



Supplement of

Satellite detection of NO₂ distributions using TROPOMI and TEMPO and comparison with ground-based concentration measurements

Summer Acker et al.

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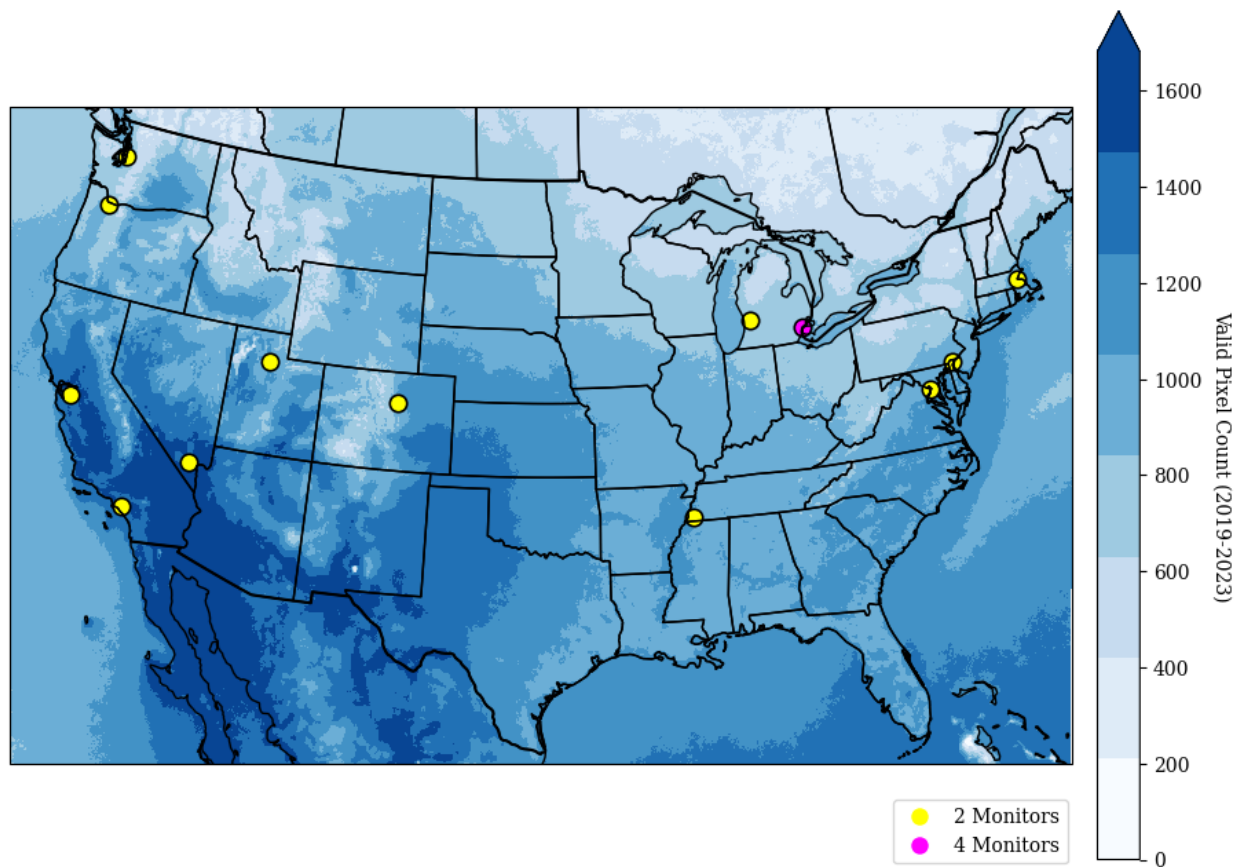


Fig. S1. Number of monitors per $4 \text{ km} \times 4 \text{ km}$ TROPOMI grid cell and valid TROPOMI retrieval counts from 2019 to 2023. Colored points indicate TROPOMI pixels containing more than one ground monitor, with yellow representing pixels containing two monitors and purple representing pixels containing four monitors. The background shading represents the number of days each TROPOMI pixel had valid NO₂ retrievals over the 2019–2023 period, with darker shades indicating more valid retrievals.

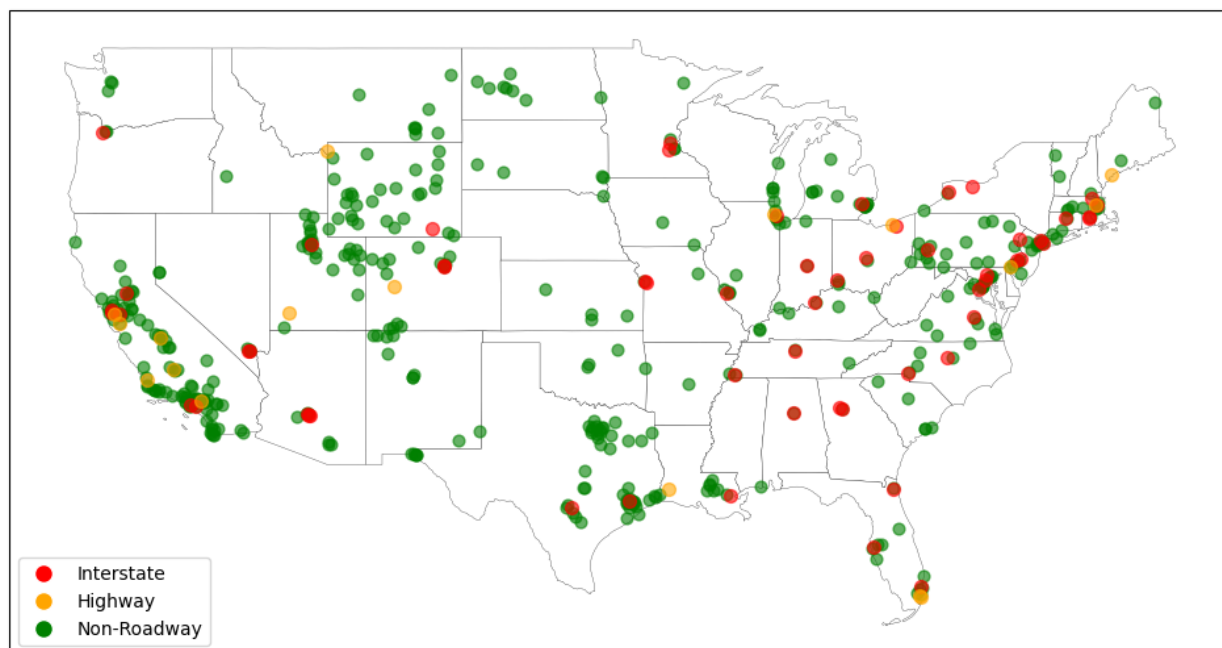


Fig. S2. All U.S. EPA AQS NO₂ ground-based monitors classified as non-roadway (green), interstate (red), and highway (orange).

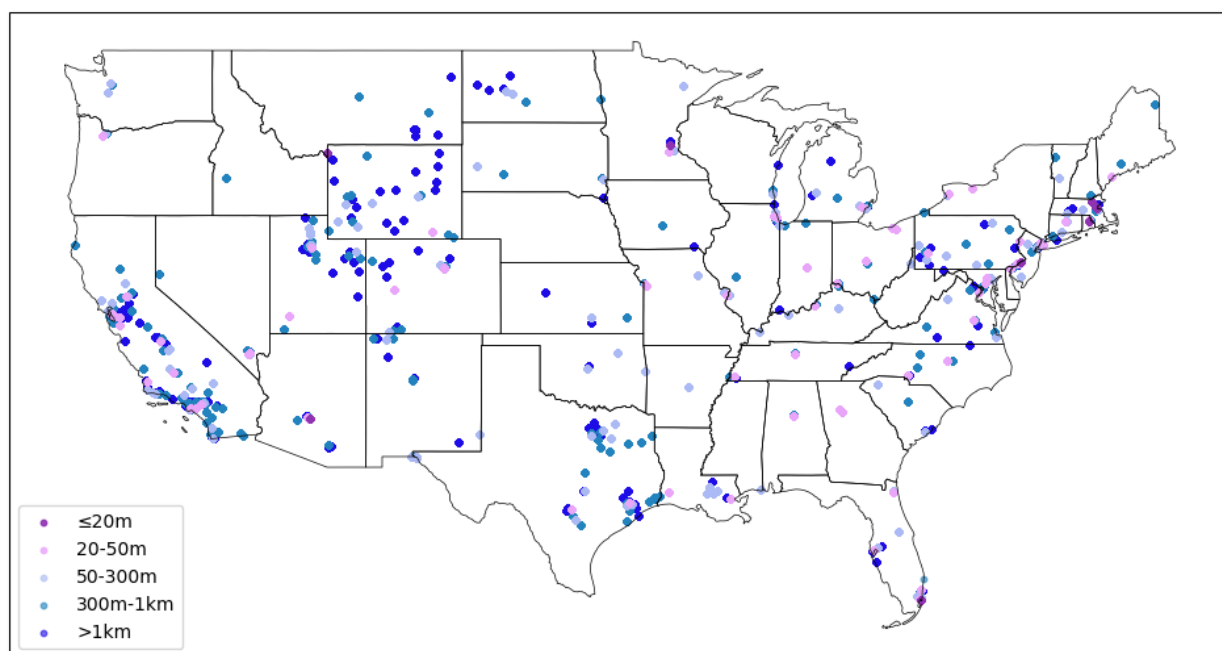


Fig. S3. All U.S. EPA AQS NO₂ ground-based monitors classified by their distance from a major roadway: monitors less than or equal to 20m from a road (purple), between 20 and 50m from a road (lilac), between 50 and 300m (periwinkle), between 300m and one kilometer (blue), and greater than one kilometer from a road (dark blue).

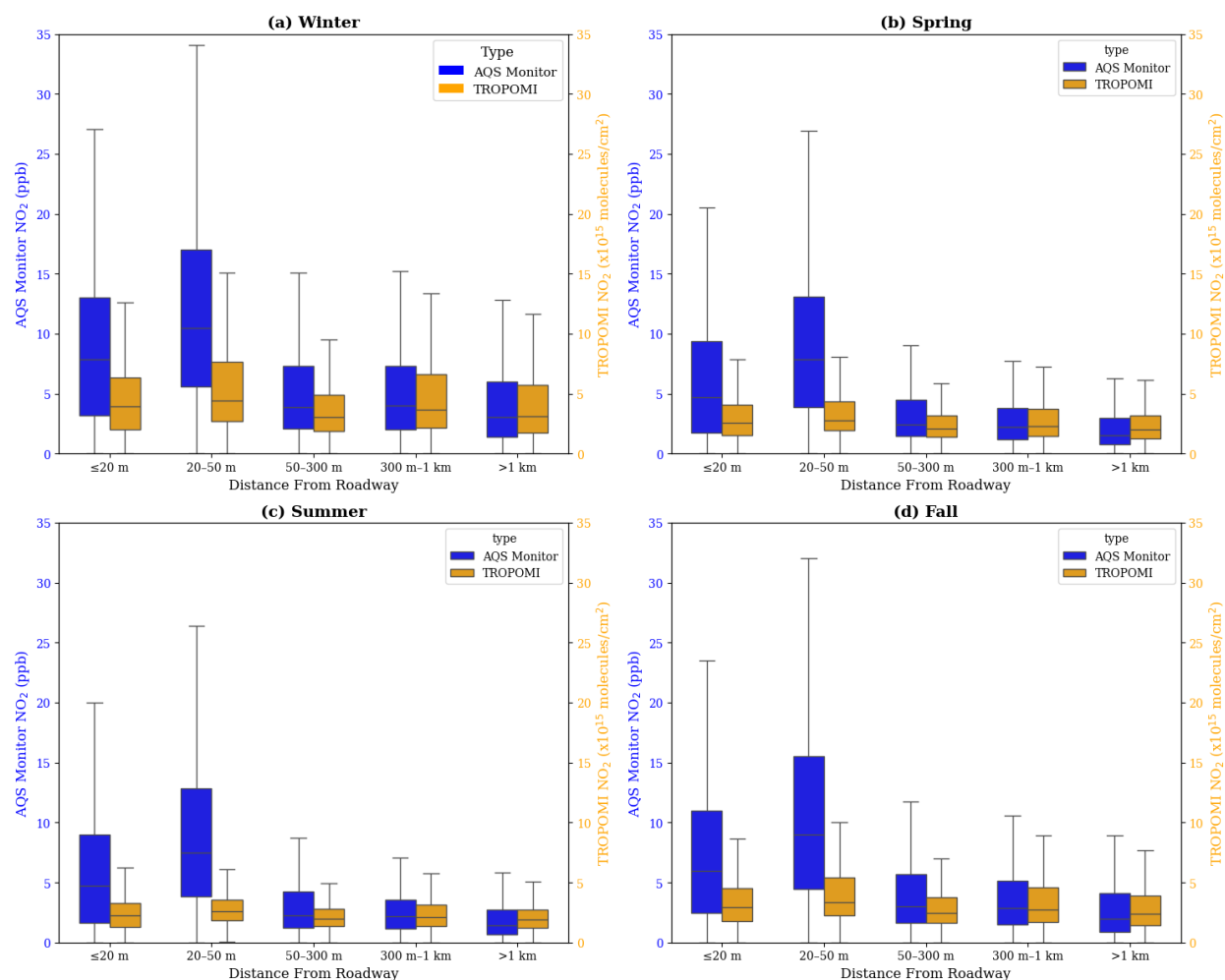


Fig. S4. Box plots show median and interquartile ranges of all daily 2019 to 2023 NO₂ as measured by AQS monitors (blue) and TROPOMI (orange) across various distances from roadways, with the whiskers extending to the 1.5 IQR range, separated by season: a) winter, b) spring, c) summer, and d) fall. No outliers are shown. The left y-axis represents AQS monitor values in parts per billion (ppb), and the right y-axis represents TROPOMI NO₂ values in 10¹⁵ molecules per cm². The distance categories from the roadway include ≤ 20m, 20-50m, 50-300m, 300m-1km, and > 1km.

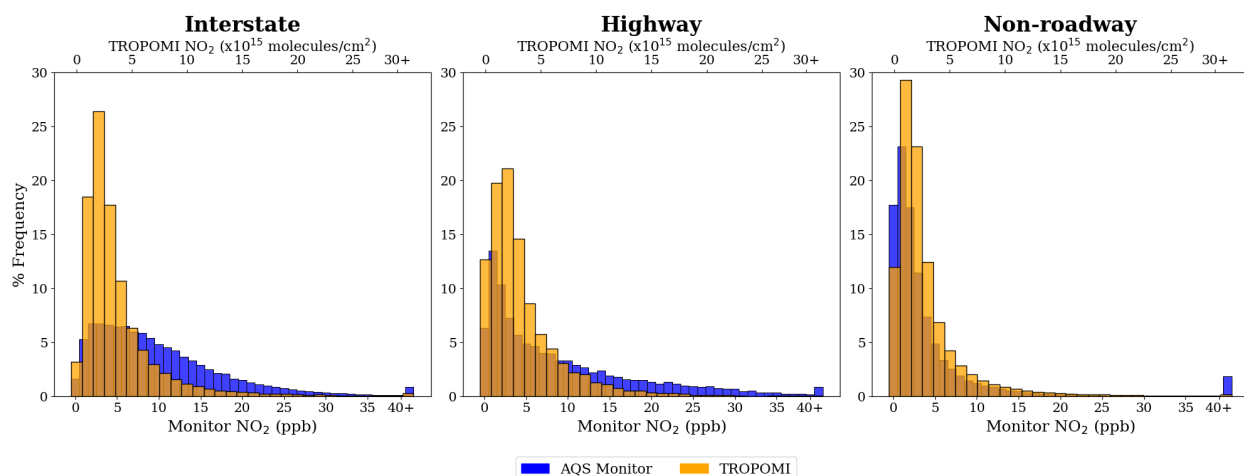


Fig. S5. Distribution of 2019-2023 NO₂ measured by AQS ground-based monitors (blue) and TROPOMI (orange) across three monitor classifications, where roadway monitors are classified as being within 50 meters of a roadway: Interstate, Highway, and Non-roadway. The primary, lower x-axis shows the monitor NO₂ concentrations in parts per billion (ppb) and a secondary, upper x-axis shows satellite NO₂ VCD in 10¹⁵ molecules per cm². The y-axis represents the percent frequency of NO₂ observations within each NO₂ bin.

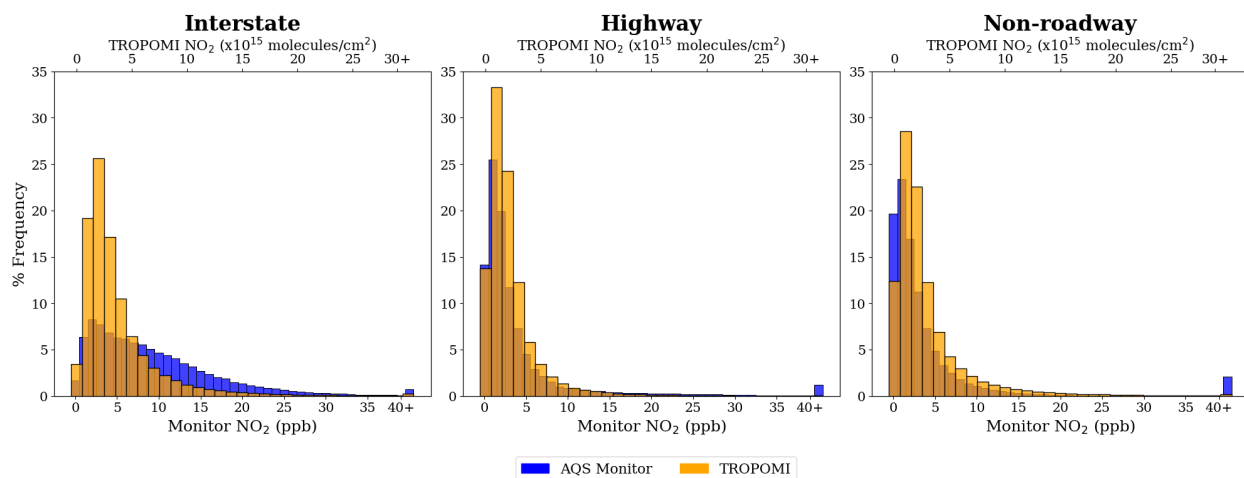


Fig. S6. Distribution of 2019-2023 NO₂ measured by AQS ground-based monitors (blue) and TROPOMI (orange) across three monitor classifications, where roadway monitors are classified as being within 300 meters of a roadway: Interstate, Highway, and Non-roadway. The primary, lower x-axis shows the monitor NO₂ concentrations in parts per billion (ppb) and a secondary, upper x-axis shows satellite NO₂ VCD in 10¹⁵ molecules per cm². The y-axis represents the percent frequency of NO₂ observations within each NO₂ bin.