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GOME-2A retrievals of tropospheric NO_2 in different spectral ranges – influence of penetration depth

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Supplementary material

For the interested reader, this supplementary material contains additional information and figures.

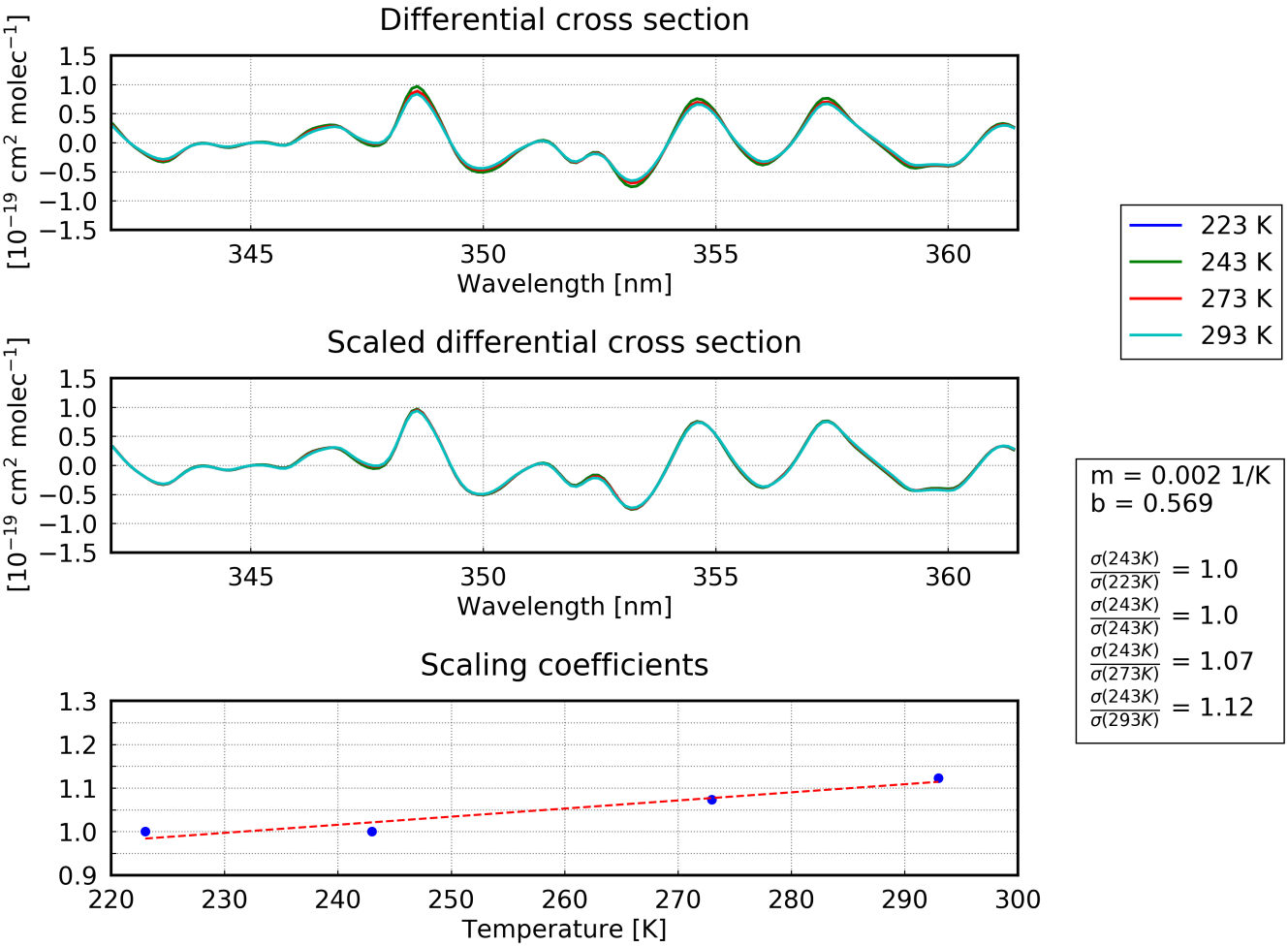

Figure S1. NO_2 cross section and temperature dependency for the UV spectral range. The scaling coefficient of the temperature dependency is calculated as average over all wavelength within the fitting window.

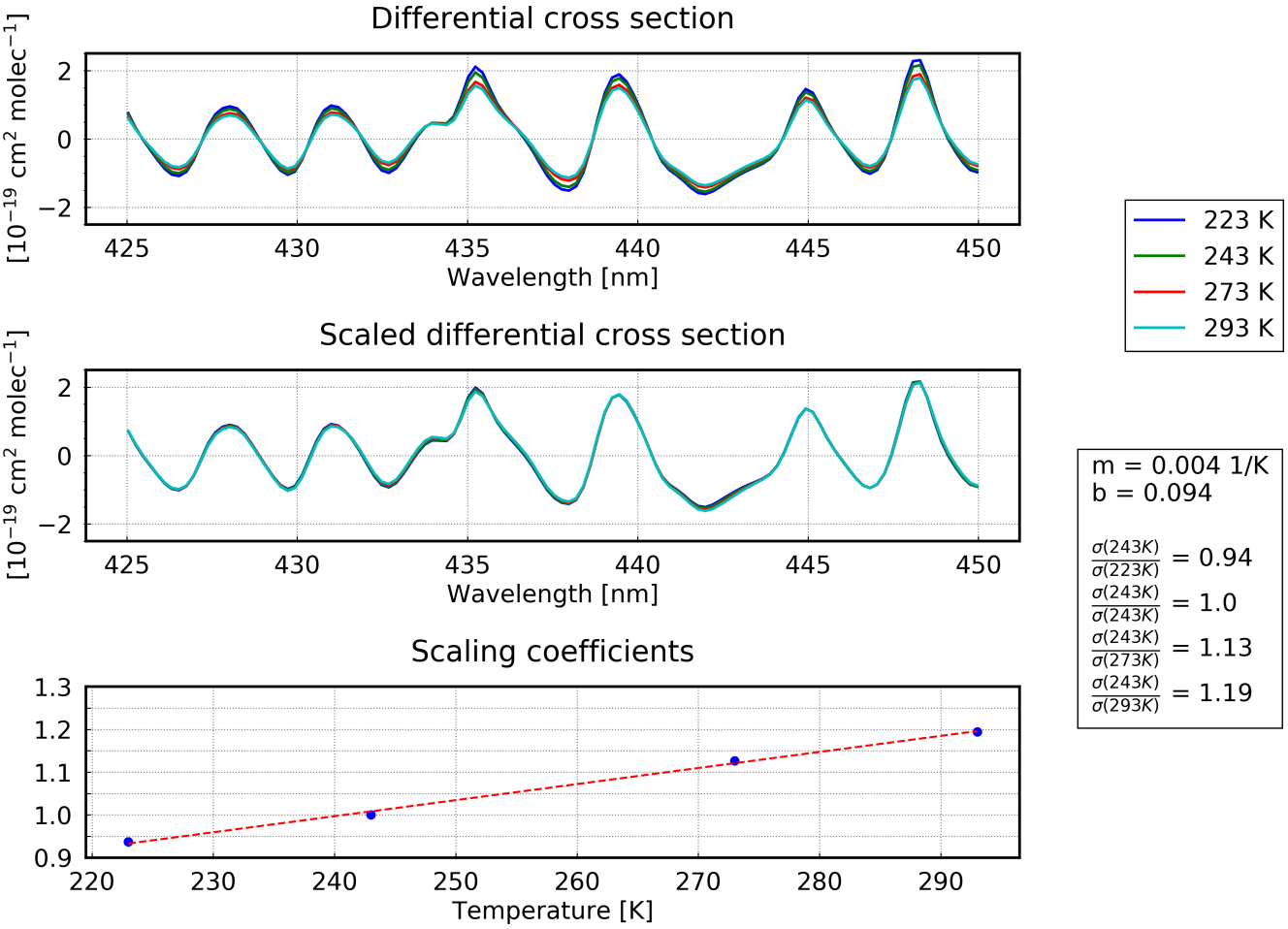

Figure S2. NO_2 cross section and temperature dependency for the blue spectral range. The scaling coefficient of the temperature dependency is calculated as average over all wavelength within the fitting window.

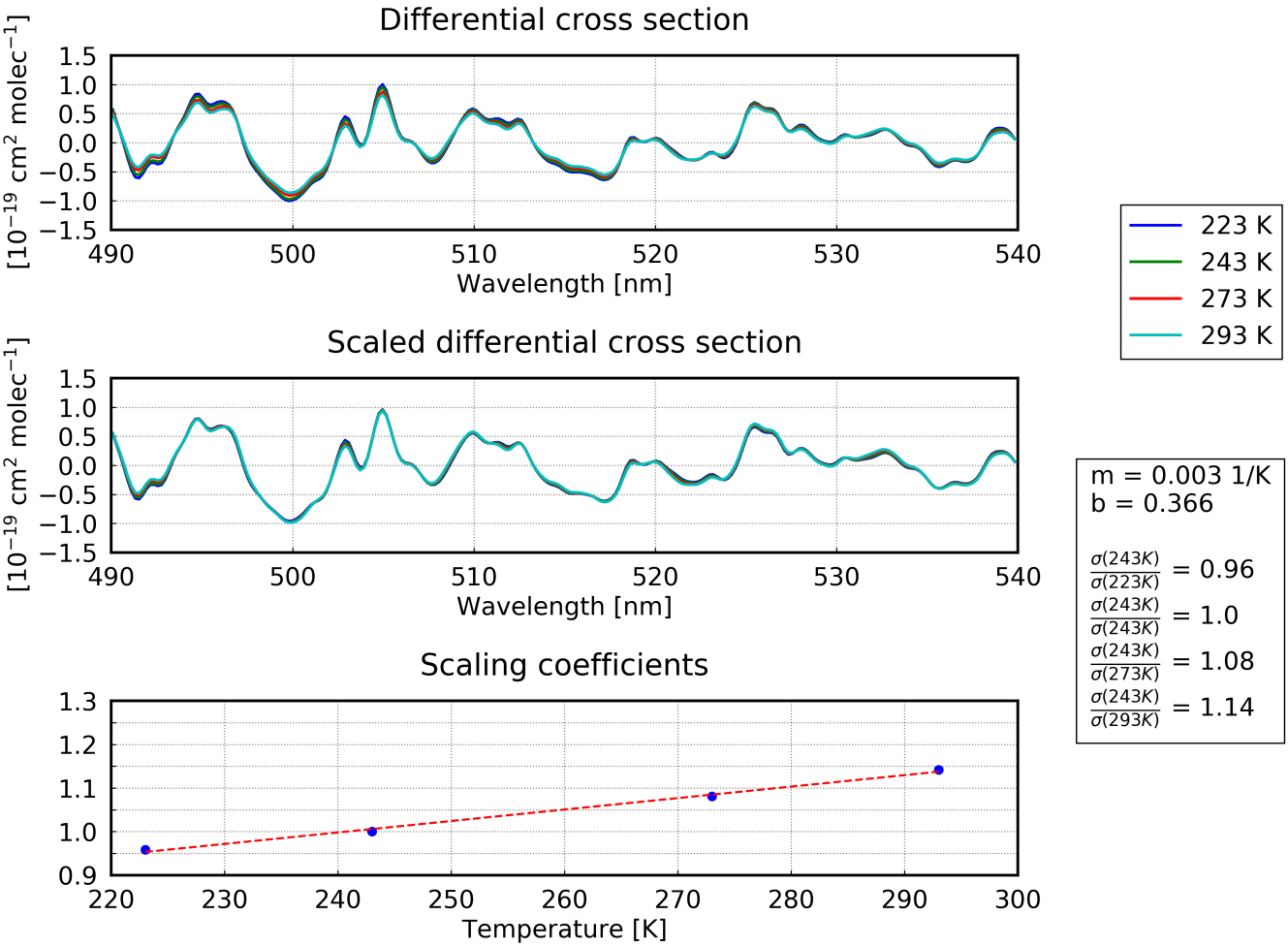

Figure S3. NO_2 cross section and temperature dependency for the green spectral range. The scaling coefficient of the temperature dependency is calculated as average over all wavelength within the fitting window.

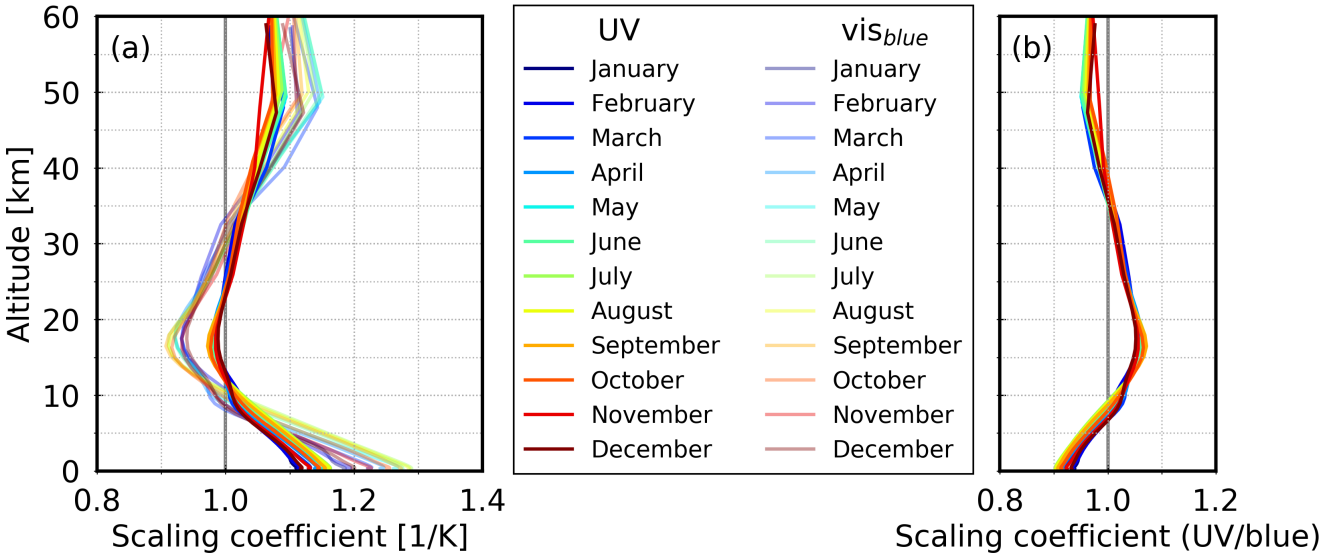

Figure S4. Altitude dependency of the NO_2 temperature scaling coefficient for China for the UV and blue spectral range. The profiles are calculated for model data simulated with the TM5-MP model for 2008.

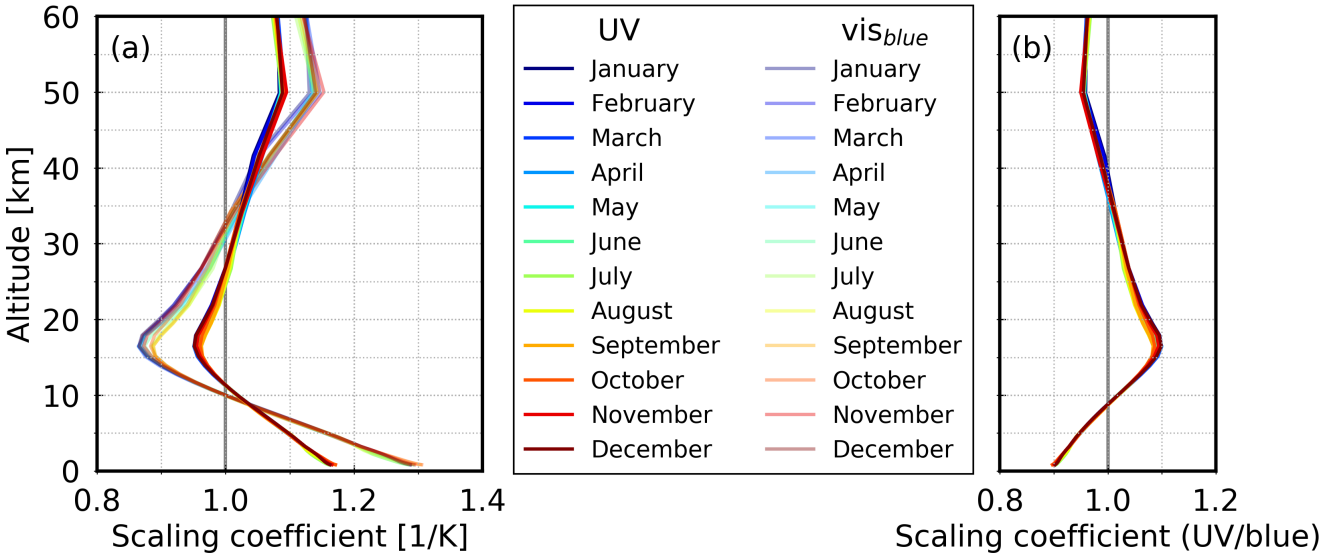

Figure S5. Altitude dependency of the NO_2 temperature scaling coefficient for ASE for the UV and blue spectral range. The profiles are calculated for model data simulated with the TM5-MP model for 2008.

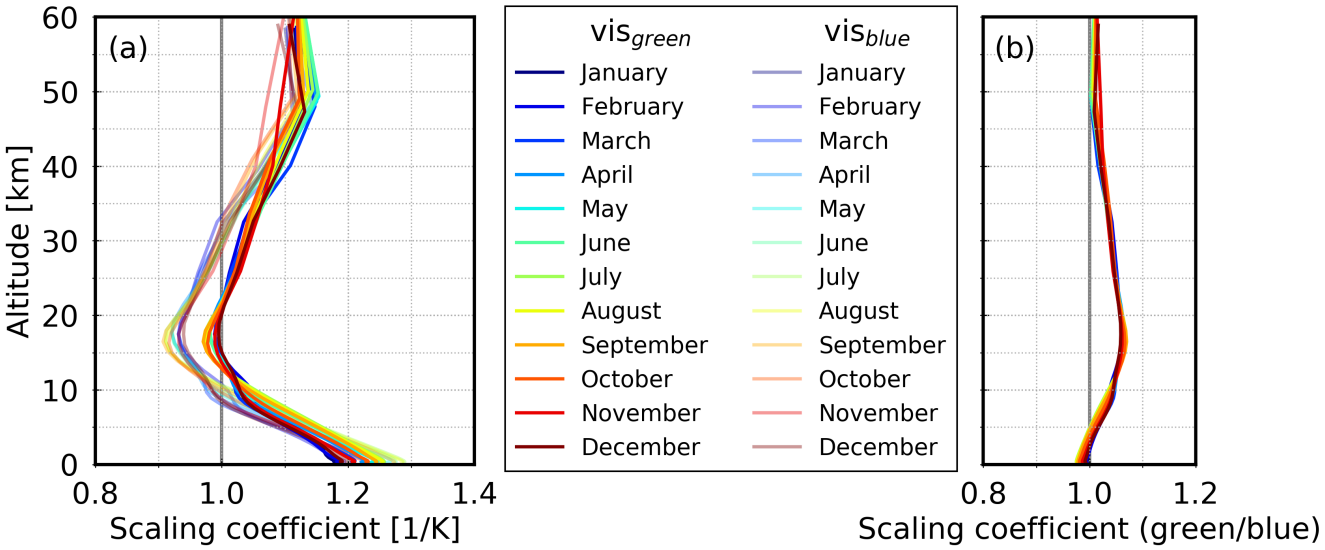

Figure S6. Altitude dependency of the NO_2 temperature scaling coefficient for China for the blue and green spectral range. The profiles are calculated for model data simulated with the TM5-MP model for 2008.

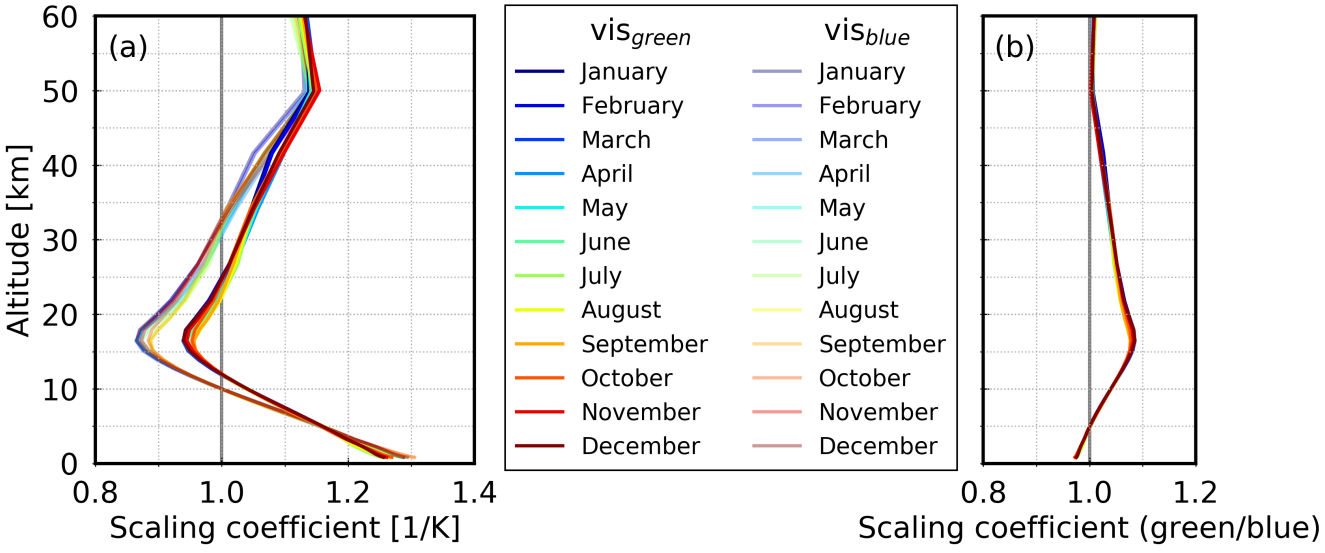

Figure S7. Altitude dependency of the NO_2 temperature scaling coefficient for ASE for the blue and green spectral range. The profiles are calculated for model data simulated with the TM5-MP model for 2008.

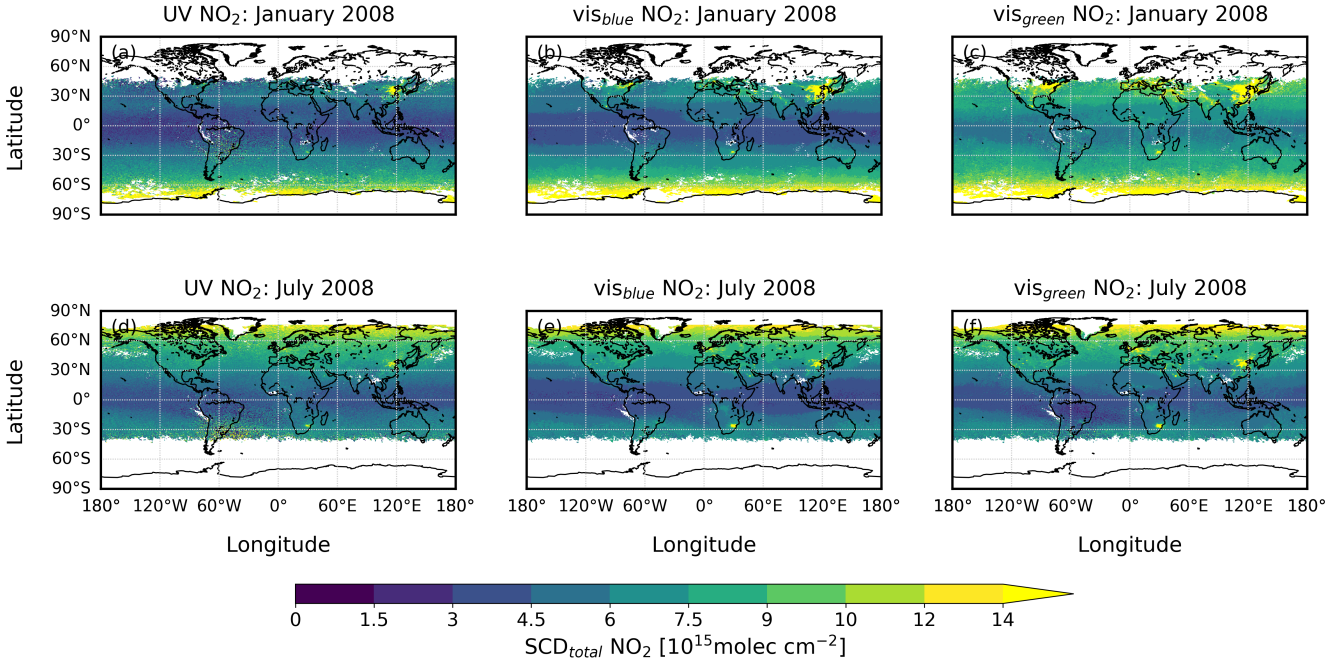

Figure S8. Monthly mean total NO_2 SCD for (a, b, c) January and (d, e, f) July 2008 for the (a, d) UV, (b, e) blue, and (c, f) green spectral range.

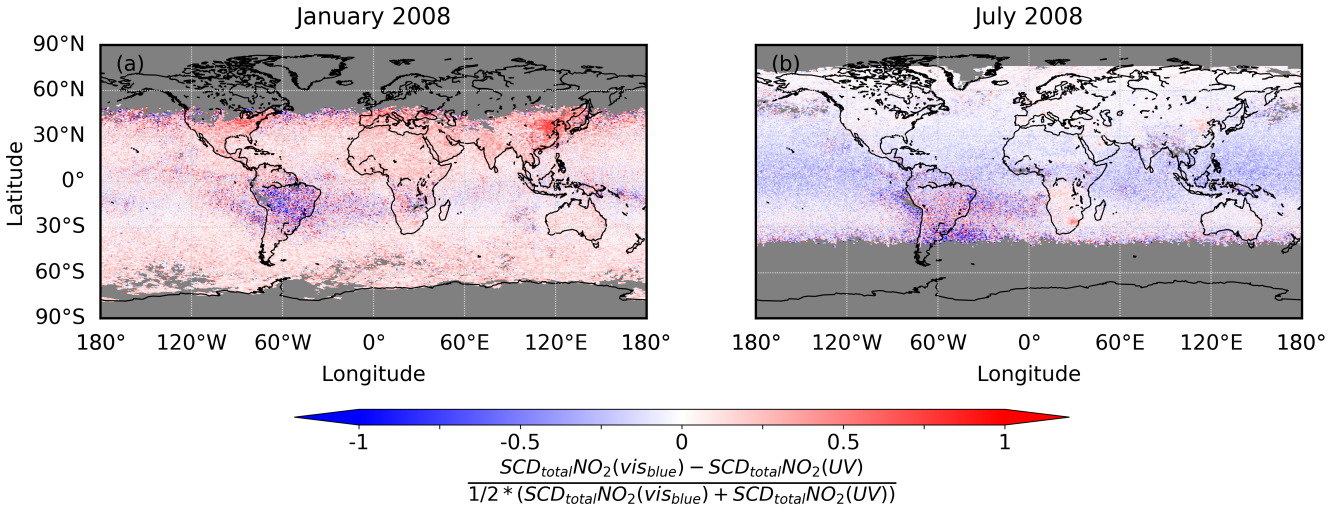

Figure S9. Relative difference between monthly mean total NO_2 SCDs in the blue and UV spectral range. Differences for (a) January and (b) July 2008. Dark grey shaded area: no NO_2 values available.

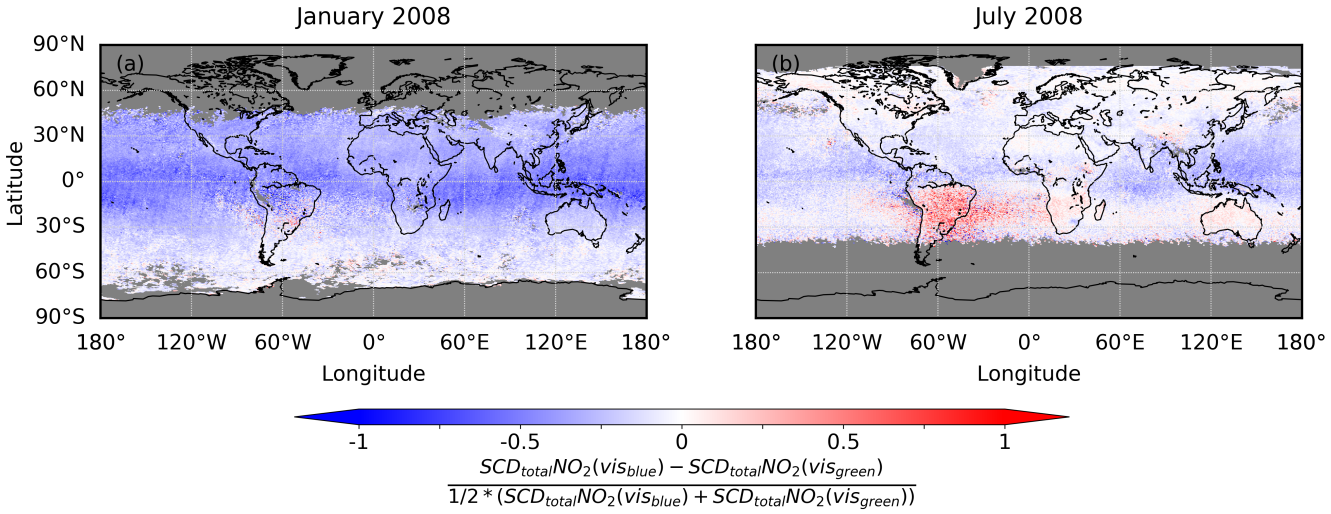

Figure S10. Relative difference between monthly mean total NO_2 SCDs for the blue and green spectral range. Differences for (a) January and (b) July 2008. Dark grey shaded area: no NO_2 values available.

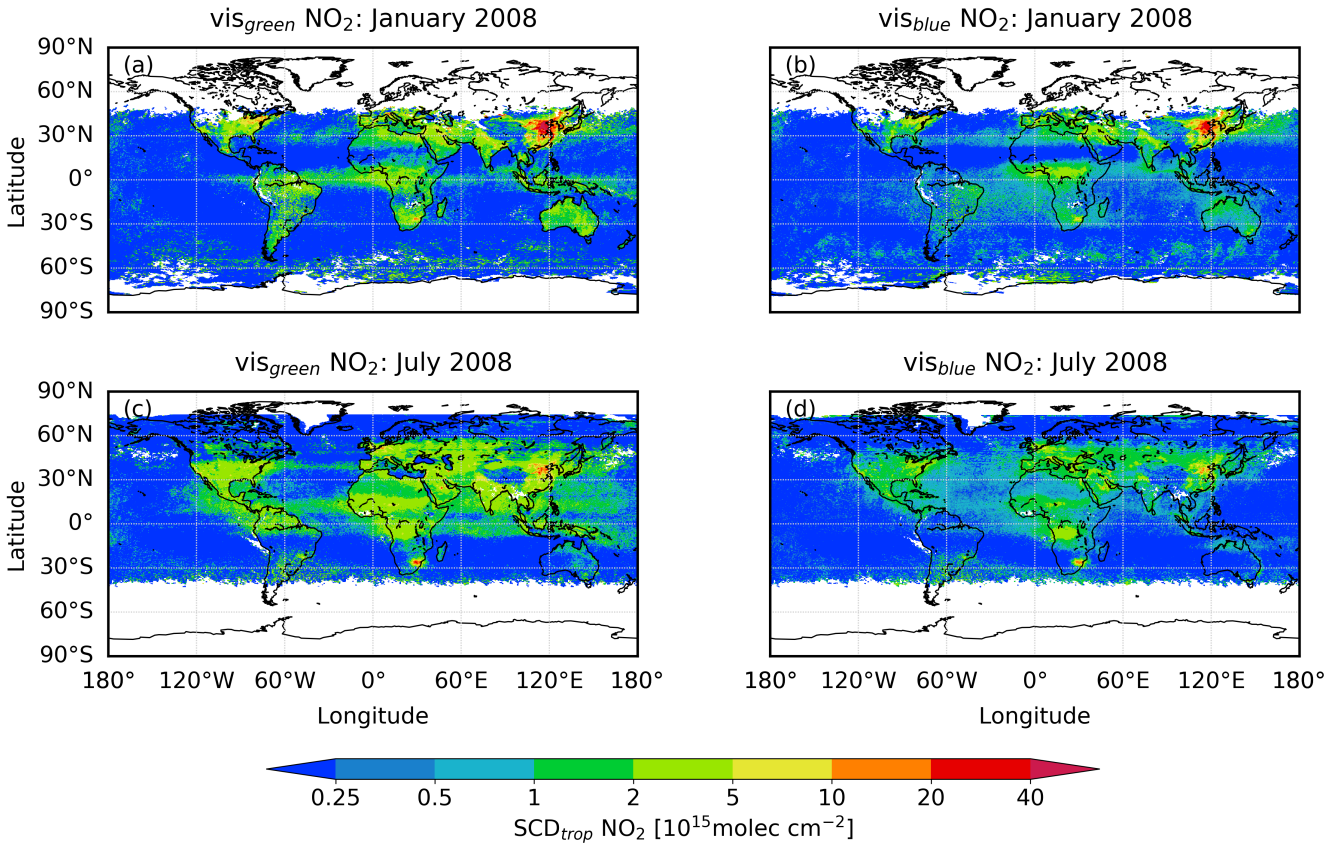

Figure S11. Monthly mean tropospheric NO_2 SCD for (a, c) January and (b, d) July 2008 for the (a, b) green and (c, d) blue spectral range.

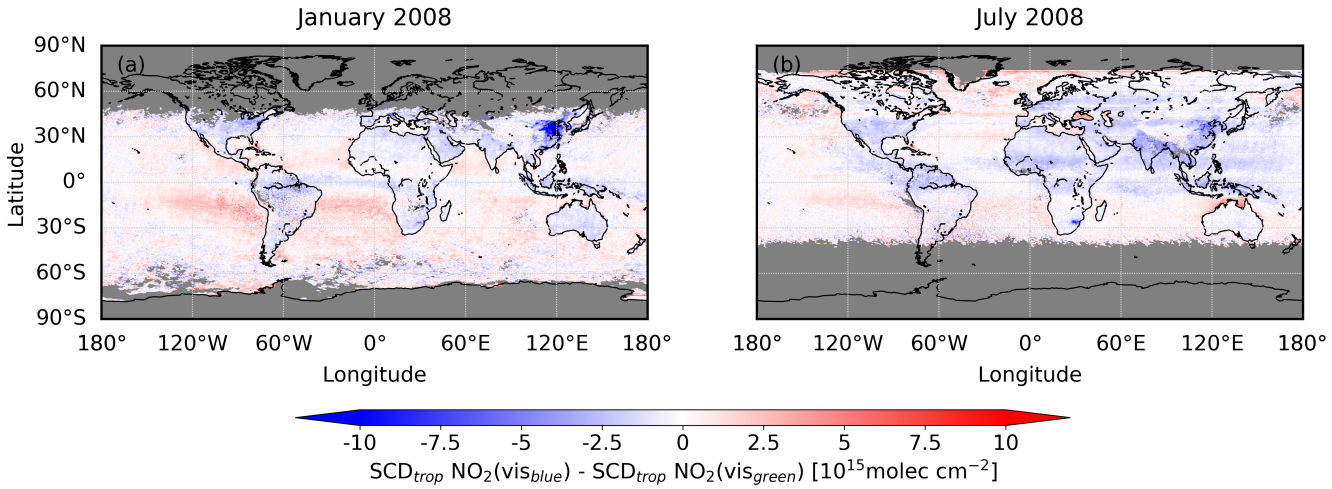

Figure S12. Absolute difference between monthly mean total NO_2 SCDs in the green and blue spectral range. Differences for (a) January and (b) July 2008. Dark grey shaded area: no NO_2 values available.

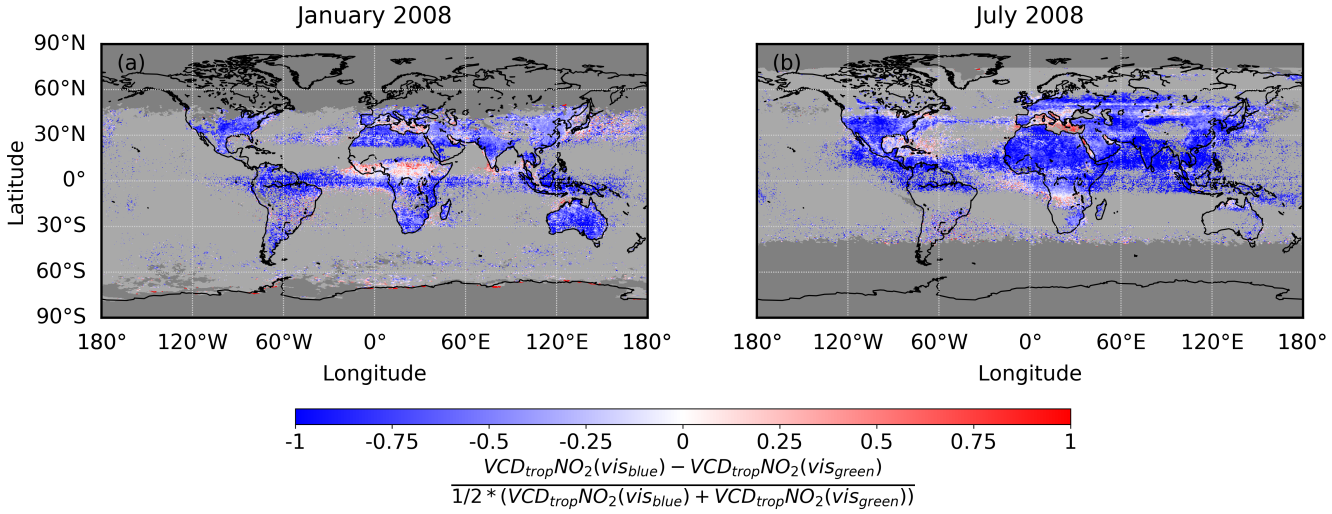

Figure S13. Relative difference between monthly mean total NO_2 SCDs in the the green and blue spectral range. Differences for (a) January and (b) July 2008. Dark grey shaded area: no NO_2 values available. Light grey coloured values indicate values where the vis_{green} NO_2 is close to zero, which have been filtered out. This threshold was defined as a smoothed latitude-dependent mean over the reference sector area. The Pacific threshold is one standard deviation of the gridded NO_2 values for both retrievals. To smooth the latitude-dependent threshold, a 5°-running-mean was used.

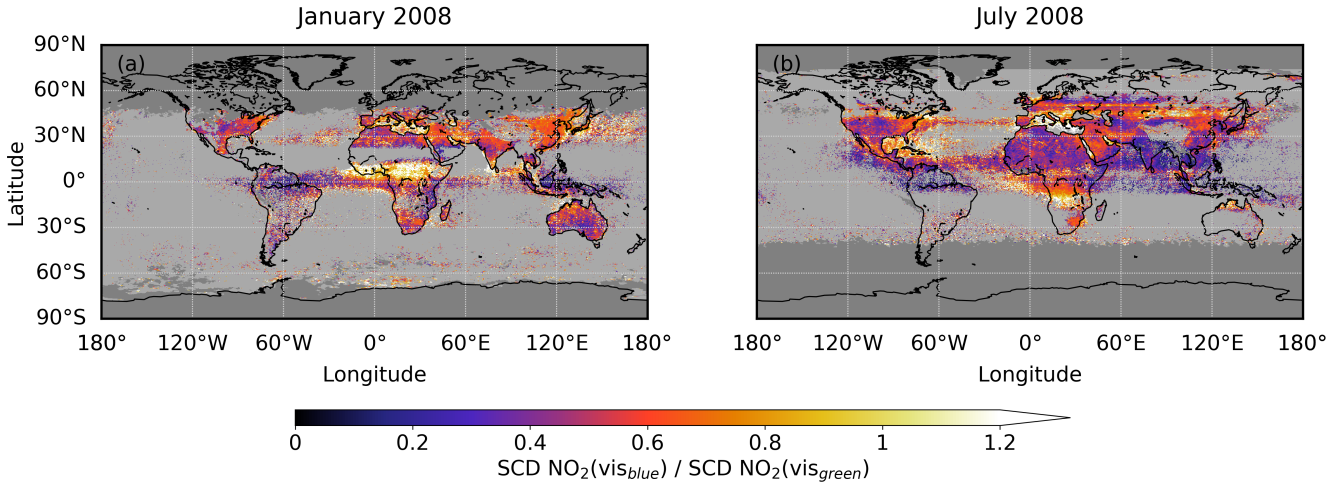

Figure S14. Ratio between monthly mean tropospheric SCDs of NO_2 in the blue and green spectral range. (a) January 2008 and (b) July 2008. Dark grey shaded area: no NO_2 values available. Light grey coloured values indicate values where the vis_{green} NO_2 is close to zero, which have been filtered out. This threshold was defined as a smoothed latitude-dependent mean over the reference sector area. The Pacific threshold is one standard deviation of the gridded NO_2 values for both retrievals. To smooth the latitude-dependent threshold, a 5°-running-mean was used.

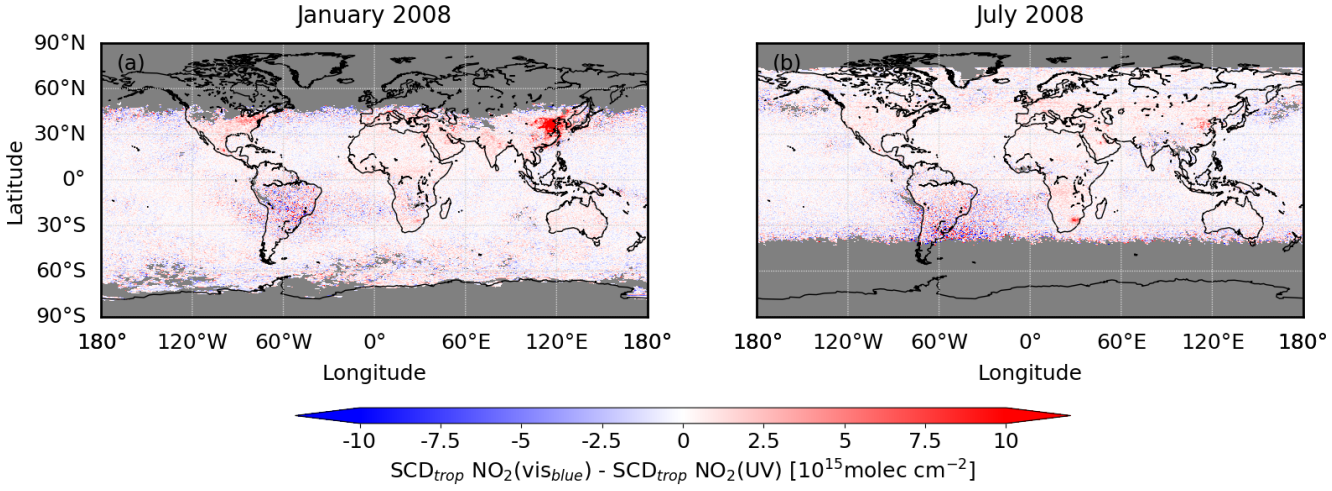

Figure S15. Absolute difference between monthly mean tropospheric NO_2 SCDs in the UV and blue spectral range. Differences for (a) January and (b) July 2008. Dark gray shaded area: no NO_2 values available.

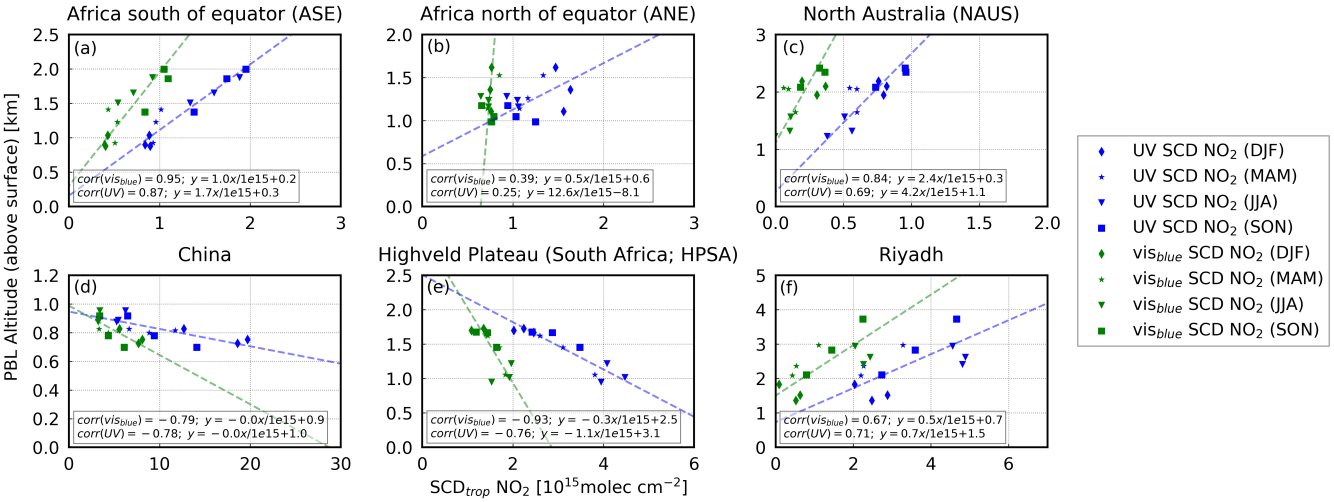

Figure S16. Planetary boundary layer height from ECMWF data vs monthly mean tropospheric NO_2 SCDs in the UV and blue spectral range.

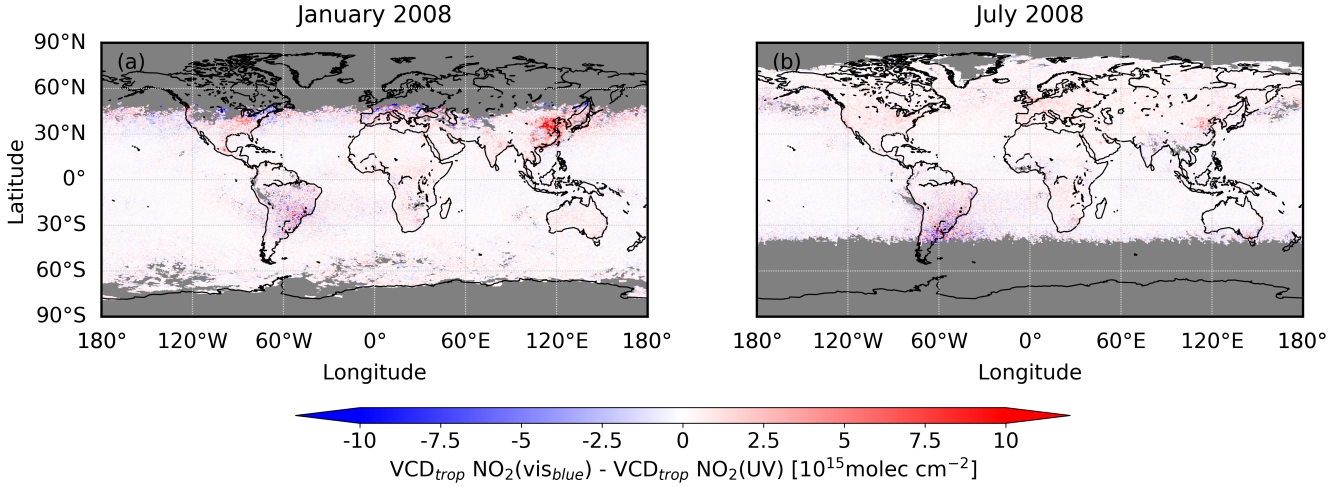

Figure S17. Absolute difference between monthly mean tropospheric NO_2 VCDs in the UV and blue spectral range. Differences for (a) January and (b) July 2008. Dark grey shaded area: no NO_2 values available.

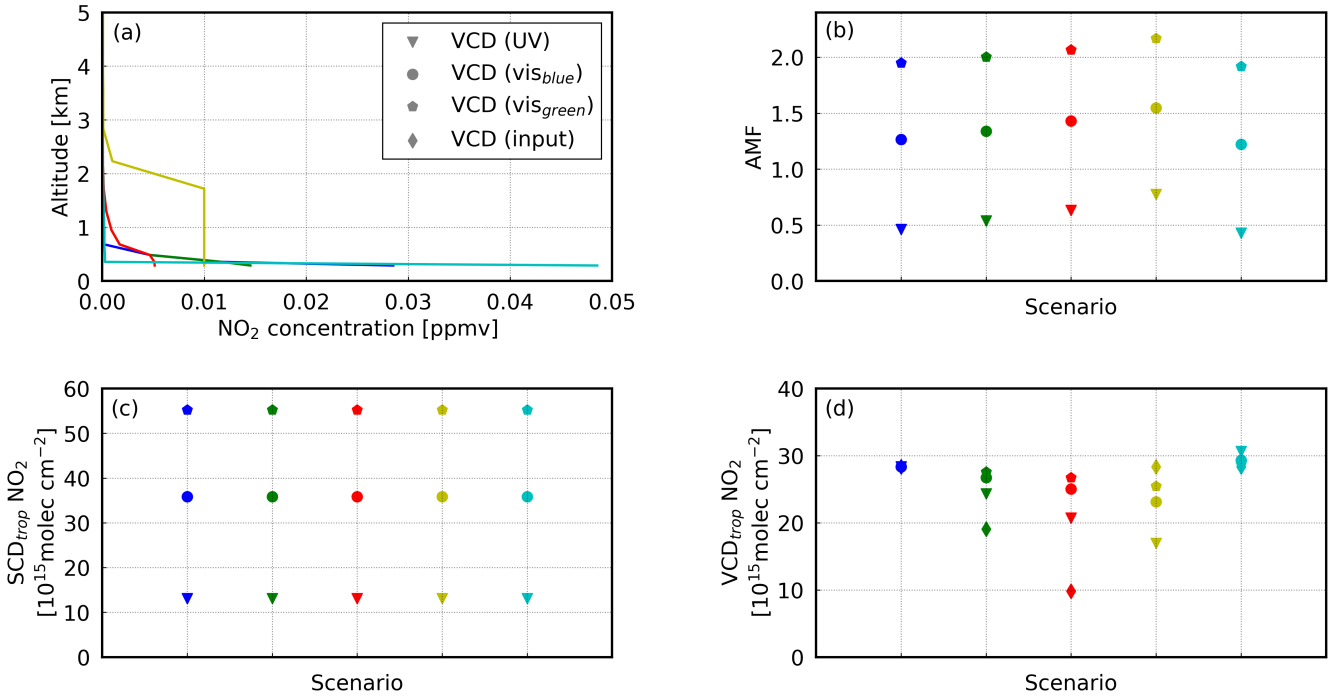

Figure S18. SCD, VCD, and AMF for different NO_2 profiles. Blue: is assumed as the true profile, the SCDs are calculated for this profile. Other colour: changed input profiles, AMF are calculated for the changed profiles which leads to changes in the retrieved VCDs.

Table S1. Correlation, slope, and intercept (in 1e15 molec cm^{-2}) of SCDs between the UV, blue, and green spectral range for China. In the brackets the standard errors are shown.

	Annual	DJF	MAM	JJA	SON
UV and green:					
correlation	0.98	0.96	0.98	0.85	0.97
slope	0.25 (0.005)	0.27 (0.02)	0.32 (0.01)	0.35 (0.04)	0.25 (0.01)
intercept	0.89 (0.09)	0.19 (0.41)	-0.01 (0.21)	0.05 (0.38)	0.76 (0.19)
blue and green:					
correlation	0.995	0.98	0.99	0.95	0.997
slope	0.67 (0.01)	0.64 (0.02)	0.70 (0.02)	0.70 (0.05)	0.67 (0.01)
intercept	-0.45 (0.11)	0.41 (0.62)	-0.66 (0.22)	-0.91 (0.44)	-0.43 (0.17)

Table S2. Correlation, slope, and intercept (in 1e15 molec cm^{-2}) of VCDs between the UV, blue, and green spectral range for China. In the brackets the standard errors are shown.

	Annual	DJF	MAM	JJA	SON
UV and green:					
correlation	0.98	0.95	0.98	0.94	0.98
slope	0.73 (0.01)	0.70 (0.04)	076 (0.03)	0.75 (0.05)	0.67 (0.03)
intercept	-0.51 (0.16)	0.20 (0.77)	-0.76 (0.36)	-0.69 (0.40)	0.06 (0.33)
blue and green:					
correlation	0.98	0.94	0.98	0.92	0.99
slope	1.07 (0.02)	0.94 (0.07)	1.04 (0.04)	0.997 (0.08)	1.13 (0.04)
intercept	-0.95 (0.27)	1.29 (1.16)	-0.91 (0.49)	-0.79 (0.64)	-1.19 (0.44)