



Supplement of

Long-term evaluation of surface air pollution in CAMSRA and MERRA-2 global reanalyses over Europe (2003–2020)

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Figure S1. Evaluation of O_3 over Europe depicting: a) Monthly time series of $[O_3]$, nMB, nRMSE and PCC over the period 2003-2020; b) Spatially-averaged $[O_3]$, nMB, nRMSE and PCC for countries with at least 5 cells with observations; c) Mean $[O_3]$ climatology in CAMSRA; d) Mean $[O_3]$ climatology in MERRA-2; e) Differences in Mean $[O_3]$ climatology between CAMSRA and MERRA-2. Black, green and blue colors in a) and b) indicate observations, CAMSRA and MERRA-2, respectively. Numbers between parentheses in b) indicate the cells with available observations. Only PCC values in the range 0-1 are displayed in b). Statistically significant trends, at a 99 % confidence level, are displayed in a). Dotted areas in e) indicate where the differences are not statistically significant at a 99 % confidence level, whereas the black dashed contour stands for a zero difference in concentration between reanalyses.



Figure S2. Evaluation of NO₂ over Europe depicting: a) Monthly time series of $[NO_2]$, nMB, nRMSE and PCC over the period 2003-2020; b) Spatially-averaged $[NO_2]$, nMB, nRMSE and PCC for countries with at least 5 cells with observations; c) Mean $[NO_2]$ climatology in CAMSRA. Black and green colors in a) and b) indicate observations and CAMSRA, respectively. Numbers between parentheses in b) indicate the cells with available observations. Statistically significant trends, at a 99 % confidence level, are displayed in a).



Figure S3. Similar to Fig. S1 but for CO.



Figure S4. Similar to Fig. S1 but for SO₂.



Figure S5. Similar to Fig. S1 but for PM₁₀.



Figure S6. Similar to Fig. S1 but for PM_{2.5}.



Figure S7. a) Spatially-averaged $[O_3]$, nMB, nRMSE and PCC for all countries reporting data to the EEA evaluated against rural background stations; b) Same as a) but for NO₂. Black, green and blue colors indicate observations, CAMSRA and MERRA-2, respectively. Numbers between parentheses indicate the rural cells with available observations.



Figure S8. Same as Fig. S7 but for CO, a), and SO₂, b).





Figure S9. Same as Fig. S7 but for PM_{10} , a), and $PM_{2.5}$, b).





Figure S10. a) Spatially-averaged $[O_3]$, nMB, nRMSE and PCC for all countries reporting data to the EEA evaluated against urban background stations; b) Same as a) but for NO₂. Black, green and blue colors indicate observations, CAMSRA and MERRA-2, respectively. Numbers between parentheses indicate the urban cells with available observations.



Figure S11. Same as Fig. S10 but for CO, a), and SO₂, b).





Figure S12. Same as Fig. S10 but for PM_{10} , a), and $PM_{2.5}$, b).





Figure S13. Reconstruction of the $[PM_{10}]$ field in MERRA-2 over the period 2003-2020 according to four different sources. The differences between Buchard et al. (2016) and Provencal et al. (2017a) are barely distinguishable due to the large overestimation of sea salt and dust concentration in both cases.