Supplement of Atmos. Chem. Phys., 22, 1333–1349, 2022
https://doi.org/10.5194/acp-22-1333-2022-supplement

Atmospheric Chemistry and Physics
Open Access

Supplement of

A new method for inferring city emissions and lifetimes of nitrogen oxides from high-resolution nitrogen dioxide observations: a model study

Fei Liu et al.

Correspondence to: Fei Liu (fei.liu@nasa.gov)

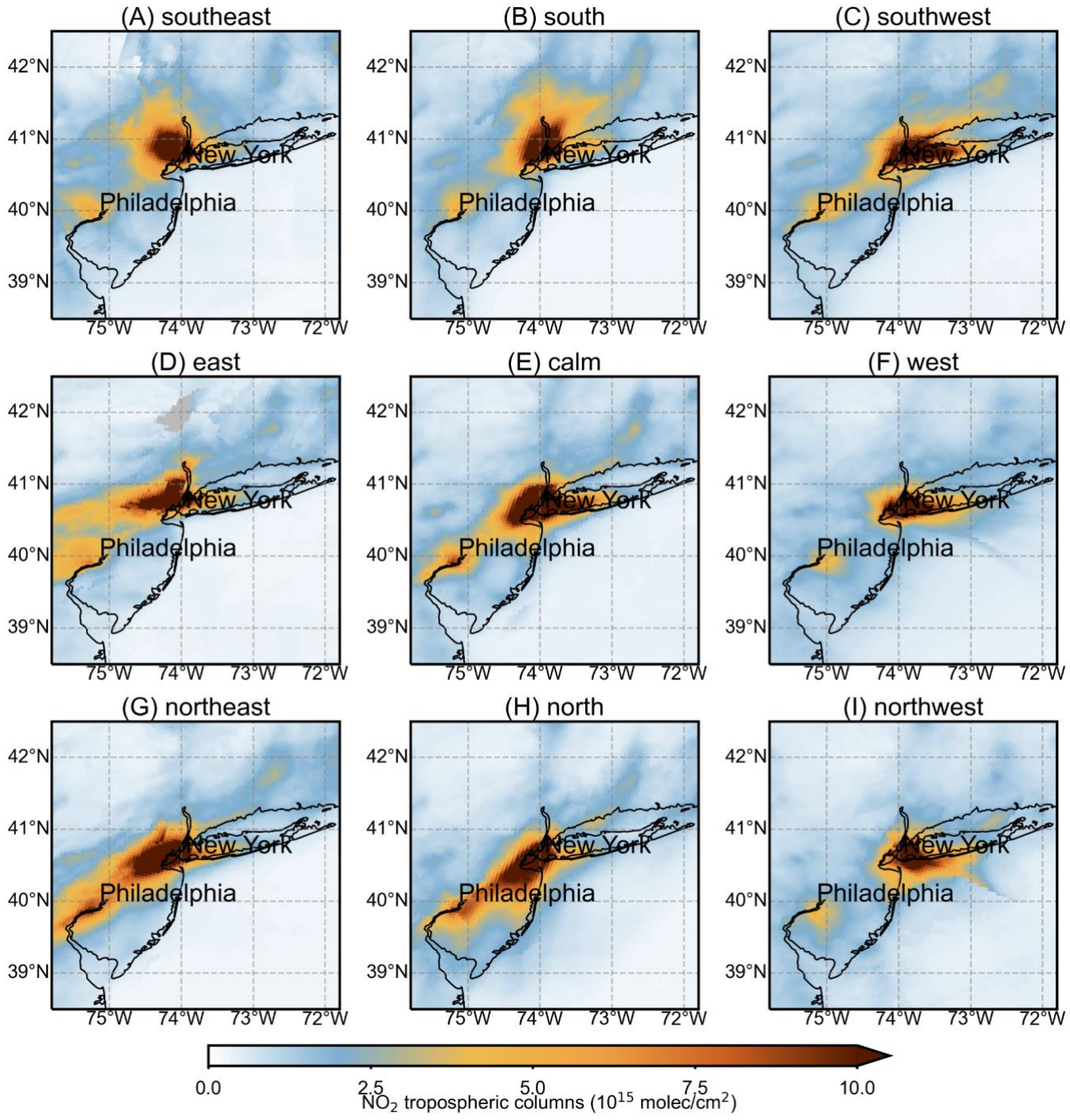

Figure S1 Wind dependency of the NU-WRF tropospheric NO_2 vertical column densities around New York City. NO_2 columns at the local overpass time of TROPOMI are averaged from April through September, 2016. Mean NO_2 column densities for different wind conditions, i.e., calm (center panel) and eight main wind direction sectors (surrounding panels; titles indicate the mean of the respective winds). Missing data due to lack of observations for a certain wind direction is in grey.

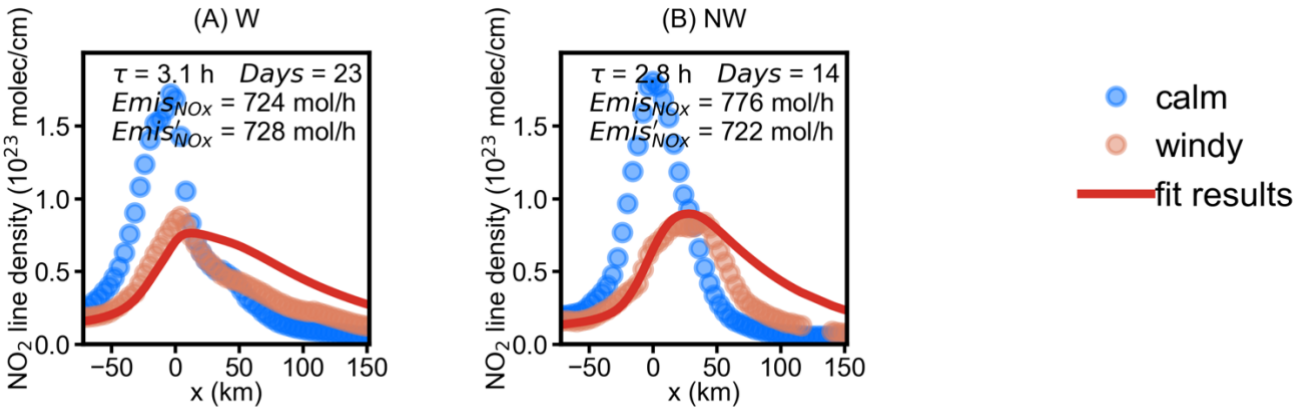

Figure S2 Similar to Figure 4, but for wind direction sectors with fitting results of insufficient quality: (A) westerly and (B) northwesterly wind.

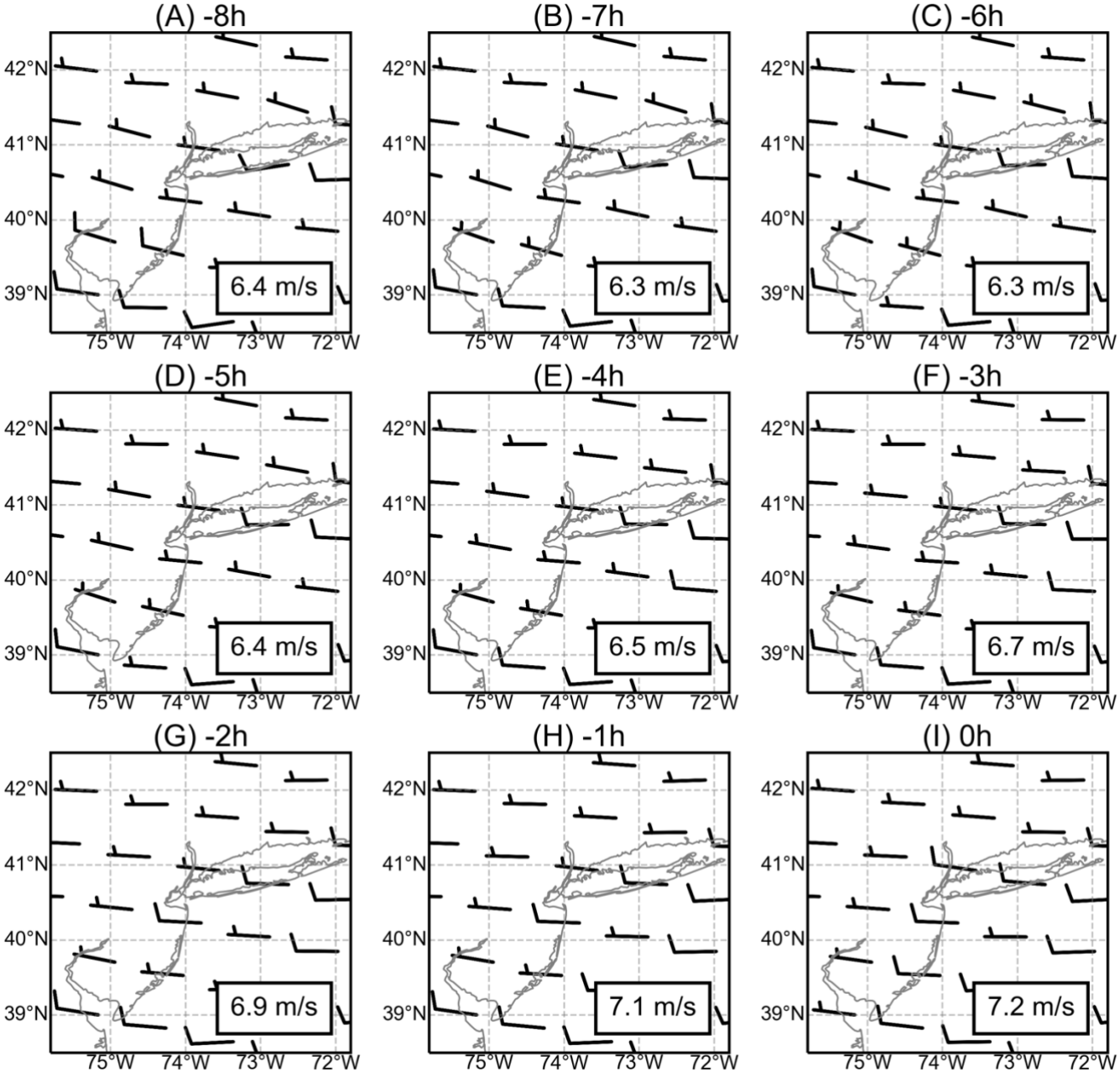

Figure S3 Similar to Figure 5, but for westerly wind.

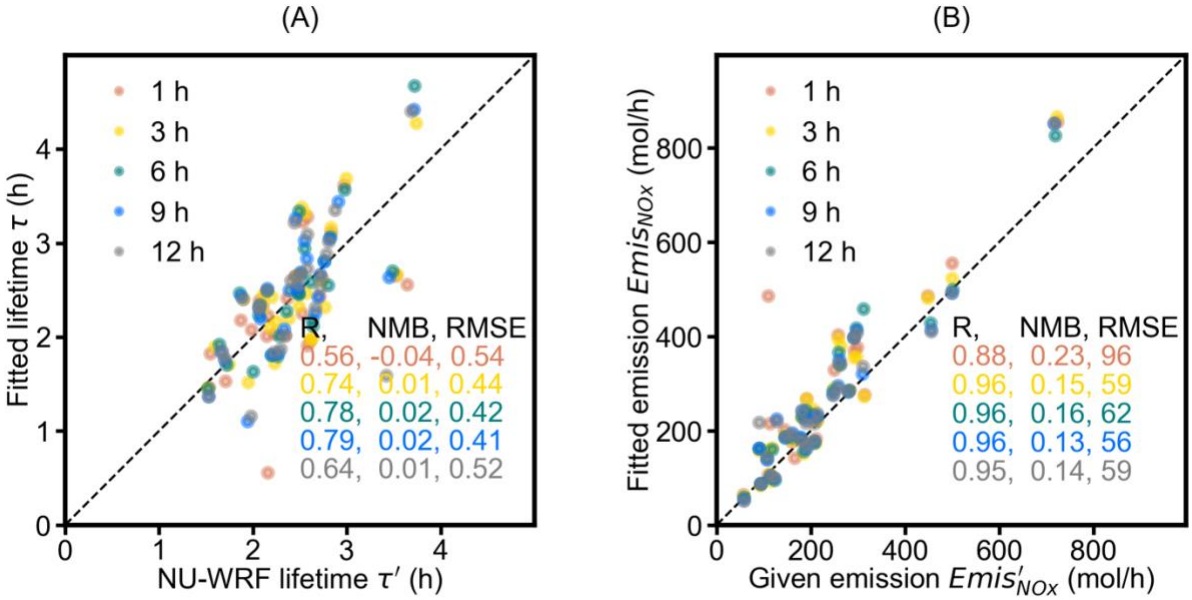

Figure S4 Scatterplots of (A) the fitted NO_x lifetime τ as compared to the NU-WRF lifetime τ'; and (B) the fitted NO_x emissions $Emis_{NO_x}$ as compared to the given emissions $Emis'_{NO_x}$. The results deriving from the wind fields sampled at the 14:00 local time ("1 h"), the weighted average of 3 h wind fields ("3 h"), 6 h wind fields ("6 h"), 9 h wind fields ("9 h"), and 12 h wind fields ("12 h") are displayed by red, yellow, green, blue, and grey dots, respectively. The dash line represents the 1:1 line.

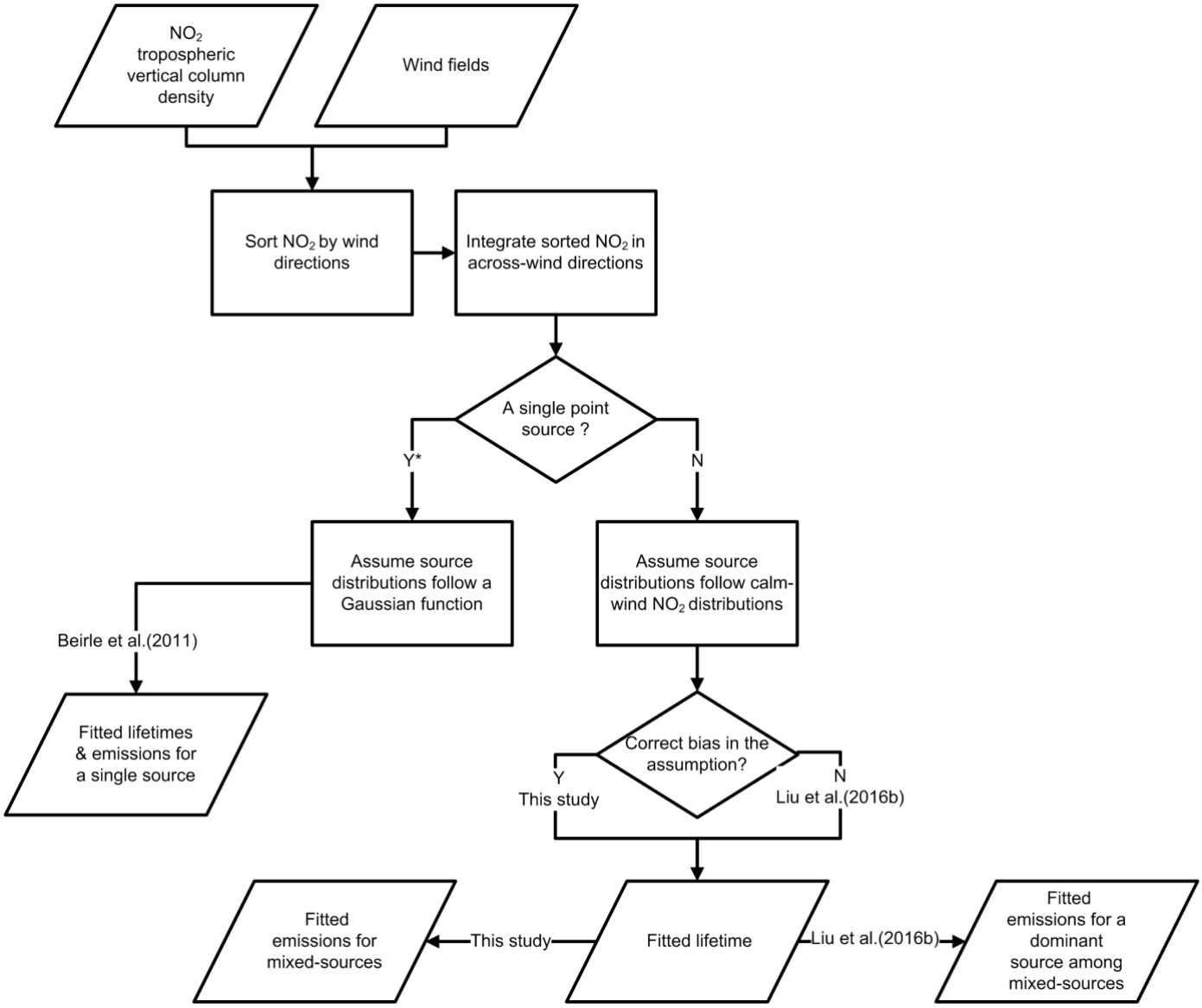

Figure S5 Comparison of methodology between this study (MISATEAM) and Beirle et al. (2011) and Liu et al. (2016b).

***MISATEAM and the approach of Liu et al. (2016b) are also applicable to a single point source.**

Table S1 Summary of cities investigated in this study.

City	Latitude	Longitude	Label*
Albuquerque	35.11	-106.65	Y
Atlanta	33.76	-84.42	
Austin	30.30	-97.75	
Bakersfield	35.32	-119.02	
Baltimore	39.30	-76.61	Y
Baton Rouge	30.44	-91.13	
Birmingham	33.53	-86.80	
Boise	43.60	-116.23	
Boston	42.33	-71.02	Y
Buffalo	42.89	-78.86	Y
Charlotte	35.21	-80.83	
Chicago	41.84	-87.68	Y
Cincinnati	39.14	-84.51	
Cleveland	41.48	-81.68	
Columbus	39.99	-82.98	
Dallas	32.79	-96.77	Y
Denver	39.76	-104.88	
Detroit	42.38	-83.10	Y
El Paso	31.85	-106.43	Y
Fayetteville	35.08	-78.97	
Fort Wayne	41.09	-85.14	
Fresno	36.78	-119.79	
Greensboro	36.10	-79.83	
Houston	29.79	-95.39	Y
Indianapolis	39.78	-86.15	
Jacksonville	30.34	-81.66	Y
Kansas City	39.13	-94.55	Y
Las Vegas	36.23	-115.26	
Lexington	38.04	-84.46	
Lincoln	40.81	-96.68	Y
Los Angeles	34.02	-118.41	
Louisville	38.17	-85.65	
Lubbock	33.57	-101.89	
Memphis	35.10	-89.98	
Milwaukee	43.06	-87.97	Y
Minneapolis	44.96	-93.27	Y
Montgomery	32.35	-86.27	
Nashville	36.17	-86.79	
New Orleans	30.05	-89.93	
New York	40.66	-73.94	Y
Norfolk	36.92	-76.24	Y

Oklahoma City	35.47	-97.51	Y
Omaha	41.26	-96.05	Y
Orlando	28.42	-81.27	Y
Philadelphia	40.01	-75.13	Y
Phoenix	33.57	-112.09	Y
Pittsburgh	40.44	-79.98	Y
Portland	45.54	-122.65	
Raleigh	35.83	-78.64	
Reno	39.55	-119.85	
Richmond	37.53	-77.48	
San Antonio	29.47	-98.53	
San Diego	32.82	-117.14	
St. Louis	38.64	-90.24	Y
Tampa	27.97	-82.48	Y
Toledo	41.66	-83.58	Y
Tucson	32.15	-110.87	
Tulsa	36.13	-95.90	
Washington	38.90	-77.02	Y
Wichita	37.69	-97.35	

***Y represents cities with valid fit results.**