



Supplement of

Direct observations of NO_x emissions over the San Joaquin Valley using airborne flux measurements during RECAP-CA 2021 field campaign

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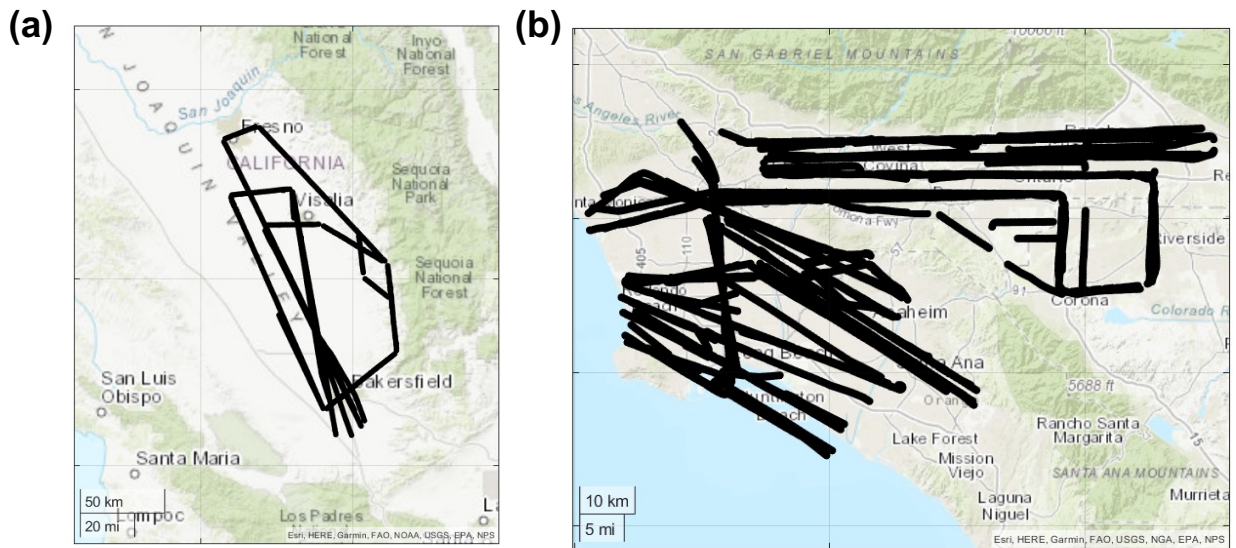


Figure S1: RECAP flight patch over San Joaquin Valley (a) and Los Angeles (b), consisting of 7 flights and 9 flights, respectively.

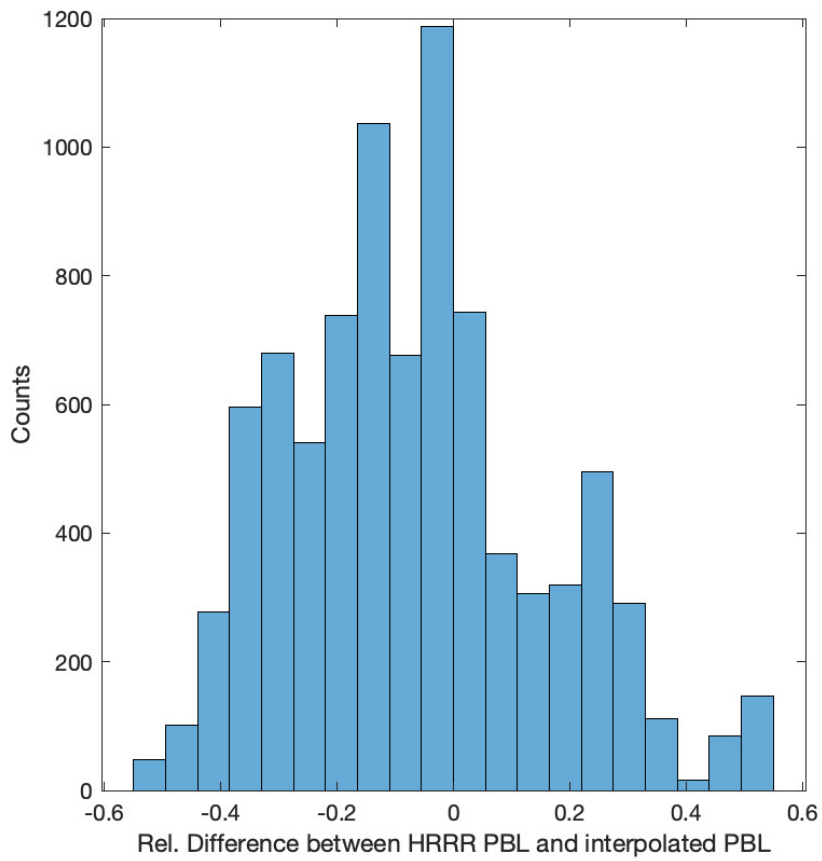


Figure S2: The distribution of relative difference between PBL height from HRRR and interpolated PBL height from the measurements.

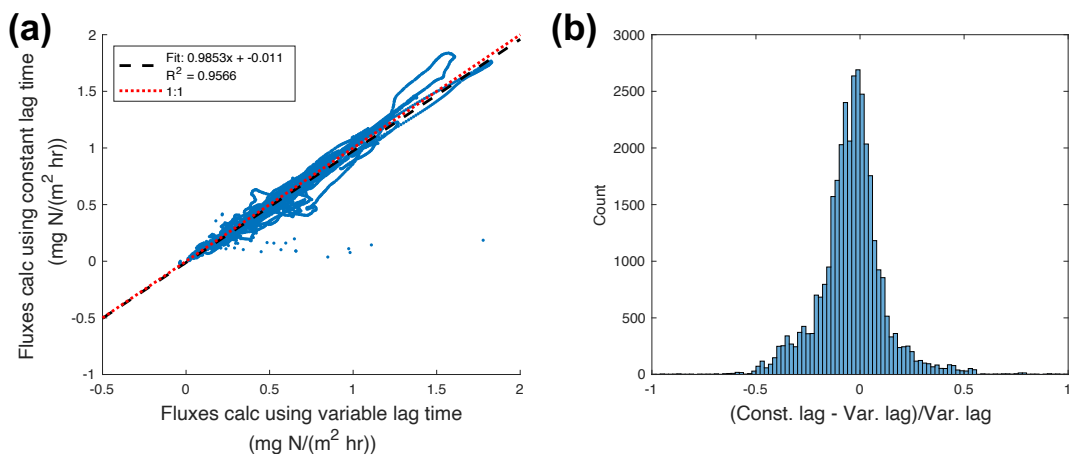


Figure S3: a) the comparison of calculated fluxes using various and constant lag time. b) corresponds the relative difference of fluxes.

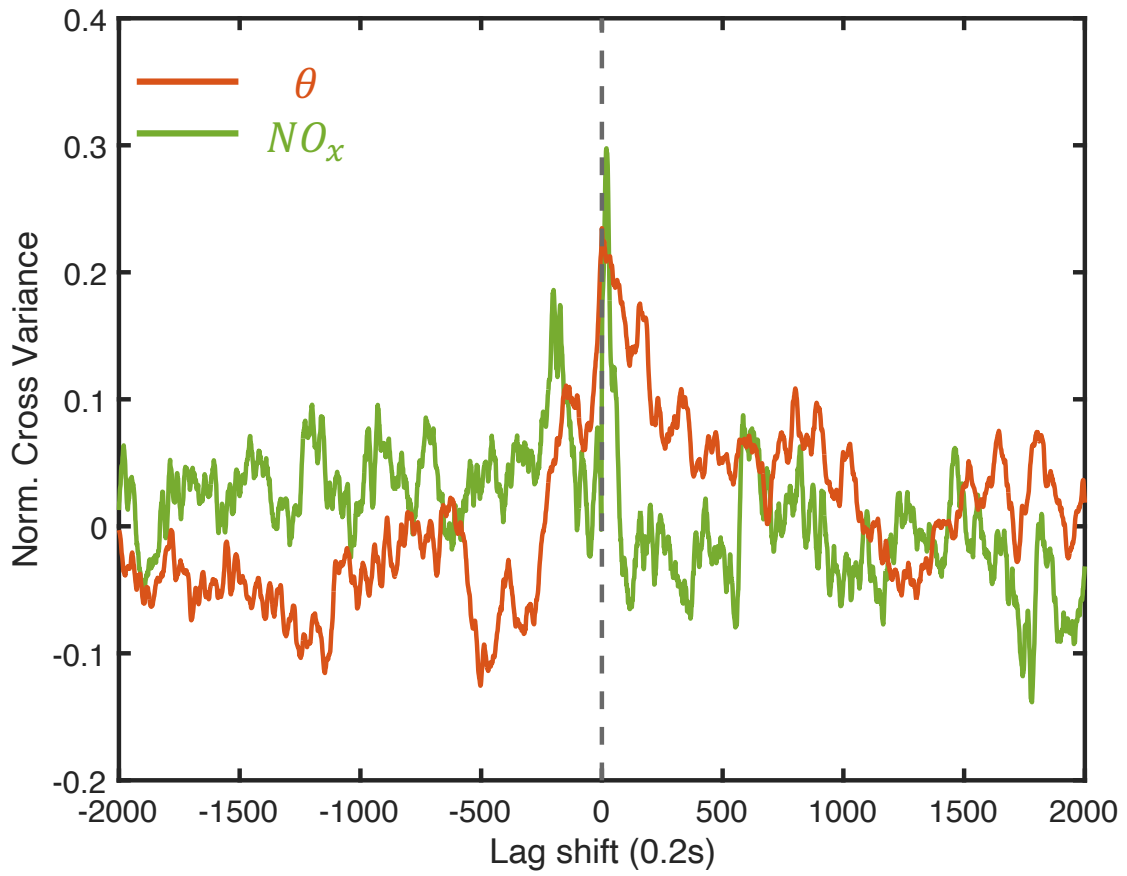


Figure S4: The normalized covariance peak for NO_x and potential temperature (θ).

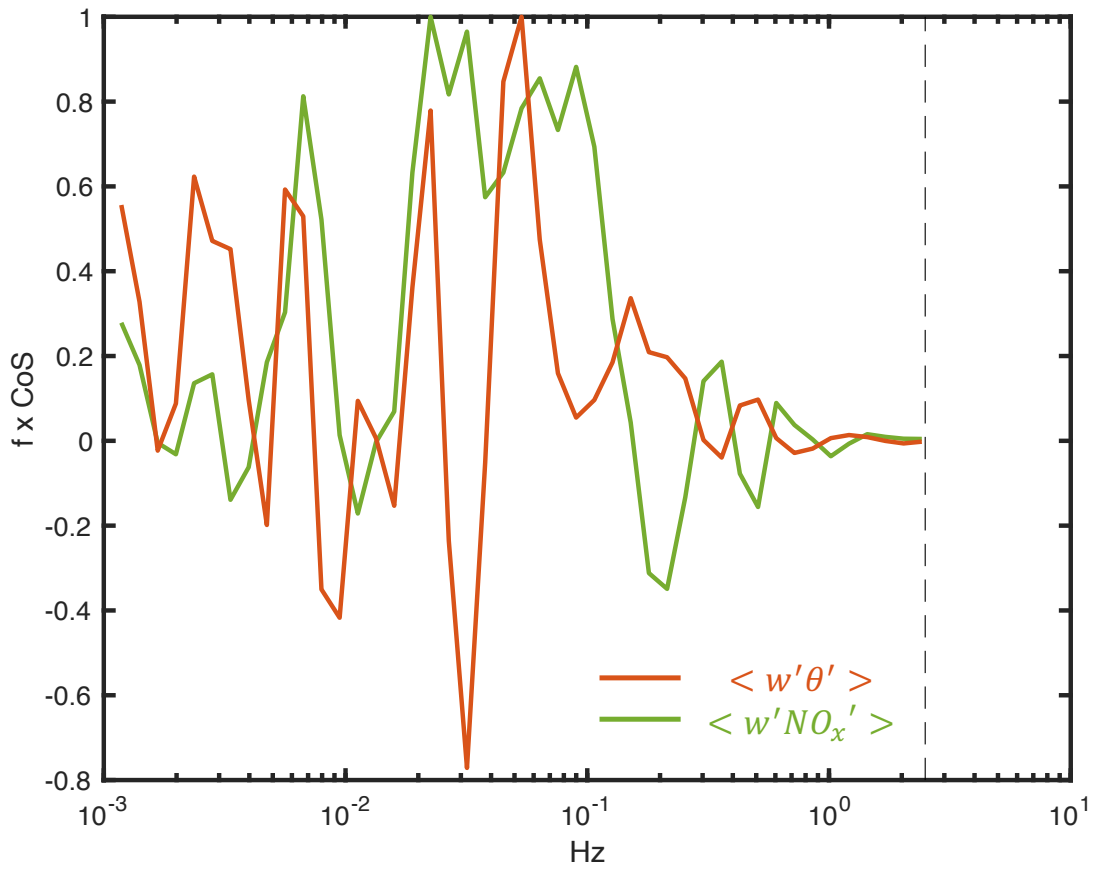


Figure S5: Normalized co-spectra of NO_x and heat flux. The black dashed represents the Nyquist frequency for NO_x flux.

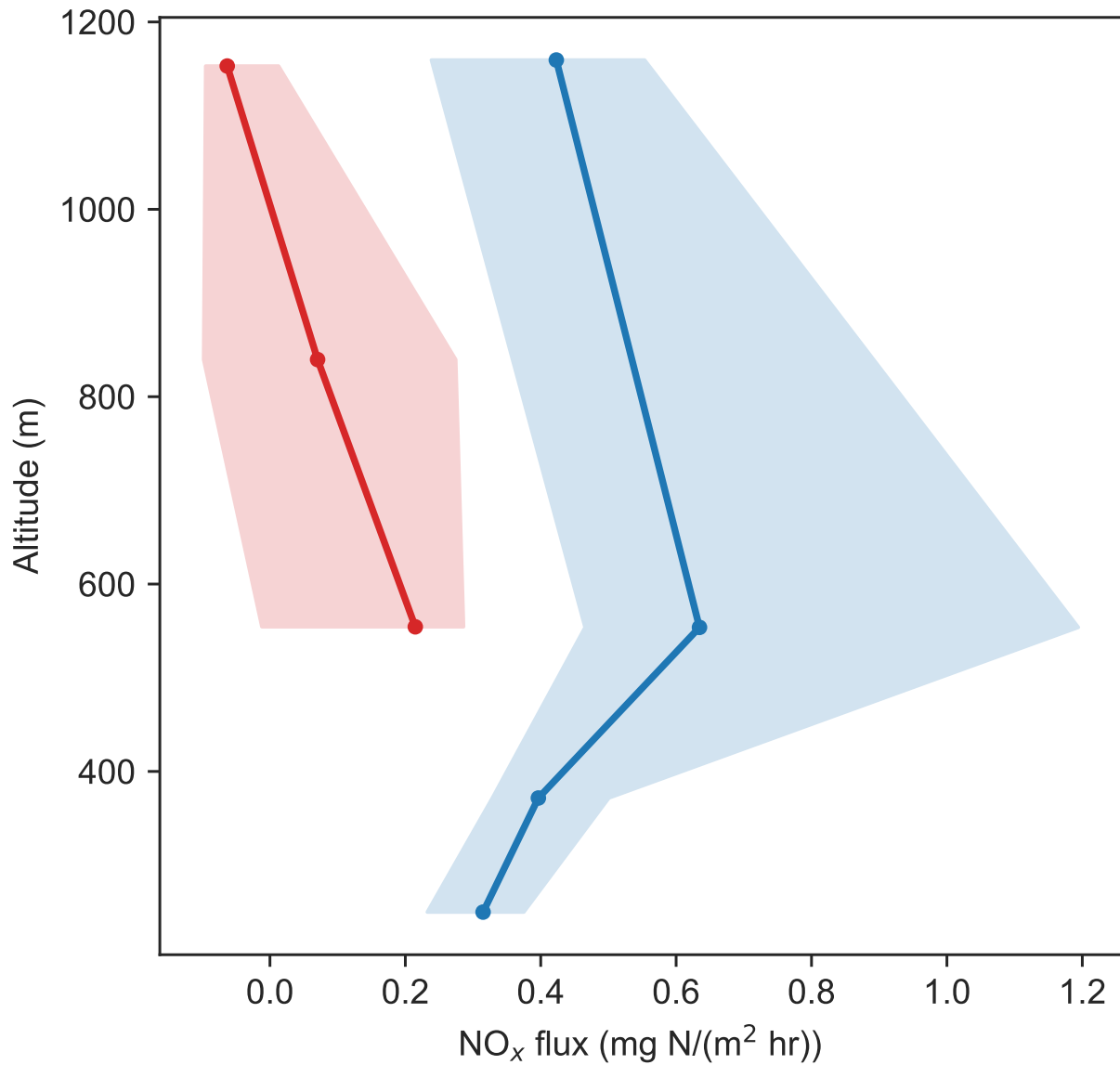


Figure S6: Vertical distribution of observed flux during racetrack, separated by the west patch (red) and east patch (east). The dot represents the median flux and the shade refers to the interquartile range.

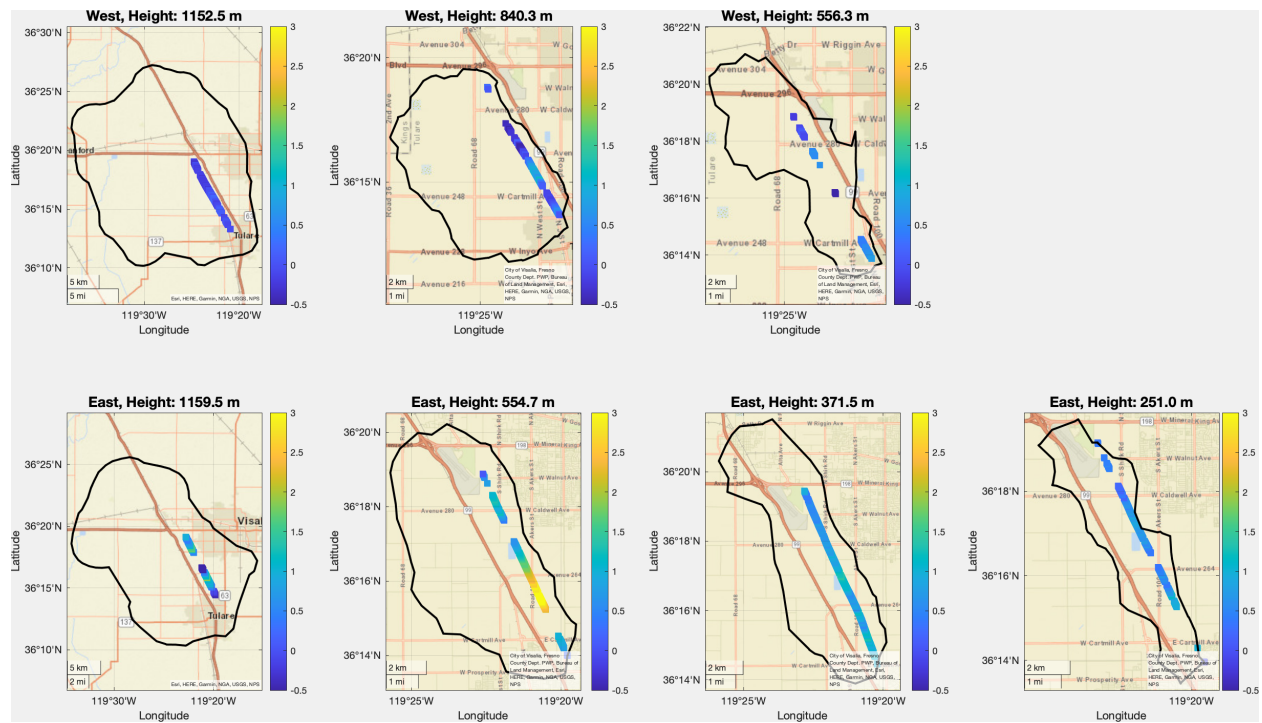


Figure S7: The spatial distribution of observed flux at each segment during racetrack. The black line contours the 90% of the footprint extent.

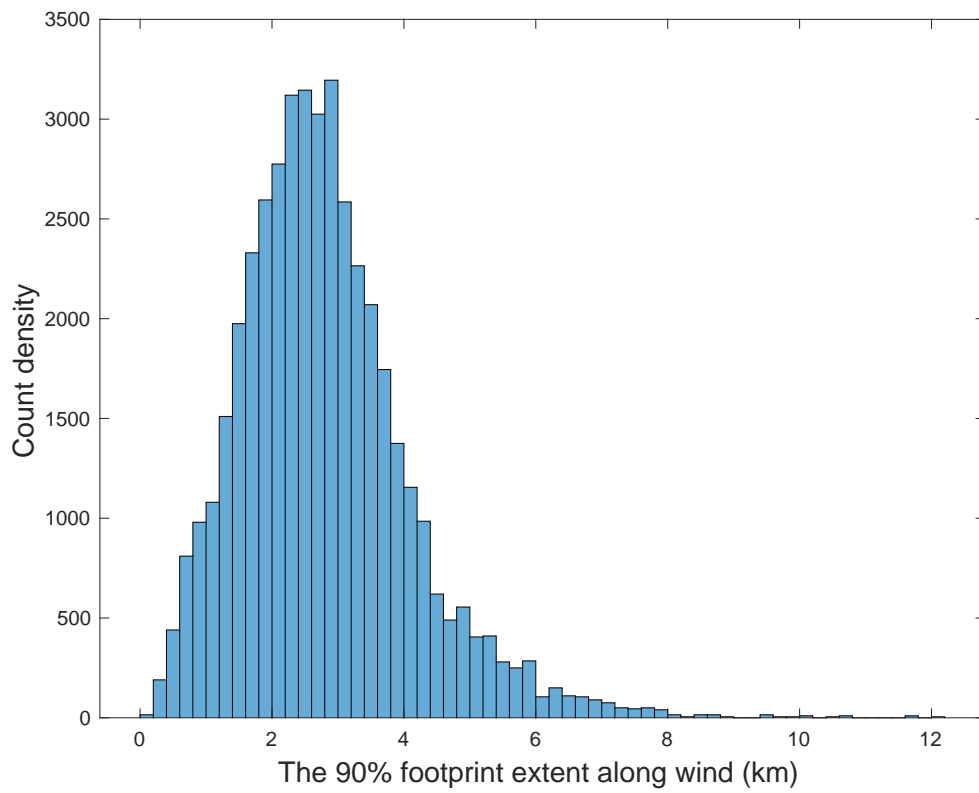


Figure S8: The count density distribution of 90% footprint extent.

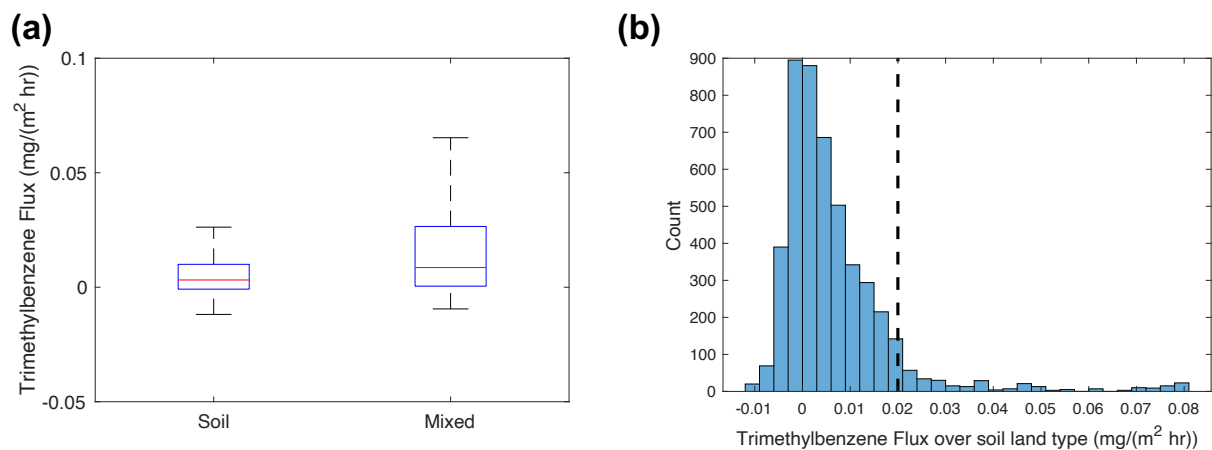


Figure S9: a) the comparison of trimethylbenzene fluxes with footprints exclusively covering soil land cover type and those with footprints covering mixed land cover types. b) The distribution of trimethylbenzene fluxes with footprints exclusively covering soil land cover type. The dashed line denotes a trimethylbenzene flux of $0.02 \text{ mg m}^{-2} \text{ h}^{-1}$.

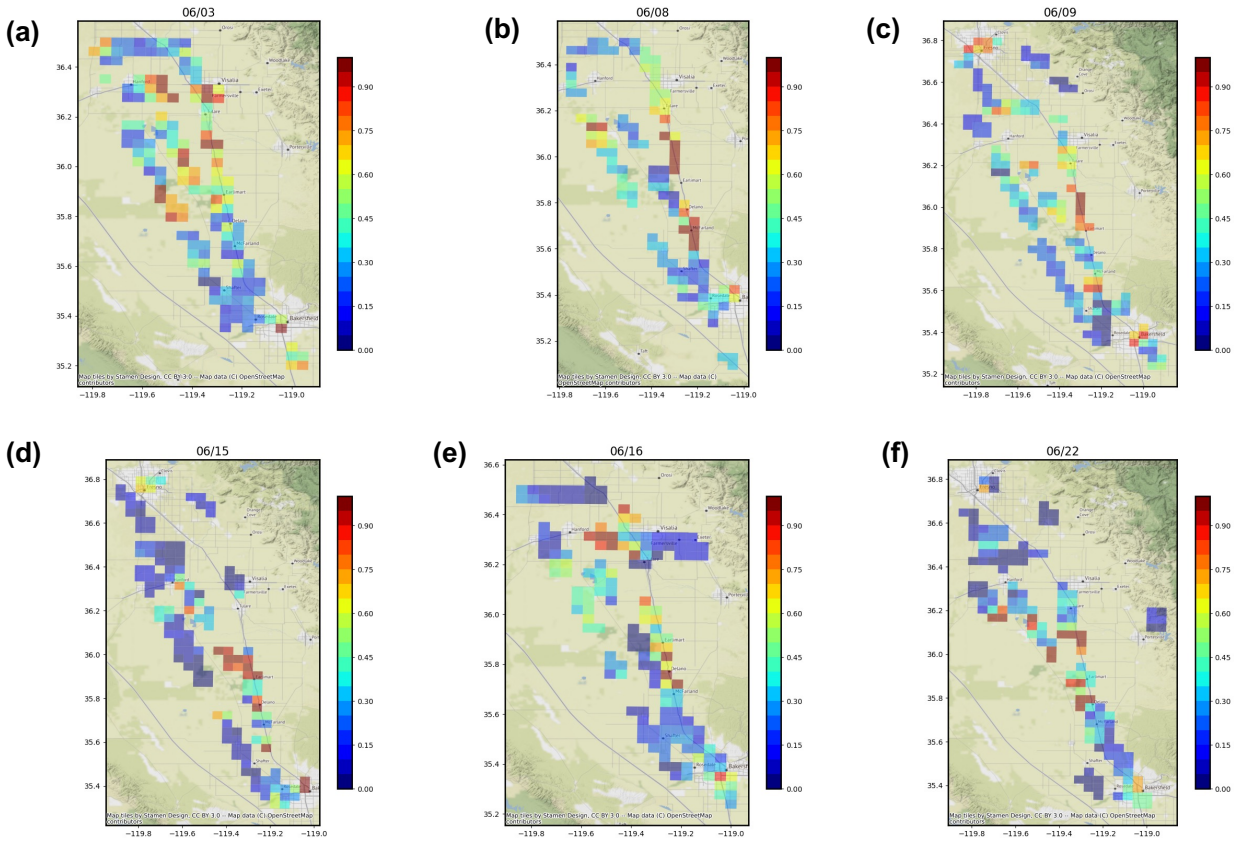


Figure S10: The estimated gridded emission map for each flight, aligned in the order of flight days. ©OpenStreetMap contributors 2022. Distributed under the Open Data Commons Open Database License (ODbL) v1.0.

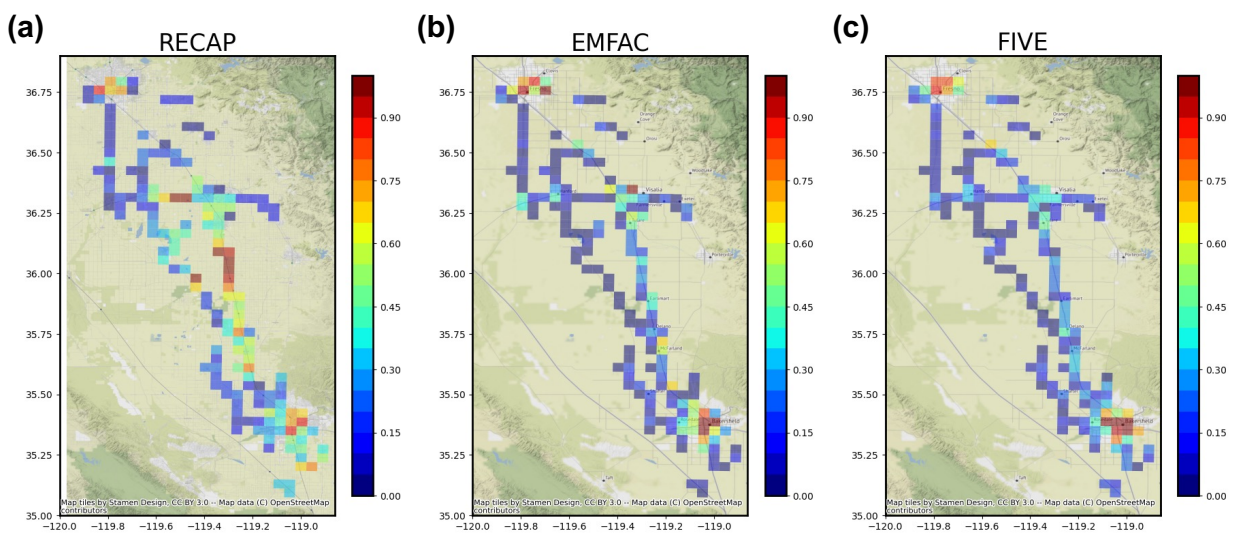


Figure S11: a) The estimated anthropogenic NO_x emission map at 4km during weekday. b) and c) are EMFAC and FIVE anthropogenic emission inventories matched both in time and space, respectively. ©OpenStreetMap contributors 2022. Distributed under the Open Data Commons Open Database License (ODbL) v1.0.

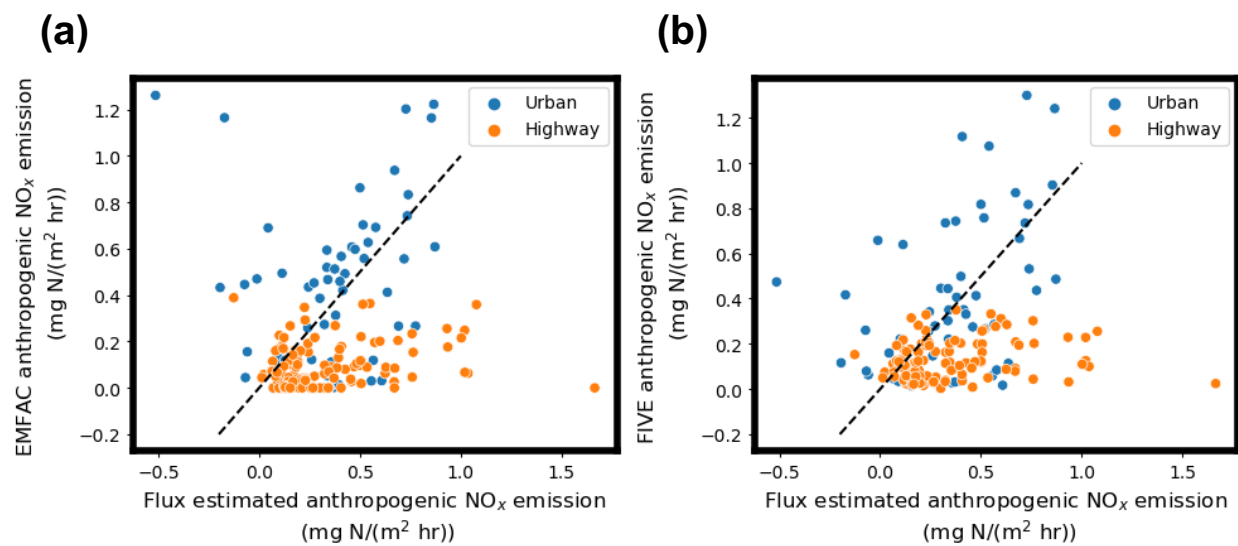


Figure S12: The scatter plot of observed RECAP anthropogenic NO_x emissions from transportation and fuel combustion as well as those from EMFAC (a) and FIVE (b) emission inventories, separated by highway and urban land cover types.

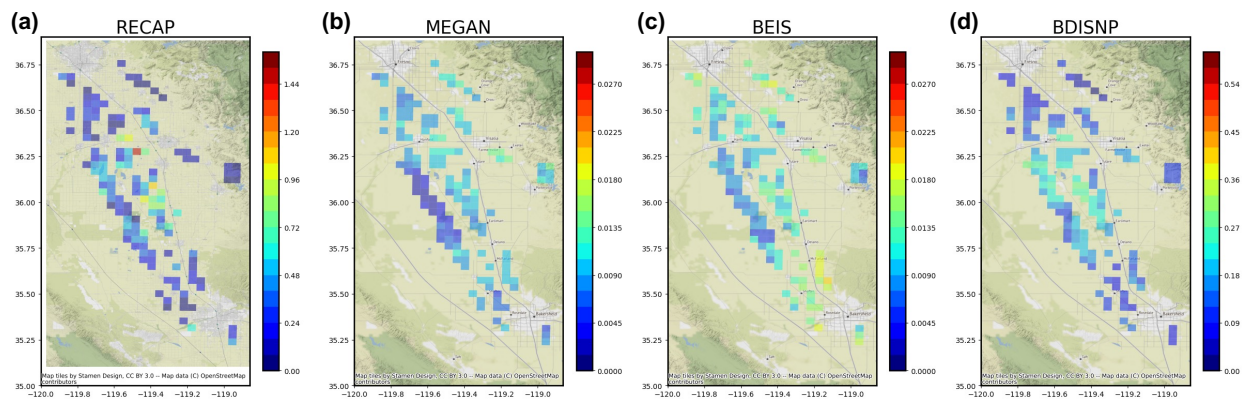


Figure S13: a) The estimated soil NO_x emission map at 4km during weekday. b), c), d) are made from soil NO_x schemes matched both in time and space, including MEGAN, BEIS and BDISNP. ©OpenStreetMap contributors 2022. Distributed under the Open Data Commons Open Database License (ODbL) v1.0.