

IMEO Eye on Methane data platform

Data Dictionary : MARS methane plumes and sources

IMEO built the Eye on Methane data platform to drive climate action. We invite you to use this data to identify and mitigate methane emissions.

This data export includes two datasets: one listing detected plumes and one listing detected sources identified by the Methane Alert and Response System (MARS). Files are available in either CSV or GeoJSON format, depending on the option selected on the website. A **plume** is a single methane emission observation from one satellite overpass, while a **source** is a ground location where one or more plumes have been detected over time. The tables below describe the structure of both datasets (plumes and sources), including each variable's name, definition, data type, and an example value.

If you need more detail about how the data is produced or how to interpret it, several resources are available. The [MARS Technical Documentation](#) provides a deeper explanation of the methodology. The [Frequently Asked Questions page](#) addresses common issues. You can also email the MARS team at unep-mars@un.org if you require further clarification.

All plumes in the platform from Sentinel-2, Landsat-8/9, EMIT, PRISMA, and EnMAP were requantified after 20th February 2026; for more information on the quantification methodology, see the [MARS Technical Documentation](#).

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Per-plume information

The table below summarizes the content of all the plumes detected by MARS ([unep_methanedata_detected_plumes](#)). Note that S5P/TROPOMI plumes with detection institution CAMS/ECMWF/SRON were generated using Copernicus Atmosphere Monitoring Service information 2025.

Column name	Definition	Type	Example
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* ISO3CD refers to the three-letter codes defined in ISO 3166-1 and the number is the 3-digit identification number.

** The timestamp of satellite observation in ISO 8601 format, which refers to a standardized way of representing the exact date and time when the observation occurred. The Time Zone is UTC.

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id_plume	36-digit unique identifier (UUID) of the for each plume.	string (text)	bd5f3817-ded2-4cc1-9a5d-a0d02968865f
source_name	ID of the source, formatted as {ISO3CD}_S_{number}.*.	string	ALG_S_002
satellite	Name of the satellite and the agency responsible for the observation.	string	Sentinel-2 - ESA
tile_date	Timestamp of the satellite observation in ISO 8601 format**	string	2020-01-01T12:00:00
lat ***	Latitude coordinate of the source location (north-south direction) in decimal degrees (WGS84), rounded to 5 decimal places	float	12.34567
lon ***	Longitude coordinate of the source location (east-west direction) in decimal degrees (WGS84), rounded to 5 decimal places.	float	12.34567
actionable	<ul style="list-style-type: none"> • “Yes”: if the plume is 1) high resolution, 2) from the oil and gas sector, 3) attributable to a facility, and 4) validated by MARS remote sensing experts within approximately 15 days from image acquisition. • “No”: if the (high-resolution and from the oil and gas sector) plume is not attributable to a facility and/or is not validated by MARS remote sensing experts within approximately 15 days from image acquisition. • “Not applicable”: if the plume is not from the oil and gas sector and/or is not from not high-resolution satellites. • “Not available”: for plumes whose validation date is not available (i.e. for plumes detected before May 2024) 	string	YES
notified	<i>TRUE</i> : indicates whether the plume was notified to governments and/or OGMP 2.0 companies (if applicable).	boolean	TRUE

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	<i>FALSE</i> : indicates that the plume was not notified because it was not 'actionable' or it was detected during the pilot phase.		
country	Name of the country where the emission occurred.	string	United States of America
sector	Industry sector of the emission source (e.g., 'Oil and Gas', 'Waste', 'Met Coal', 'Thermal Coal', 'Thermal and Met Coal' or 'Other').	string	Oil and Gas
detection_institution	Name of the institution responsible for detecting the emission (e.g., CarbonMapper, Kayrros, NASA JPL EMIT, UNEP IMEO MARS and UPV LARS).	string	UNEP IMEO MARS
quantification_institution	Name of the institution responsible for quantifying the emission.	string	UNEP IMEO MARS
tile	ID of the satellite product from which the plume was detected.	string	S2B_MSIL1C_20221102T102059_N0400_R065_T31SGR_20221102T122533
ch4_fluxrate	The methane flux rate is a measure of the rate at which methane gas (CH ₄) is emitted from a specific source into the atmosphere over time. It quantifies the mass of methane released by unit of time in kilograms per hour (kg/h). MARS provides an estimate of this flux, with typical emissions detectable by satellites ranging from 500 to 10,000 kg/h.	integer	3500
ch4_fluxrate_std	Standard deviation of the estimated methane flux rate, measured in kg/h. Usual range between 200 and 1000 kg/h.	integer	400
wind_u	Eastward component of wind speed, measured in m/s.	float	1.00
wind_v	Northward component of wind speed, measured in m/s.	float	1.00
total_emission	Total mass of methane attributable to the emission, in tonnes. Only available for estimates made with a combination of VIIRS and Sentinel-3/GOES/TROPOMI.	integer	100
total_emission_std	Standard deviation of the total estimate methane mass, in tonnes. Only available	integer	10

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	for estimates made with a combination of VIIRs and Sentinel-3/ GOES/TROPOMI.		
wind_speed	Magnitude of the windspeed, measured in m/s.	float	1.00
last_update	Timestamp of the most recent modification to the plume entry, in ISO 8601 format.	string	2020-01-01T12:00:00.000000
insert_date	Timestamp of the most recent modification to the plume entry, in ISO 8601 format.	string	2020-01-01T12:00:00.000000
tile_background	ID of the satellite product used as the background (reference) for the multi-temporal retrieval.	string	S2B_MSIL1C_20221102T102059_N0400_R065_T31SGR_20221102T122533

Per-source information

The table below summarizes the content of all the sources with emissions detected by MARS (*unep_methanedata_detected_sources*).

Column name	Definition	Type	Example
source_name	ID of the source, formatted as {ISO3CD}_S_{number}*.	string	ALG_S_002
lon	Longitude coordinate of the source location (east-west direction) in decimal degrees (WGS84), rounded to 5 decimal places.	float	12.34567
lat	Latitude coordinate of the source location (north-south direction) in decimal degrees (WGS84), rounded to 5 decimal places.	float	12.34567
country	Name of the country where the source is located	string	United States of America
sector	Industry sector of the emission source (e.g., ‘Oil and Gas’, ‘Waste’, ‘Met Coal’, ‘Thermal Coal’, ‘Thermal and Met Coal’ or ‘Other’).	string	Oil and Gas
source_type	Equipment, infrastructure or facility associated with source of methane emission. Source types with the suffix “generic” indicate that the specific	string	Flare

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	emitting equipment could not be identified from the available information.		
persistence	Estimates how often emissions are detected from a specific source over time. It looks at the number of times emissions were detected compared to the number of high-quality observations over the last six months. Values range between 0 and 1, or null if insufficient observations are available.	float or null	0.65
persistence_std	Standard deviation of the persistence estimate. Values range between 0 and 1, or null if insufficient observations are available.	float or null	0.1
persistence_category	Categorical classification of emission frequency based on persistence: <ul style="list-style-type: none"> • "Undetermined": insufficient observations. • "Absent": no emissions detected, persistence is equal to 0. • "Sporadic": persistence within the interval (0, 0.2]. • "Frequent": persistence within the interval (0.2, 0.8]. • "persistent": persistence larger than 0.80. 	string	frequent
n_plumes_detected	Number of plumes attributed to this source from all the available observations.	integer	12
id_last_plume	36-digit unique identifier (UUID) of the latest plume detected.	string	a3f2e1d4-5c6b-7a8e-9f0d-1c2b3a4e5f6g
last_plume_date	Timestamp of the satellite observation in ISO 8601 format**	string (datetime)	2020-01-01T12:00:00
feedback_operator	Indicates whether feedback has been received from the facility operator regarding any emission from this source: <ul style="list-style-type: none"> • "Yes": feedback received. • "No": no feedback received (only for Oil and Gas sector sources with 	string	Yes

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	<p>plumes after feedback tracking began).</p> <ul style="list-style-type: none"> • "Not Applicable": feedback tracking not applicable (non-Oil and Gas sectors or sources whose last plume was detected before feedback tracking implementation). 		
feedback_government	<p>Indicates whether feedback has been received from the relevant government authority regarding any emission from this source:</p> <ul style="list-style-type: none"> • "Yes": feedback received. • "No": no feedback received (only for Oil and Gas sector sources with plumes after feedback tracking began). • "Not Applicable": feedback tracking not applicable (non-Oil and Gas sectors or sources whose last plume was detected before feedback tracking implementation). 	string	Yes
feedback	<p>Combined feedback status from both operator and government:</p> <ul style="list-style-type: none"> • "Yes": feedback received from either operator or government (or both). • "No": no feedback received from either operator or government. • "Not Applicable": feedback tracking not applicable (non-Oil and Gas sectors or sources whose last plume was detected before feedback tracking implementation). 	string	Yes
notified	<p>Indicates whether a notification has been sent to the relevant government or facility operator:</p>	string	Yes

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	<ul style="list-style-type: none"> • “Yes”: At least one plume over this source has been notified. • “No”: No plumes on this source have been notified. • “Not Applicable”: MARS currently only notifies Oil and Gas sources. 		
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