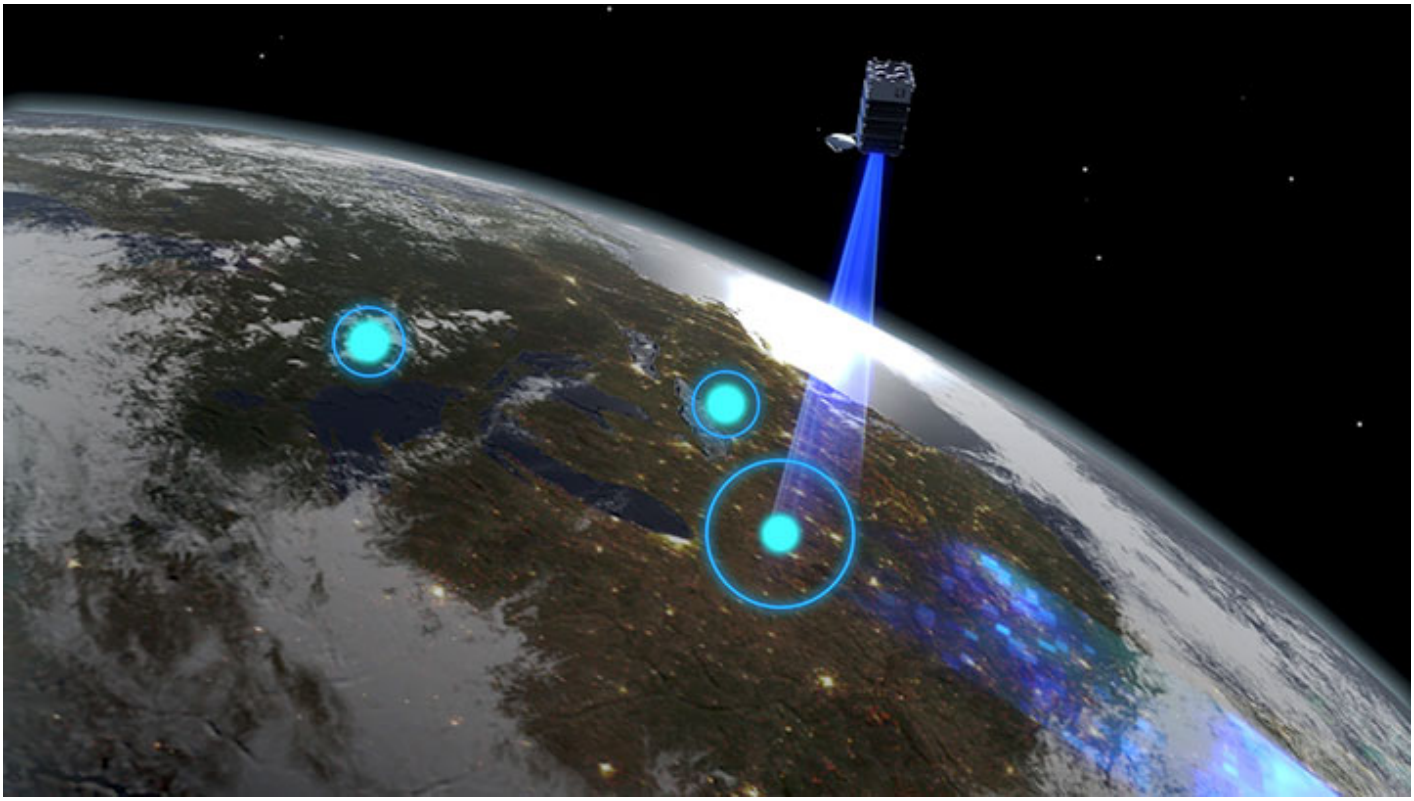
METHANE FROM FLARING TOOLKIT



Can I identify a flare with a performance issue: Satellite monitoring – Directed methane monitoring

Summary

can be used to monitor for flares with higher than normal methane emissions. Several technologies are now available, and further systems and services are being launched in the coming years.

The technology can be broadly classed in to two types of activity:

1. Wide area survey – in which the spatial resolution is low. An example of this is the Tropomi sensor onboard the Sentinel-5P satellite. Monitoring of this kind can identify trends in total methane emissions within a region.
2. Directed satellite monitoring – The satellite is directed towards specific locations and monitored with a higher resolution. GHGSat and MethaneSat are examples of this technology.

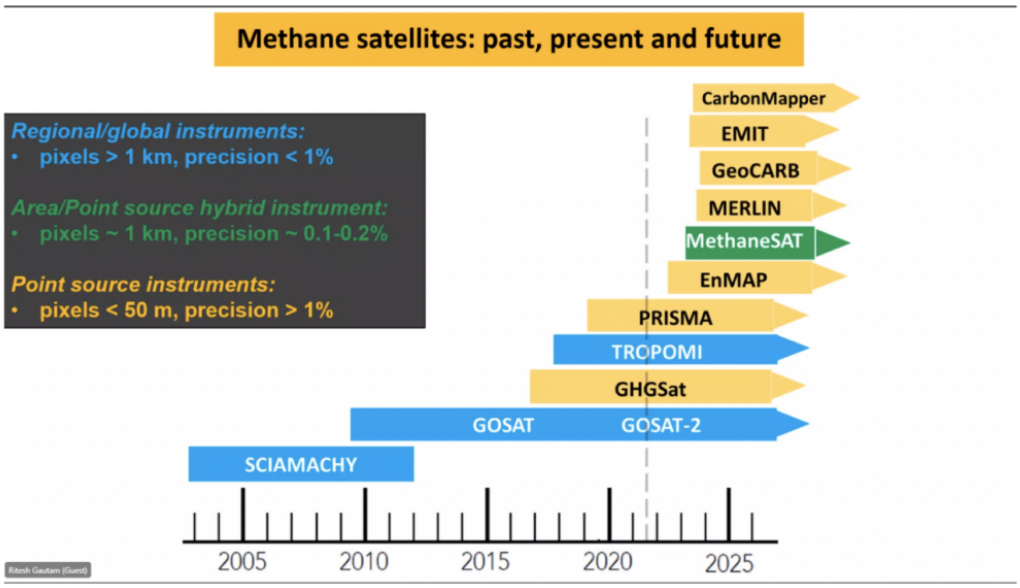
There are advantages and challenges associated with both technologies. Both require additional information – such as visible imagery or thermal data (VIIRS) to differentiate flaring from other potential sources of methane, such as venting.

This entry focuses on directed measurements where the satellite is measuring the spectral signature of methane. It is different to technologies that infer methane emissions from other data sources such as the thermal signature (see VIIRS)

In addition to satellite operators, there are a growing number of service organisations that will process publicly available or privately sourced data and use analytics to give insights to an operator.

How it Works

- The satellite is positioned with a low-altitude polar orbit designed to give global coverage and tasked towards a chosen location.
- Methane is measured using multi-spectral imaging using sunlight that is scattered back to space by Earth's surface and atmosphere. Gases of interest, such as methane, have a unique spectral fingerprint.
- The sensor measures the total-column of methane in the atmosphere – It is not differentiating between background methane or emissions from different sources that overlap vertically.
- The image quality is dictated by the resolution of the imager. Targeted measurements offer much higher resolution than regional measurements with individual images being 100m or less.
- Converting image data in to emission rates requires additional data inputs, most notably windspeed. Information on metered gas volumes is required to derive deeper insights into flare efficiency.
- Ground truth of satellites based upon controlled release experiments are ongoing – with reported emissions >200kg/h so far presented. At this scale the satellite will identify an unlit flare, but not the residues of incomplete combustion.



Advantages

- Global coverage provides an overview of changes in flaring – allowing regional trends to be measured
- Publicly accessible data provides an independent view of changes to flaring

Limitations

- Multi-spectral imaging is dependent upon daylight and cloud-free cover for the location of interest. In some parts of the world, cloud free days are rare
- Quantification is dependent upon additional information, such as wind speed
- Measurements conducted over water, ice or snow are subject to light reflection, which impairs data accuracy. Work is ongoing to develop specialised ‘glint mode’ analytics to provide improved data over water
- Swath size dictates the number of targets viewable within a defined period

Go Deeper

- Vendor website: GHGSat
- MethaneSat

Case study

Quantifying methane emissions from the global scale down to point sources using satellite observations of atmospheric methane

Daniel J. Jacob et al.

Satellite instruments for observation of methane in the shortwave (SWIR). Area flux mappers are designed to quantify total methane emissions on regional to global scales. Point source imagers are designed to quantify emissions from individual point sources by imaging the atmospheric plumes.

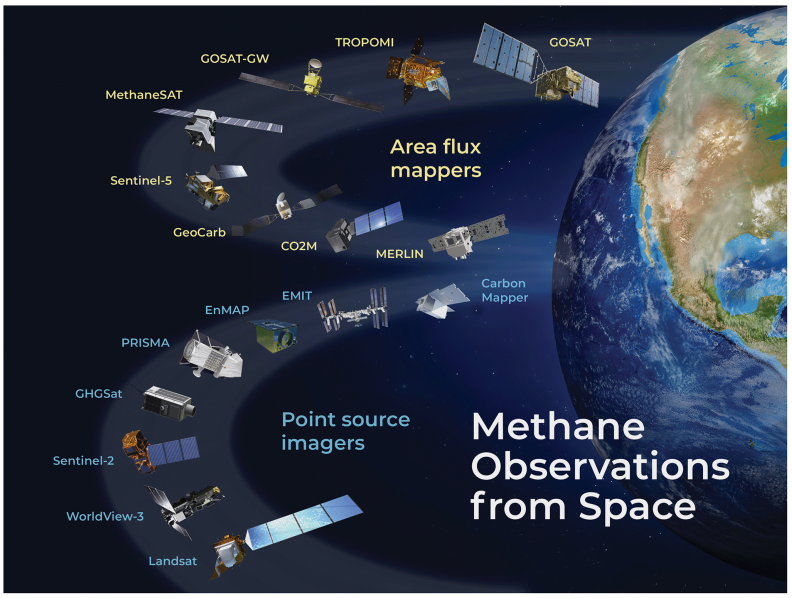


Figure 1

Can I identify a flare with a performance issue?

Can I identify a flare with a performance issue: Satellite monitoring – Wide area methane emissions monitoring

Can I identify a flare with a performance issue: Optical Gas Imaging

Can I identify a flare with a performance issue: Helicopter Optical Gas Imaging

Can I identify a flare with a performance issue: Point Sensors and Arrays

Can I identify a flare with a performance issue: Monitoring Black carbon generation