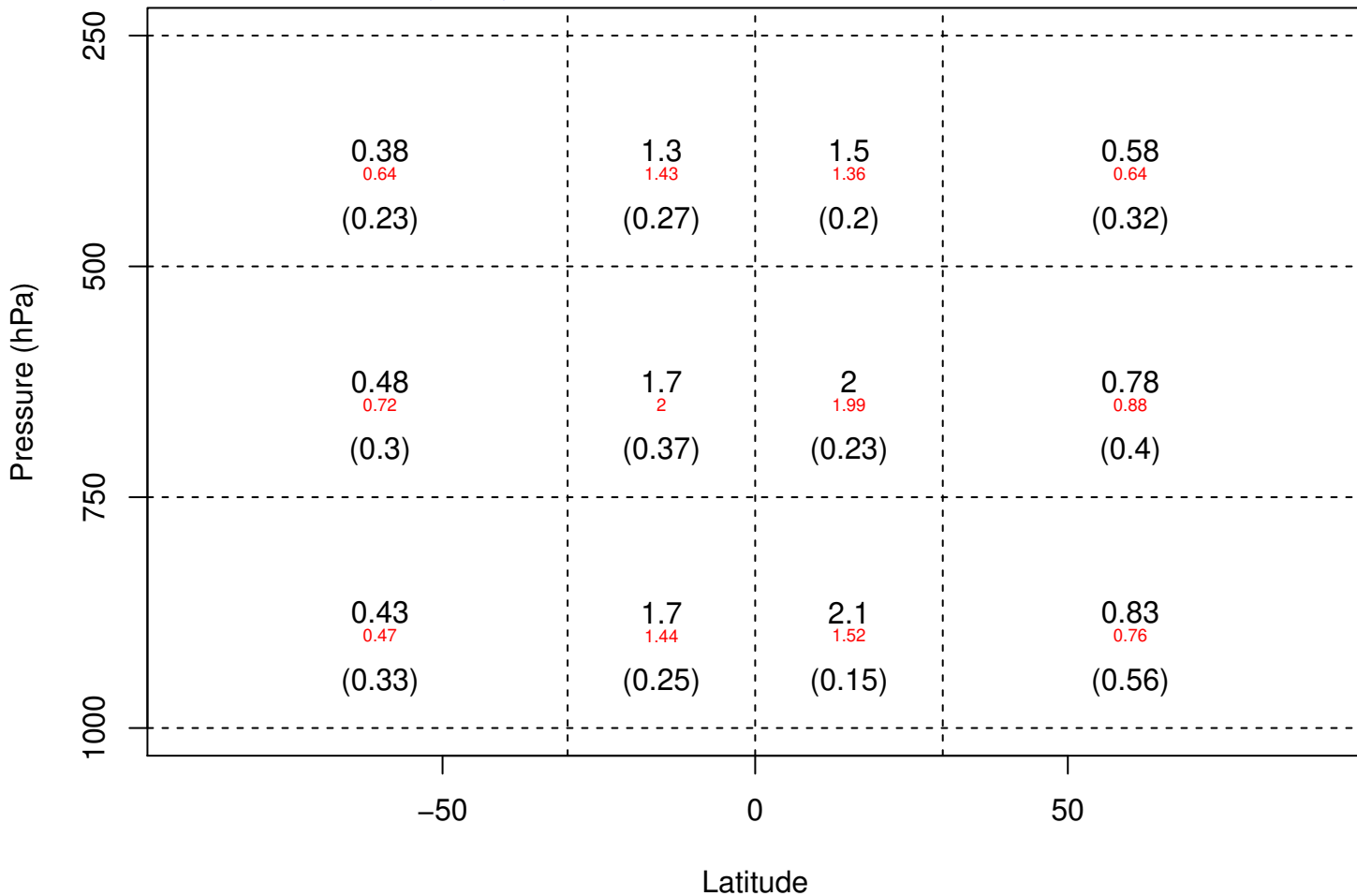
Mean OH= 1.23e+06 molec/cm³

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

NH:SH ratio= 1.37 Patra et al 2014: 0.97 +/- 0.12

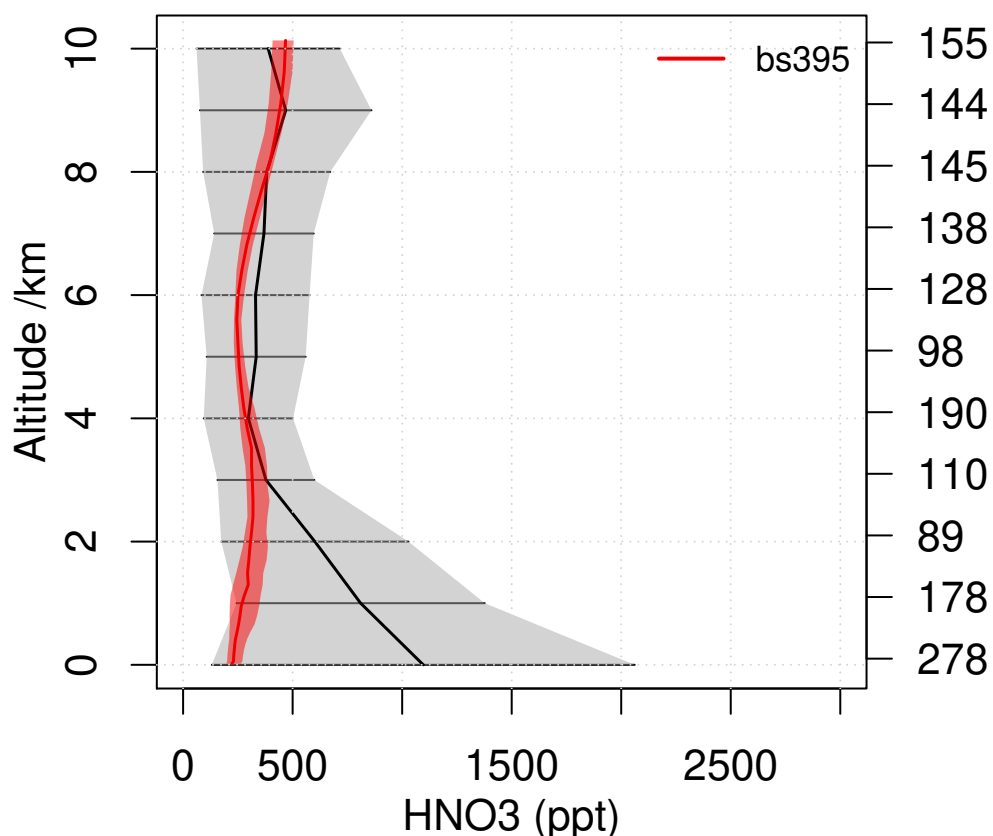
Red: Spivakovsky values

Values in (): Std dev

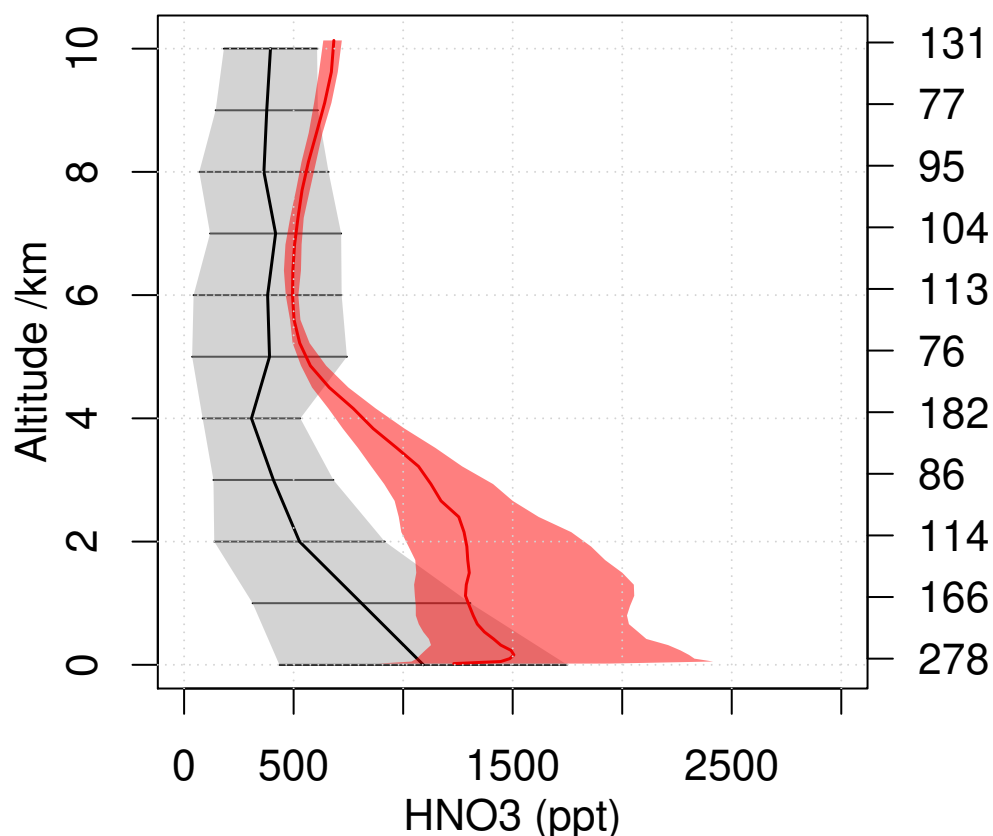


Emmons HNO3 comparison

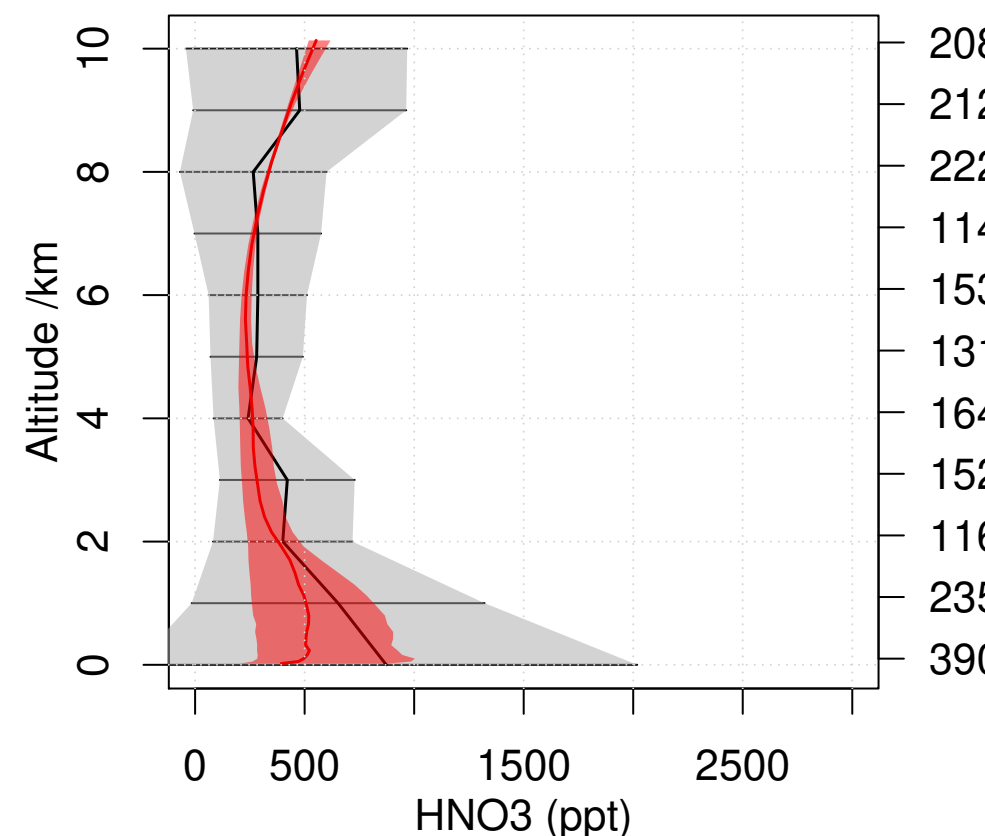
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



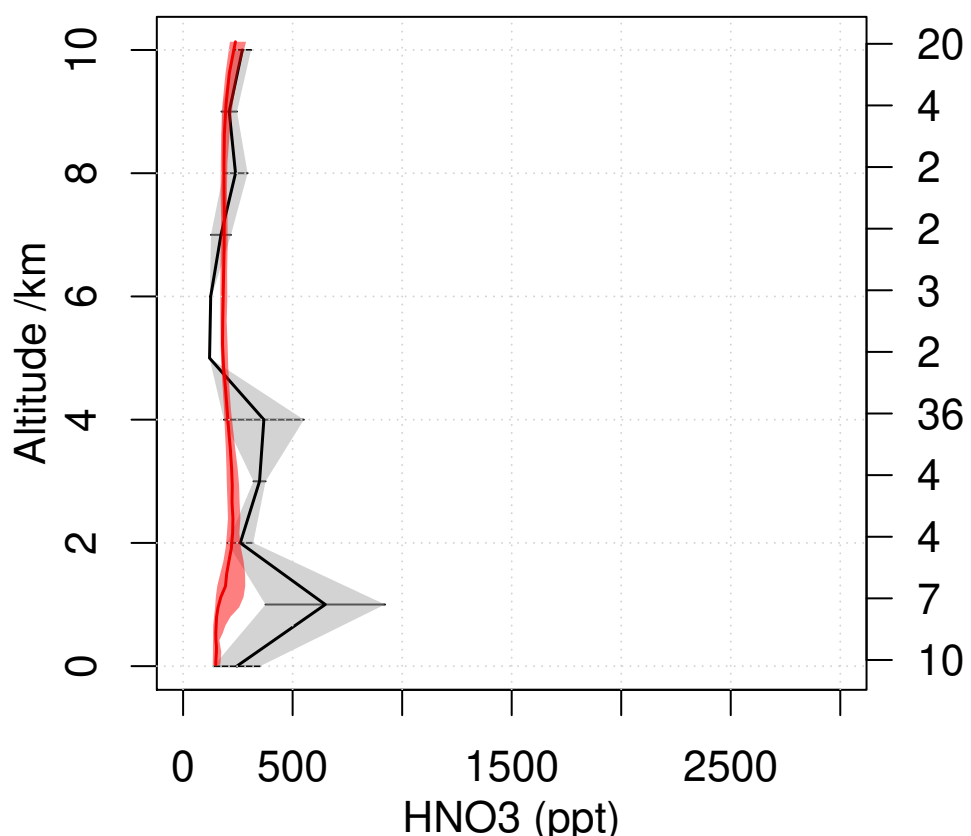
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



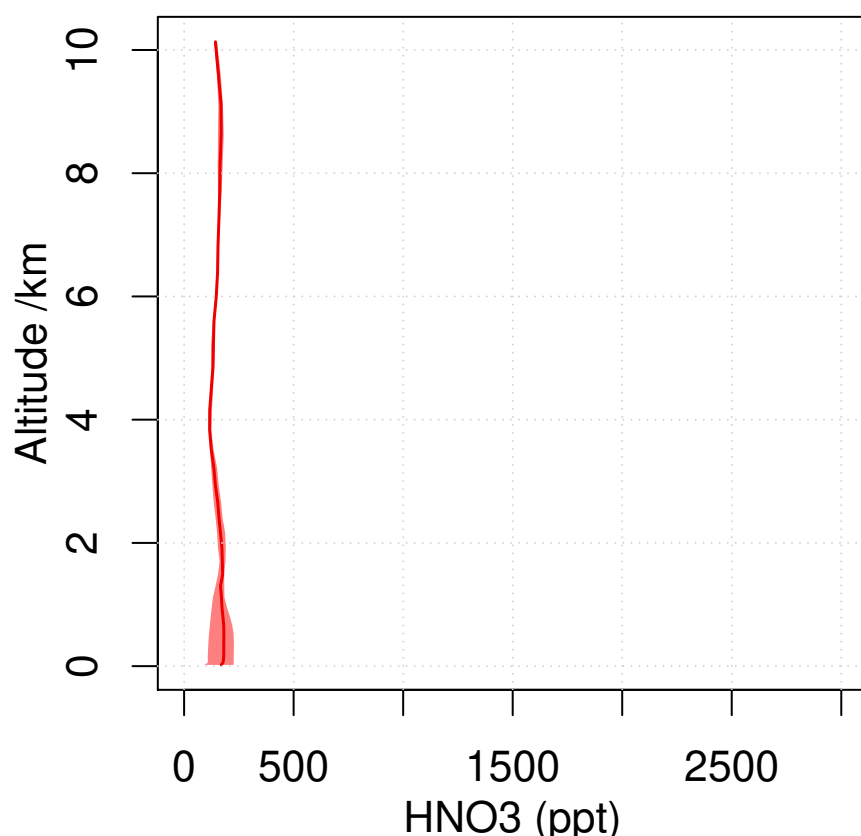
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



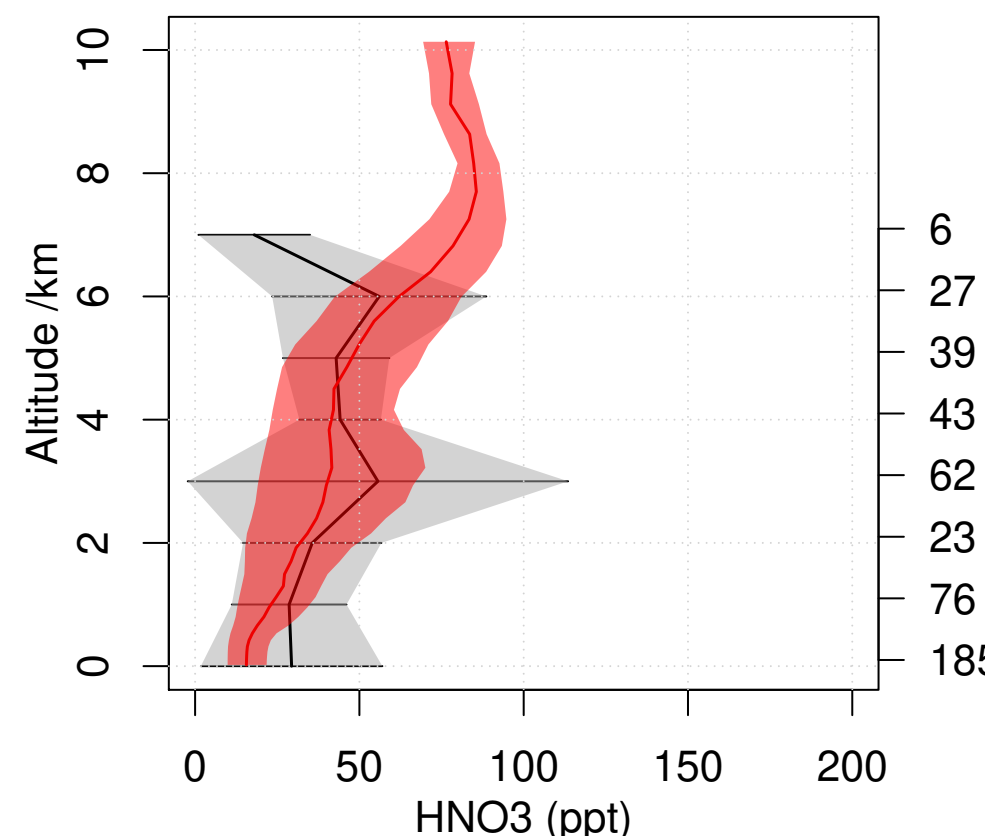
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



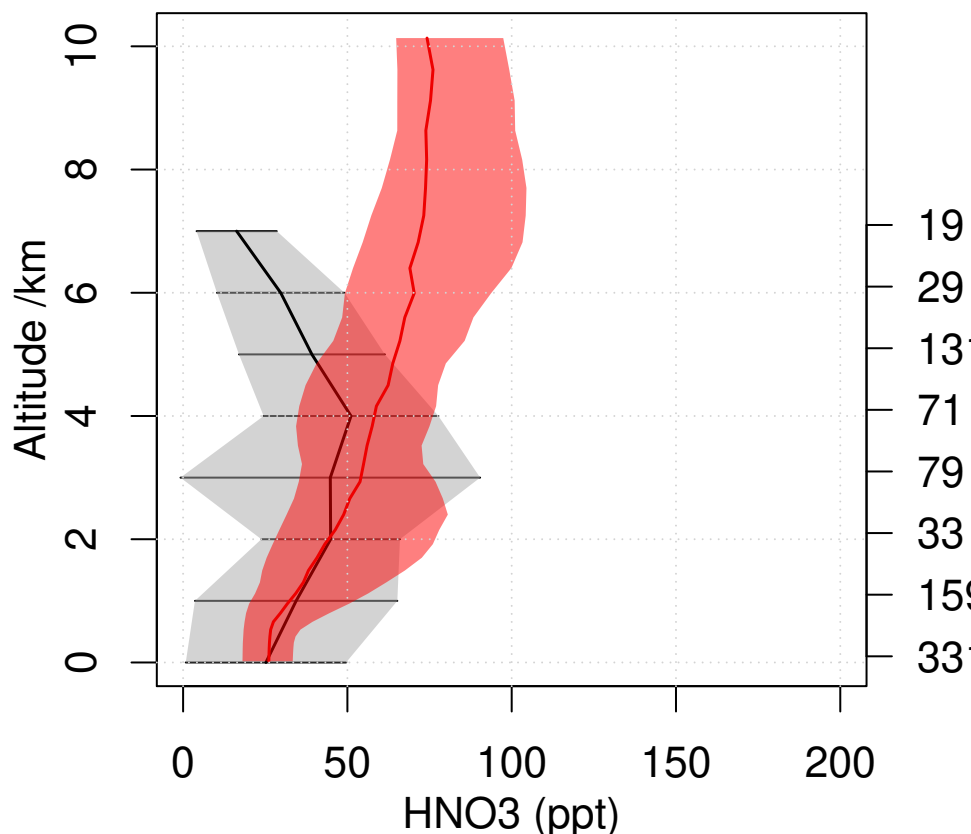
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



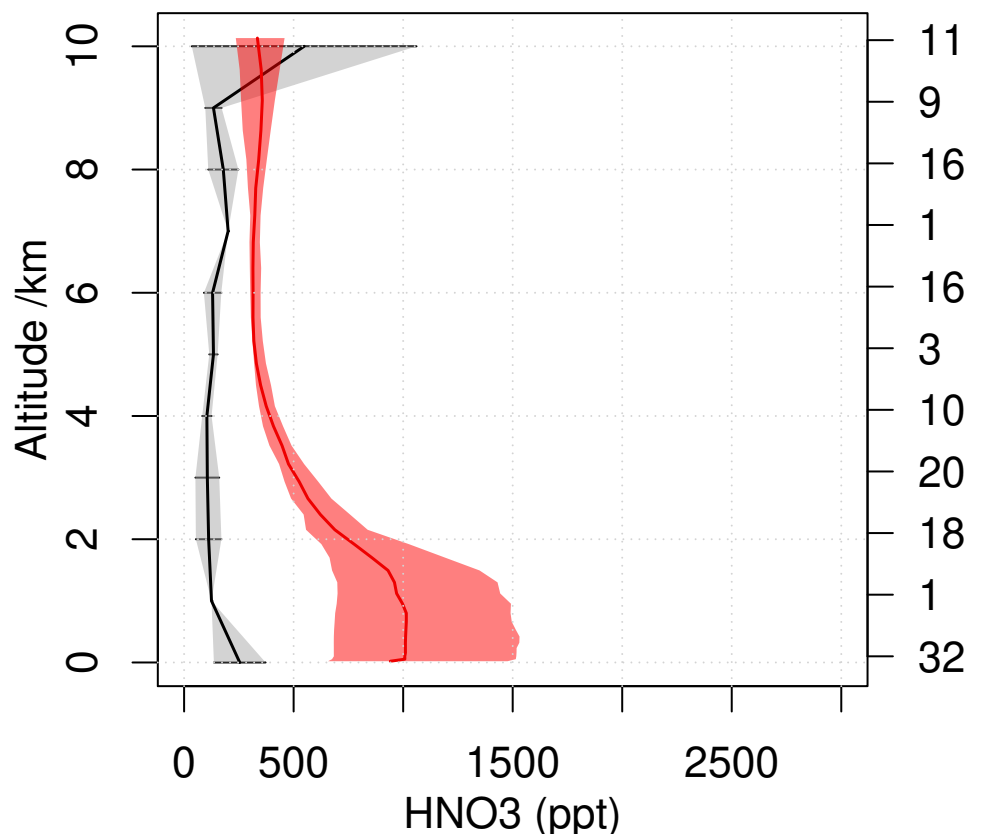
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



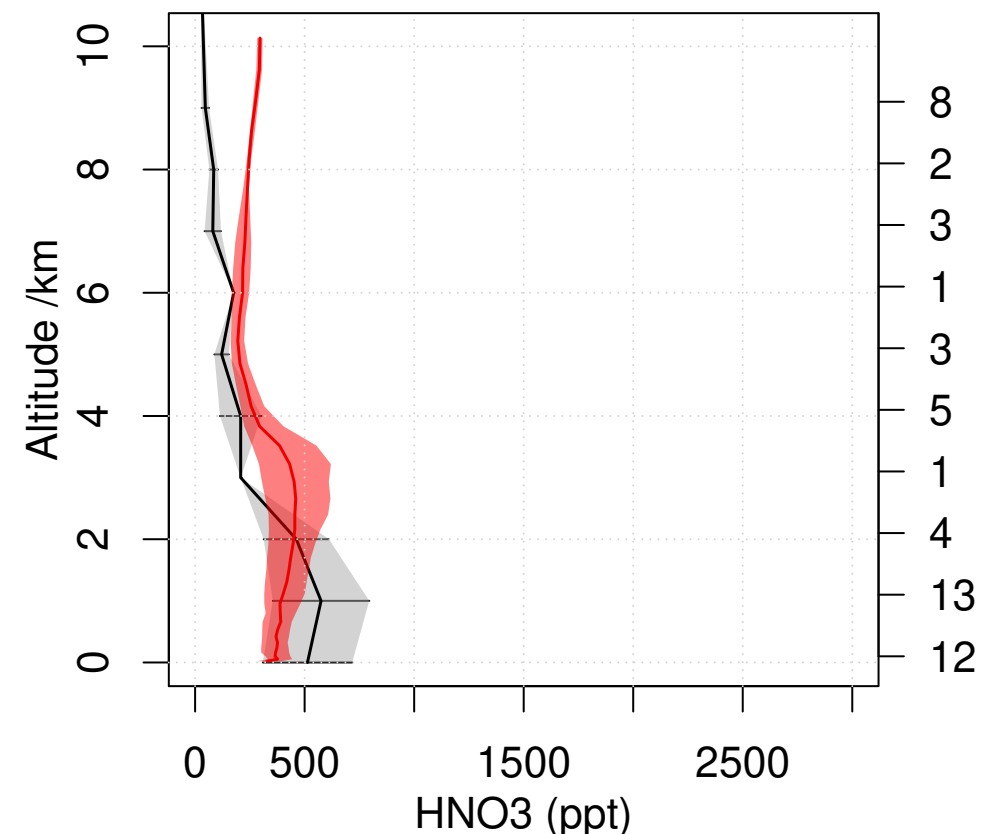
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



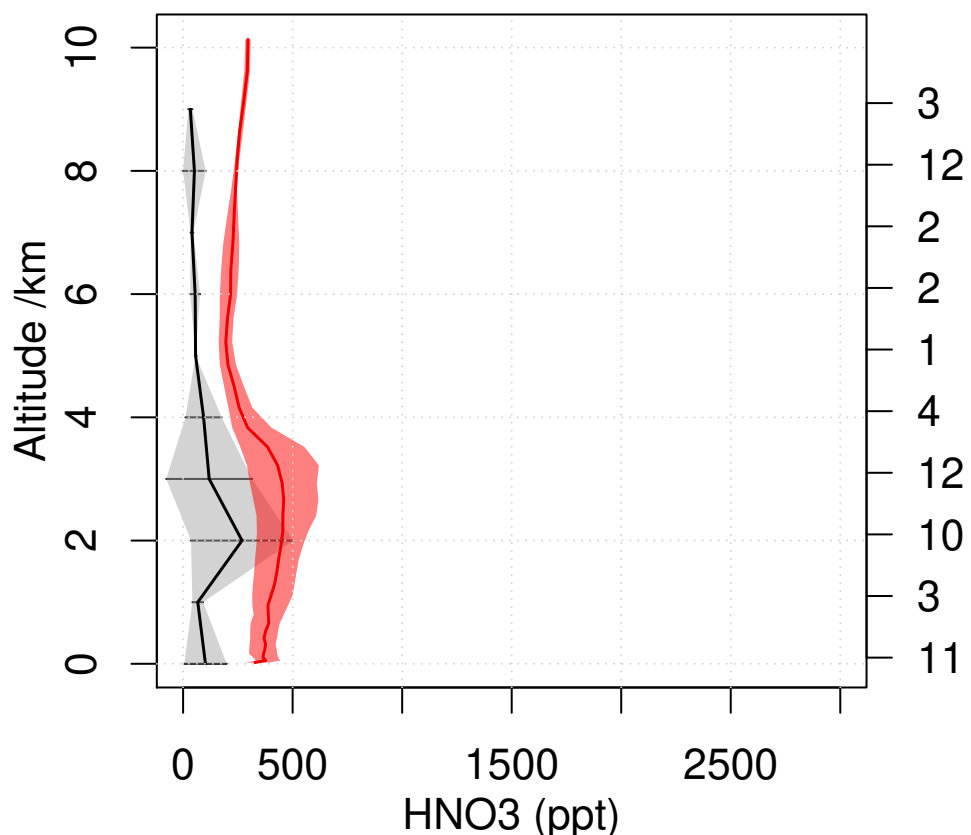
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



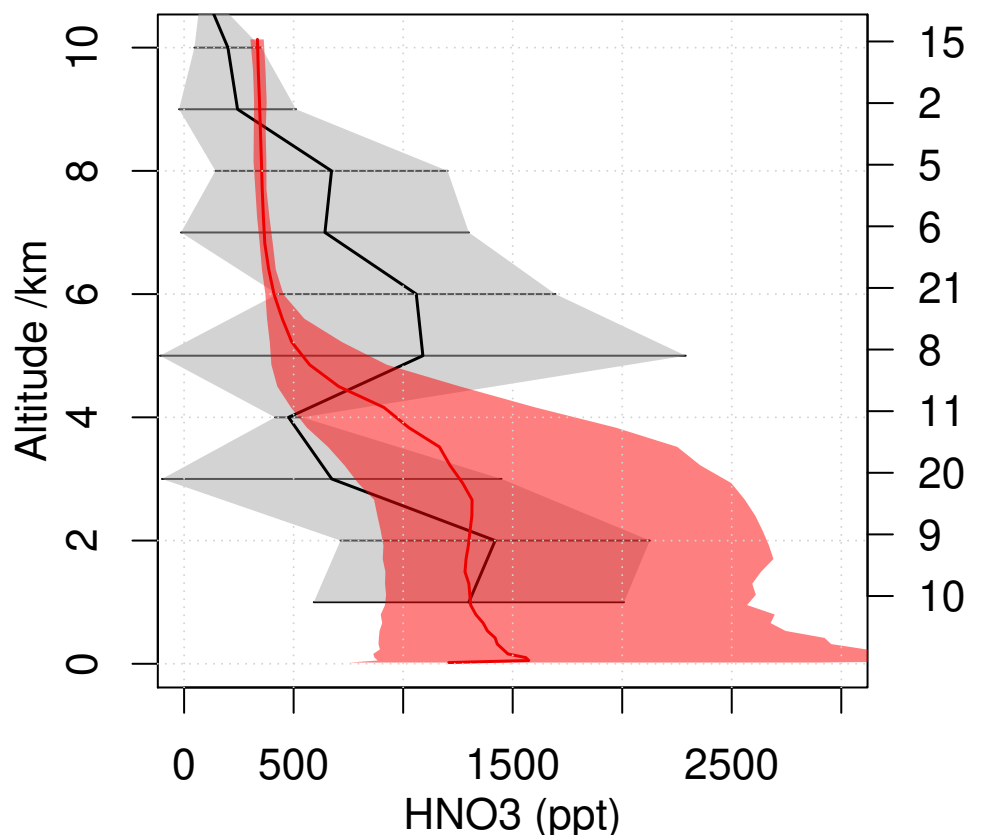
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



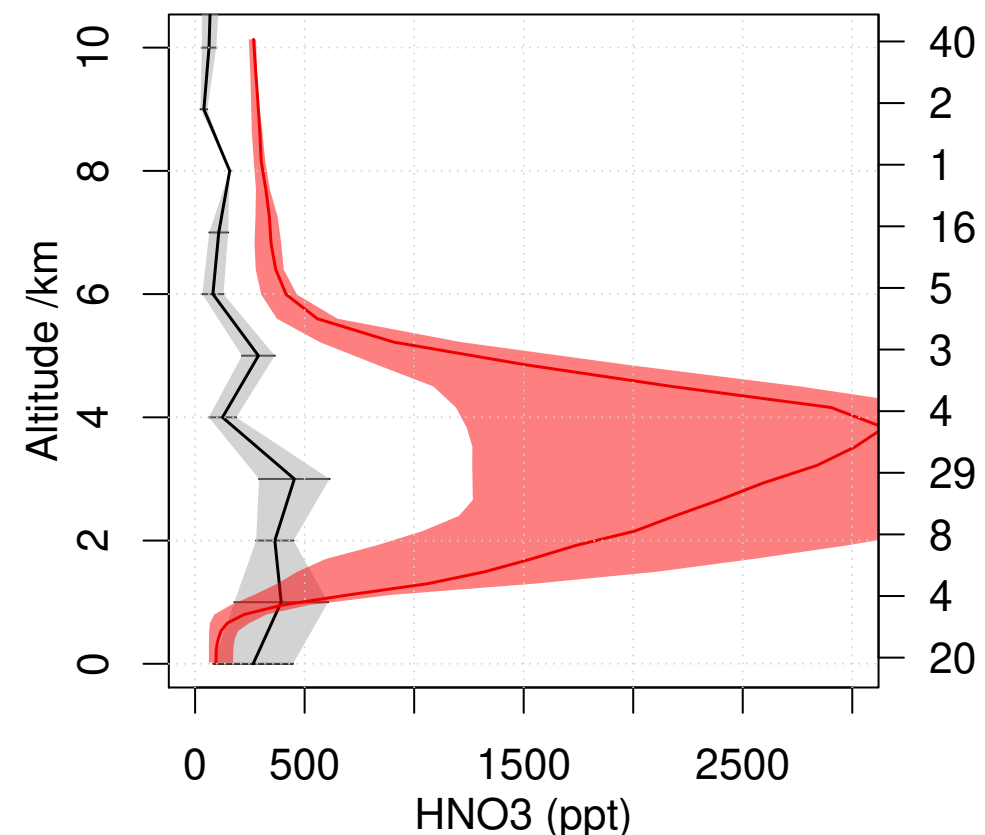
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

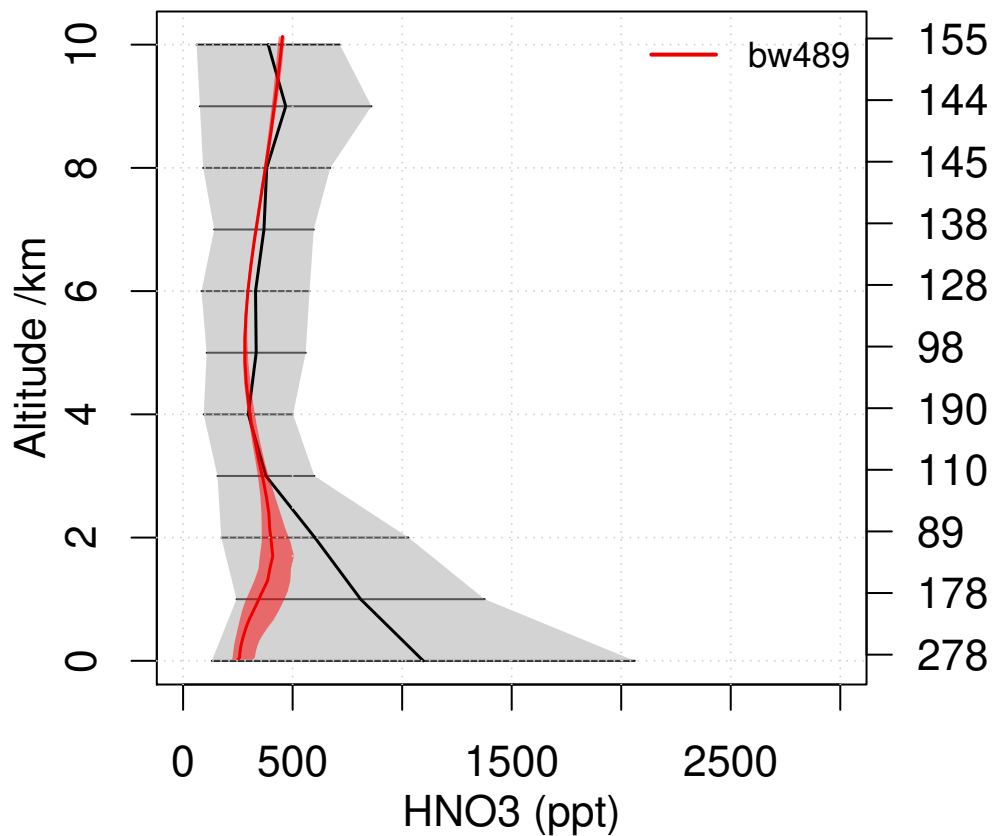


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10

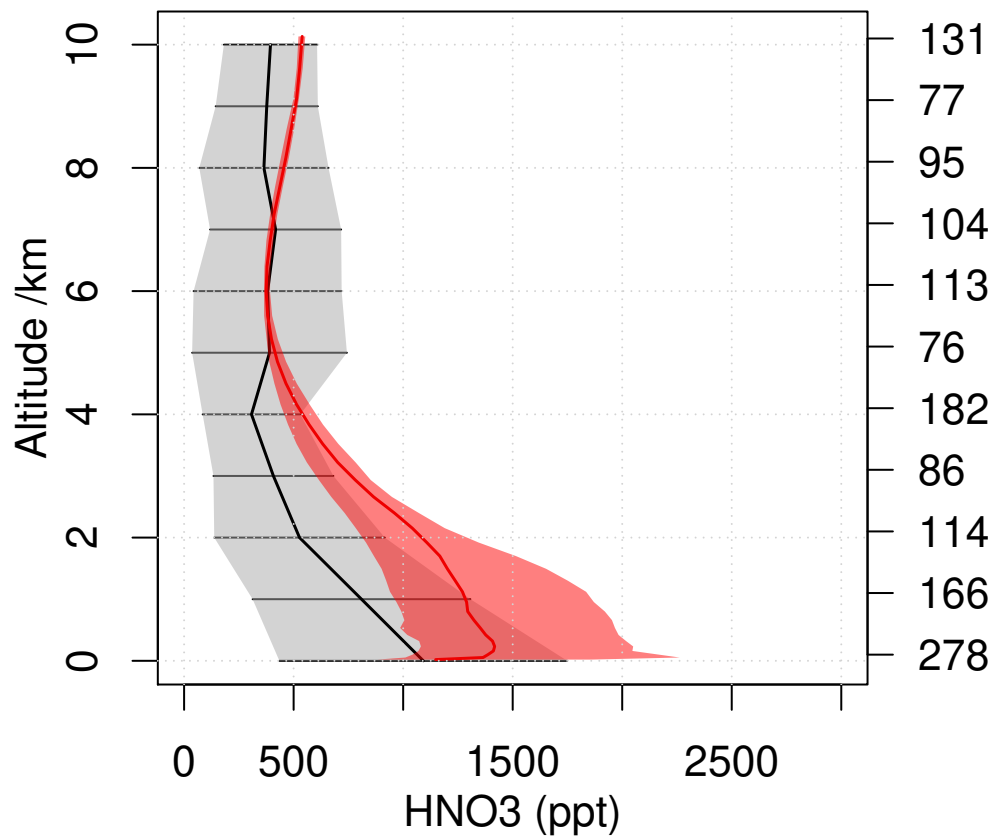


Emmons HNO3 comparison

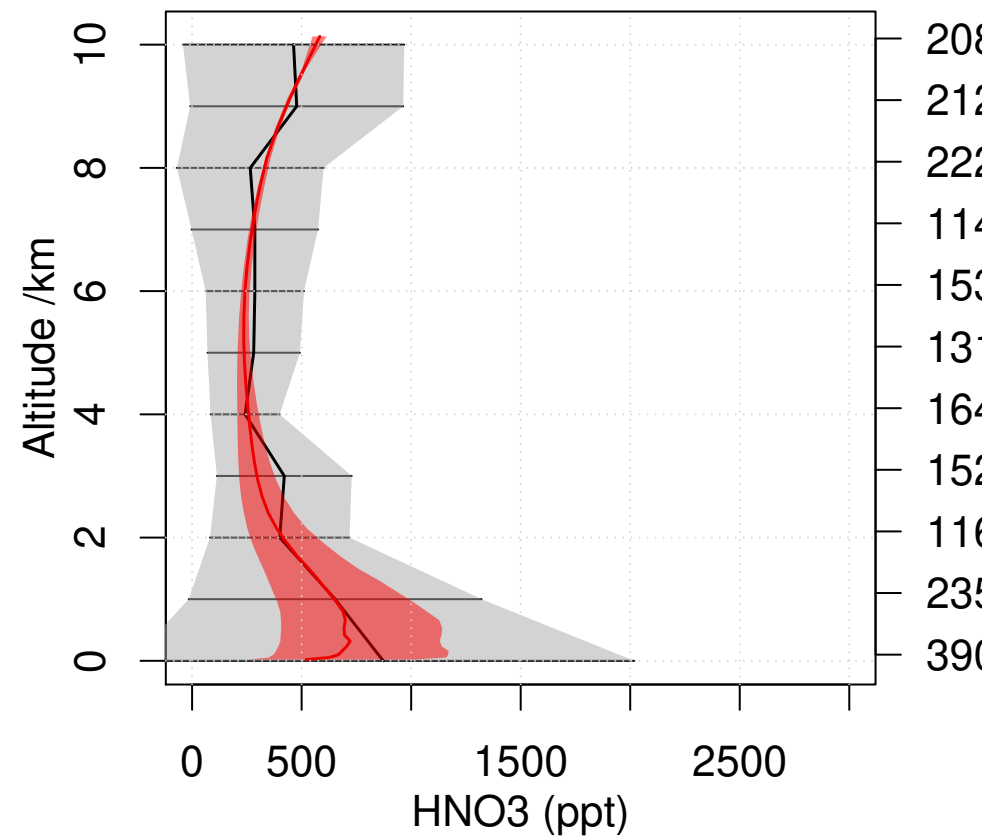
INTEX-NA East Coast 2004 07
Lat 32.5 – 40 Lon 296.5 – 307



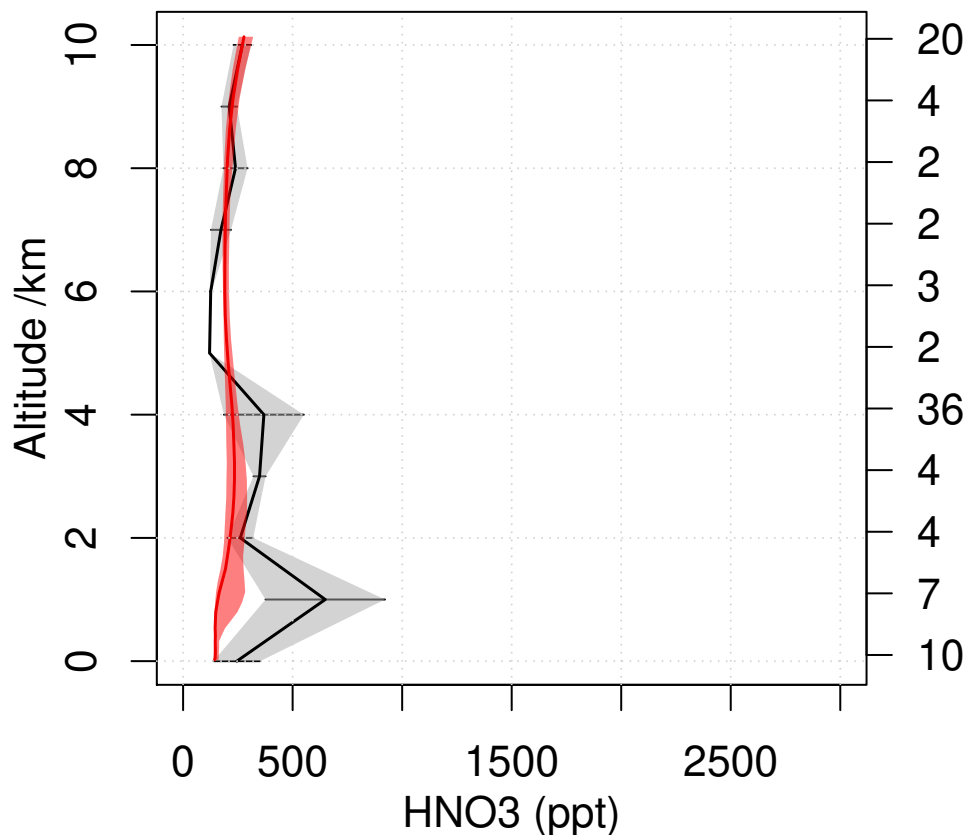
INTEX-NA Central 2004 07
Lat 30 – 40 Lon 259.5 – 285



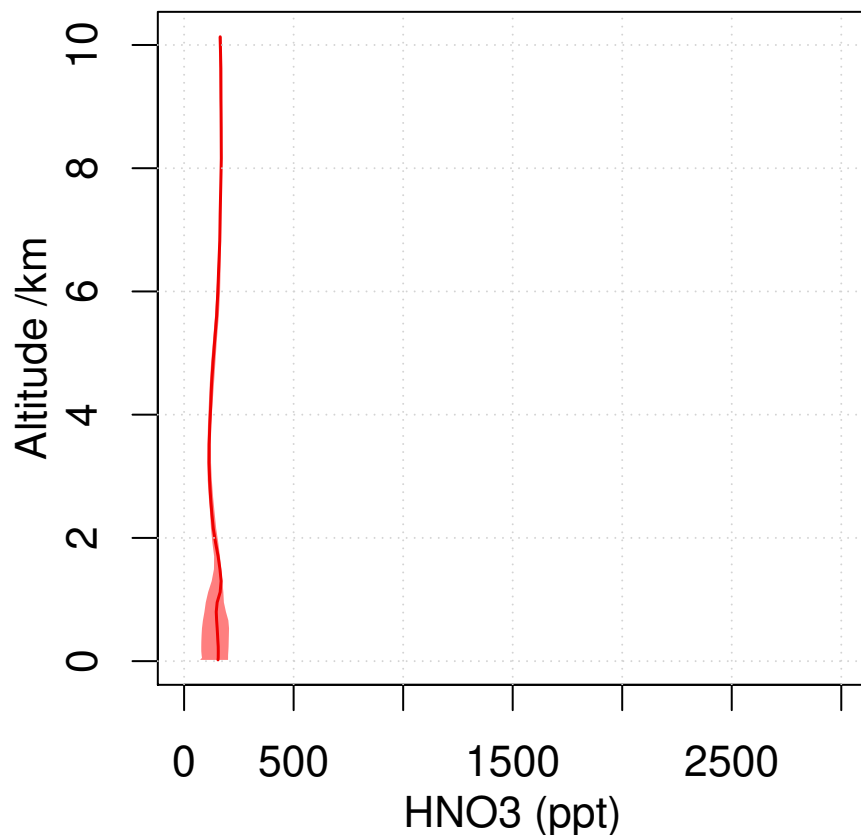
INTEX-NA North East 2004 07
Lat 42.5 – 52.5 Lon 285 – 310



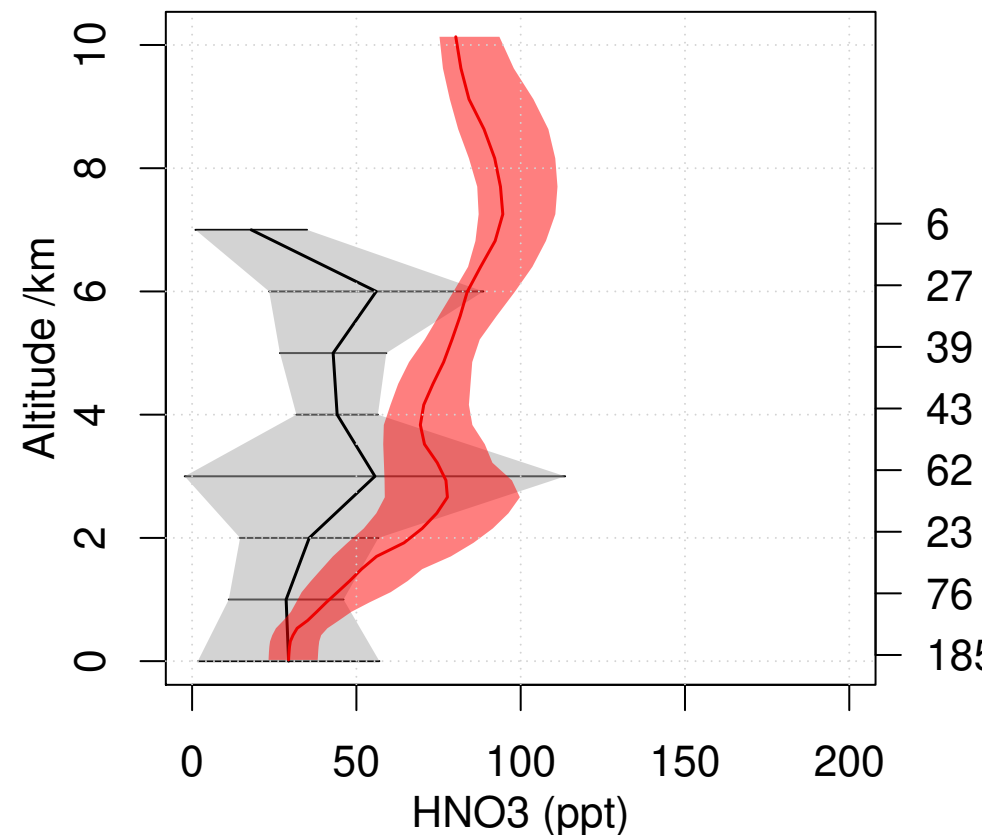
INTEX-NA West Coast 2004 07
Lat 32.5 – 45 Lon 217 – 240



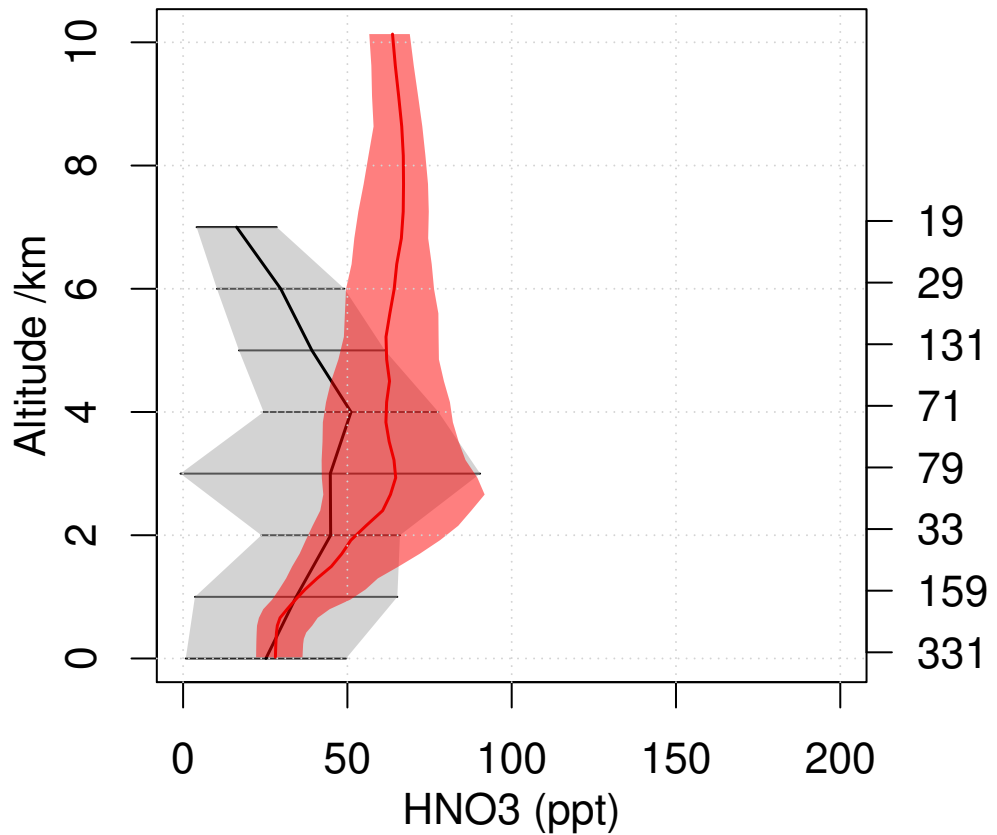
OP3 2008 07
Lat 2.5 – 7.5 Lon 112.5 – 120



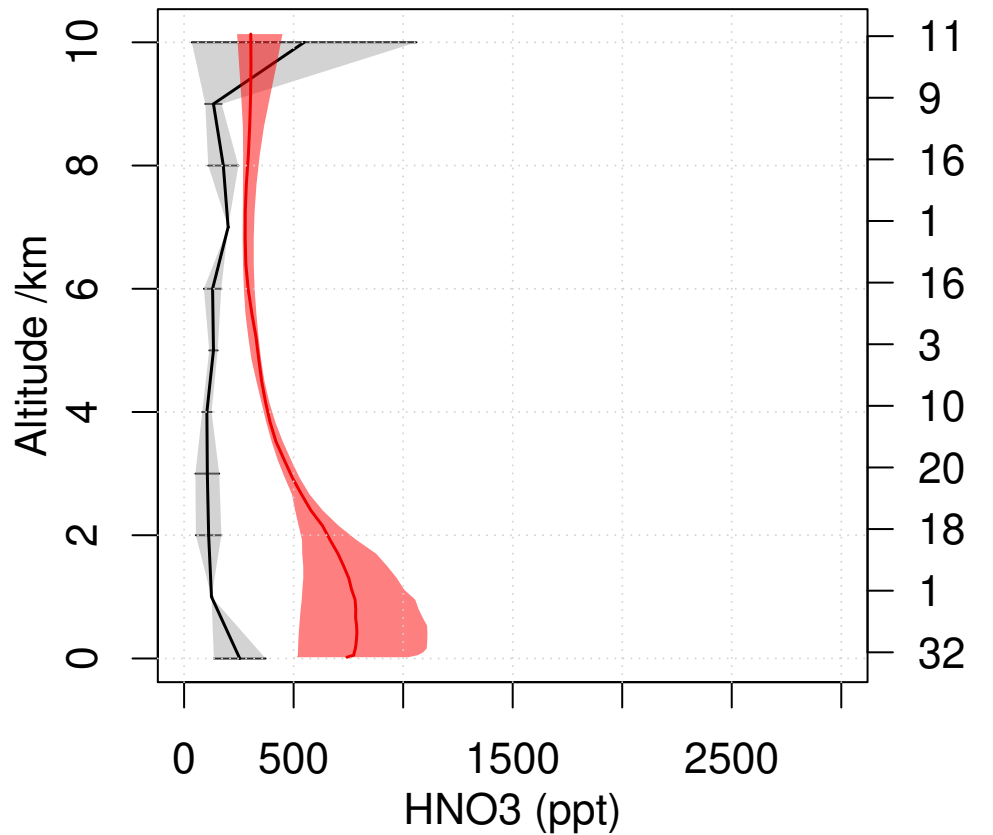
PEM-Tropics-B Christmas-Island 1999 07
Lat 0 – 10 Lon 200 – 220



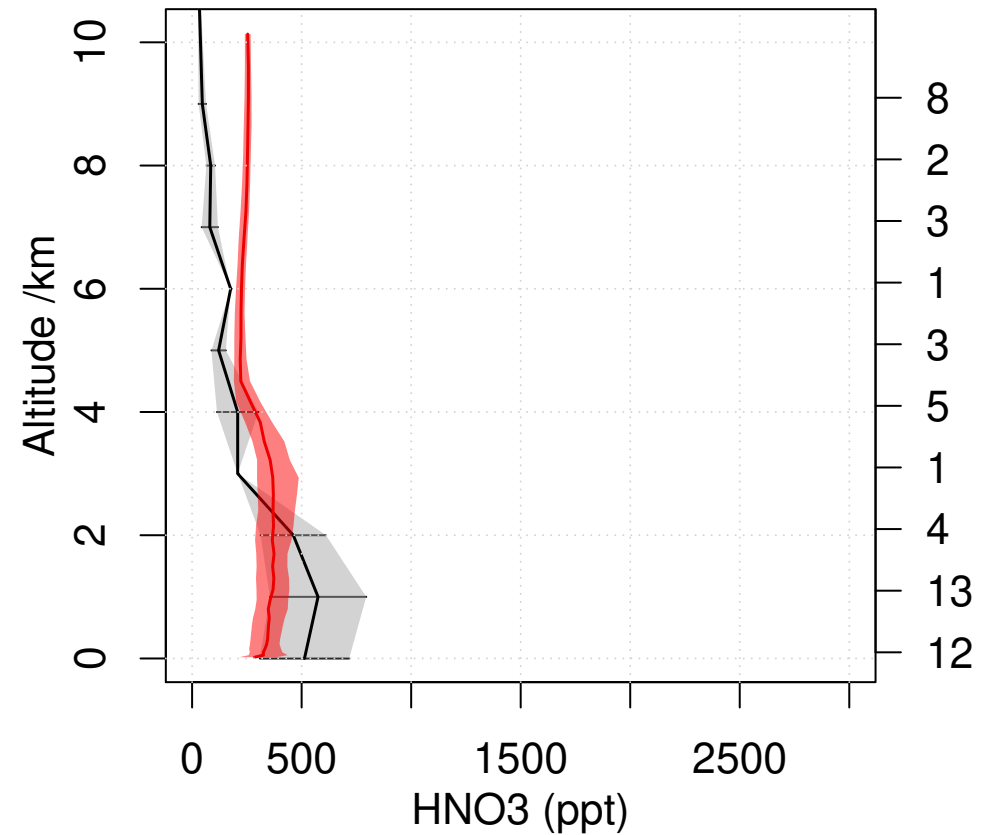
PEM-Tropics-B Tahiti 1999 03
Lat -20 – 0 Lon 200 – 230



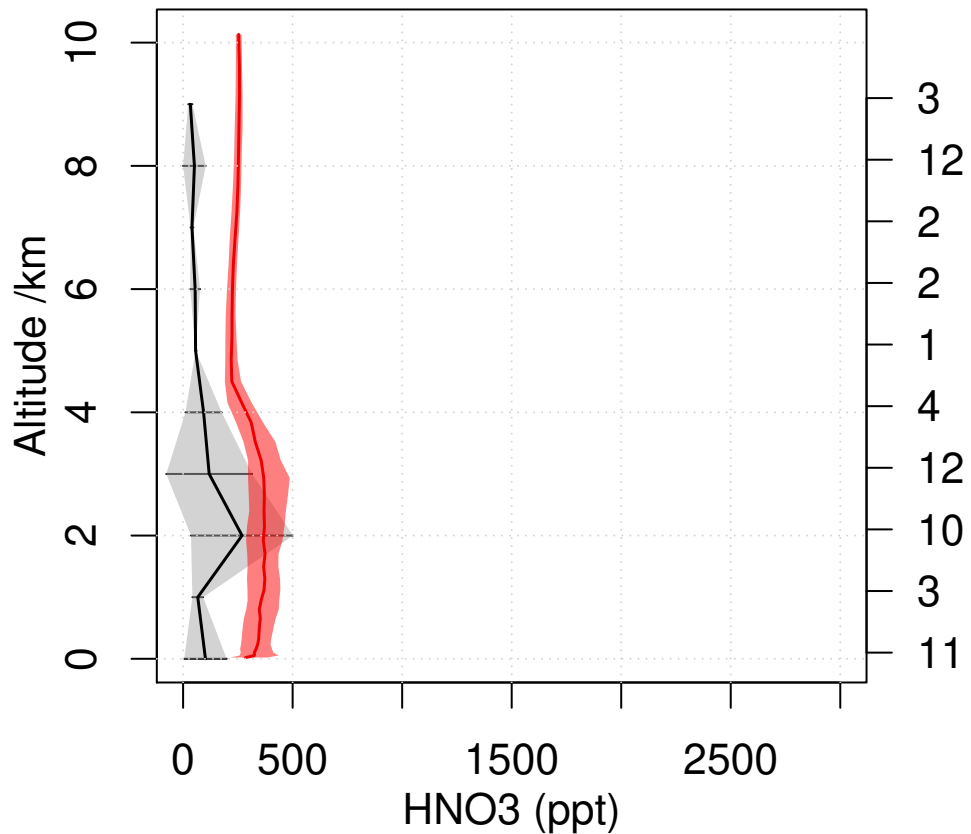
PEM-West-B Japan 1994 02
Lat 25 – 40 Lon 135 – 150



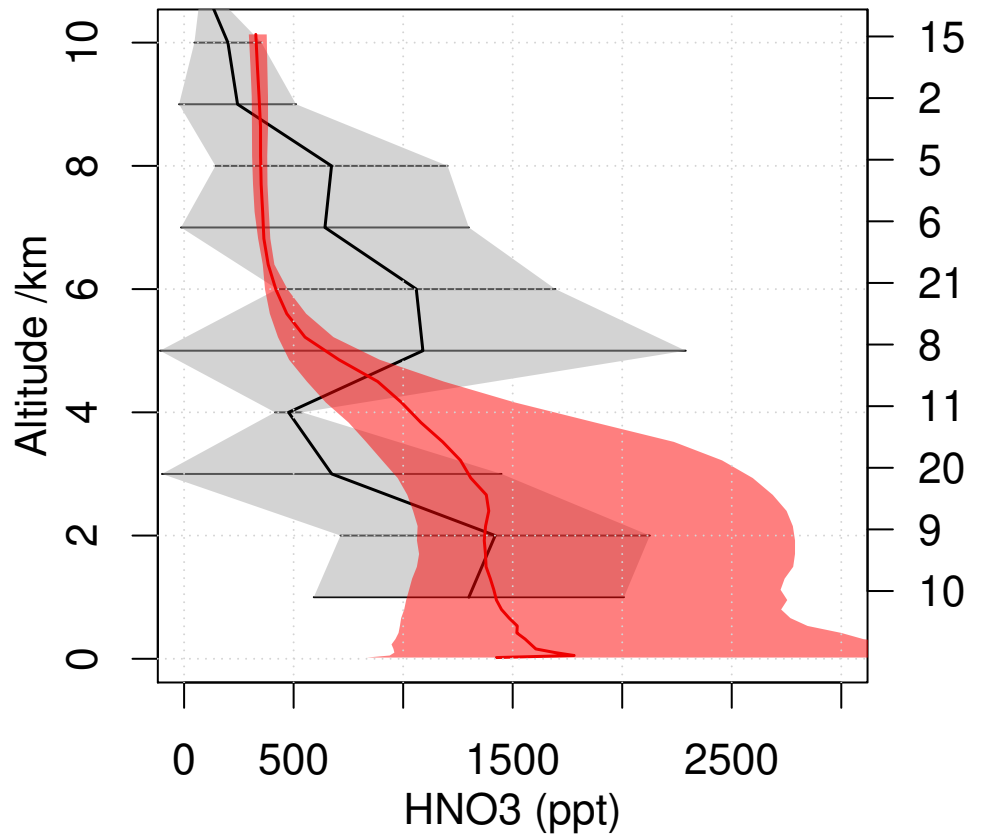
TRACE-A E-Brazil 1992 09
Lat -15 – -5 Lon 310 – 320



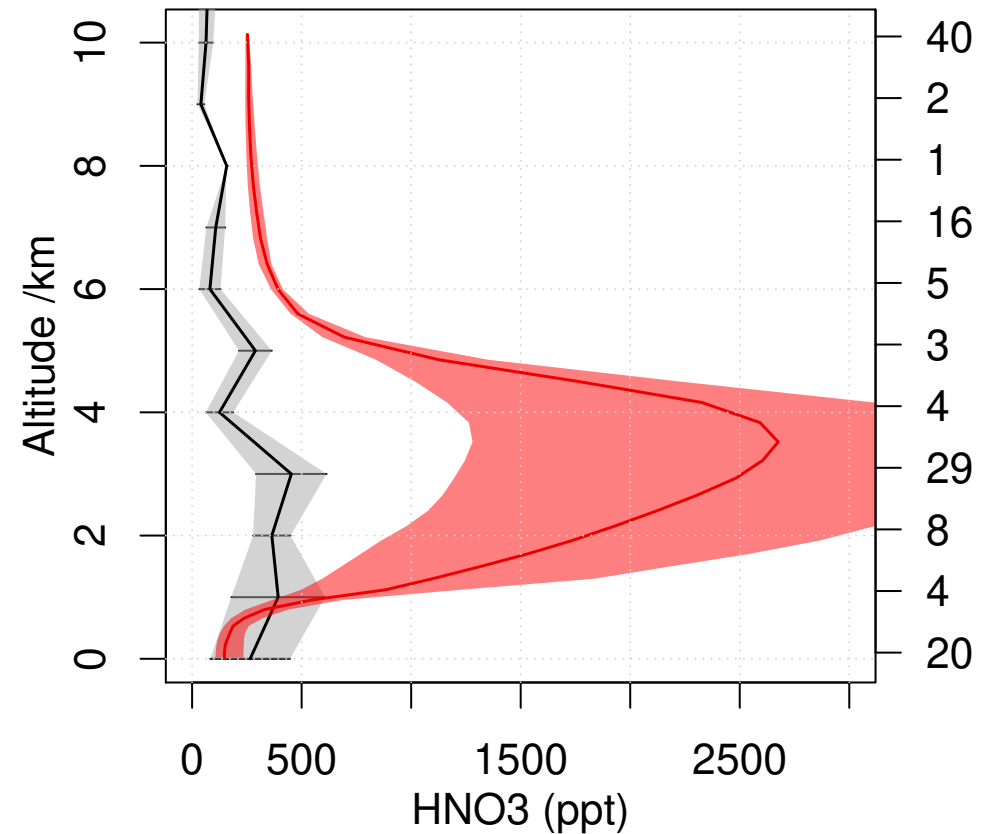
TRACE-A E-Brazil Coast 1992 09
Lat -35 – -25 Lon 310 – 320



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

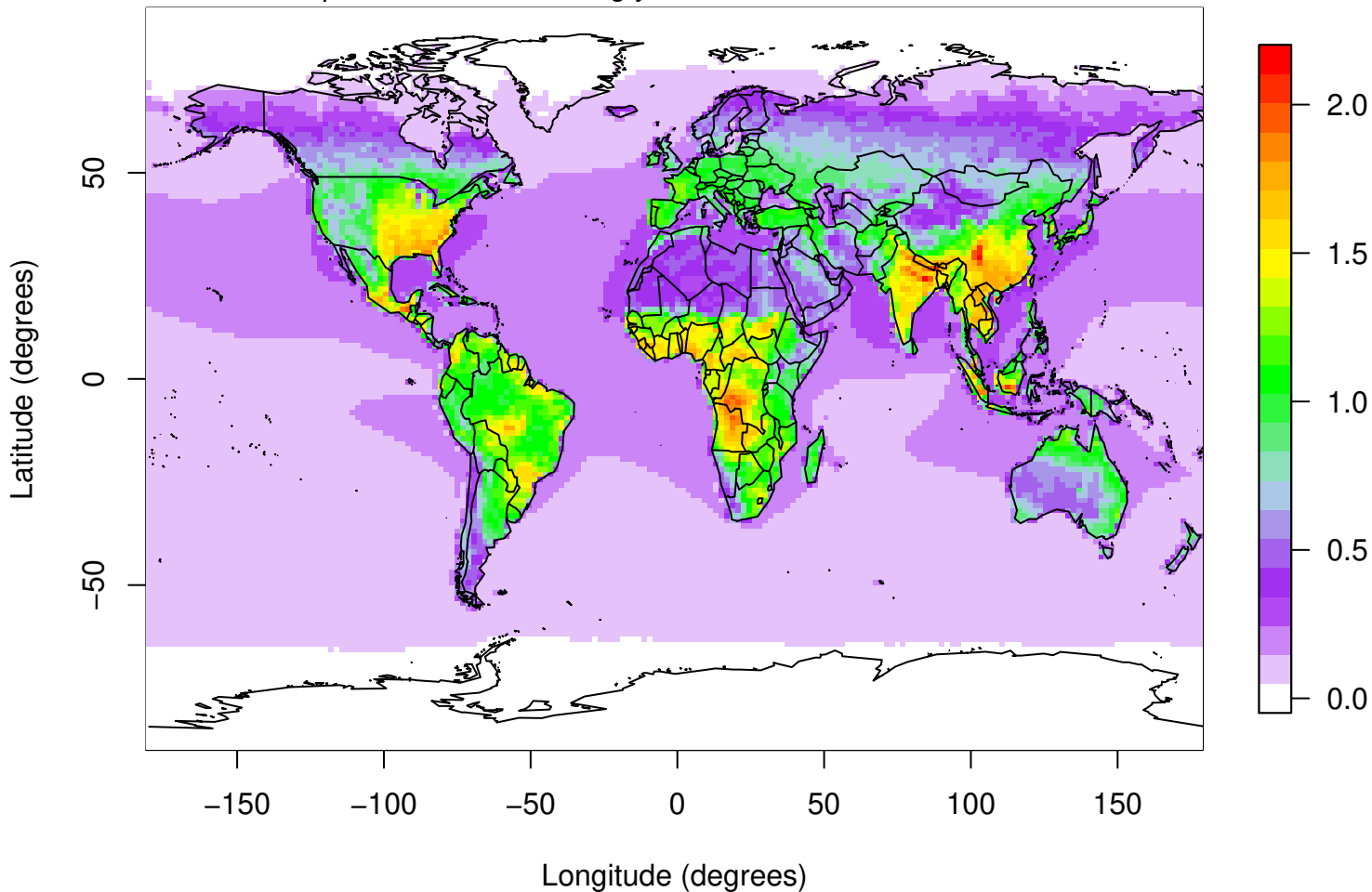


TRACE-A W-Africa Coast 1992 09
Lat -25 – -5 Lon 0 – 10



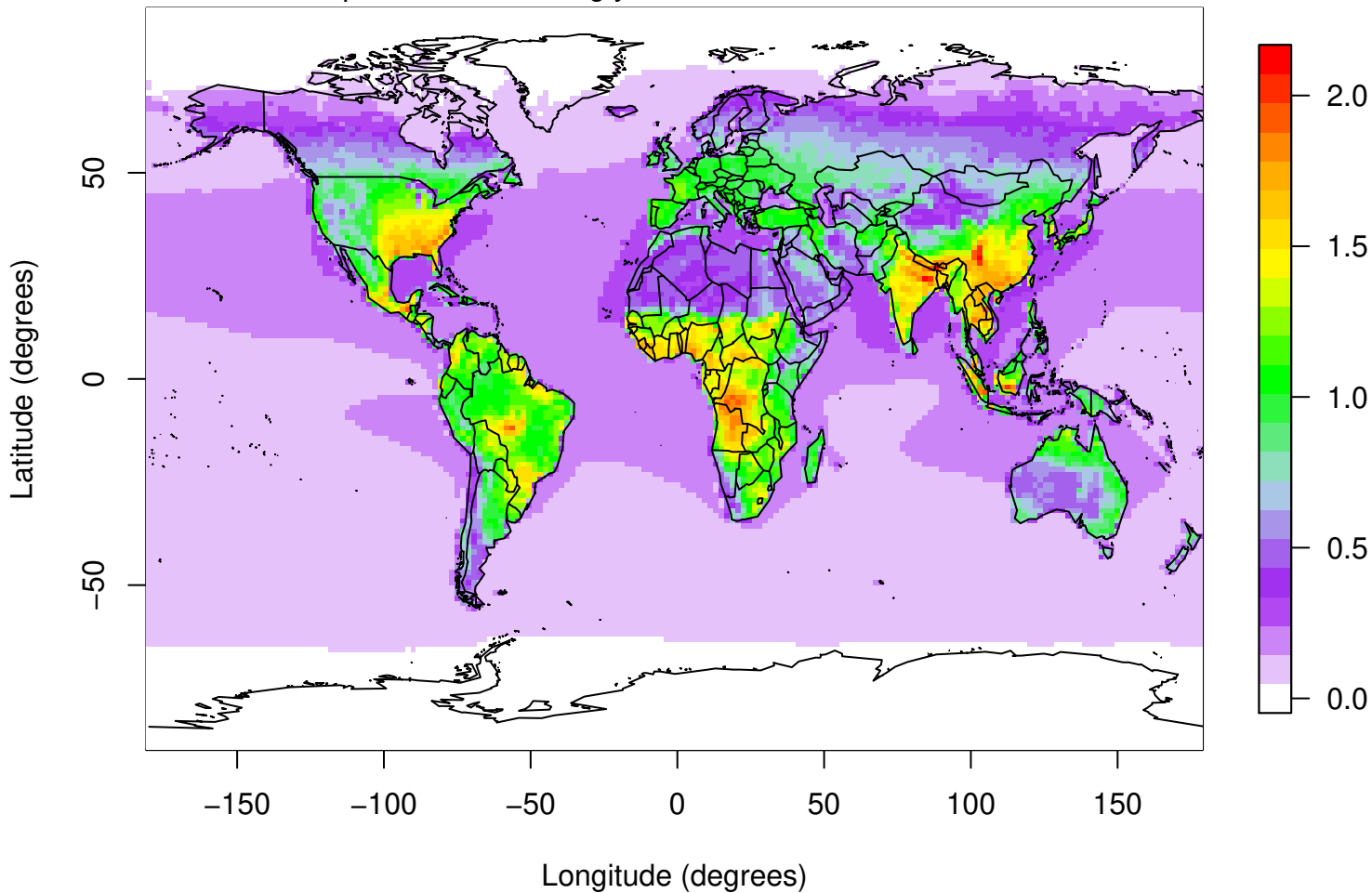
UKCA Ox deposition bs395

Total Ox Deposition = 1.01×10^3 Tg/yr



UKCA Ox deposition bw489

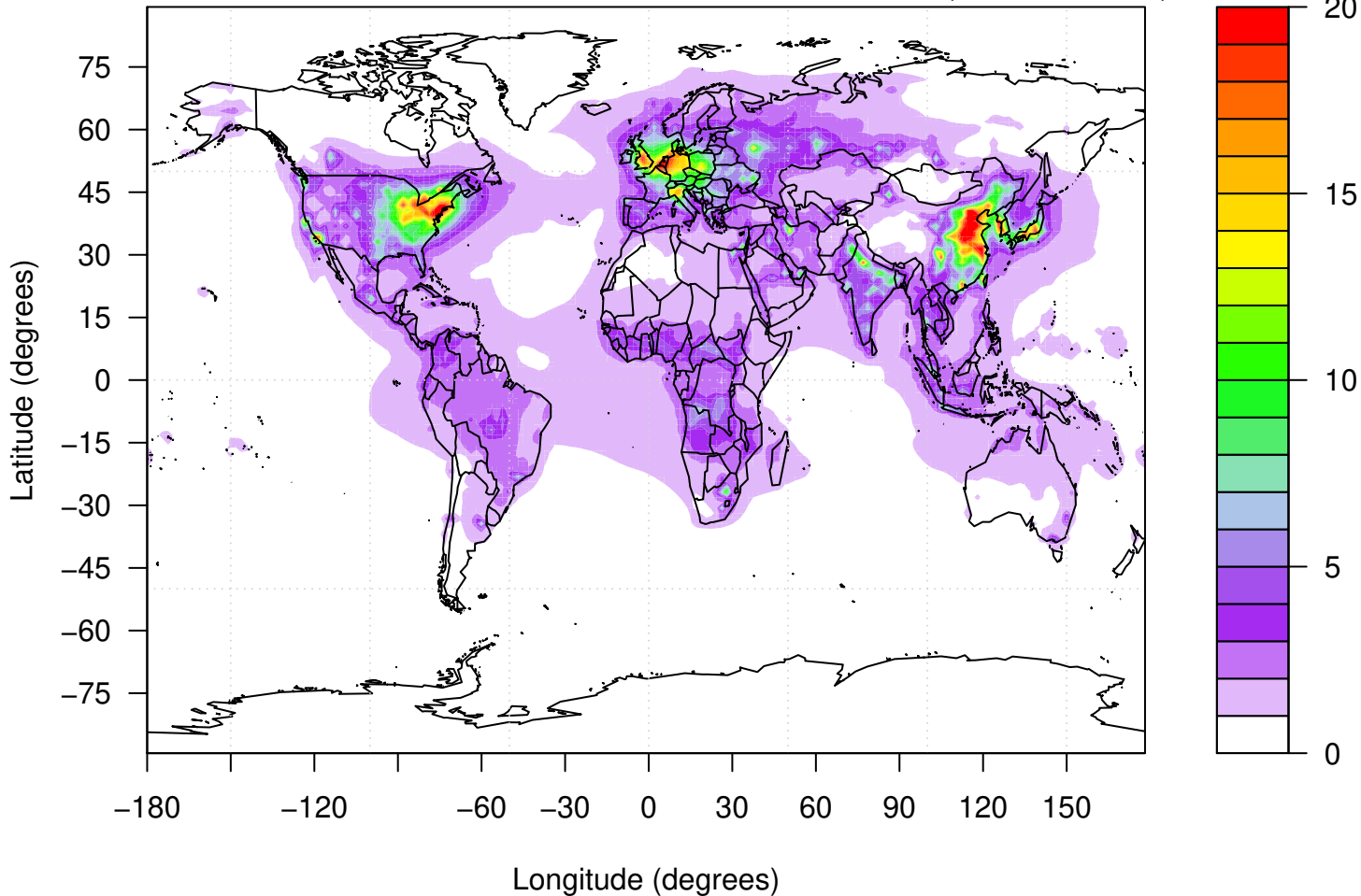
Total Ox Deposition = $1e+03$ Tg/yr



bs395 tropospheric NO₂ column

Min = 0.0143 Mean = 1.14 Max = 44.7

10¹⁵ (molecules cm⁻²)



bw489 tropospheric NO₂ column

Min = 0.0156 Mean = 1.16 Max = 41.3

10¹⁵ (molecules cm⁻²)

