Reducing Methane Emissions
Data and Satellites are Critical

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We have tools to cut global methane emissions in half within 10 years.

Do we have the necessary data?

Source: Ocko et al. ERL 2021
Accelerating emissions reductions requires knowing:

• **What** is being emitted?
• **Where** are the emissions, what are the sources?
• **How much** is being emitted?
• **Are emissions** changing over time?

Thus, we need fine spatial and temporal scale satellite remote sensing data.
Satellite observations reveal high Permian methane emissions

TROPOMI (Sentinel 5-P) methane data averaged from May 2018 – March 2019

Zhang et al. (2020) Science Advances. 6: eaaz5120
TROPOMI data reveal highest methane emissions from the Permian Basin ever measured from any U.S. oil and gas basin.

Zhang et al. (2020), Science Advances. 6: eaaz5120
Most readily identified and mitigated

Fat tail: ~30%?

Body of the distribution: ~70%?

What is the role of Intermittency?

Must be mitigated to reduce overall emissions

Adapted from S. Wofsy
Better data is needed to enable targeted methane mitigation strategies and policies.

(Johnson, et al. ES&T 2017)
MethaneSAT

• Primary Mission Objective
  – Provide **policy-relevant/actionable data**
  – Enabling a 45% reduction in CH₄ emissions from oil & gas production by 2025, 75% by 2030

• Mission Overview
  – Regular monitoring of regions accounting for > 80% of global oil & gas production
  – Designed to detect, quantify, and track **area emission** rates as well as those from **point source emissions**
  – **Flux data** product available immediately – data publicly available free of charge
  – Targeting satellite
  – Near real time data availability
  – Philanthropically funded
  – Partnering with New Zealand
**Necessary For Tackling Flux data product publicly available free of charge**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Dates operational</th>
<th>Grid size (subgrid pixel) (km)</th>
<th>Swath (km)</th>
<th>Precision (ppbv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MethaneSAT</td>
<td>2023-</td>
<td>$1 \times 1$ (0.1 x 0.4 raw)</td>
<td>200±</td>
<td>2-3*</td>
</tr>
<tr>
<td>GOSAT</td>
<td>2009 -</td>
<td>10 km dia., single</td>
<td>Sparse</td>
<td>~13</td>
</tr>
<tr>
<td>GHGSat</td>
<td>2016 -</td>
<td>0.05 x 0.05</td>
<td>12 x 12</td>
<td>~50</td>
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<tr>
<td>TROPOMI</td>
<td>2017-</td>
<td>7 x 5</td>
<td>2600</td>
<td>~11</td>
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<tr>
<td>GOSAT-2</td>
<td>2018 -</td>
<td>10 km dia., single</td>
<td>Sparse</td>
<td>~8</td>
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<tr>
<td>GeoCARB</td>
<td>2022 -</td>
<td>3 x 6</td>
<td>2800</td>
<td>~18</td>
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<tr>
<td>Carbon Mapper</td>
<td>2023 -</td>
<td>0.03 x 0.03</td>
<td>18</td>
<td>~30</td>
</tr>
</tbody>
</table>

* Gradient measured over 10 – 100 km length scales.*
The International Methane Emissions Observatory will integrate all the data we have on methane emissions.

Each element is necessary, but not sufficient to drive change.

IMEO interconnects activities across the methane ecosystem.
How will IMEO integrate methane emissions data?

Data flow of the IMEO

**COLLECT DATA**
- OGMP companies’ assets data
- Science measurements studies
- National inventories
- Satellite data

**Apply Big Data, data science, and machine learning**

**Reconcile inconsistencies and identify gaps**

**GENERATE FINAL PRODUCTS**
- Full methane emissions dataset
- Annual methane report
- Direct measurement studies
- Science-based implementation support
What is required to collect the data needed to catalyze greenhouse gas emissions reductions?

- Diverse types of satellites – including LiDAR
- High precision detectors
- Flux rate data products – from day 1
- Rapid development and deployment
- Source attribution
- Fine spatial scale
- Frequent repeat times at different times of the day
Thank you