Supplement of

Tracking daily NO$_x$ emissions from an urban agglomeration based on TROPOMI NO$_2$ and a local ensemble transform Kalman filter

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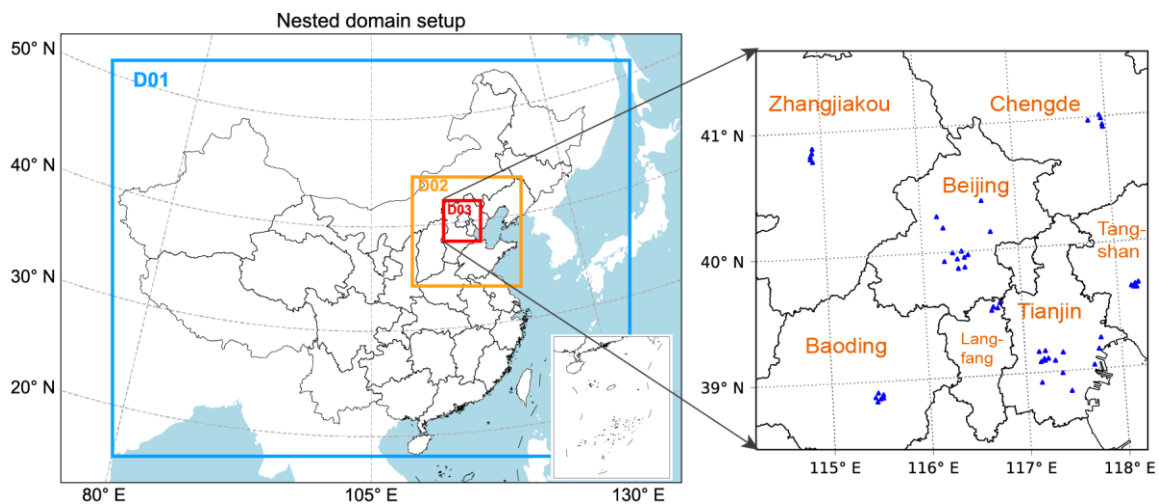
Figure S1. The nested domains for CMAQ modeling and inversion. The domain D03 is the area for NO_x emission inversion that covers Beijing and its surroundings. The blue triangles in the domain D03 are the locations of the air quality monitoring stations used for evaluation in this study.
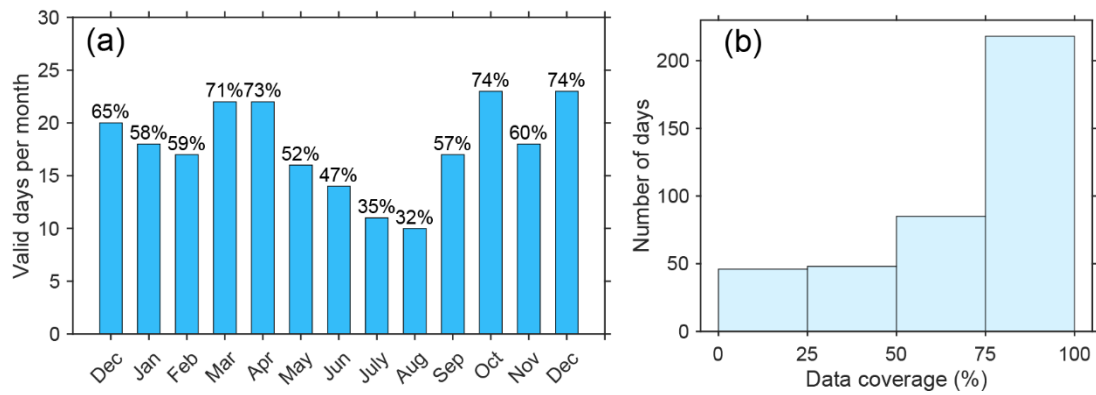
Figure S2. **Number of days with TROPOMI coverage exceeding 70% per month (a), and the TROPOMI data coverage histogram (b).**

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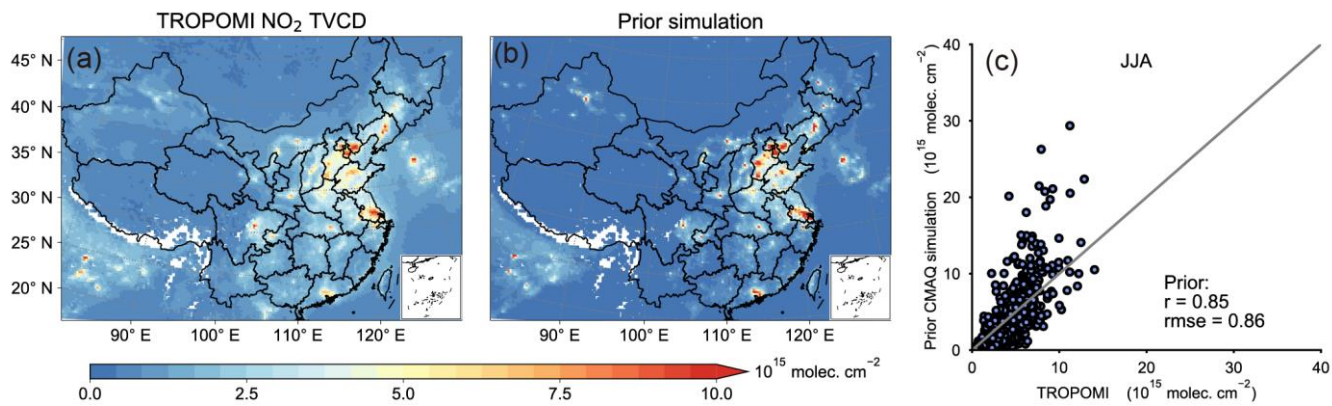


Figure S3. Comparison between TROPOMI NO₂ TVCD and CMAQ-modeled NO₂ TVCDs driven by the prior emissions in the D01 region at 27 km scale during the summer (June-July-August). The third column is the scatter plot for comparison at grid scales.

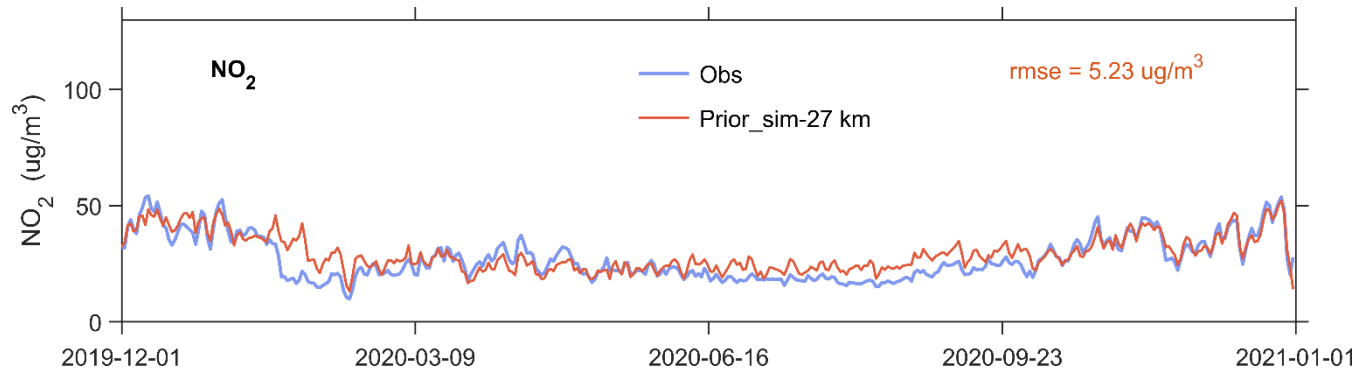



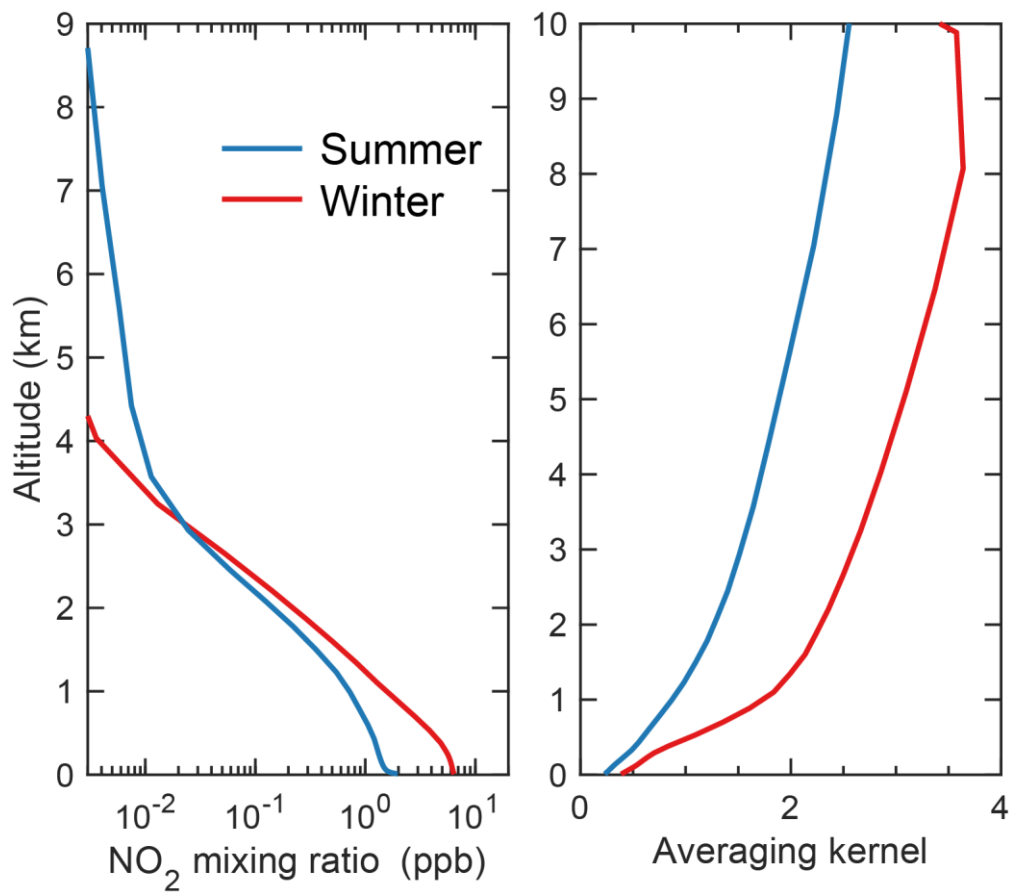
Figure S4. Comparison of the ground-based daily NO₂ observations with the CMAQ simulations in the domain D01 at the 27 km scale utilizing the bottom-up NO$_x$ emissions as the model input.

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Figure S5. NO₂ profiles (a) and AK profiles (b) in Summer and Winter averaged from the domain D03.
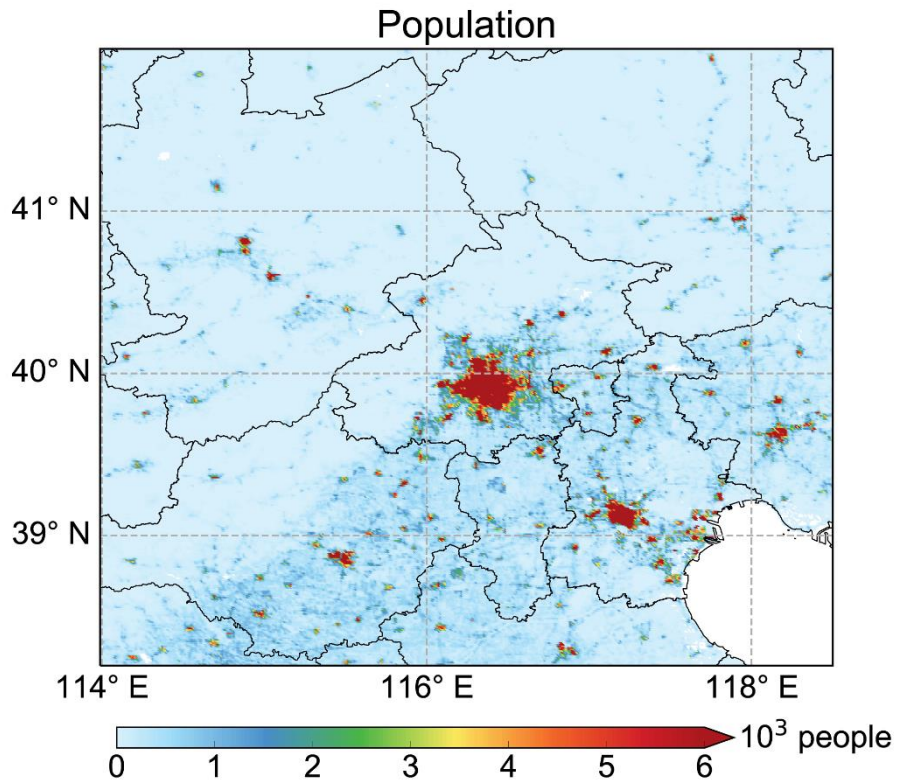
Figure S6. Spatial map of the population in Beijing and surrounding areas. The population data are obtained from WorldPop (https://www.worldpop.org/).
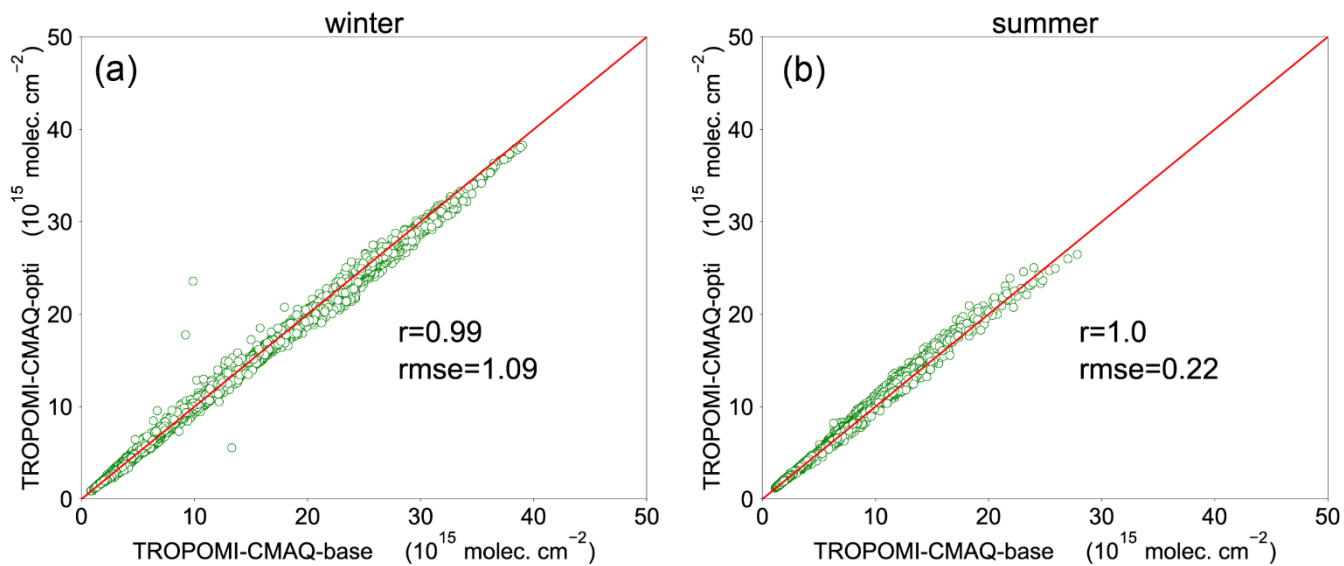
Figure S7. Comparison of the new satellite products calculated based on the CMAQ profiles simulated by the prior (X-axis) **and posterior (Y-axis) emissions in winter (a) and summer (b).**