Global Energy Monitor

BRIEF: DECEMBER 2024

23 “super-emitter” events linked to eight global coal mines

Coal mines in Australia, Colombia, Mexico, and China have been observed releasing “super-emitter” scale methane emissions, sometimes repeatedly over the span of 16 months, according to new analysis from Global Energy Monitor. The 23 plume detections, observed between January 1st 2023 to April 1st 2024, all surpassed the US Environmental Protection Agency’s definition of a “super-emitter,” which would require swift action from U.S. operators once detected.

In a first-of-its-kind analysis, GEM researchers manually reviewed every coal sector plume detected by the NASA EMIT sensor to determine whether the plumes fell within the footprint of an identifiable asset in GEM’s Global Coal Mine Tracker. GEM’s annotations represent the only currently publicly-available and systematic analysis connecting satellite-detected methane plumes to asset-scale mine operator data, including major private sector and state-owned enterprises.

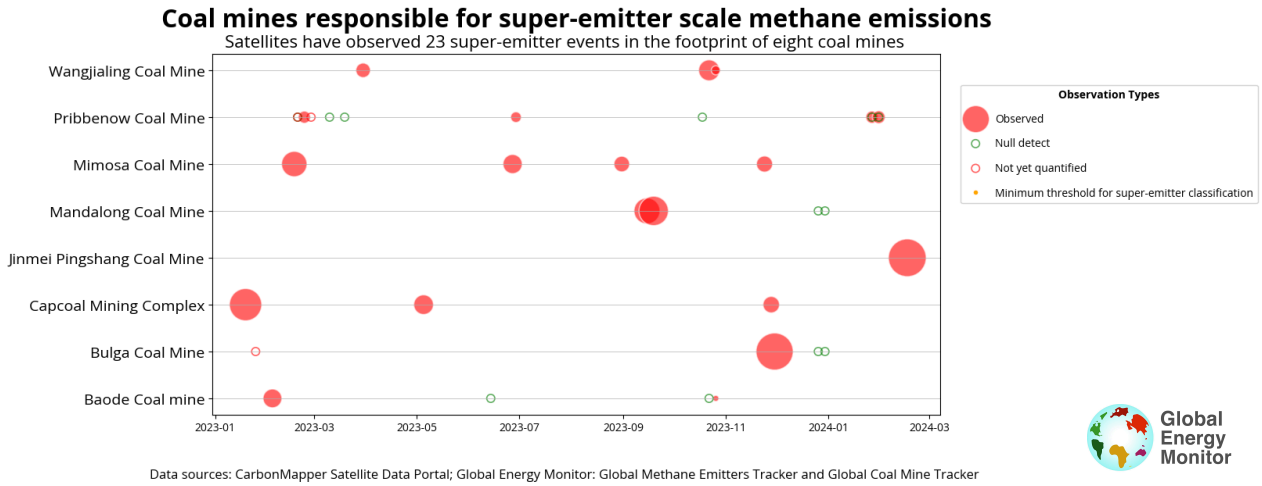

Figure 1

GEM's analysis highlights the need for stronger incentives for coal mine operators to mitigate methane. As new methane satellites are entering orbit, more work must be done to connect remotely-sensed methane data to the parties responsible for emissions.

The problem with coal mine methane

Methane is a powerful greenhouse gas, with a warming potential 28–84 times as potent as CO_2. Because of this, even a small number of large leaks can drive concerning amounts of global warming. Coal mine methane is responsible for one-third of all fossil fuel methane emissions worldwide, though some estimates have suggested that the coal sector may emit more methane than the oil or gas sectors. Reconciling discrepancies between company-reported methane emissions, "bottom-up" estimates based on infrastructure characteristics, and "top-down" satellite investigations is essential for accurately tracking progress towards climate goals.

While capturing coal mine methane is technically straightforward, and the gas can either be resold or used for onsite power, there are insufficient incentives globally — positive or negative — for operators to make repairs, according to the IEA.

Specifically, methane emissions from mine ventilation shafts — the most common source — tend to be diluted, even if the gas is flowing at a fast rate. Abatement in these cases often does not compare favorably with other kinds of capital expenditures for mine operators, especially in the absence of rebates, aggressive mandatory emissions thresholds, or enforcement programs requiring quick repair of super-emitters. As governments worldwide adopt new coal mine methane management plans and regulations, satellite observations help both characterize the scale of the issue and verify that improvements are working.

The need to identify emission sources

GEM's Global Methane Emitters Tracker (GMET) provides the only currently publicly available and international information about which specific coal mines, power plants and liquid natural gas terminals are near observed satellite plumes. The tracker therefore offers industry watchdogs information about which specific assets — and their operators — are in close proximity to emitted plumes.

This information offers a key layer of transparency: While some NGOs, agencies, and media groups have provided basin and sector-specific plume attribution, none have provided publicly-available information which can link plumes to specific operators of nearby assets outside of the United States and Canada and across fossil fuel supply chains.

Critically, while the UN's flagship Methane Alert and Response System (MARS) alerts operators and government agencies about plumes observed from satellites, MARS

does not currently equip the broader public with information about which asset and which operator was responsible for the emissions. Table 1 lists every plume detected by the NASA EMIT sensor labeled as coal mining related by CarbonMapper analysts, and which were found nearby to a GEM coal mine asset during our study period. The table includes "Null detects," or passes by the EMIT satellite over a coal mine in which no methane was observed.

Identifiable coal mines with methane plume observations in their footprints

Mine name	Owners	Country	Date	CarbonMapper ID	Rank of nearby plumes (out of 1383 quantified plumes)	Nearby plume emissions (kg/hr)	Nearby plume emissions uncertainty (kg/hr)	Observation type
Baode coal mine	China Shenhua Energy	China	2/4/2023	emi20230204t040649p03007-A	488	2713.722	705.250	Observed
			6/14/2023					Null detect
			10/22/2023					Null detect
			10/26/2023	emi20231026t022145p02006-C	1367	277.507	78.491	Observed
Bulga Coal Mine	Bulga Coal Management [BCM]	Australia	1/25/2023	emi20230125t004744p16006-C				Not yet quantified
			11/30/2023	emi20231130t220644p14006-A	37	10607.935	968.079	Observed
			12/26/2023					Null detect
			12/30/2023					Null detect
Capcoal Mining Complex	Capcoal	Australia	1/19/2023	emi20230119t040223p02019-B	64	8031.541	69.258	Observed
			5/5/2023	emi20230505t004444p16007-A	436	2982.142	249.573	Observed
			11/28/2023	emi20231128t234458p15021-B	626	2085.083	10.494	Observed
Jinmei Pingshang Coal Mine	Shanxi Jinmei Group Pingshang Coal	China	2/17/2024	emi20240217t052731p04010-B	32	10983.989	1674.417	Observed

	Industry Company							
Mandalong Coal Mine	Centennial Mandalong Pty Ltd	Australia	9/15/2023	emi20230915t042628p02007-A	165	5177.625	372.555	Observed
			9/19/2023	emi20230919t025213p01007-A	94	6646.649	334.689	Observed
			12/26/2023					Null detect
			12/30/2023					Null detect
Mimosa Coal Mine	Altos Hornos de México [AHMSA] - Grupo Acerero del Norte S.A. de C.V	Mexico	2/17/2023	emi20230217t203432p13032-A	180	4974.245	541.933	Observed
			6/27/2023	emi20230627t171011p11031-A	465	2831.325	351.188	Observed
			8/31/2023	emi20230831t152922p10018-A	705	1876.186	201.099	Observed
			11/24/2023	emi20231124t205924p14006-A	660	1999.097	192.421	Observed
Pribbenow Coal Mine	Drummond Ltd	Colombia	2/19/2023	emi20230219t190539p12019-A				Not yet quantified
			2/19/2023					Null detect
			2/23/2023	emi20230223t173139p11013-A	1036	1146.261	352.704	Observed
			2/27/2023	emi20230227t155714p10003-A				Not yet quantified
			3/10/2023					Null detect
			3/19/2023					Null detect
			6/29/2023	emi20230629t154054p10011-A	1160	879.905	215.973	Observed
			10/18/2023					Null detect
			1/27/2024	emi20240127t164546p11002-A	1023	1170.905	455.516	Observed
			1/27/2024					Null detect
			1/31/2024	emi20240131t151130p10004-A	974	1262.560	523.232	Observed
			1/31/2024					Null detect
Wangjialing Coal Mine	Shanxi Wangjialing Coal Industry Company	China	3/30/2023	emi20230330t064432p05014-A	807	1629.163648	91.49756181	Observed

			10/22/2023	emi20231022t035702p03010-A	363	3382.431965	218.3057043	Observed
			10/26/2023	emi20231026t022145p02006-B	1260	629.366434	52.0578344	Observed

Sources: Global Energy Monitor: Global Methane Emitters Tracker and Global Coal Mine Tracker; CarbonMapper Satellite Data Portal

Table 1

Methodology

To identify these emissions sources, GEM analysts analyzed every plume detected by the NASA EMIT sensor which CarbonMapper labeled as coal mining-related (79 plumes). The timeframe of the analysis was between January 2023 and April 1st, 2024, and thus covered plumes uploaded to the CarbonMapper platform by April 1st. GEM researchers manually reviewed each plume image alongside GEM datasets of energy infrastructure in the region.

Plumes which were within the footprint of a coal mine or coal plant were identified in Table 1, totaling 23 plume observations. GEM did not associate the remaining 56 of the 79 plume observations, because the origin points were either located just outside the footprint of a coal mine, because there were multiple mines close together, or because GEM did not have data on the asset depicted (e.g. potentially an abandoned mine). Note that there are slight discrepancies in the data presented in this analysis and the data available for download through GMET. This is largely because there are minor differences in the plumes included in the bulk data download of CarbonMapper used in GMET (data downloaded April 5th, 2024) and data accessed through CarbonMapper's online portal, on which this analysis is built. Additionally, the GMET data is limited to plumes found within 10.5 km of a GEM coal mine asset.

A key limitation of satellite-based plume detections is that satellites cannot image everywhere at once. In addition, the paths of the NASA EMIT sensor reflect its primary

mission to analyze mineral dust; its tracks do not cover all major regions of energy production. Additional challenges include collecting imagery in cloudy areas, at night, and over the ocean.

About Global Methane Emitters Tracker

GEM's Global Methane Emitters Tracker (GMET) provides attribution information for remotely-sensed methane plumes and estimates of fossil fuel emissions at oil and gas and coal extraction sites, natural gas transmission pipelines, proposed projects and reserves.

As of the September 2024 data update, the tracker includes methane emissions estimates for coal extraction and gas pipelines, and attribution information for remotely-sensed methane plume observations worldwide, including annotations for hundreds of plumes related to oil and gas production in the United States which are not analyzed elsewhere. GMET also associates assets from GEM's Oil & Gas Extraction Tracker to the methane emissions estimates developed by ClimateTRACE.

Data is available to download and viewable with interactive mapping and aggregate summary tables. Each coal and oil and gas asset is linked to a separate factsheet on GEM.wiki that provides references and further background.

About Global Energy Monitor

Global Energy Monitor (GEM) develops and shares information in support of the worldwide movement for clean energy. By studying the evolving international energy landscape and creating databases, reports, and interactive tools that enhance understanding, GEM seeks to build an open guide to the world's energy system. Follow us at www.globalenergymonitor.org and on Twitter @GlobalEnergyMon.

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