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Figure S1 Top: Time series of deseasonalized mothly NO2 columns from OMI/AURA for the period between 2005 and 2020 at the pixel where Ag. Dimitrios is located. Bottom: Time series of mean annual NO2 columns from OMI/AURA at the same location. The shaded area denotes the standard deviation of the mean values and the trend is shown in blue.

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**Figure S2.** Timeseries of NO2 hourly measurements (blue dots) in the station of Florina and the daily mean NO2 (orange line) for the summer of 2018 (top) and 2019 (bottom).

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**Figure S3.** Timeseries of NO2 hourly measurements (blue dots) in the station of Amyntaio and the daily mean NO2 (orange line) for the summer of 2018 (top) and 2019 (bottom).

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**Figure S4 (a)** Seasonal averaged NO2 tropospheric columns in summer 2018 from S5P/TROPOMI retrieval**; (b)** LOTOS-EUROS NO2 tropospheric simulation in summer 2018 after the averaging kernels of the satellite product are applied.

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**Figure S5 (a)** Aggregated NOx *a priori* emissions over the four grid pixels in Northwest Greece in summer 2018 used for the base run; **(b)** Aggregated NOx *a posteriori* emissions assimilated using S5P/TROPOMI observations over the four grid pixels in Northwest Greece as in summer 2018.

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**Figure S6 (a)** Diurnal variability of NOx *a priori* emissions and *a posteriori* NOx emissions derived from TROPOMI assimilation over the grid pixel the power plants of Kardia (top), Amyntaio (middle) and Meliti (bottom) are located in summer 2018; **(b)** the same for summer 2019.

**Table S1.** Statistics of the comparison of LOTOS-EUROS surface simulations with the *a priori* emissions (base run) and the simulations with the *a posteriori* emissions (assimilated) with in situ surface measurements in summer 2018. P.P. refers to power plant.

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| **Air Quality stations** | **Emission sources** | **Seasonal mean (μg/m3) ±std** | | | **Bias (μg/m3)** | |
| **Measurements** | **Base run** | **Assimilated** | **Base run** | **Assimilated** |
| Koilada | P.S. Ag. Dimitrios | 6.22±3.93 | 14.68±10.70 | 9.05±6.98 | 8.46 | **2.83** |
| Filotas | Town of Filotas/ P.P. Amyntaio | 5.05±3.74 | 5.46±4.65 | 4.93±4.43 | 0.40 | -**0.13** |
| Amyntaio | Town of Amyntaio/ P.S. Amyntaio | 6.37±3.82 | 7.50±7.35 | 7.22±7.55 | 1.13 | **0.85** |
| Meliti | Town of Meliti/P.P. Meliti/ P.P. Bitola | 10.93±11.05 | 6.38±5.53 | 5.30±4.94 | -4.54 | -5.63 |
| Florina | Town of Florina | 5.90±2.67 | 6.49±6.13 | 4.74±4.81 | 0.59 | -1.15 |

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**Figure S 7** Windroses for the pixels around around the power plant and city of Bitola in summer 2018.

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**Figure S 8** Windroses for the pixels around around the power plant and city of Bitola in summer 2019.

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**Figure S 9** Windroses for the pixels around the power plant and city of Meliti in summer 2018 (top) and 2019 (bottom).