Supplemental Materials,

Measurement report: Atmospheric mercury in a coastal city of Southeast China: inter-annual variations and influencing factors

Jiayan Shi[1,2,4], Yuping Chen[1,2,3], Lingling Xu[1,2,*], Youwei Hong[1,2], Mengren Li[1,2], Xiaolong Fan[1,2], Liqian Yin[1,2],Yanting Chen[1,2], Chen Yang[1,2,3], Gaojie Chen[1,2,3], Taotao Liu[1,2,3], Xiaoting Ji[1,2,3], Jinsheng Chen[1,2,*]

[1] Center for Excellence in Regional Atmospheric Environment, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China

[2] Key Lab of Urban Environment and Health, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China

[3] University of Chinese Academy Sciences, Beijing 100049, China

[4] College of Resources and Environment, Fujian Agriculture and Forestry University, Fuzhou 350002, China

Correspondence: Lingling Xu (linglingxu@iue.ac.cn) and Jinsheng Chen (jschen@iue.ac.cn)

The potential source regions identification

The five and four potential source regions were identified in January and July respectively according to the travel path of backward air mass trajectory clusters.

Month	Source regions	Region description
January	*Local*	Air mass trajectory originated from Fujian province over the last 3 d.
	East China (EC)	Air mass trajectory originated from Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi and Shandong provinces over the past 3 d.
	Southwest China (SWC)	Air mass trajectory passed mainly through southwestern China, including Chongqing, Sichuan, Guizhou, Yunnan, and Tibet provinces.
	Central China (CC)	Air mass trajectory was sandwiched between East China and southwest China within 3 d, mainly including Henan, Hubei and Hunan, three inland provinces.
	North China (NC)	Air mass trajectory migrated over long distances within the last 3 d, mainly covering Beijing, Tianjin, Hebei, Shanxi and Inner Mongolia.
July	*Local*	The same as that in January
	Philippine sea and Taiwan Strait (PhiS+TW)	Air mass trajectory originated from the Philippine Sea and passed over Taiwan island within 3 days.
	Philippine sea and East China Sea (PhiS+ECS)	Air mass trajectory originated from the Philippine Sea to the east to monitoring site within 3 d.
	South China Sea (SCS)	R Air mass trajectory came from the South China Sea within 3 d

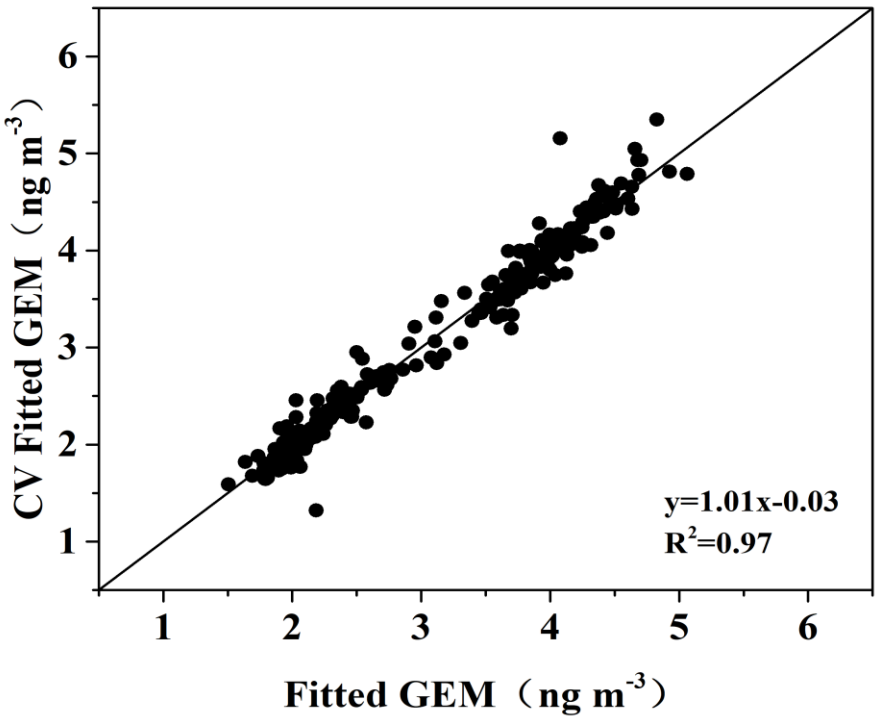

Figure S1. The results of 10-fold cross-validation test. The strong correlation, with a determination coefficient (R^2) of approximately 0.97, demonstrated the accuracy of GAMs

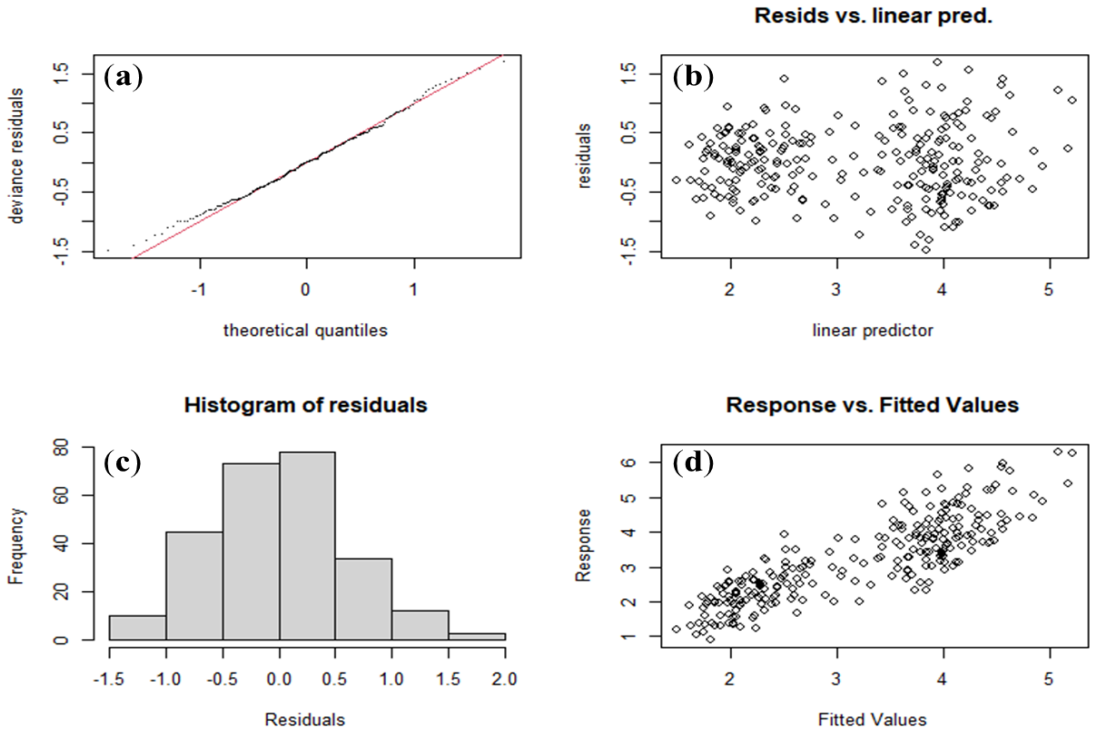

Figure S2. The assessment results of the GAMs: (a) quantile-quantile (QQ) plots, (b) The Resids vs. linear (c) Histogram of residuals (d) Response vs. Fitted Values

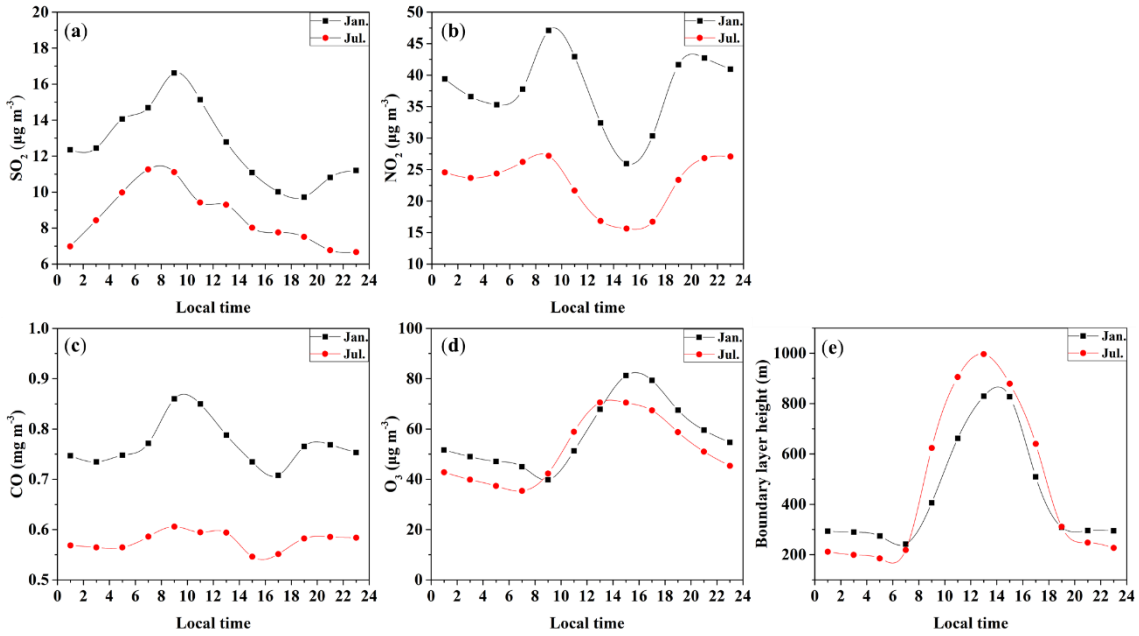

Figure S3. The diurnal trend of (a) SO_2, (b) NO_2, (c) CO, (d) O_3 and (e) boundary layer height in January and July during the whole study period.

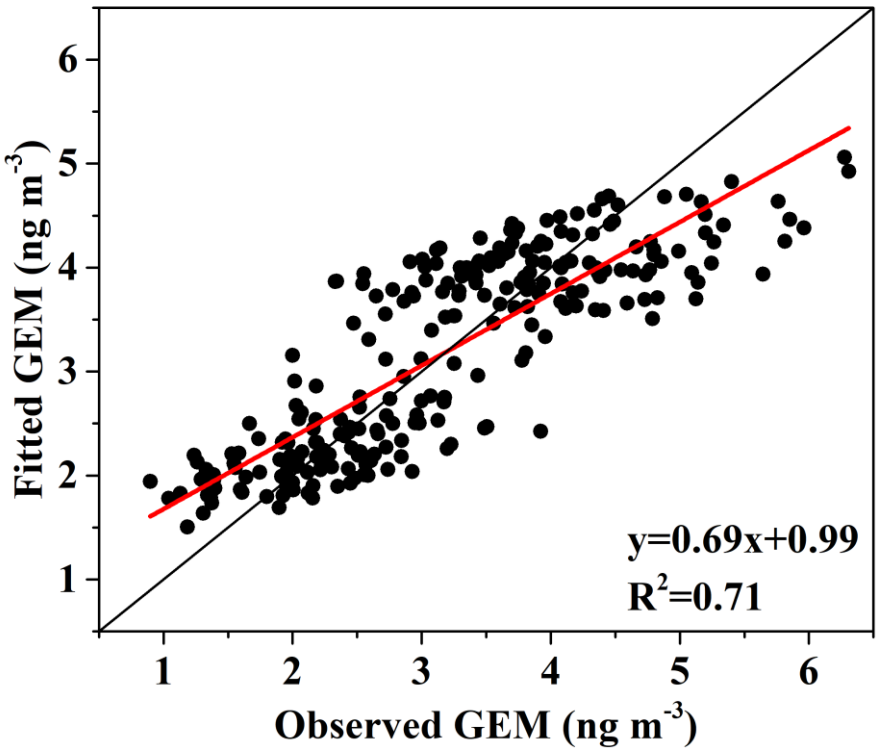

Figure S4. Relationships between the fitted and the observed GEM concentrations.

Table S1. Test variables in the GAMs.

Categories	Parameters	Data source
Emissions	SO_2、NO_2、O_3、CO、$PM_{2.5}$、PM_{10}	
Surface meteorology	Temperature Relative humidity Wind speed Wind direction Surface air pressure	Observation data from Xiamen air quality monitoring site
High-altitude meteorology	Boundary layer height Downward UV radiation at the surface Low cloud cover	European Centre for Medium-Range Weather Forecasts (ECMWF) reanalysis (https://www.ecmwf.int)
Air transmission	24h-Latitude 24h-Longitude	HYSPLIT model

Table S2. Final selected variables for the GAMs.

Variables	e.d.f	F	Approximate significance
s(CO)	6.16	5.81	<0.05
s(RH)	1.27	8.52	<0.05
s(SP)	4.63	2.28	<0.05
te (24h-Latitude, 24h- Longitude)	9.30	1.84	<0.05

Note: e.d.f stands for estimated degree of freedom, F is an indicator for importance assessment, s () represents the smooth function, te () represents the interaction functions of tensors.

Table S3. Statistics of coal consumption and SO_2, NO*x* emissions in Fujian Province during 2012 – 2020

Year	Coal (10000 tons of SCE)	Coal for Households (10000 tons of SCE)	SO_2 (10000 tons)	NO*x* (10000 tons)
2012	5983.76	83.00	37.13	46.72
2013	6190.35	54.95	36.10	43.83
2014	6251.02	31.30	35.60	41.17
2015	5919.53	30.10	33.79	37.90
2016	5163.44	26.86	18.93	26.18
2017	5662.19	24.00	13.39	27.72
2018	6355.41	23.00	12.19	28.41
2019	6488.76	21.35	12.10	30.15
2020	6716.21	10.50	/	/

Table S4. Pearson correlations results of GEM and tracer pollutants in January and July in each study year.

Month (Season)	Year	SO_2	NO_2	O_3	CO	PM_{10}	$PM_{2.5}$
January (Winter)	2012	0.15*	0.32**	-0.33**	0.14*	0.11*	/
	2013	0.38**	0.35**	-0.12*	**0.53****	0.45**	**0.53****
	2015	0.16**	0.41**	-0.28**	**0.50****	0.10	0.39**
	2017	0.15**	0.17**	-0.25**	/	0.19**	0.26**
	2020	0.32**	**0.60****	**-0.54****	0.48**	0.34**	**0.53****
July (Summer)	2012	0.44**	0.34**	-0.08	0.22**	0.39**	-0.04
	2013	0.23**	0.18**	-0.09	0.26**	0.24**	0.29**
	2015	0.21**	0.18**	-0.18**	0.25**	0.20**	0.12
	2017	0.18**	0.38**	-0.18*	0.31**	0.14	-0.01
	2020	/	0.19**	-0.09	/	0.25**	0.21**

$P < 0.01$, **; $P < 0.05$, *; $r > 0.5$ are show in bold phase.

Table S5. The monthly averages value of wind speed (WS), relative humidity (RH), temperature (*T*) and surface air pressure (SP) in January and July.

Month (Season)	Year	WS (m s^{-1})	RH (%)	*T* (℃)	SP (hPa)
January (Winter)	2012	1.87	74.6	12.82	1002.2
	2013	0.96	63.9	14.27	1003.3
	2015	1.23	69.0	13.21	1003.7
	2017	1.35	78.0	15.15	1003.0
	2020	0.99	78.5	14.99	1002.2
	Average	1.28	72.8	14.09	1002.9
July (Summer)	2012	1.84	71.3	29.72	987.5
	2013	1.92	75.3	28.89	990.2
	2015	1.30	82.4	28.01	986.6
	2017	1.35	78.0	15.15	1003.0
	2020	0.99	78.5	14.99	1002.2
	Average	1.53	77.1	29.06	988.8