Supplement of

Evaluation of the LOTOS-EUROS NO_2 simulations using ground-based measurements and S5P/TROPOMI observations over Greece.

Ioanna Skoulidou[1], Maria-Elissavet Koukouli[1], Astrid Manders[2], Arjo Segers[2], Dimitris Karagkiozidis[1], Myrto Gratsea[3], Dimitris Balis[1], Alkiviadis Bais[1], Evangelos Gerasopoulos[3], Trisevgeni Stavrakou[4], Jos van Geffen[5], Henk Eskes[5] and Andreas Richter[6]

[1]Laboratory of Atmospheric Physics, Aristotle University of Thessaloniki, Greece.
[2]TNO, Climate, Air and Sustainability, Utrecht, The Netherlands.
[3]Institute for Environmental Research and Sustainable Development, National Observatory of Athens, Greece
[4]Royal Belgian Institute for Space Aeronomy, Brussels, Belgium.
[5]Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands.
[6]Institute of Environmental Physics and Remote Sensing, University of Bremen, Germany

Correspondence to: Ioanna Skoulidou (ioannans@auth.gr)

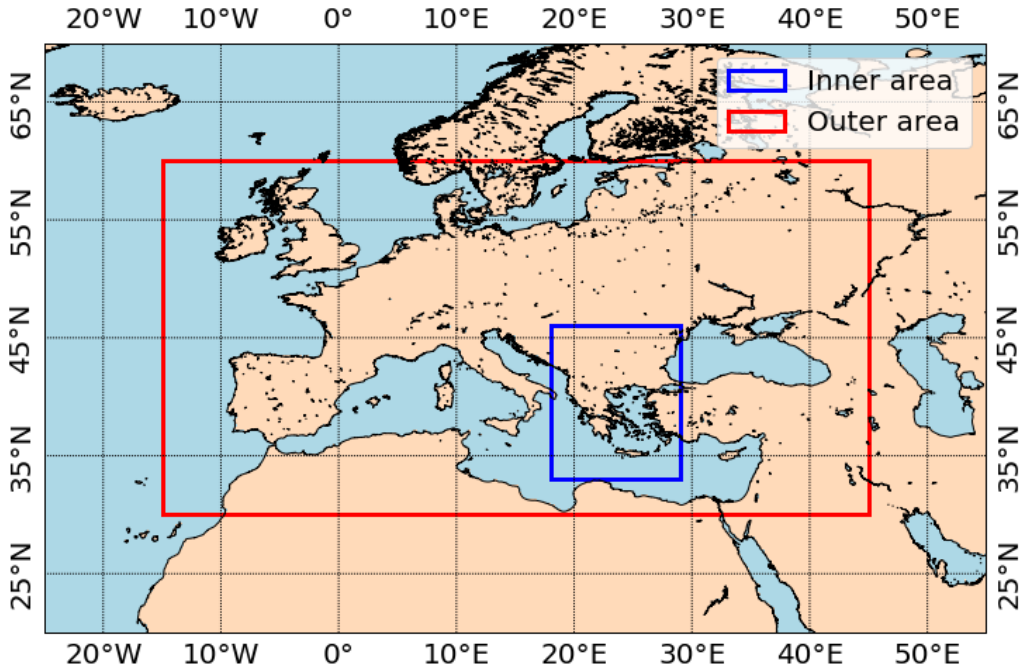

Figure S1. Map of the two domains of this study. The outer area, marked with the red colour, refers to the European domain while the inner area, marked with the blue colour, refers to the Greek domain.

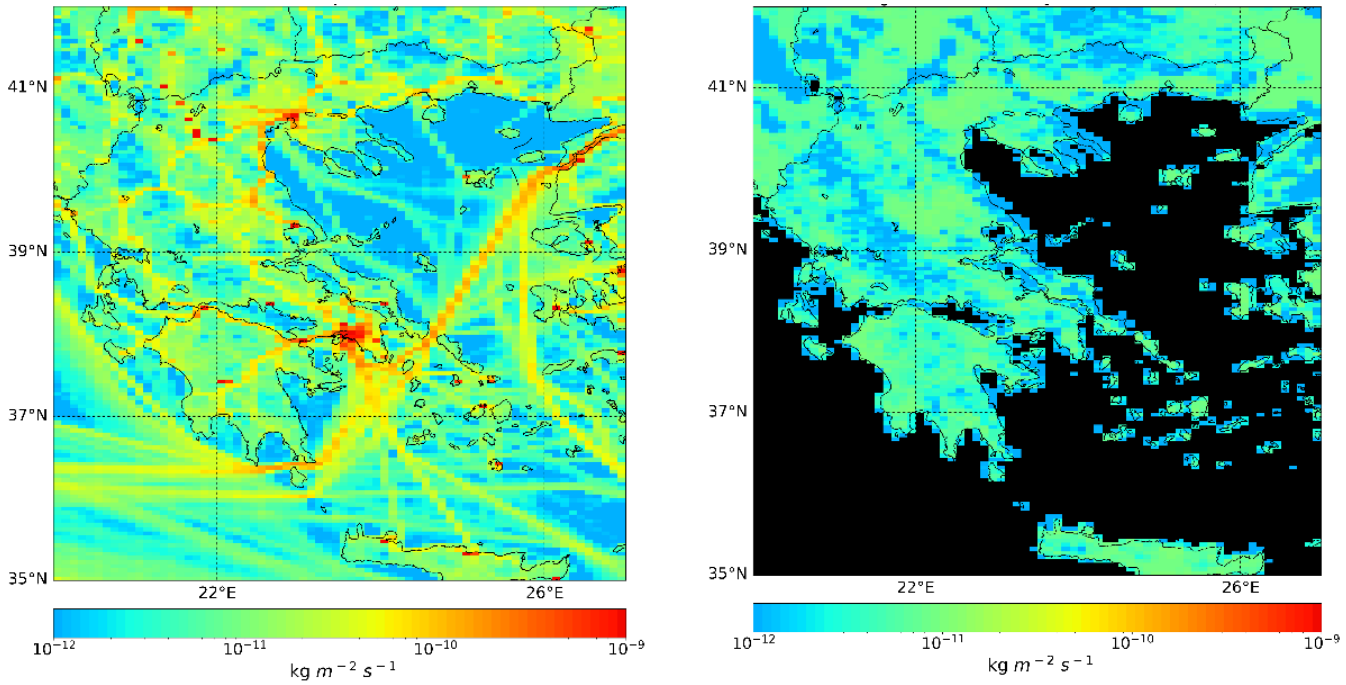

Figure S2. Aggregated anthropogenic and biogenic NO emissions in Greece for June-December 2018 (left) and biogenic (right) for the same period in logarithmic scale.

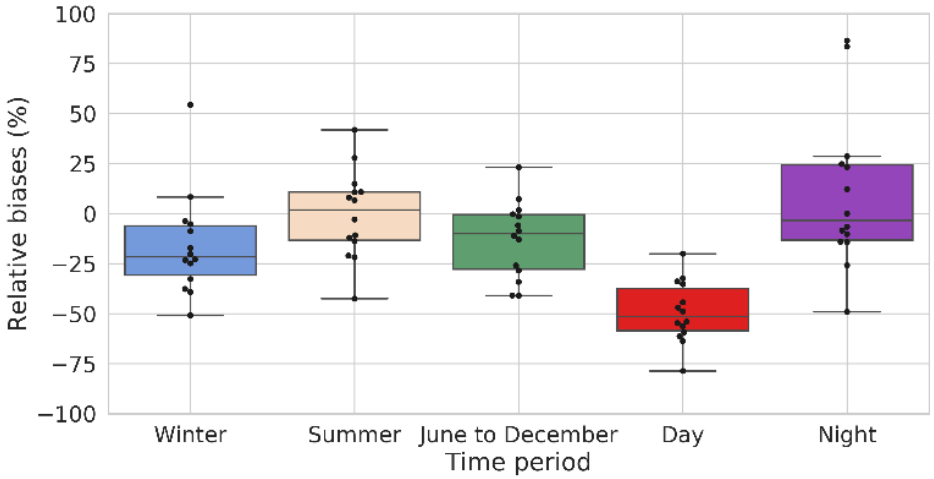

Figure S3. Box and whisker plots of the relative biases between the simulated and observed NO_2 concentrations for the 14 station used for the validation during the five different periods; June to December (green box), daytime (red box), night-time (purple box), summer (orange box) and winter (blue box). The boxes extend from the lower to upper quartile values of the biases while the horizontal line in each box represents the median. The whiskers extend from the box to show the range of the data and outliers past the end of the whiskers.

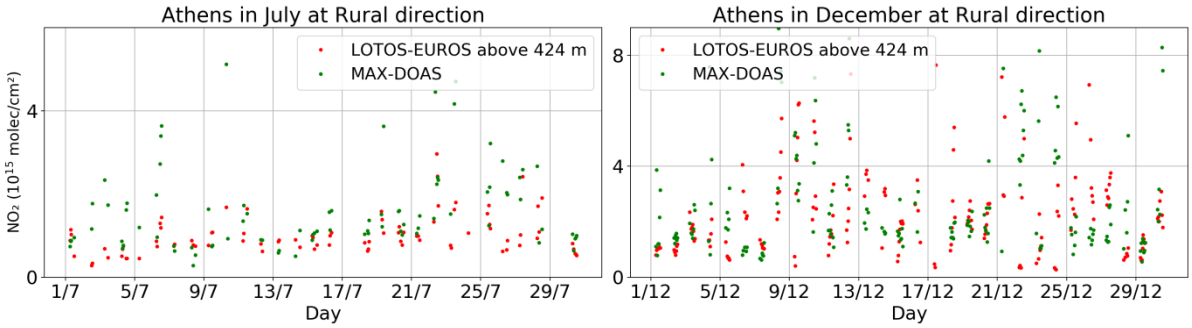

Figure S4. Time series of LOTOS-EUROS (red) and MAX-DOAS (green) NO_2 columns over Athens for July (left) and December (right) 2018 in rural direction.

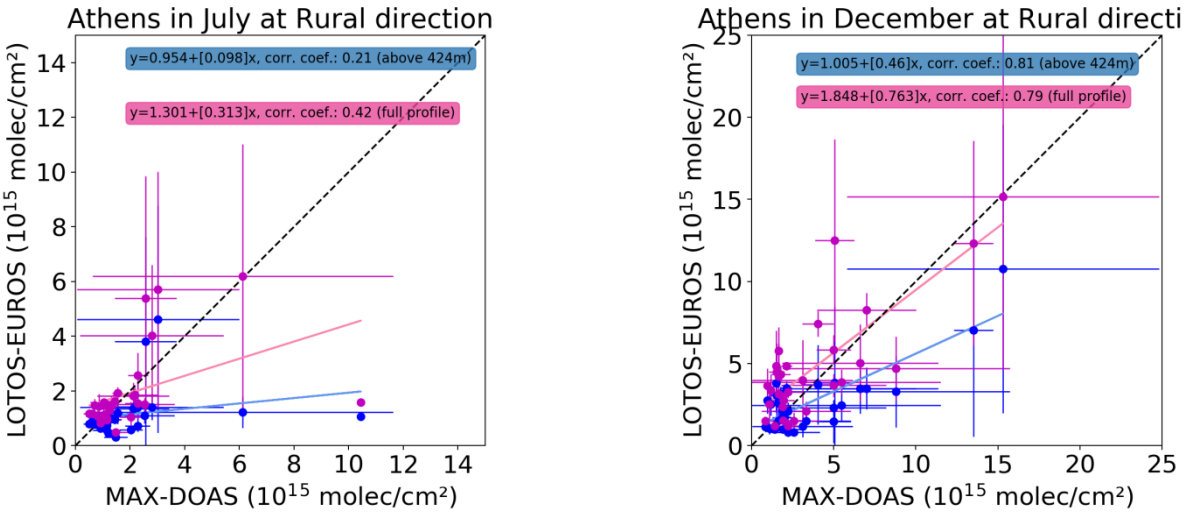

Figure S5. Scatter plots between daily LOTOS-EUROS integrated column above 424 m (blue) and full profile (magenta) with MAX-DOAS NO_2 columns in Athens for July (left) and December 2018 (right) for the rural direction. The linear regression equation and the correlation coefficient between the model and the observed data are given in the top right of each plot.

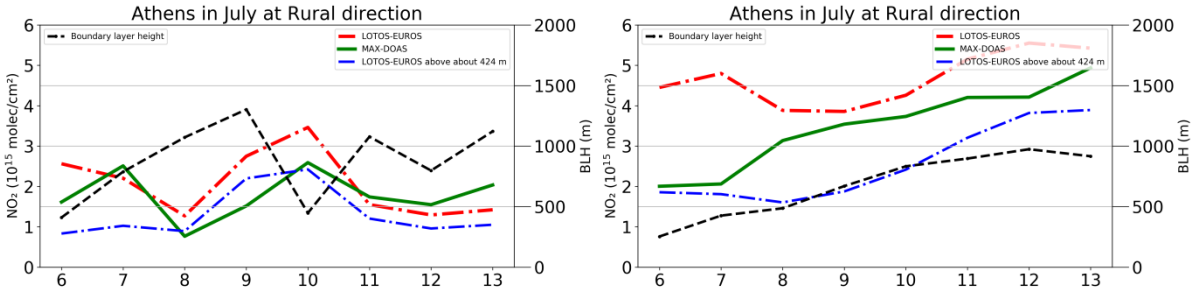

Figure S6. Average diurnal cycle of the MAX-DOAS in Athens (green line), LOTOS-EUROS full-profile (red line) NO_2 columns, LOTOS-EUROS partial NO_2 columns (blue line) and boundary layer height (black line) during July (left) and December (right) for rural direction (bottom).

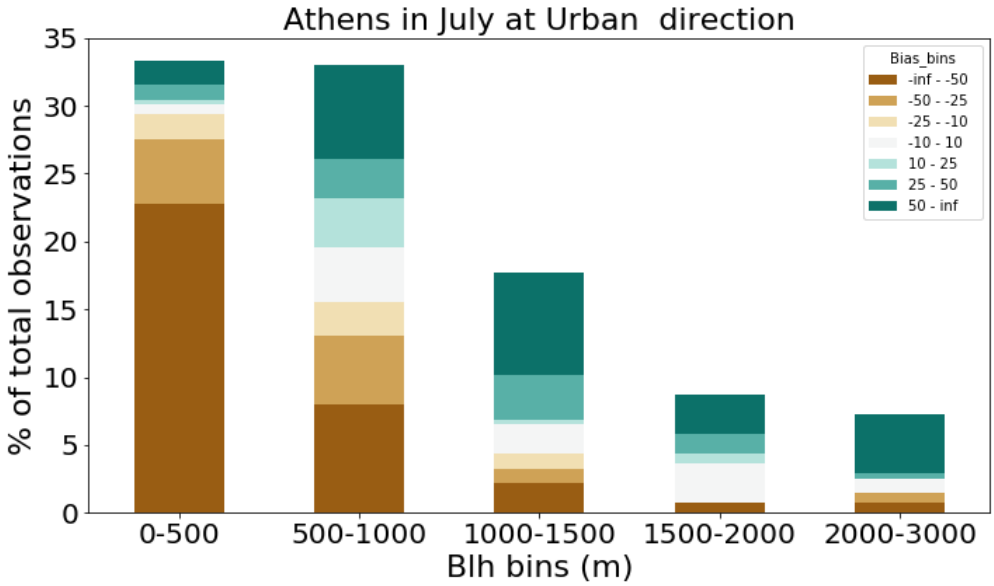

Figure S7. Bar plots of the relative biases between the LOTOS-EUROS partial column and the MAX-DOAS measurements during July for the urban direction. The y-axis refers to the percentage of occurrences of biases.