

Methane Observations for Large Emission Event Detection and Monitoring

Part 2: EMIT Data Products and Visualization

Andrew Thorpe (Jet Propulsion Laboratory), Phillip Broderick (Jet Propulsion Laboratory), Dana Chadwick (Jet Propulsion Laboratory), Melanie Follette-Cook (NASA Goddard Space Flight Center)

November 21, 2024



Training Outline

Part 1

United States
Greenhouse Gas
Center (US GHG)
and Remote
Detection of Large
Methane Emissions

November 19, 2024

11:00-12:30 EST

Part 2

EMIT Data Products
and Visualization

November 21, 2024

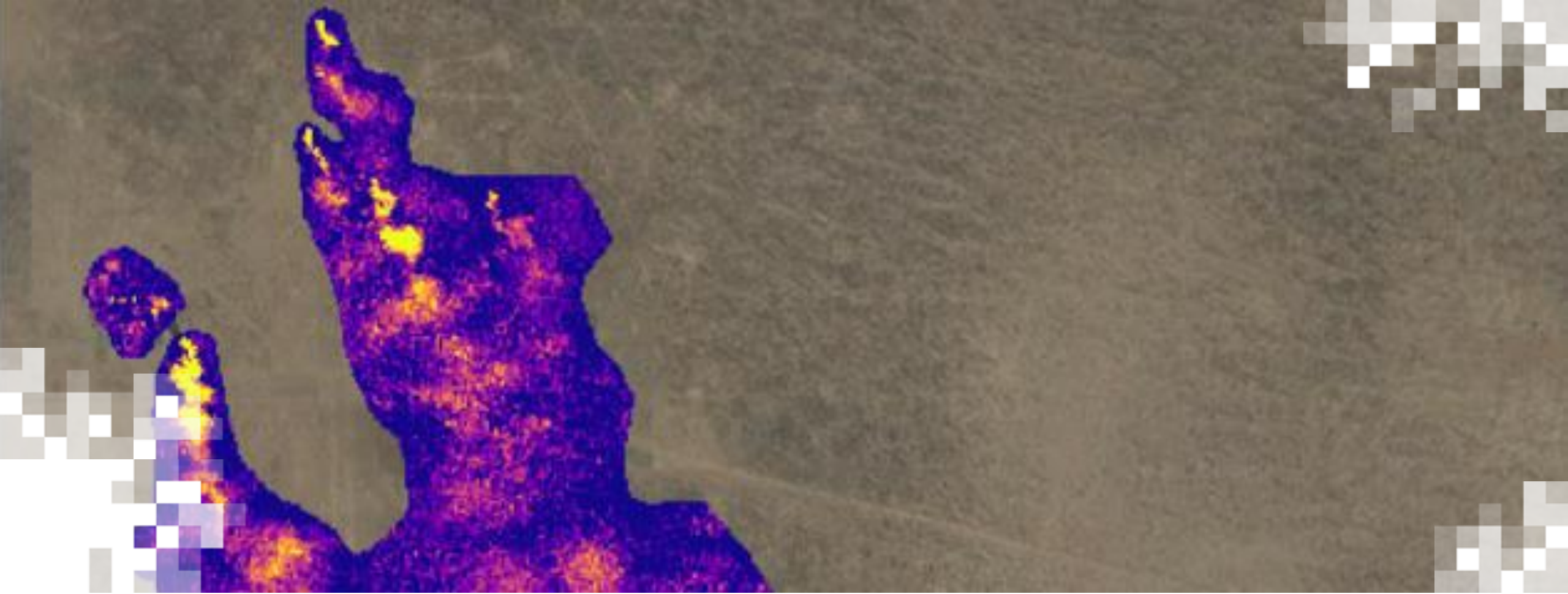
11:00-12:30 EST

Homework

Opens Month DD – Due Month DD – Posted on Training Webpage

A certificate of completion will be awarded to those who attend all live sessions and complete the homework assignment(s) before the given due date.





Methane Observations for Large Emission Event
Detection and Monitoring
Part 2: EMIT Data Products and Visualization

Part 2 – Trainers

Andrew Thorpe

Research Technologist
Jet Propulsion Laboratory



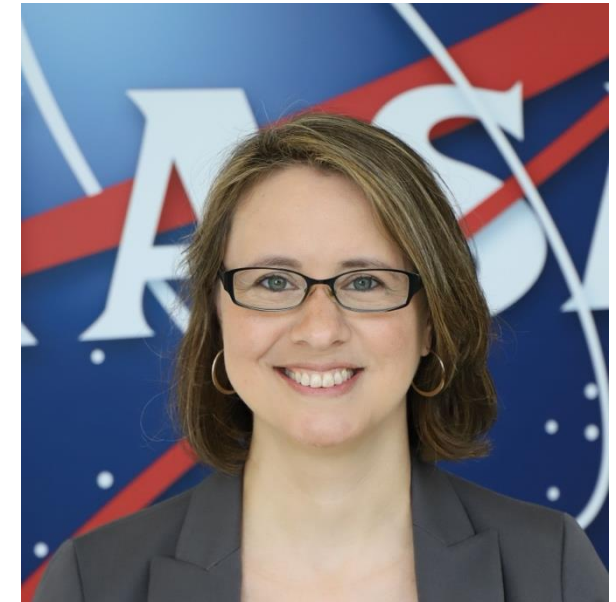
Phil Brodrick

Data Scientist
Jet Propulsion Laboratory



Melanie Follette-Cook

Project Scientist, ARSET
NASA Goddard Space Flight
Center



Part 2 Objectives

By the end of Part 2, participants will be able to:

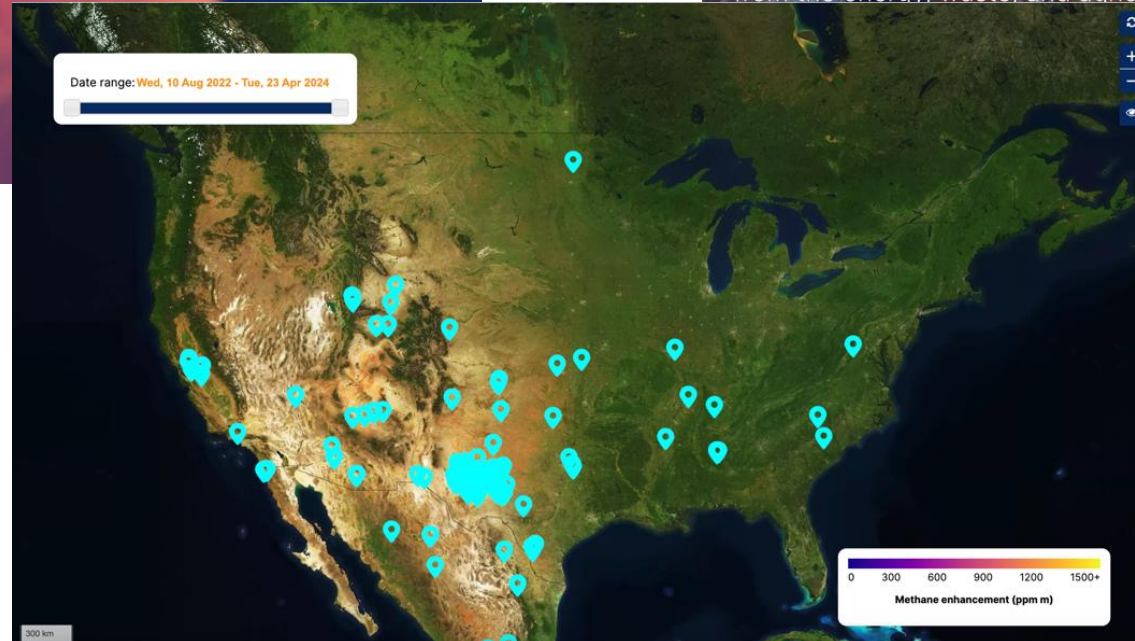
- Navigate EMIT Observations through the U.S. Greenhouse Gas Center Portal
- Use EMIT VISIONS Data Portal to explore ancillary data that can contextualize methane enhancement observations



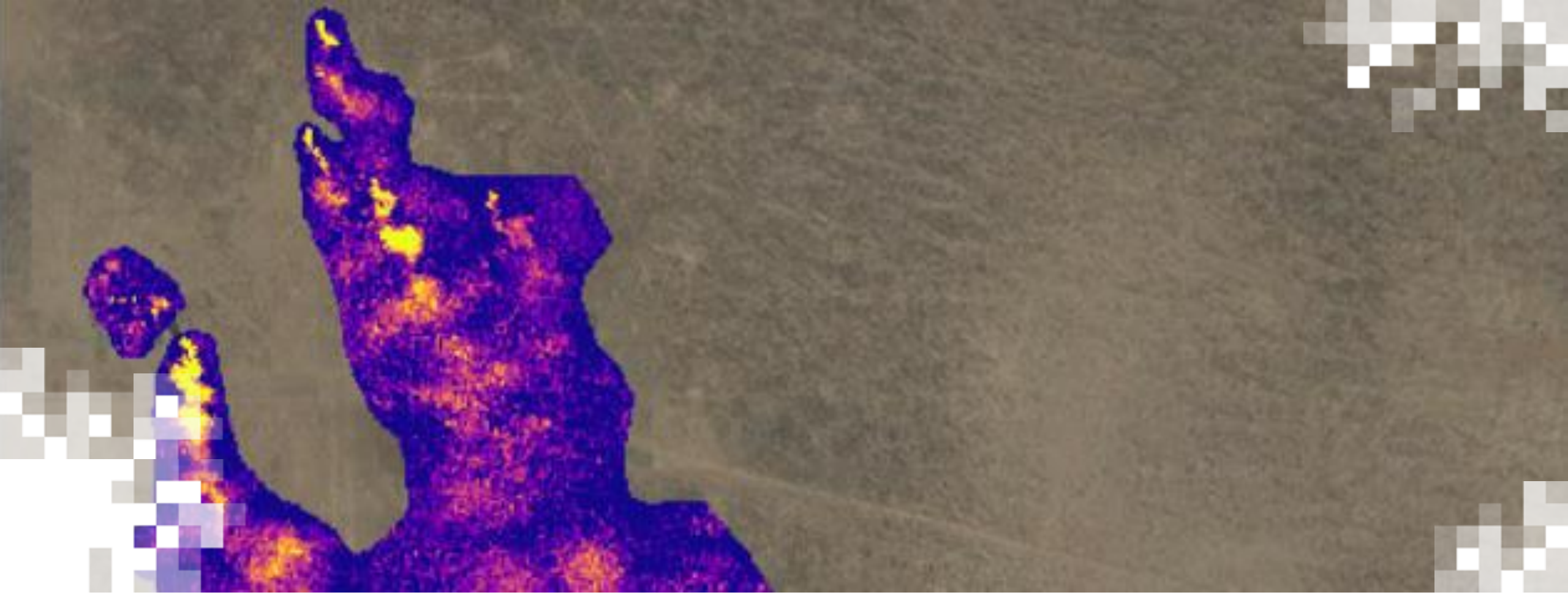
How to Ask Questions

- Please put your questions in the Questions box and we will address them at the end of the webinar.
- Feel free to enter your questions as we go. We will try to get to all of the questions during the Q&A session after the webinar.
- The remainder of the questions will be answered in the Q&A document, which will be posted to the training website about a week after the training.

Review from Part 1: Large Emission Events



Currently visualizing EMIT methane plumes, will soon host airborne and other spaceborne datasets.

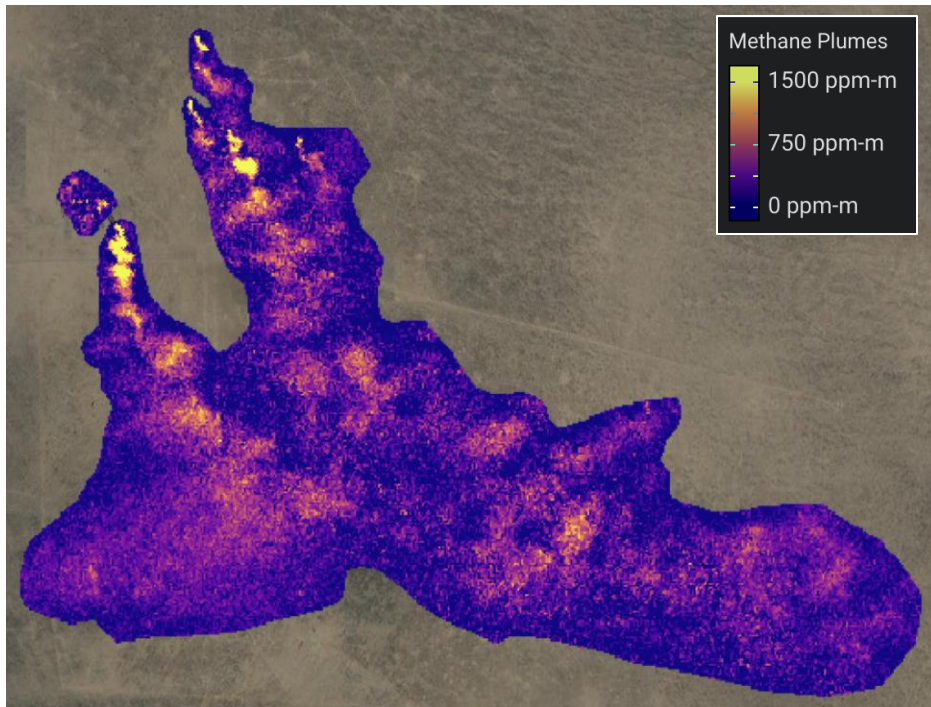


Accessing Large Emission Event Data from EMIT

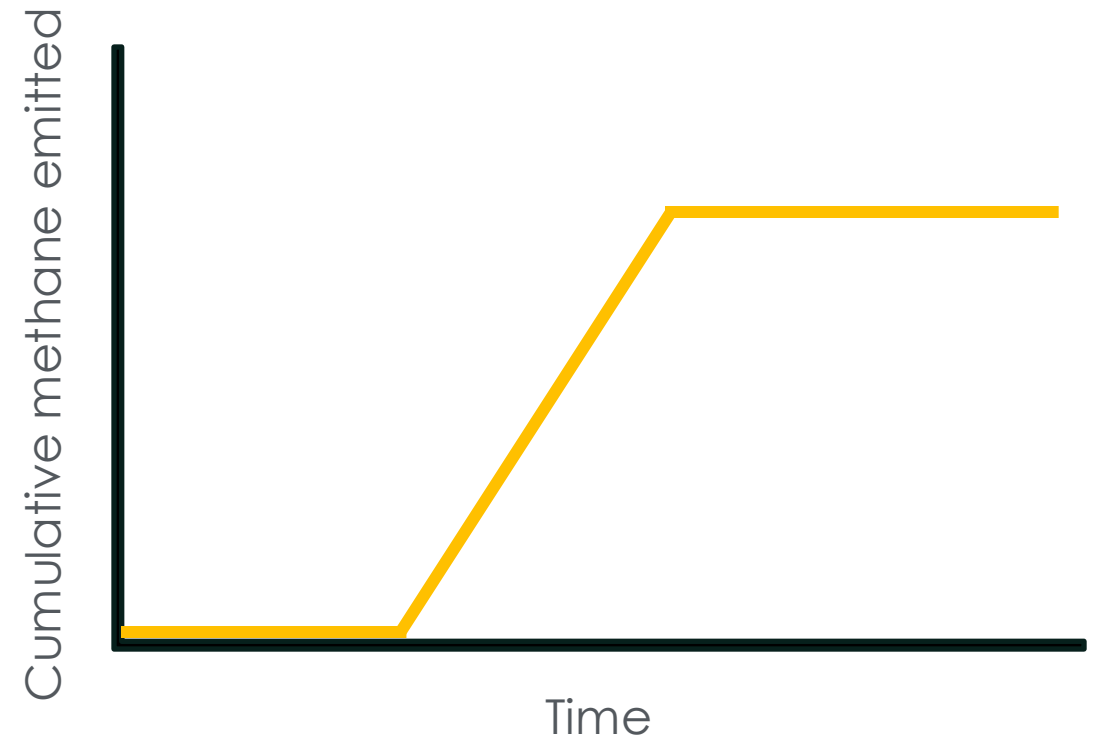
There are Usually Two Main Questions About Large Emission Events:



Is there methane detected at this location?



How much methane has been emitted from this location?



These questions require different amounts of information to answer.



Addressing these Questions Allows for Different Action



Is there methane detected at this location?

- Operators can send technicians to the field to check for leaks or damage.
- State agencies can send employees to sites to assess emission rates or compliance issues .
- Landfill operators can identify opportunities for methane capture.

How much methane has been emitted from this location?

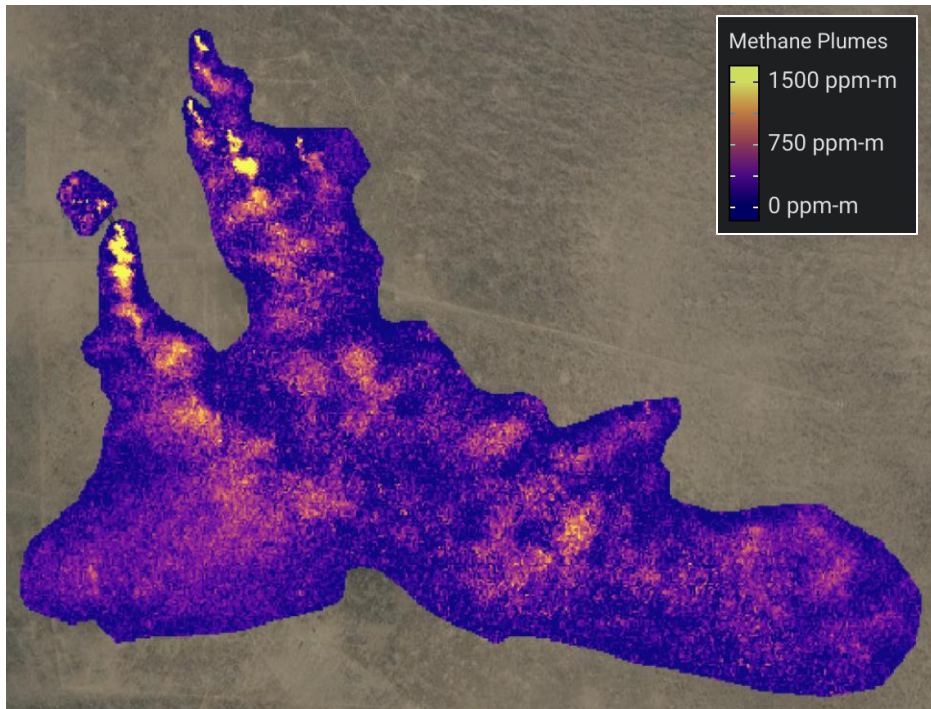
- Inventories can capture short term but large-scale emission events.
- Quantifying compliance violation scope when standards are defined by scale of emission.
- Assessing how jurisdictions (domestic and international) are performing related to their stated obligations.



Where Are We?

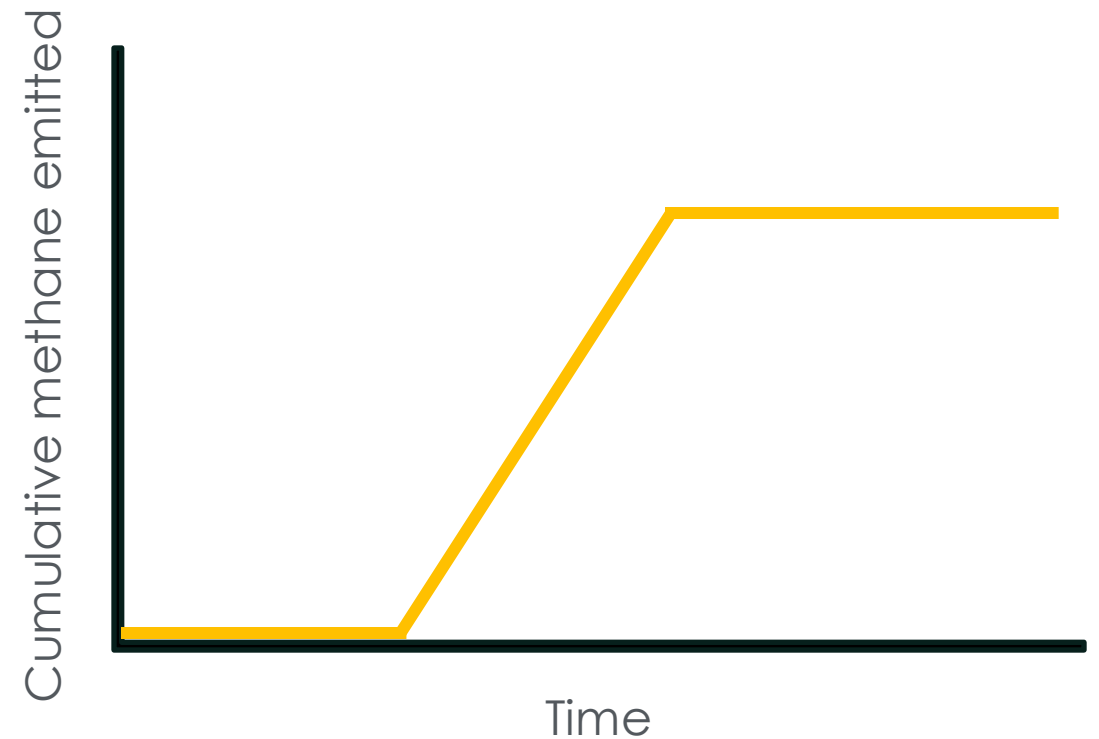
We are here.

Is there methane detected at this location?

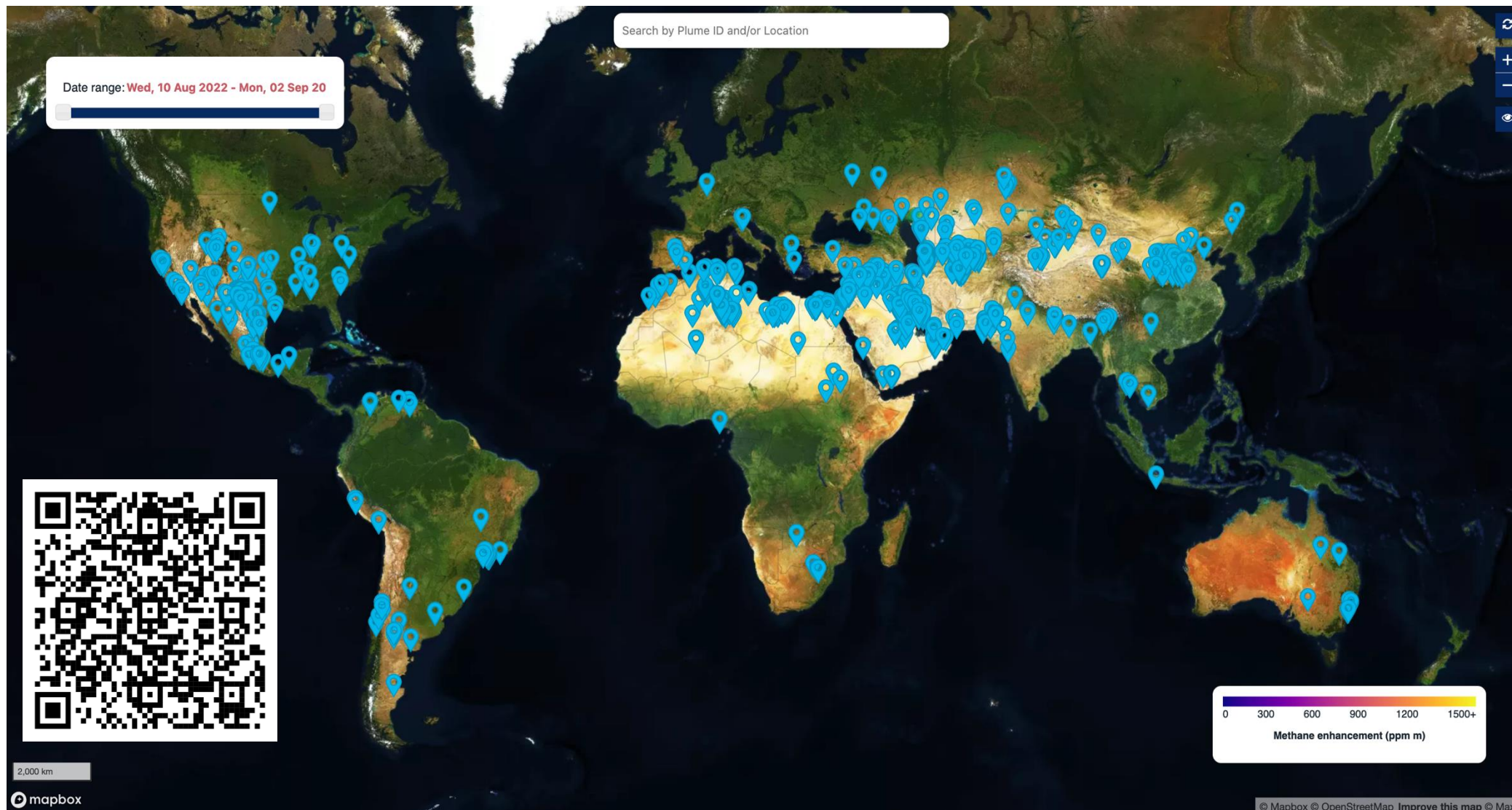


We are working to be here.

How much methane has been emitted from this location?



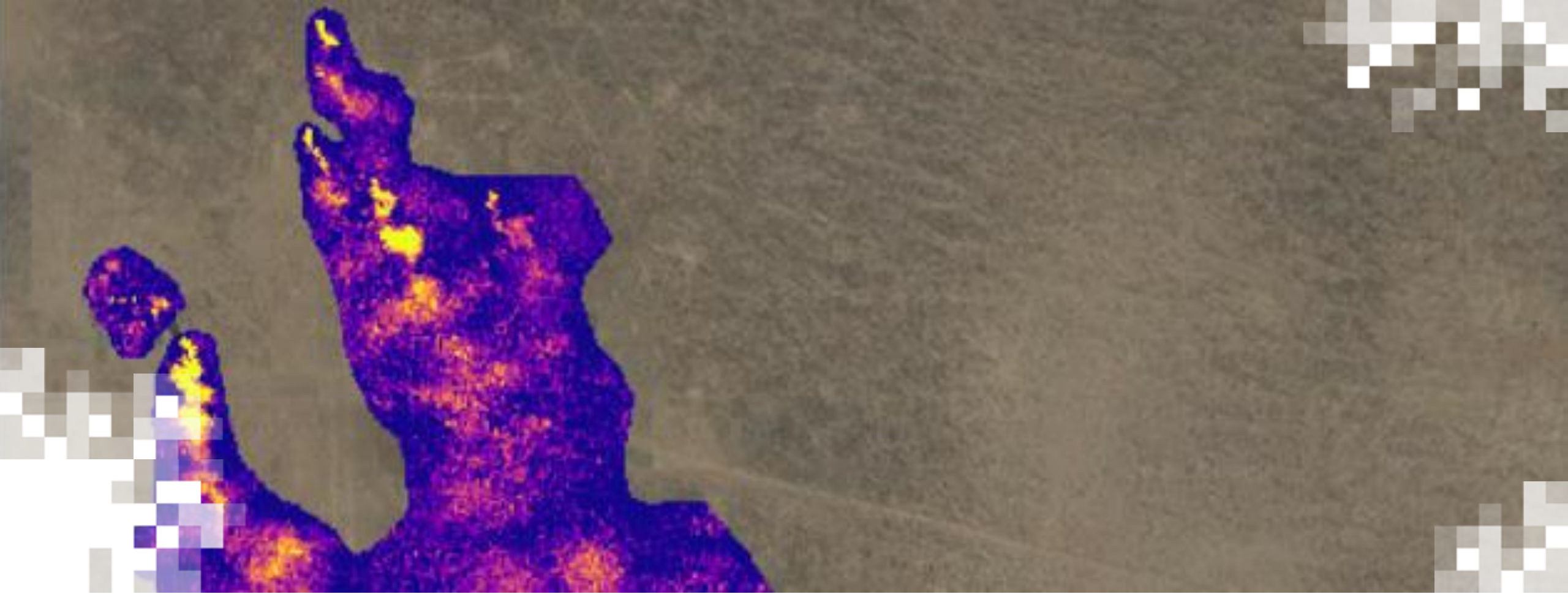
Exploring Methane Plumes Observed with EMIT Through GHG Center



GHG Center Portal Walkthrough

- Navigate GHG Center [home page](#) and [Stories](#)
- Highlighted Stories:
 - [Tracking Methane Plumes from Space and Sky](#)
 - [Discovering Large Methane Emission Events with Remote Measurement](#)
- Data Toolkit → EMIT Methane Plume viewer
 - Information about EMIT measurements and Interactive Map
 - Shows all methane plumes observed by EMIT to date
- Can navigate/zoom into specific plumes, toggle plume on and off to view sources and ancillary information
 - Maximum plume concentration, link to download geotiff image, latitude and longitude of maximum concentration
- Example sources shown, compressor station, waste lagoon, landfill, coal ventilation





EMIT VISIONS Portal

Different Tools for Different Uses

NASA Data are available on many platforms – here are some reasons you might use one platform or another for different tasks:

US GHG Center

- The US GHG Center is the home for lots of different GHG-related data from multiple agencies.
- Use the US GHG Center if you want to discover and compare different data sources, find out how different datasets are being used, and/or learn more about the greenhouse gas cycle.

EMIT VISIONS Portal

- The EMIT VISIONS Portal lots of context about EMIT measurements and forecasting.
- Use the EMIT VISIONS portal if you want to put EMIT GHG detections in the context of past and future observations.

Earth Data Search

- NASA data are all available through Earth Data Search, as a single access point – including all EMIT data.
- Use NASA Earth Data Search if you want to couple EMIT data with other NASA datasets.

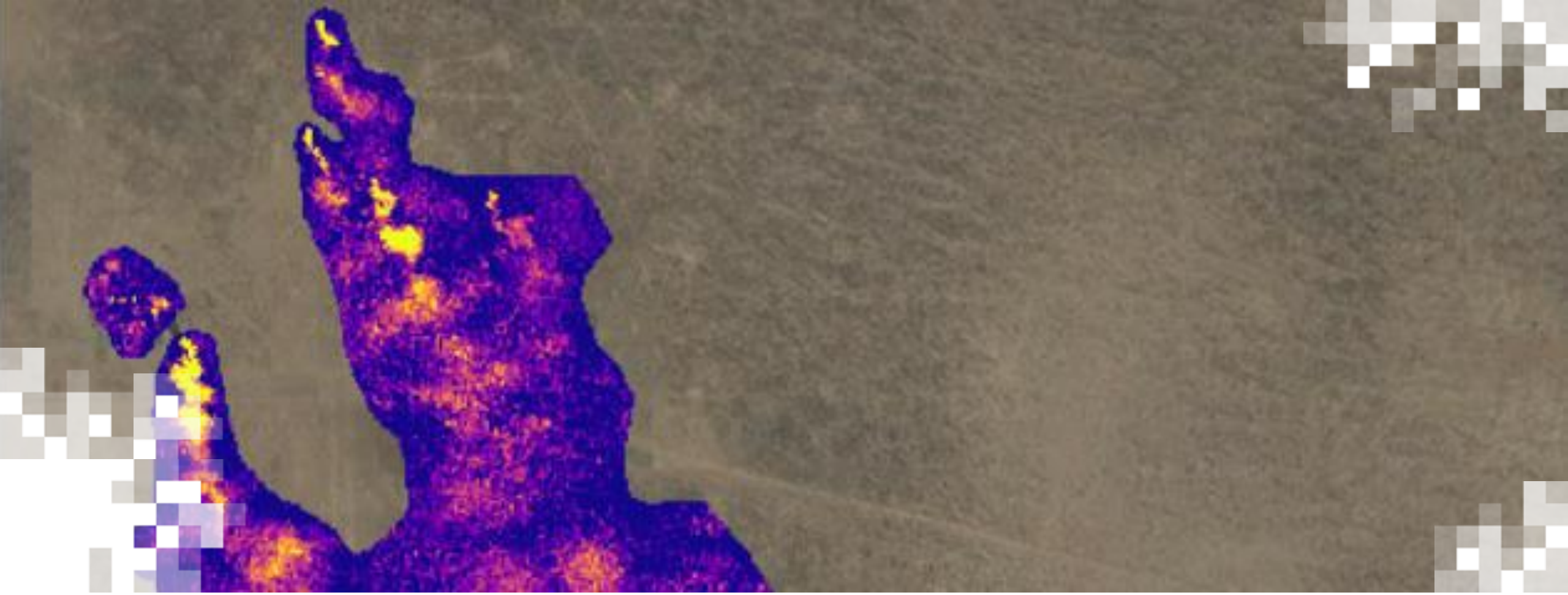


EMIT VISIONS Tutorial

In this section, we will use the [EMIT VISIONS portal](#) to:

- Understand when and where EMIT data has been collected to date
- Explore where EMIT data might be collected in the future
- Understand additional information about each EMIT detection
- Visualize EMIT scenes
- Walk through point source examples to understand the temporal context of the plumes EMIT has detected





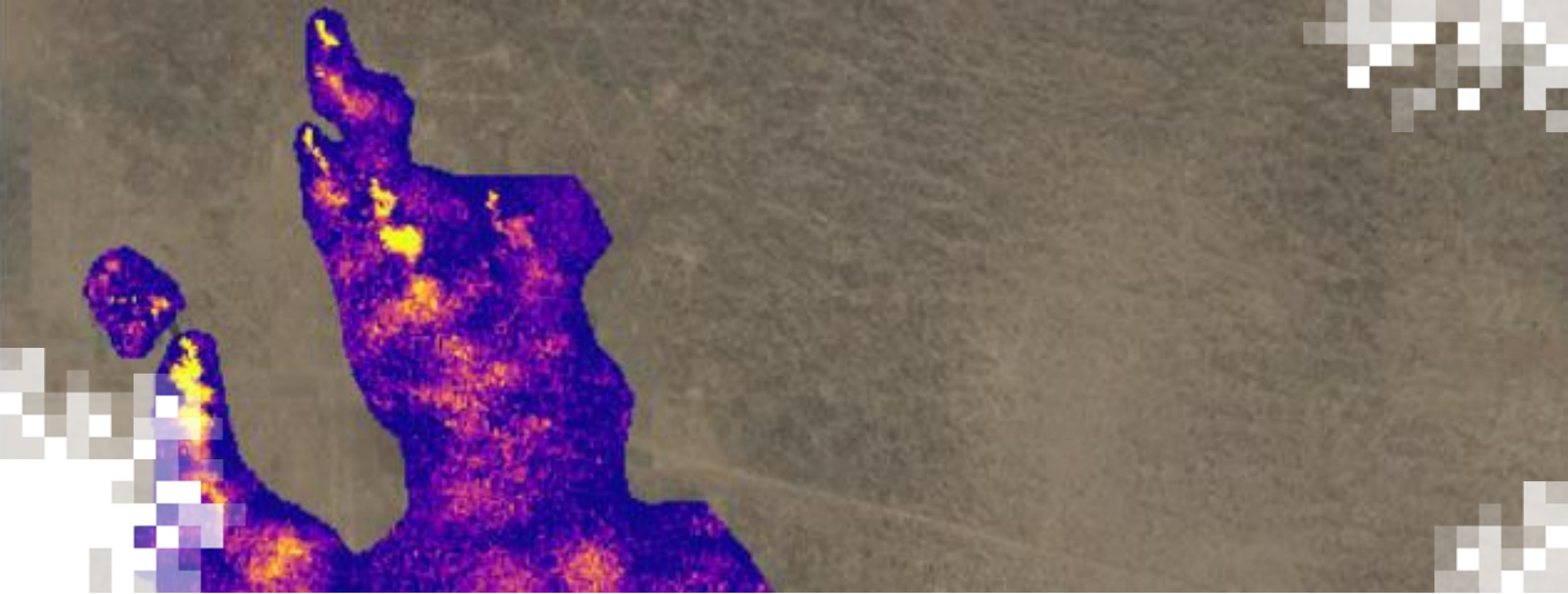
NASA Earthdata Search

NASA Earth Data Search & Open Science Walkthrough

In this section, we will preview NASA Earth Data Search in the context of EMIT data, demonstrating:

- How to find and download EMIT and other datasets on Earth Data Search
- How to find documentation around all EMIT products
- Where to look for tutorials and open-source code, if you want to dig deeper for different research tasks





Methane Observations for Large Emission Event
Detection and Monitoring
Summary

Summary – Part 1

- Methane is a potent greenhouse gas
- Satellite observations are important for showing the effectiveness of policy changes
- The US GHG Center is initially led by NASA, EPA, NIST, and NOAA and is part of a national strategy to advance and integrated US GHG measurement, monitoring, and information system
- The goals of the US GHG Center involve making data that supports decision making, improving the quality and reliability of information, and ultimately providing users with consensus information to enable climate change mitigation.
- Point sources are emissions of methane from a distinct location on the ground and can come from different emissions sectors such as oil and gas, landfills, and agricultural activities
- EMIT satellite observations of methane can be used to:
 - locate methane sources associated with known pieces of infrastructure, which can lead attribution to a given emission sector, and inform mitigation activities
 - discover unexpected emission not in inventories such as pipeline leaks or new sources
 - track methane point source emissions over time



Summary – Part 2

- There are several tools or to access EMIT data, and users should use the tools that best fits their needs.
 - Use the US GHG Center if you want to discover and compare different data sources from multiple agencies, find out how different datasets are being used, and/or learn more about the greenhouse gas cycle.
 - Use the EMIT VISIONS portal if you want to put EMIT GHG detections in the context of past and future observations.
 - Use NASA Earth Data Search if you want to couple EMIT data with other NASA datasets.
- The [US GHG Center portal](#) provides guided narratives describing examples of data use alongside tools for accessing and exploring available data.
- Using the Interactive Map (EMIT Methane Plume Viewer) users can zoom in on plumes, view associated sources, find ancillary information, and download a geotiff.



Summary – Part 2

- [EMIT VISIONS Dataportal](#)
 - Contains many layers to understand context around each EMIT observation and find out additional information
 - Coverage layer – Visualize when and where EMIT data has been collected to date, find out information about cloud cover and
 - Methane Plumes and Methane Metadata – Visualize methane plumes and additional information such as maximum plume concentration is and its latitude and longitude
 - Step through methane plume observations over time
- [NASA Earthdata Search](#)
 - Earthdata is the home for all NASA data, including data from EMIT
 - Find and download EMIT data and documentation
 - Can search using bounding box and time to find other data to complement EMIT
- [NASA EMIT Data Resources page](#)
 - Repository that contains tutorials and open-source code showing how to access and work with EMIT data



Homework and Certificates

- **Homework:**
 - One homework assignment
 - Opens on 21/11/2024
 - Access from the [training webpage](#)
 - Answers must be submitted via Google Forms
 - **Due by 05/12/2024**
- **Certificate of Completion:**
 - Attend both live webinars (attendance is recorded automatically)
 - Complete the homework assignment by the deadline
 - You will receive a certificate via email approximately two months after completion of the course.



Contact Information

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- [ARSET Website](#)
- Follow us on Twitter!
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Resources

- U.S. GHG Center, <https://earth.gov/ghgcenter/>
- U.S. GHG Center, Large Methane Emission Events, <https://earth.gov/ghgcenter/stories/discovering-large-methane-emissions>
- EMIT Open Data Portal, <https://earth.jpl.nasa.gov/emit/data/data-portal/Greenhouse-Gases/>
- CEOS Greenhouse Gas Satellite Missions Portal, <https://database.eohandbook.com/ghg/>
- EMIT Open Science Repositories, <https://github.com/emit-sds>, <https://github.com/emit-sds/emit-ghg>
- Land Processes Distributed Active Archive Center (LP DAAC), EMIT data, <https://lpdaac.usgs.gov/data/get-started-data/collection-overview/missions/emit-overview/#nav-heading>
- Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC), AVIRIS-3 data, https://daac.ornl.gov/cgi-bin/dataset_lister.pl?p=47
- NASA EMIT Data Resources Page, <https://github.com/nasa/EMIT-Data-Resources>



Acknowledgements

Lesley Ott

Project Scientist, US
Greenhouse Gas Center
NASA Goddard Space
Flight Center



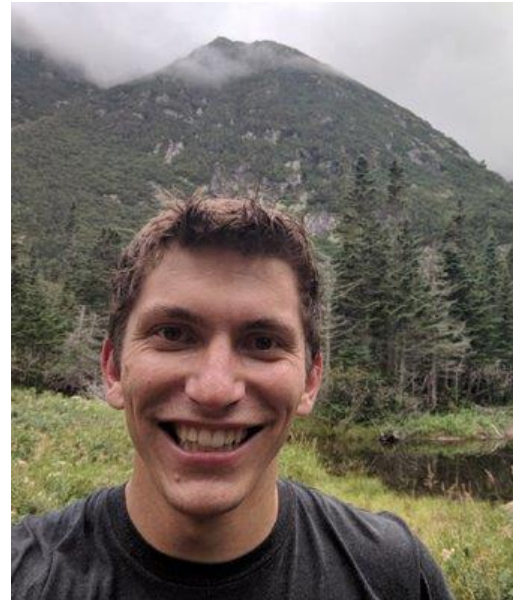
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Thank You!

