*Supplement of*

# Horizontal distribution of tropospheric $NO_2$ and aerosols derived by dual-scan multi-wavelength MAX-DOAS measurements in Uccle, Belgium

**Table S1. DOAS settings for $O_4$ and $NO_2$ in the six different fitting intervals.**

| Fitting window/ nm | Reference wavelength/ nm | Molecule | Reference |
|---|---|---|---|
| **330 – 361** | 343 | BrO (223 K) | Fleischmann et al. (2004) |
| **350 - 370** | 360 | $O_4$ | Finkenzeller, H. (private communication) |
| | | $NO_2$ (298 K) | Vandaele et al. (1998) with $I_o$ correction (SCD of $10^{17}$ molec.cm$^{-2}$) |
| | | $O_3$ (223 K) | Serdyuchenko et al. (2014) with $I_0$ correction (SCD of $10^{20}$ molecules/cm$^2$) |
| | | HCHO (297 K) | Meller and Moortgat (2000) |
| | | $O_3$ (243 K) | Pre-orthogonalized Serdyuchenko et al. (2014) with $I_0$ correction (SCD of $10^{20}$ molecules/cm$^2$) |
| | | Ring | Pseudo cross-section according to Chance and Spurr (1997) and normalized as in Wagner et al. (2009) |
| | | Polynomial | Order 3 (4 coefficients) |
| **360-383.5** | 380 | BrO | Fleischmann et al. (2004) |
| | | $O_4$ | Finkenzeller, H. (private communication) |
| | | $NO_2$ (298 K) | Vandaele et al. (1998) with $I_o$ correction (SCD of $10^{17}$ molec.cm$^{-2}$) |
| | | $NO_2$ (220 K) | Pre-orthogonalized Vandaele et al. (1998) with $I_0$ correction |
| | | Ring | Pseudo cross-section according to Chance and Spurr (1997) and normalized as in Wagner et al. (2009) |
| | | Polynomial | Order 5 (6 coefficients) |
| **420-460** | 447 | $NO_2$ (298 K) | Vandaele et al. (1998) with $I_o$ correction (SCD of $10^{17}$ molec.cm$^{-2}$) |
| **450 - 490** | 477 | | |
| | | $O_4$ (293 K) | Thalman and Volkamer (2013) |

| | | | |
|---|---|---|---|
| | | $O_3$ (223 K) | Serdyuchenko et al. (2014) with $I_0$ correction (SCD of $10^{20}$ molecules/cm$^2$) |
| | | $H_2O$ | HITRAN (Rothman et al., 2013) |
| | | $NO_2$ (220 K) | Pre-orthogonalized Vandaele et al. (1998) with $I_0$ correction |
| | | Ring | Pseudo cross-section according to Chance and Spurr (1997) and normalized as in Wagner et al. (2009) |
| | | Polynomial | Order 3 (4 coefficients) |
| **510 – 540.1** | 530 | $NO_2$ (298 K) | Vandaele et al. (1998) with $I_o$ correction (SCD of $10^{17}$ molec.cm$^{-2}$) |
| | | $O_4$ (293 K) | Thalman and Volkamer (2013) |
| | | $O_3$ (223 K) | Serdyuchenko et al. (2014) with $I_0$ correction (SCD of $10^{20}$ molecules/cm$^2$) |
| | | $H_2O$ | HITRAN (Rothman et al., 2013) |
| | | $NO_2$ (220 K) | Pre-orthogonalized Vandaele et al. (1998) with $I_0$ correction |
| | | Ring | Pseudo cross-section according to Chance and Spurr (1997) and normalized as in Wagner et al. (2009) |
| | | Polynomial | Order 2 (3 coefficients) |

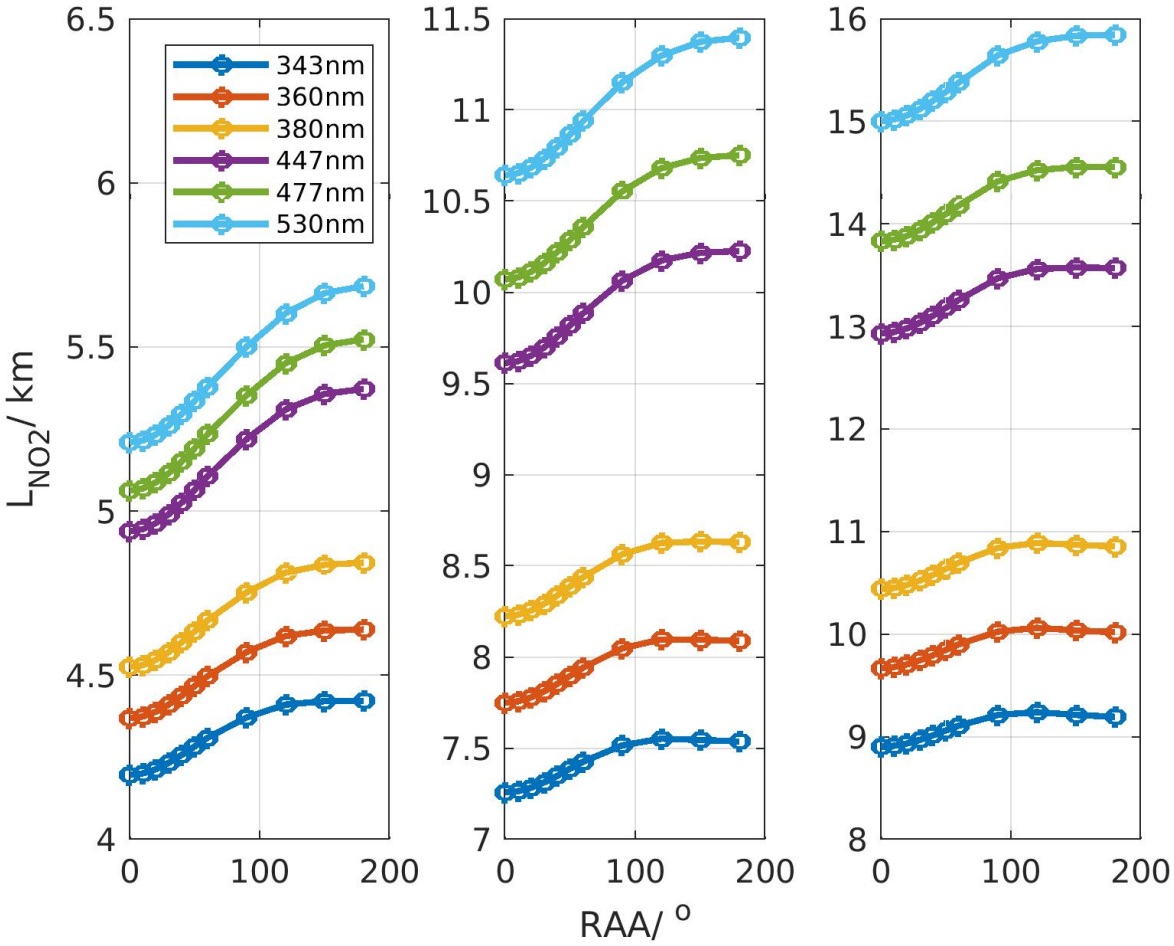


**Figure S1. Simulated $L_{NO2}$ as a function of the RAA for different $MLH_{NO2}$ values (from left to right panel: $MLH_{NO2}$ equal to 500 m, 1000 m, and 1500 m), wavelengths, one SZA value (30°), and one AOD value (0.3).**

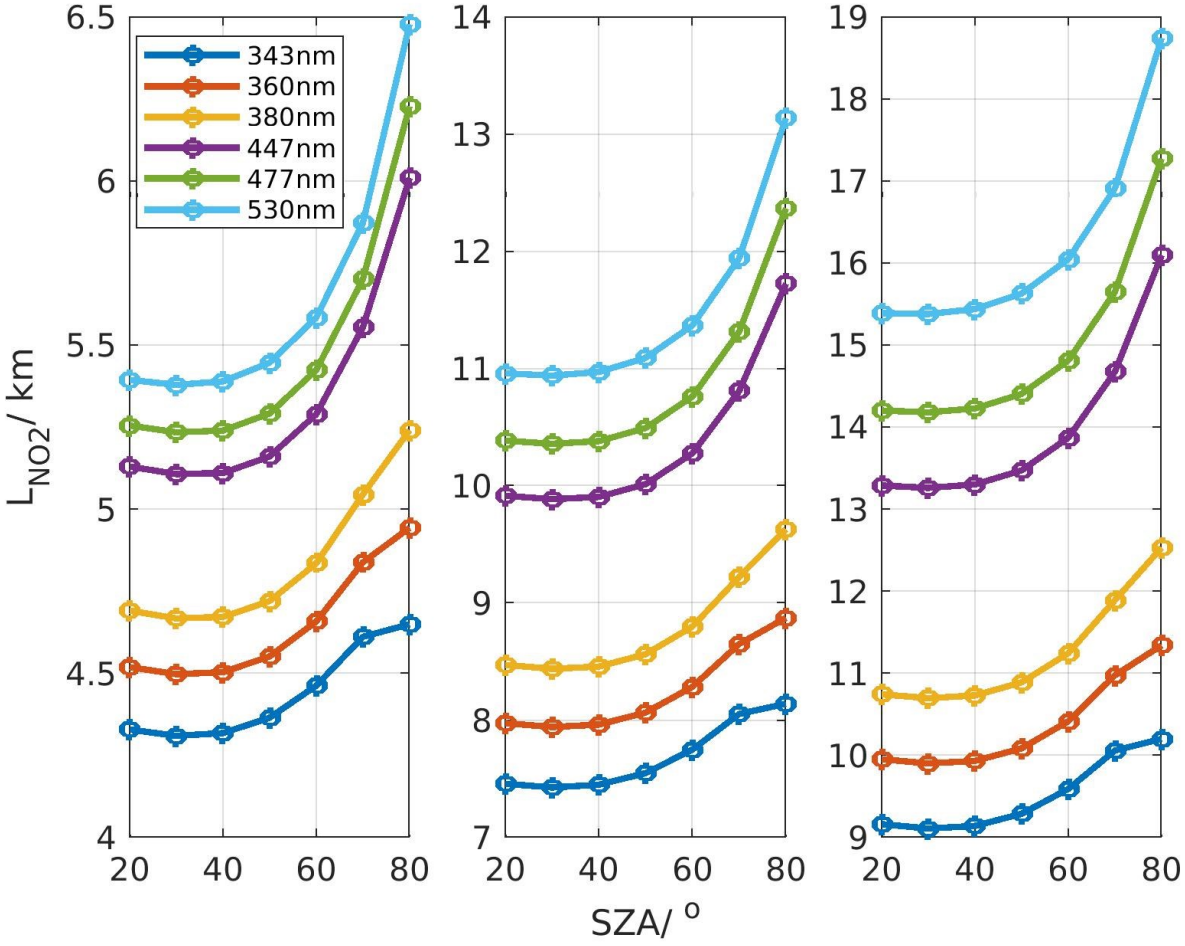


**Figure S2. Simulated $L_{NO2}$ as a function of the SZA for different $MLH_{NO2}$ values (from left to right panel: $MLH_{NO2}$ equal to 500 m, 1000 m, and 1500 m), wavelengths, one RAA value (60°), and one AOD value (0.3).**

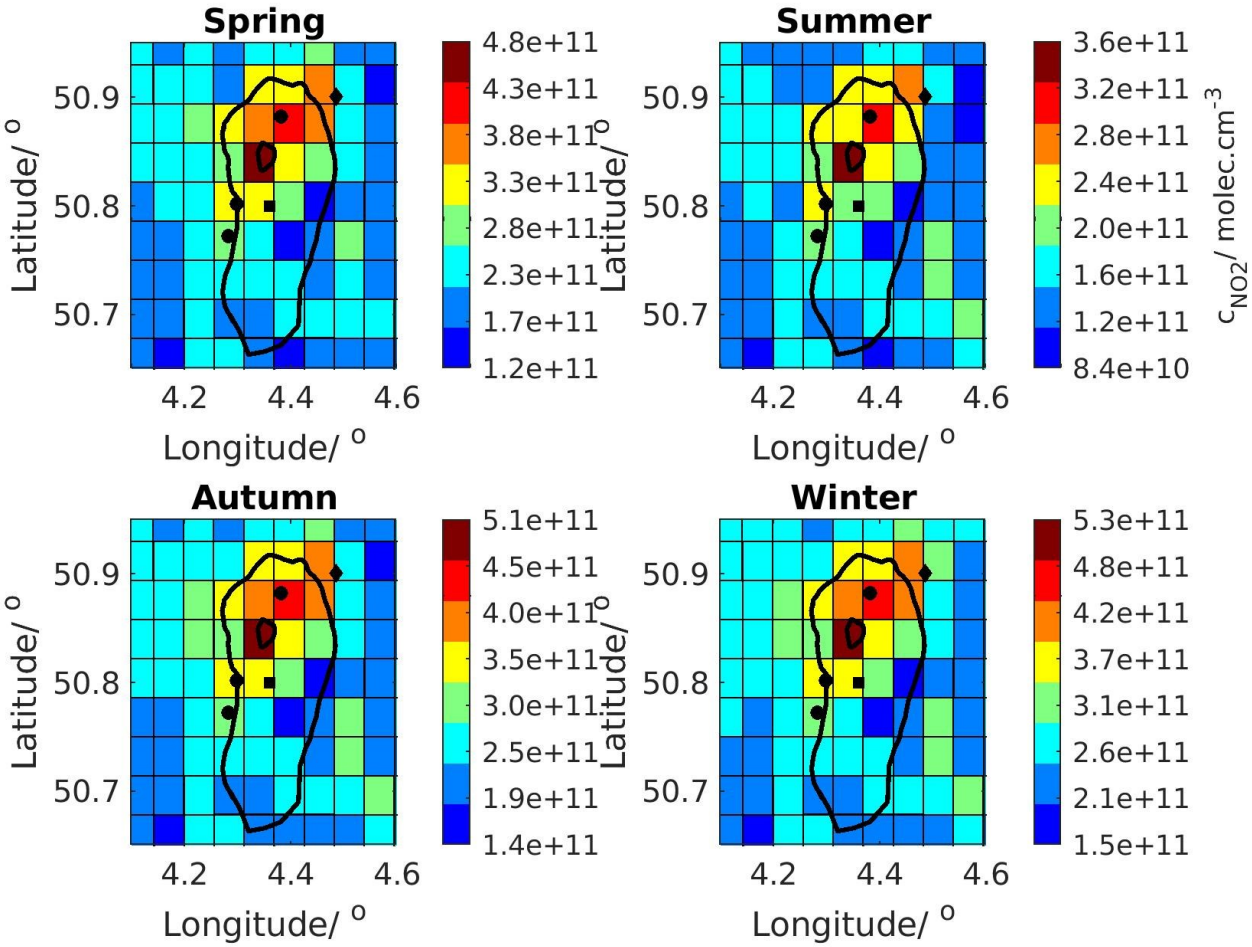


**Figure S3. Seasonal near-surface $NO_2$ concentration grids as estimated over Brussels by the RIO air-quality model. The black square shows the MAX-DOAS position, the black polygon the National Airport, the black dots the $NO_2$ hotspots, and the black line represents the Brussels Ring motorway.**

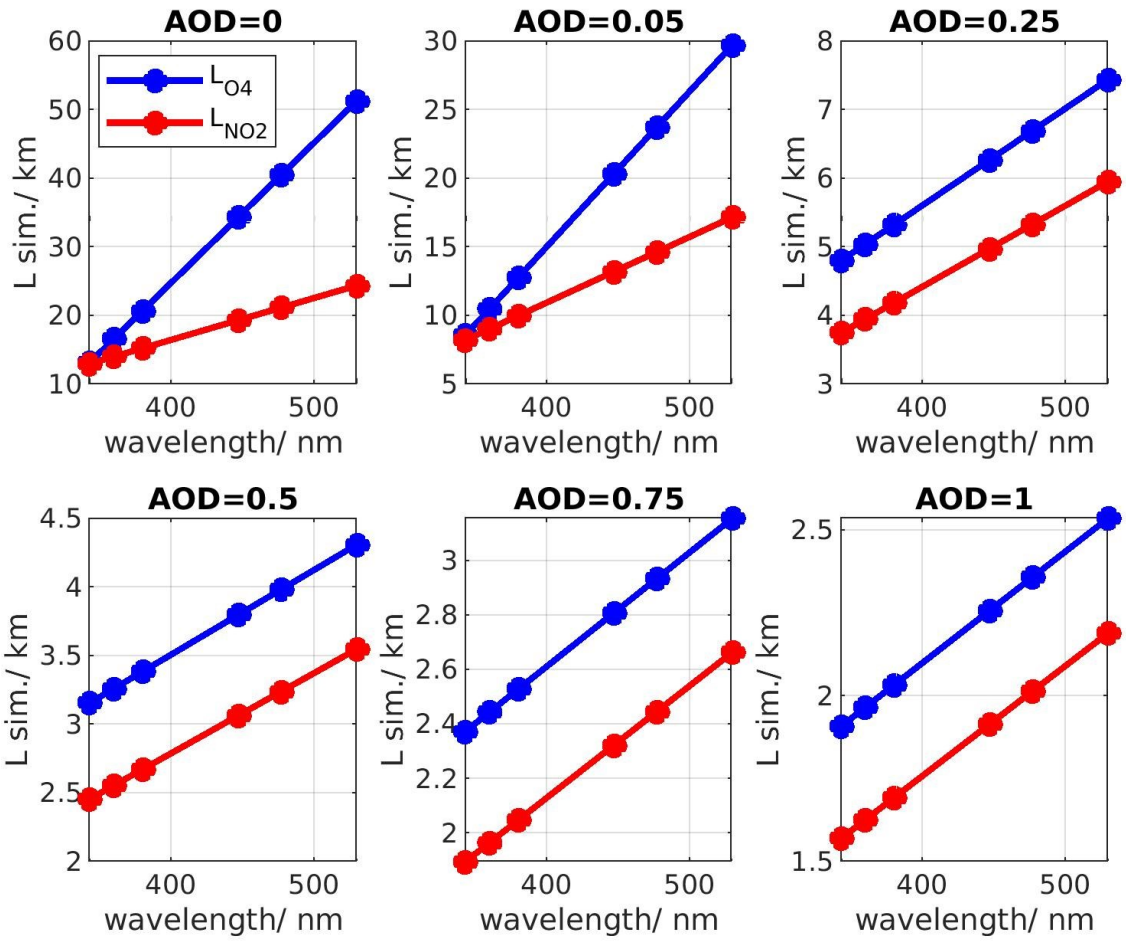


**Figure S4. Simulated differential effective light path of $O_4$ dSCDs ($L_{O4}$ sim.) and $NO_2$ dSCDs ($L_{NO2}$ sim) as a function of wavelength for different AOD scenarios.**