CONTINUOUS MONITORING OF METHANE EMISSIONS WITH TROPOMI SATELLITE OBSERVATIONS

Leveraging area mapper and point source satellite data to provide continuous, high-frequency methane emission monitoring on a global scale.

DONOR:
n/a

BENEFITTING COUNTRIES OR REGIONS:
Worldwide

SECTOR:
Multisector

Subsector, if applicable:
-

STATUS:
Project initiation

TIMELINE:
Inversion to quantify methane in 2025

IMEO SCIENCE OBJECTIVE:

→ **Validation of measurement-based approaches.**

KEY FINDINGS

The study will quantify high-frequency (weekly, monthly) methane emissions from satellite measurements, allowing the identification of factors driving the variability of the emissions. The study underscores the potential of satellite-based remote sensing as a tool for accurate, continuous and large-scale monitoring of methane emissions.

RATIONALE

Methane-monitoring satellites offer a valuable tool to track emissions, target mitigation and assess progress. The European Space Agency's TROPOspheric Monitoring Instrument (TROPOMI) on board the Sentinel-5P satellite is an area mapping instrument that surveys larger regions at a time for methane emissions.

There is an opportunity to integrate data from other satellite missions which have higher resolution over smaller areas (point source mappers) to refine insights and provide more granular and actionable methane data. The Integrated Methane Inversion (IMI) provides a ready-made open access tool to make these integrated observations available to users.

United Nations Environment Programme | International Methane Emissions Observatory
1 rue Miollis 75015 Paris, France | www.unep.org/imeo
For more information, please contact imeo@un.org

UN environment programme

RELATED PUBLICATIONS

In progress

SIGNIFICANCE FOR DECISIONMAKERS

The continuous, high-frequency estimate of regional and country level methane emissions provides an overview of how methane emissions change with time. This is crucial for understanding the effectiveness of mitigation strategies and for identifying trends, periods and areas of heightened emissions. Furthermore, the identification of factors driving the variability of emissions is an opportunity to mitigate those emissions.

CATALYZING ACTION

A wide range of users can leverage the Integrated Methane Inversion, an open-access and user-friendly cloud-computing framework that allows a wide range of users to independently assess methane emissions. This transparency enables collaborative efforts to identify methane emissions and prioritize mitigation actions. The user-friendly design makes advanced inversion techniques accessible to non-experts. The results of this study will drive action by influencing policymakers and by empowering more stakeholders to perform in-depth emission analysis and it will support data-driven decision making.

OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator:
Harvard University, US

Revision History: **08/22/2024**

STUDY APPROACH/ACTIVITIES

The Integrated Methane Inversion (IMI) is an open-access, user-friendly cloud-computing framework that allows researchers and stakeholders to perform regional inversions of TROPOMI satellite observations to infer methane emissions. In the past, these global scale inversions have focused on accounting for data from global area-mapping satellites. The inversions can benefit from incorporating data from point-source imagers as well to better represent the full spectrum of emission rates.

By utilizing satellite-based data, this study demonstrates a scalable method for monitoring methane emissions across critical areas globally. To enhance the accuracy of methane emission estimates, the study will incorporate automatic construction of inversion ensembles with varying inversion parameters and quantify the sensitivity of results to observational errors, prior emission estimates, satellite retrieval products, and other factors. The study will explore the incorporation of point-source information into the tool using IMEO's MARS point-source data from independent instruments.

The study employs an inversion technique to convert methane concentration measurements from the TROPOMI satellite instrument into emission rates. The novelty of this approach lies in its ability to provide high-frequency estimates of methane emissions, which offers a higher temporal resolution than most previous studies.

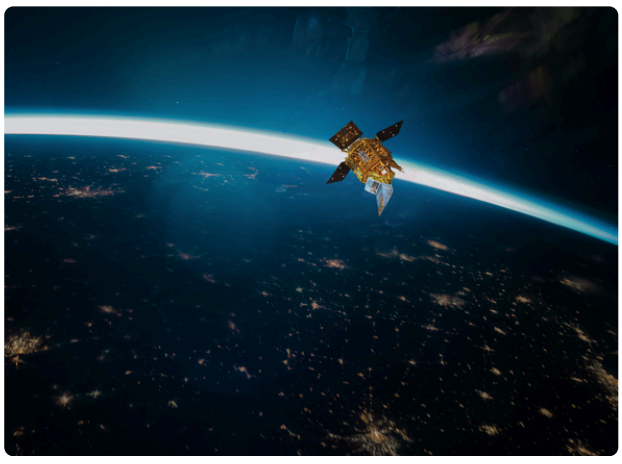

Photo Attribution: Canva

The UN Environment Programme's International Methane Emissions Observatory (IMEO) exists to provide open, reliable, and actionable data to the individuals with the agency to reduce methane emissions. IMEO does this by integrating and reconciling data across sources, including its global methane science studies. IMEO supports measurement and research studies around the world to close the knowledge gap on methane emissions and provide policy-relevant insights to decisionmakers.

United Nations Environment Programme | International Methane Emissions Observatory
1 rue Miollis 75015 Paris, France | www.unep.org/imeo
For more information, please contact imeo@un.org