



Supplement of

Spatiotemporal variations in atmospheric CH₄ concentrations and enhancements in northern China based on a comprehensive dataset: ground-based observations, TROPOMI data, inventory data, and inversions

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Fig. S25 Sectoral CH₄ emissions in the study region and fractions of total emissions in the whole mainland China.

Title	Journal	Reference
Estimation of Anthropogenic CH4 and CO2 Emissions in Taiyuan-Jinzhong Region: One of the	Journal of Geophysical Research:	(Hu et al.,
World's Largest Emission Hotspots	Atmospheres,	2023)
Individual coal mine methane emissions constrained by eddy covariance measurements: low bias and missing sources	Atmospheric Chemistry and Physics	(Qin et al., 2024)
New ground-based Fourier-transform near-infrared solar absorption measurements of XCO2, XCH4 and XCO at Xianghe, China	Earth System Science Data	(Yang et al., 2020)
Deriving Temporal and Vertical Distributions of Methane in Xianghe Using Ground-based Fourier Transform Infrared and Gas-analyzer Measurements	Advances in Atmospheric Sciences	(Ji et al., 2020)
Quantifying CH4 emissions from coal mine aggregation areas in Shanxi, China, using TROPOMI observations and the wind-assigned anomaly method	Atmospheric Chemistry and Physics	(Tu et al., 2024)
Anthropogenic Methane Emission and Its Partitioning for the Yangtze River Delta Region of	Journal of Geophysical Research:	(Hu et al.,
China	Biogeosciences	2019)
Unveiling Unprecedented Methane Hotspots in China's Leading Coal Production Hub: A Satellite Mapping Revelation	Geophysical Research Letters	(Han et al., 2024)
A survey of methane point source emissions from coal mines in Shanxi province of China using	Atmospheric Measurement	(He et al.,
AHSI on board Gaofen-5B	Techniques	2024)
A multi-city urban atmospheric greenhouse gas measurement data synthesis	Scientific Data	(Mitchell et al., 2022)
Spatial-temporal characteristics of methane emission in Shandong, China, based on an updated comprehensive methane emission inventory in 2020	Atmospheric Pollution Research	(Lu et al., 2024)
Temporal patterns and determinants of atmospheric methane in Suzhou, the Yangtze River Delta	Atmospheric Pollution Research	(Guo et al., 2023)

Table S1 Studies of CH₄ observations from ground-based and satellite in northern China

Item	Coal mine CH ₄ (CMM) emissions (Tg)	Total-estimated*	Year	Reference
Shanxi	8.9-10.2	15.5-16.8	2011-2022	(Chen et al., 2024)
Shanxi	13.1	19.7	2014	(Tate, 2022)
Shanxi	8.5-8.6	15.1-15.2	2019-2020	(Peng et al., 2023)
Shanxi	4.4-7.8	11.0-14.4	2019	(Qin et al., 2024)
Shanxi	4.7-5.5	11.3-12.1	2011-2016	(Sheng et al., 2019)
PKU-v2-Others in the study region	7.7	14.3	2019	(Peng et al., 2016)
EDGAR-V4.3.2	8.4	28.5	2019	(Janssens-Maenhout et al., 2019)
Westlake		24.0	2019	(Liang et al., 2023)

Table S2 CH₄ emissions estimates from literature

*We used other emissions (excluding Shanxi CMM emissions) from PKU-v2 (6.6 Tg) to estimate the first 5 studies' total emissions.

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