



Supplement of

Technical note: Identifying biomass burning emissions during ASIA-AQ using greenhouse gas enhancement ratios

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1 **Table S1.** Full Flight breakdown

Flight Date (YYYYMMDD)	Location	Time airborne above location (h)	Flight Number in Country
20240206	Philippines	8.278	1
20240207	Philippines	7.837	2
20240211	Philippines	7.702	3
20240213	Philippines	8.192	4
20240215	Taiwan	4.484	1
20240217	South Korea	7.338	1
20240226	South Korea	7.446	2
20240308	South Korea	8.428	3
20240310	South Korea	6.622	4
20240311	South Korea	8.544	5
20240313	Taiwan	2.582	2
20240316	Thailand	7.797	1
20240318	Thailand	8.168	2
20240321	Thailand	7.972	3
20240325	Thailand	7.842	4
20240327	Taiwan	3.061	3

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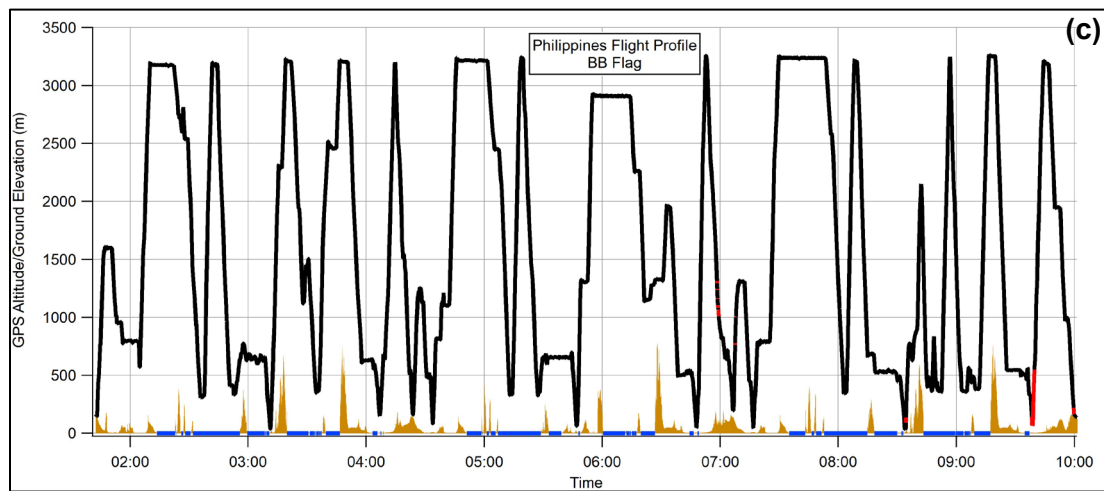
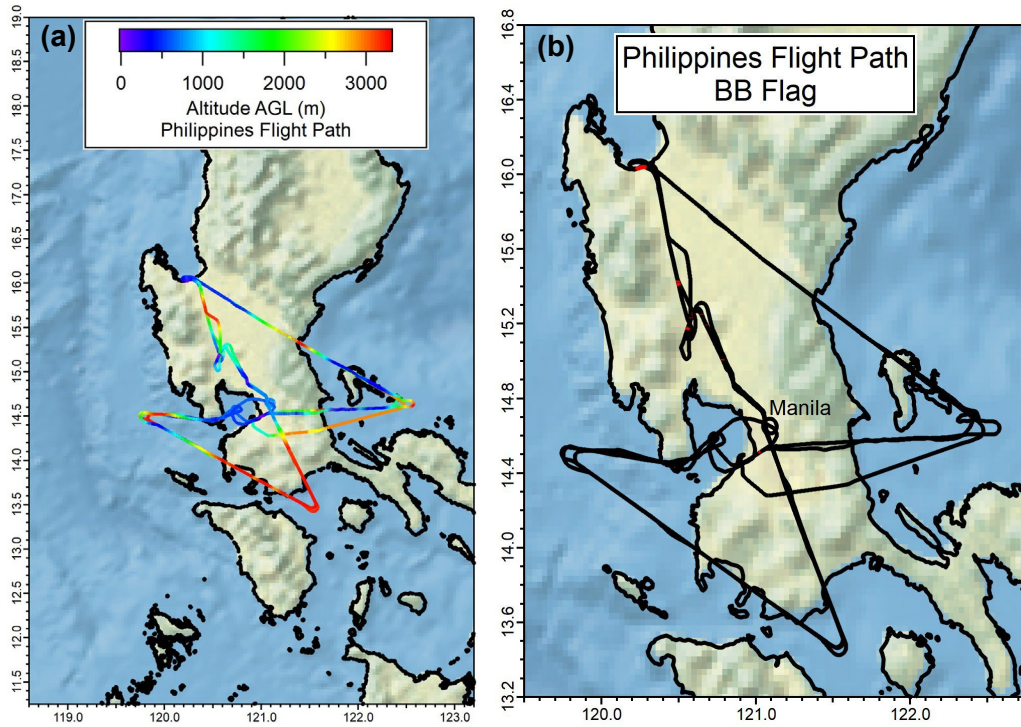
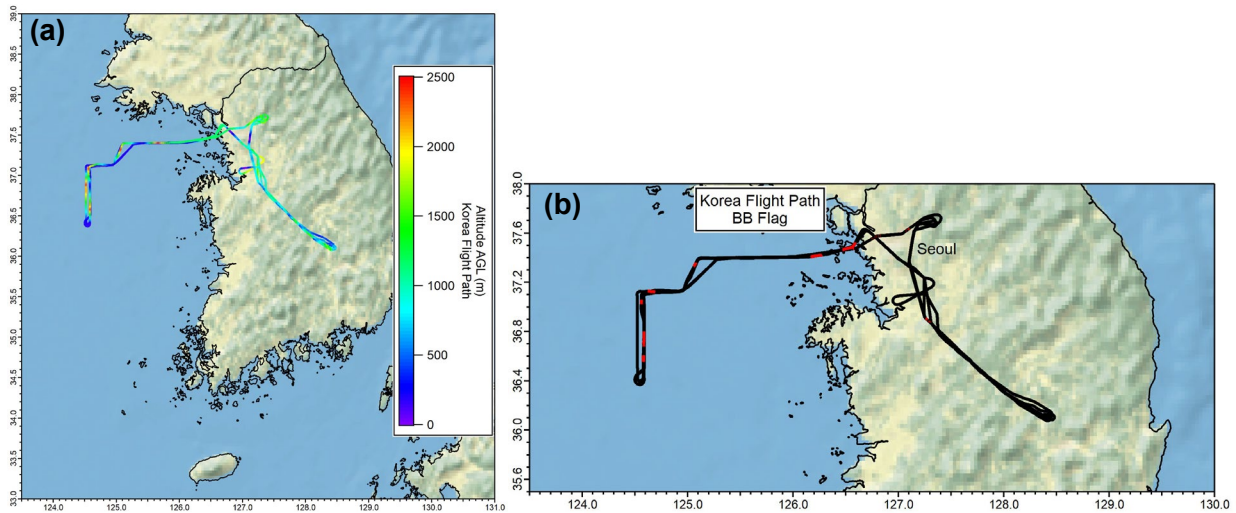


Figure S1. Philippines flight paths colored by altitude above ground level (a) and BB flag (in red) (b) for flight 1. (c) Philippines altitude profile colored by BB Flag (in red) with ground elevation (over land in brown and water in blue) for flight 1.

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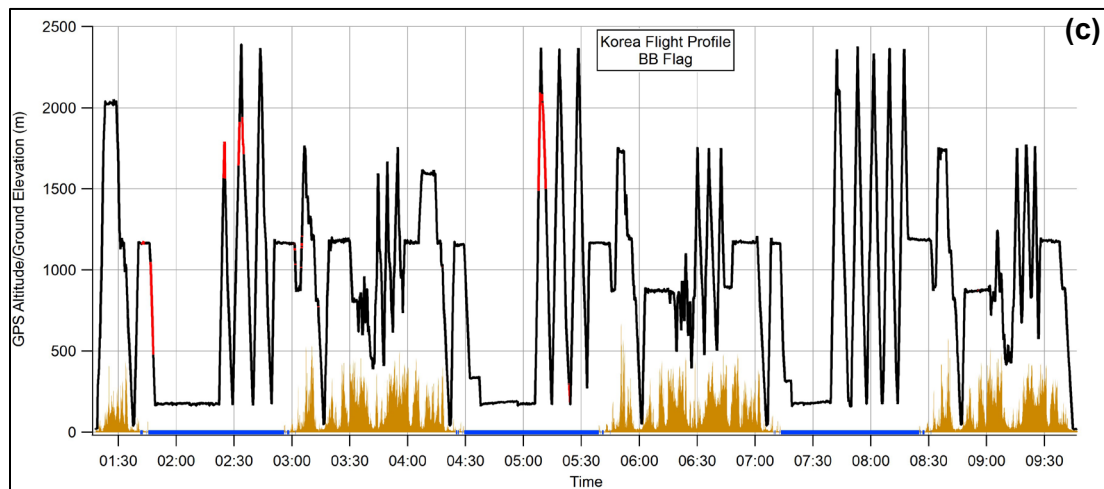


Figure S2. Korea flight paths colored by altitude above ground level (a) and BB flag (in red) (b) for flight 3. (c) Korea altitude profile colored by BB Flag (in red) with ground elevation (over land in brown and water in blue) for flight 3.

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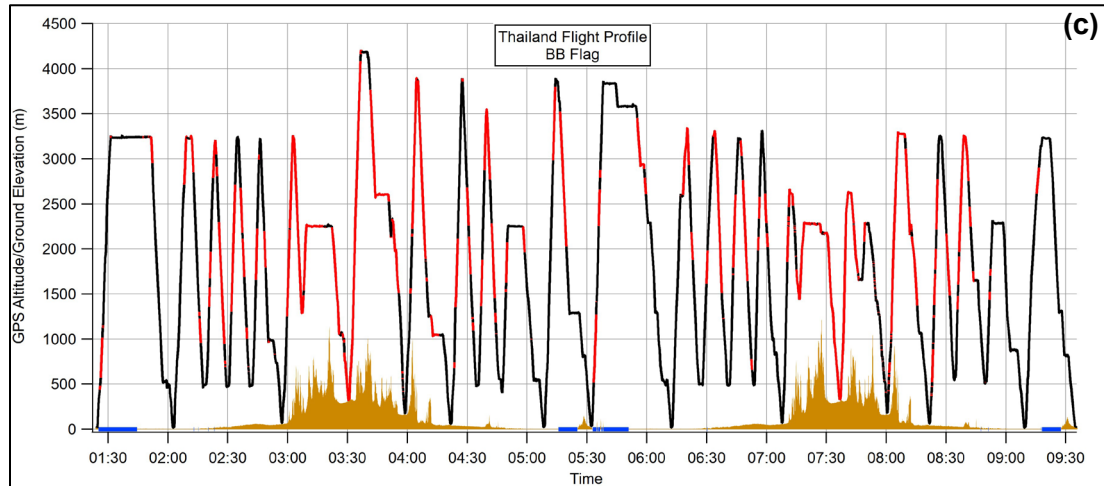
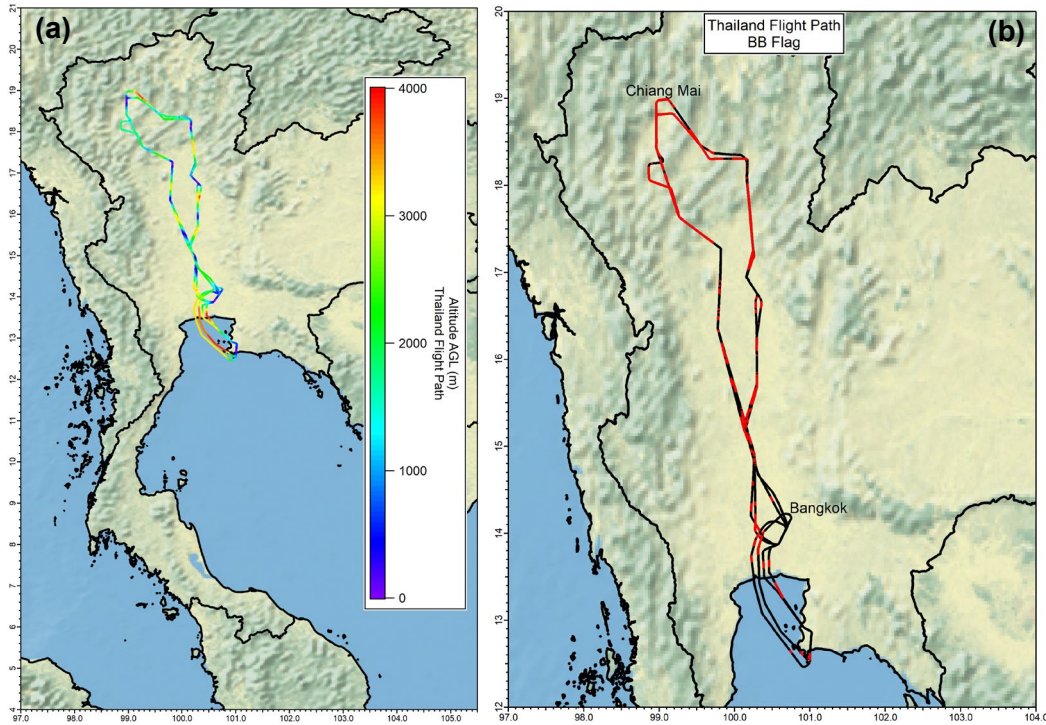


Figure S3. Thailand flight paths colored by altitude above ground level (a) and BB flag (in red) (b) for flight 2. (c) Thailand altitude profile colored by BB Flag (in red) with ground elevation (over land in brown and water in blue) for flight 2.

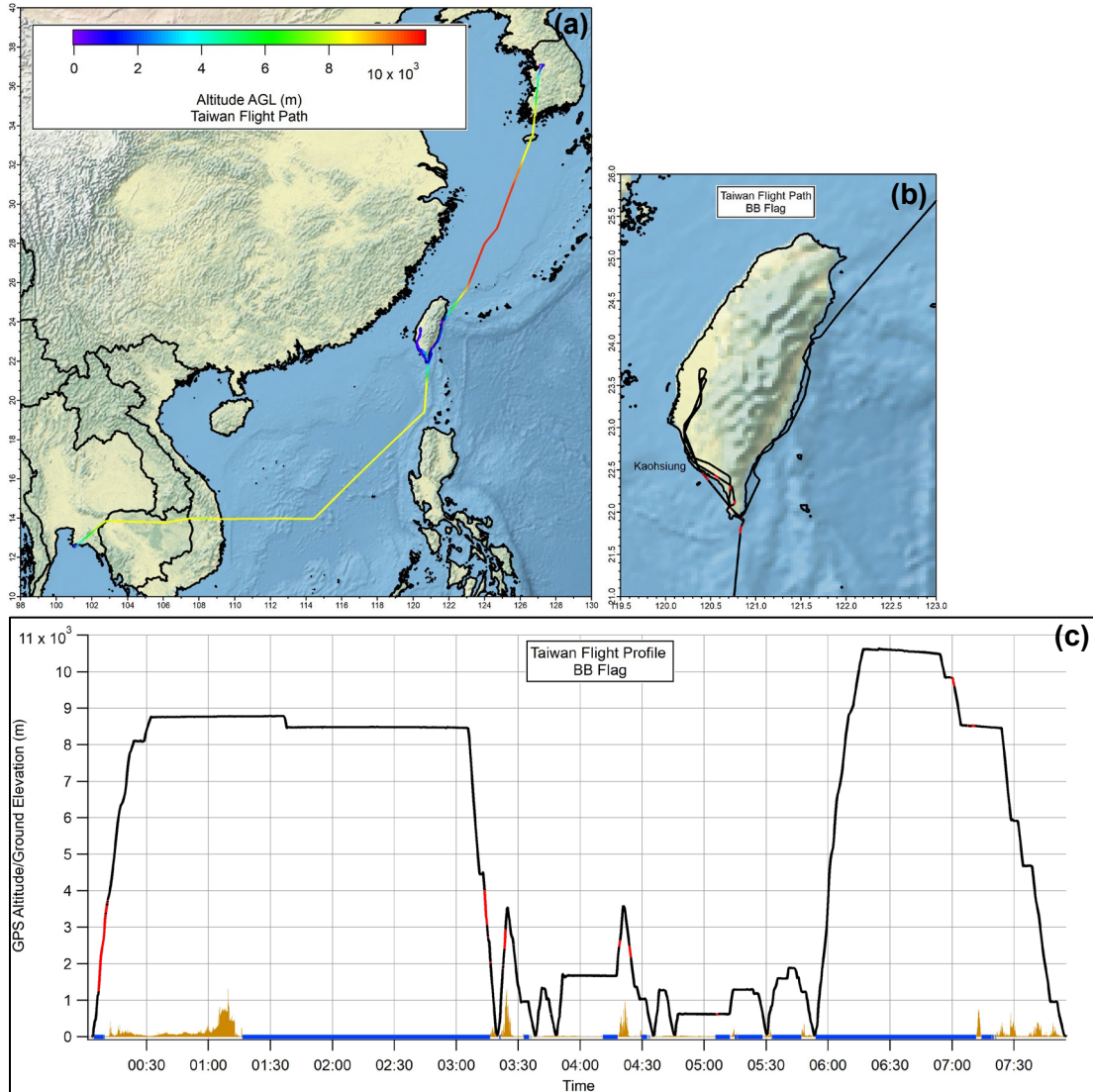


Figure S4. Taiwan flight paths colored by altitude above ground level (a) and BB flag (in red) (b) for flight 3. (c) Taiwan altitude profile colored by BB Flag (in red) with ground elevation (over land in brown and water in blue) for flight 3.

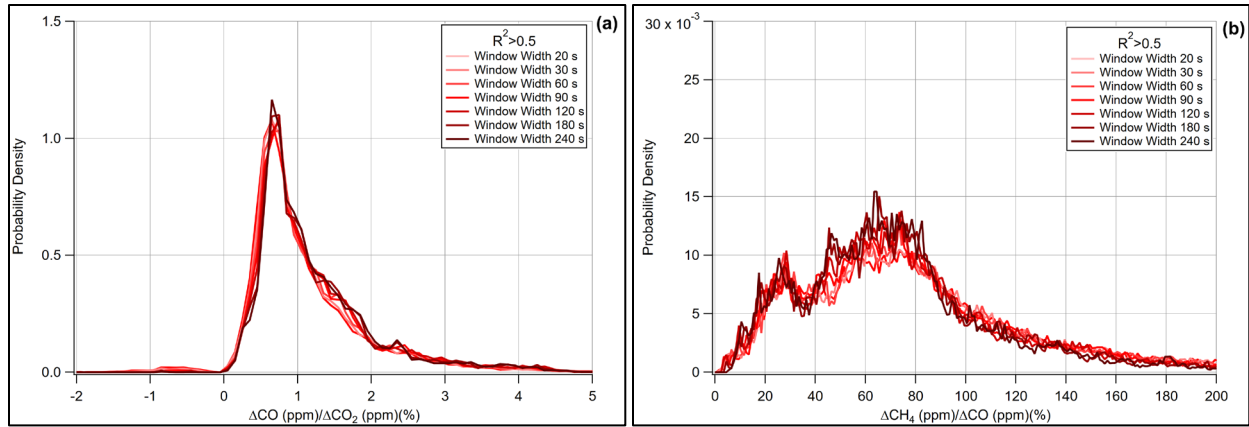


Figure S5. Sensitivity of $\Delta\text{CO}/\Delta\text{CO}_2$ (a) and $\Delta\text{CH}_4/\Delta\text{CO}$ (b) rolling slope methods to changing window width. Results shown here were calculated using all five Korea flights.

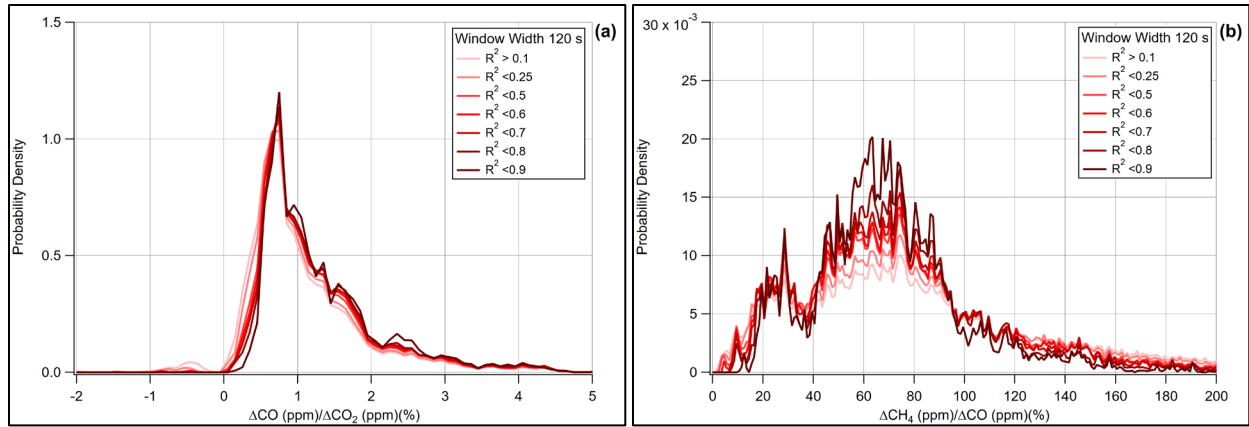


Figure S6. Sensitivity of $\Delta\text{CO}/\Delta\text{CO}_2$ (a) and $\Delta\text{CH}_4/\Delta\text{CO}$ (b) rolling slope methods to changing R^2 cutoff. Results shown here were calculated using all five Korea flights.

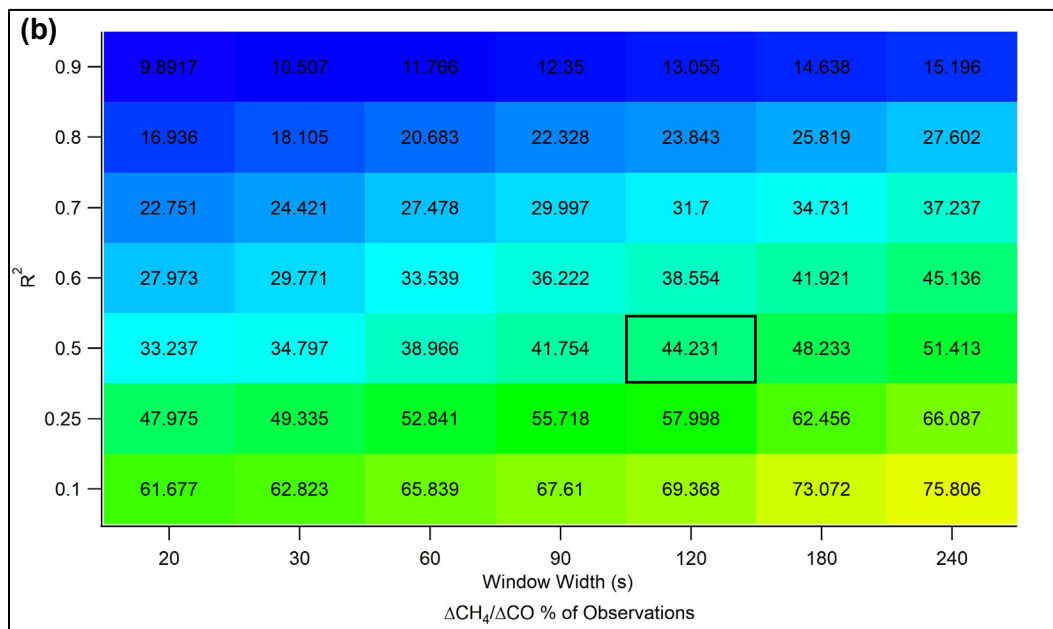
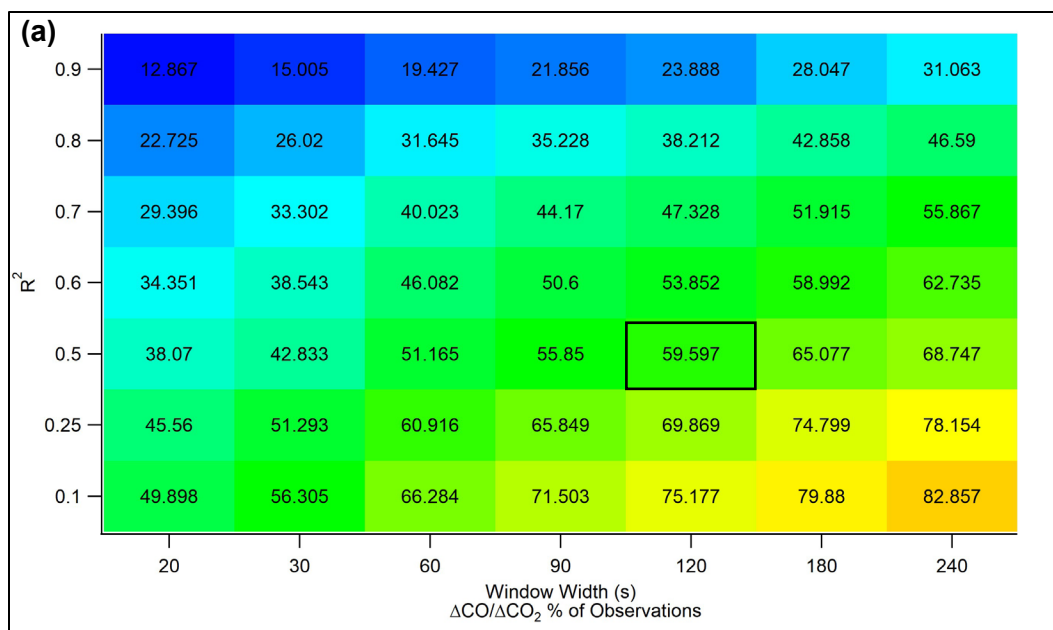


Figure S7. Sensitivity of $\Delta\text{CO}/\Delta\text{CO}_2$ (a) and $\Delta\text{CH}_4/\Delta\text{CO}$ (b) rolling slope methods to changing R^2 cutoffs and window width. Results shown here were calculated using all five Korea flights.

Table S2. Percent of calculated $\Delta\text{CO}/\Delta\text{CO}_2$ and $\Delta\text{CH}_4/\Delta\text{CO}$ slopes that were correlated ($R^2>0.5$) for each flight.

Flight	$\Delta\text{CH}_4/\Delta\text{CO}$ (%)	$\Delta\text{CO}/\Delta\text{CO}_2$ (%)
20240206	46.73	40.05
20240207	44.35	36.41
20240211	47.45	36.22
20240213	60.99	50.33
20240217	53.62	63.53
20240226	48.20	65.74
20240308	36.69	59.50
20240310	48.50	70.05
20240311	62.20	73.11
20240316	65.38	51.49
20240318	60.84	52.36
20240321	47.69	31.99
20240325	73.35	68.87
20240215	47.31	42.29
20240313	53.62	49.58
20240327	50.71	46.28

Table S3. Variable Thresholds (x) on a Flight-by-Flight basis.

Flight	$0<\Delta\text{CH}_4/\Delta\text{CO}<x$ (%)	$\Delta\text{CO}/\Delta\text{CO}_2>x$ (%)	$\text{CO}>x$ (ppm)	$\text{HCN}>x$ (ppt)	$\text{CH}_3\text{CN}>x$ (ppb)	Total scattering @ 550 nm $>x$ (Mm^{-1})
20240206	55.5	4	0.32	900	0.30	60
20240207	45.5	4	0.35	1000	0.50	100
20240211	45.5	4	0.40	750	0.38	80
20240213	45.5	4	0.36	925	0.32	80
20240217	40.5	4	0.40	500	0.25	130
20240226	40.5	4	0.52	880	0.21	160
20240308	36.5	4	0.27	575	0.19	57
20240310	37.5	4	0.37	600	0.20	105
20240311	48.5	4	0.44	600	0.26	110
20240316	44.5	4	0.32	2750	1.50	160
20240318	47.5	4	0.35	2800	1.10	150
20240321	53.5	4	0.43	1650	0.68	220
20240325	40.5	4	0.40	2400	0.97	220
20240215	44.5	4	0.38	450	0.25	120
20240313	37.5	4	0.41	750	0.26	110
20240327	43.5	4	0.72	700	0.55	200

65 **Table S4.** Locations coordinates used in HYSPLIT back trajectory quantification.

Location	Latitude Minimum	Latitude maximum	Longitude Minimum	Longitude maximum
Bangkok	13.46	14.447	99.973	100.91
Gulf of Thailand	8.64	12.54	99.973	102.153
	12.633	13.4469	99.973	100.91
	8.55	12.54	102.25	102.9
	8.55	10.69	103	104.2
	5.69	8.5	100.1	107.9
Eastern Thailand	14.46	17.86	101.177	104.298
	12.633	14.447	100.96	102.90
	14.46	17.86	104.31	105.55
Chiang Mai	18.581	19.00	98.715	99.23
Myanmar	14.46	23.605	92.331	97.86
Cambodia	10.796	14.447	102.975	106.00
	11.65	14.447	106.10	107.5
Vietnam	8.55	11.72	106.10	107.5
	8.55	16.74	107.60	109.8
	8.55	10.69	104.4	106
	17.9	23	104.31	107.5
Central Thailand	14.46	18.54	97.99	101.14
South China Sea	16.79	23	107.6	116.54
	10.387	16.74	109.9	116.54
Malay Peninsula	6.036	14.447	96	99.90
Northern Thailand	18.581	20.50	97.99	101.14
Laos	14.46	17.86	105.65	107.5

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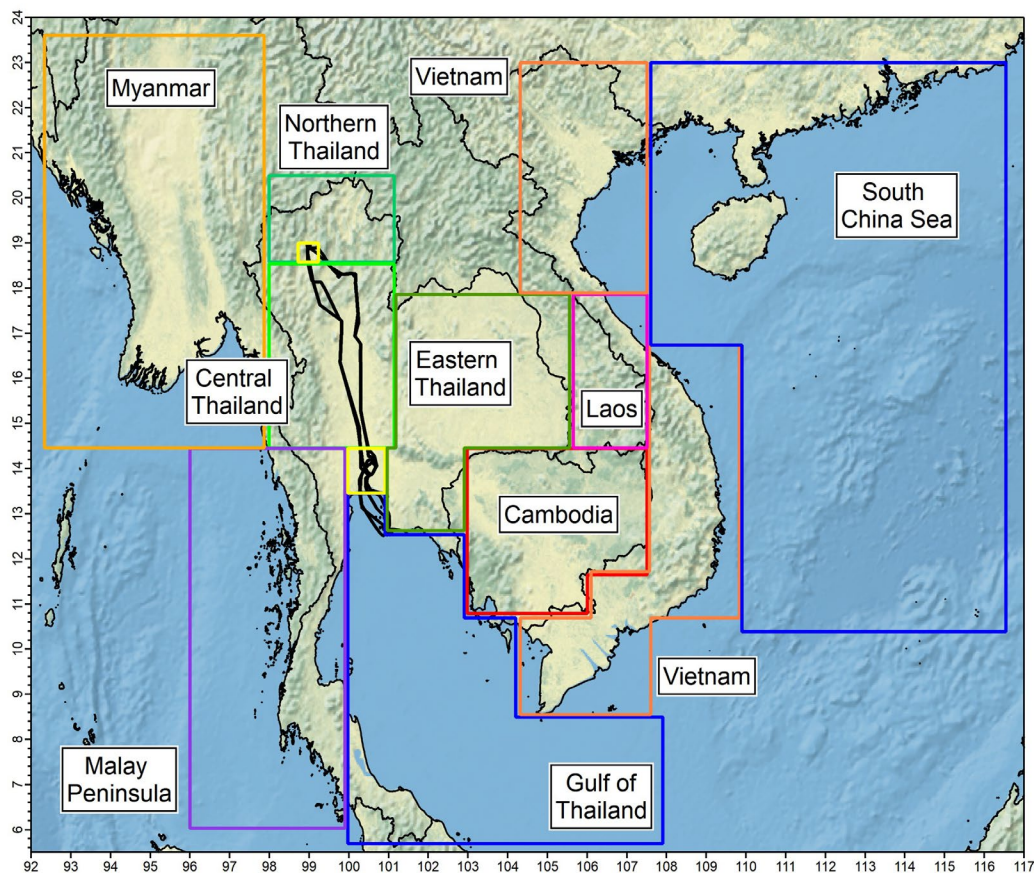


Figure S8. Map of locations used in HYSPLIT back trajectory quantification.

Table S5. Number of total and BB flagged points for the Thailand flights.

Total Points						
Flight	Thailand <1 km	Thailand >1 km	Bangkok <1 km	Bangkok >1 km	Chiang Mai <1 km	Chiang Mai >1 km
20240316	7,573	20,643	2,219	3,604	355	863
20240318	8,701	20,808	2,148	3,944	689	476
20240321	9,766	19,034	1,580	3,946	717	382
20240325	10,918	17,450	2,148	3,504	741	344
BB Flagged Points						
Flight	Thailand <1 km	Thailand >1 km	Bangkok <1 km	Bangkok >1 km	Chiang Mai <1 km	Chiang Mai >1 km
20240316	1,289	6,436	0	458	285	358
20240318	1,144	8,948	3	1,006	638	425
20240321	1	2,016	1	579	0	1
20240325	559	1,792	11	15	42	0