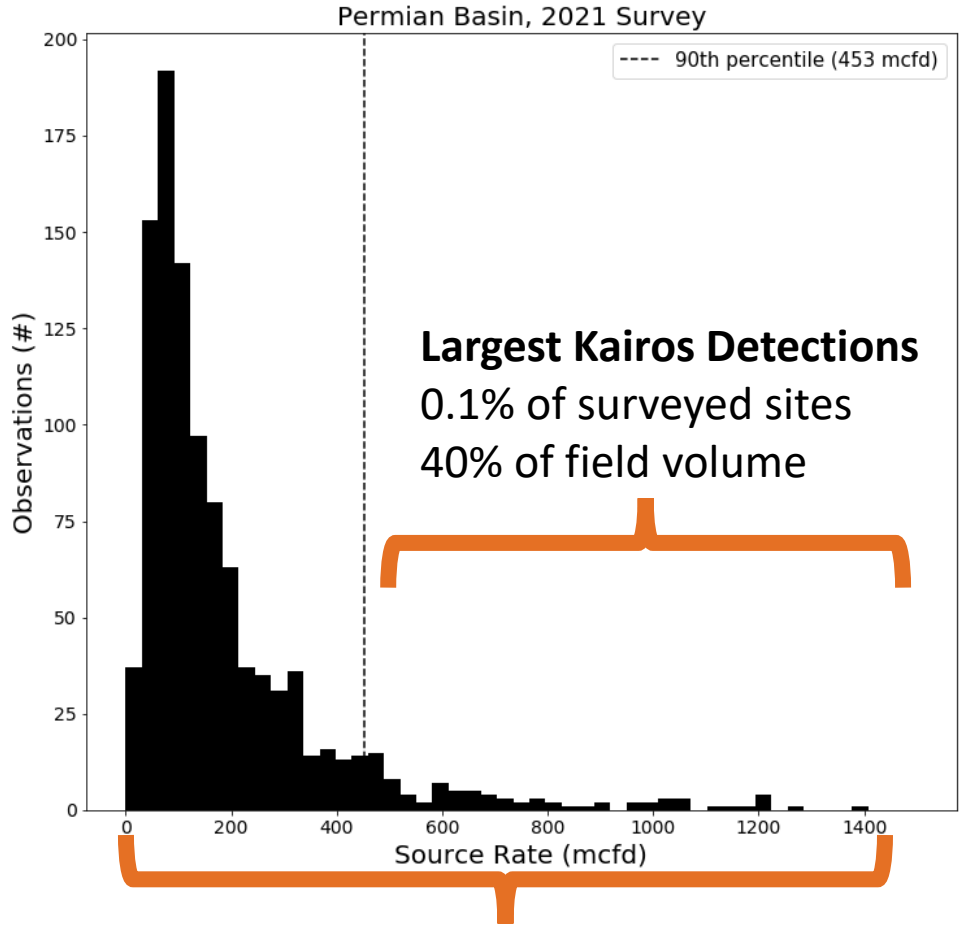

# Why we must measure everything: Insights from basin-scale surveys

Elena Berman, PhD
Chief Science Officer
elena@kairosaerospace.com

October 12, 2021

Detected Emission
1,143 MCF/d

# Spatial scale is critical: Big surveys find big leaks.



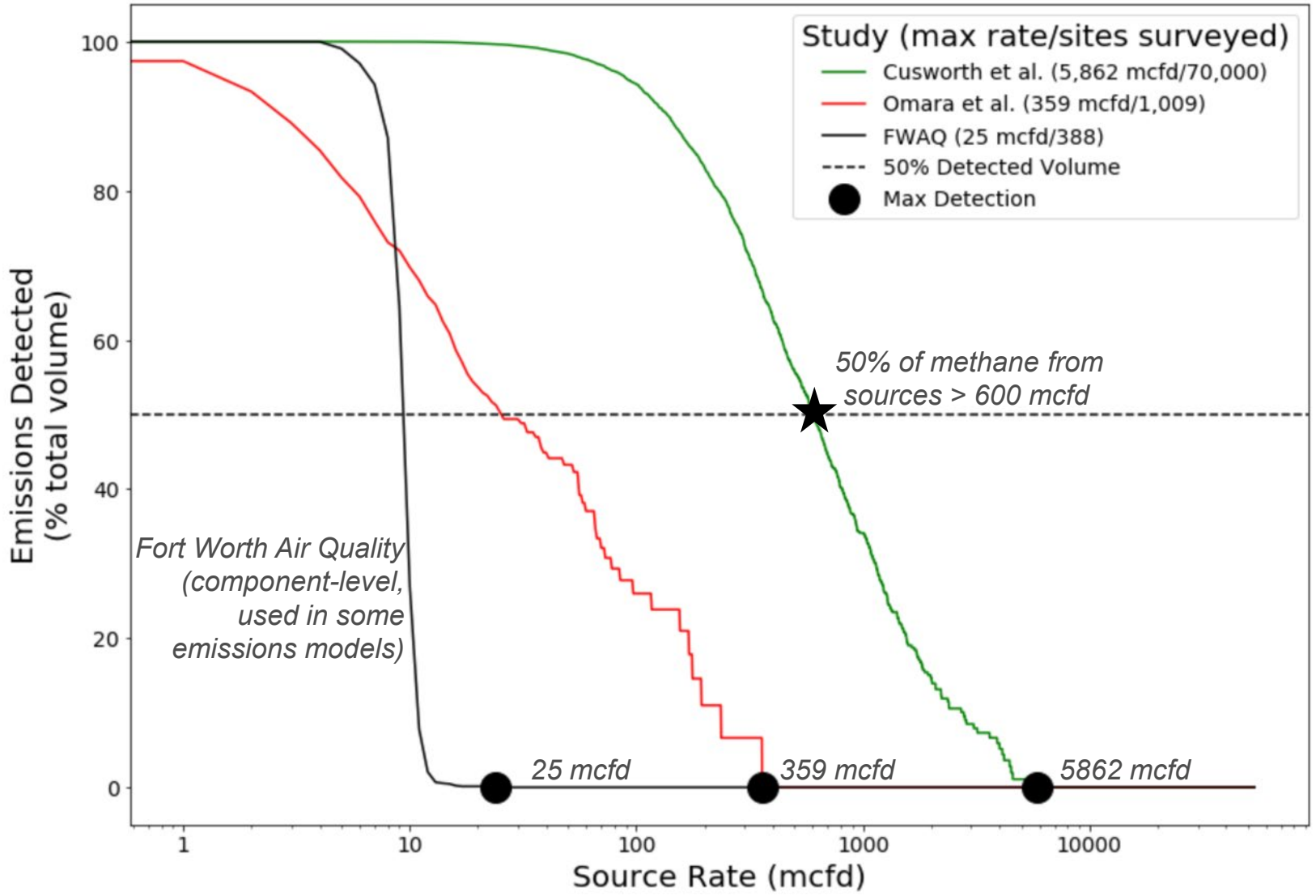

1% of facilities[1]
emit ~80% of $CH_4$ [2]

Full-basin surveys to
detect 80% of $CH_4$ emissions

KAIROS AEROSPACE

1. Cusworth et al., 2021; Results from 3 full-basin Kairos surveys of the Permian
2. https://eartharxiv.org/repository/view/2632/

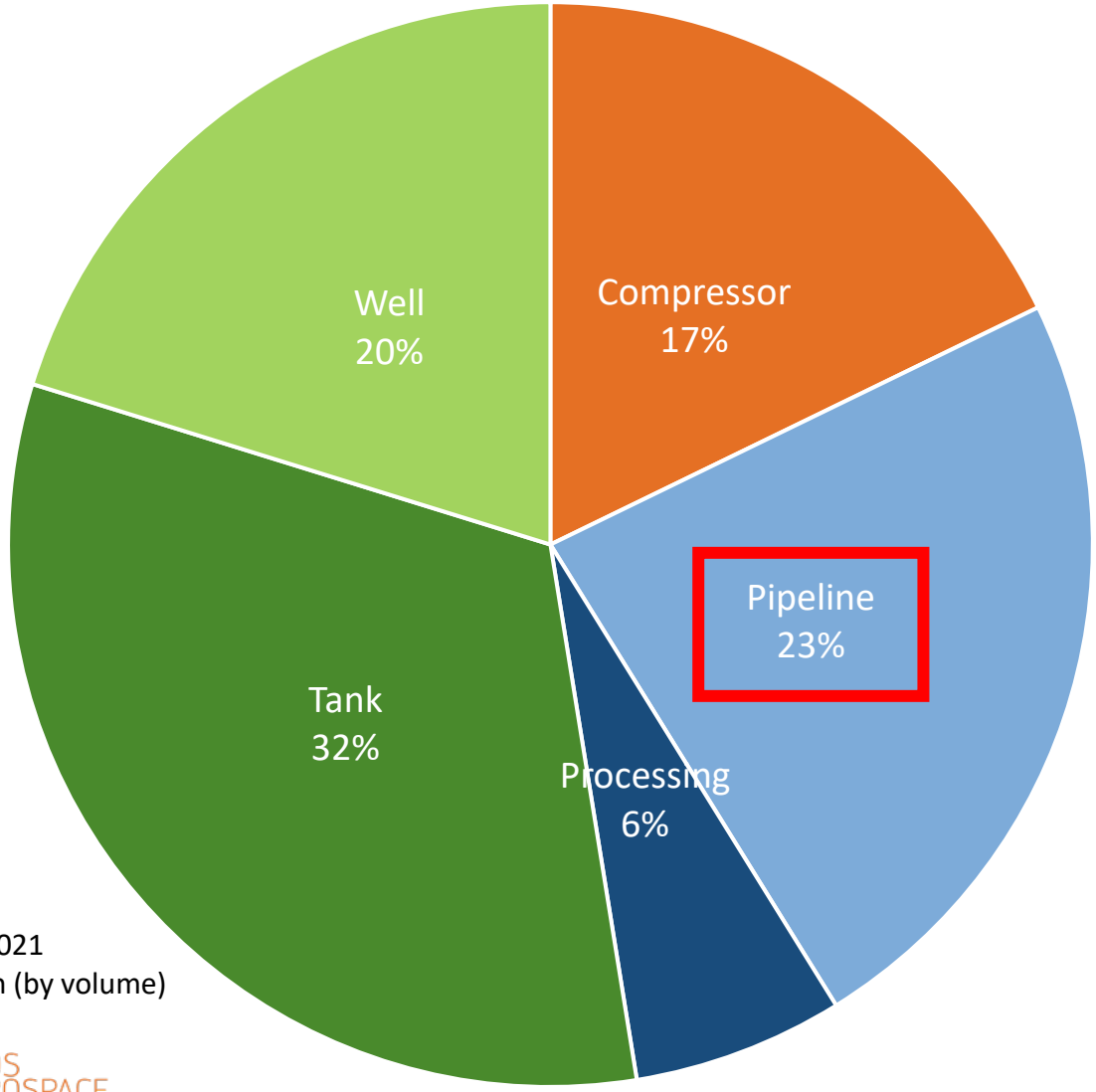
# Spatial scale is critical: Big surveys find big leaks.




Cusworth et al., 2021
Omara et al., 2018
ERG, 2011 (FWAQ)

KAIROS AEROSPACE

# Big surveys find leaks where we don't expect.

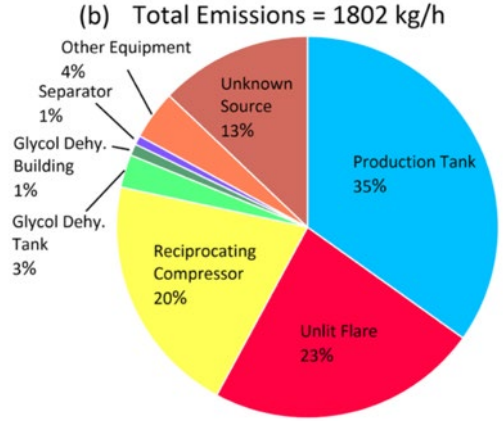



Production
52%

Midstream
48%

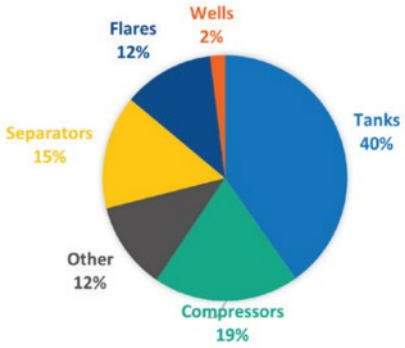
Cusworth et al., 2021
Source Attribution (by volume)

Tyner & Johnson, 2021
(LiDAR- no pipelines)




Rutherford et al., 2021
(inventory- no pipelines)

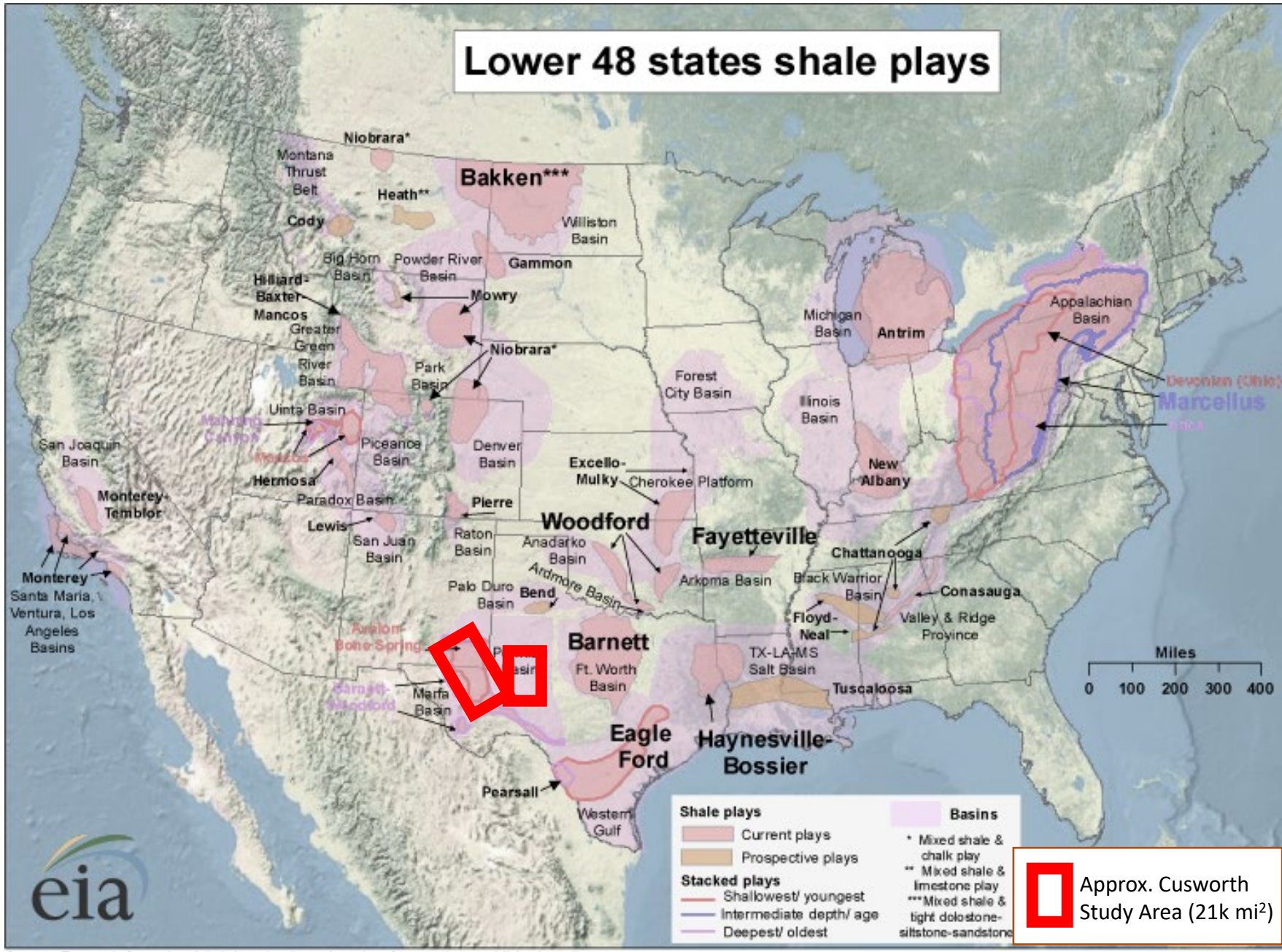

| | |
|---|---|
| *a) Well* | *39%* |
| *b) Separator* | *27%* |
| *c) Dehydrator* | *1%* |
| *d) Meter* | *18%* |
| *e) Recip Compressor* | *3%* |
| *f) Heater* | *4%* |
| *g) Header* | *9%* |




CAMS white paper, 2021
(LiDAR- no pipelines)

KAIROS AEROSPACE

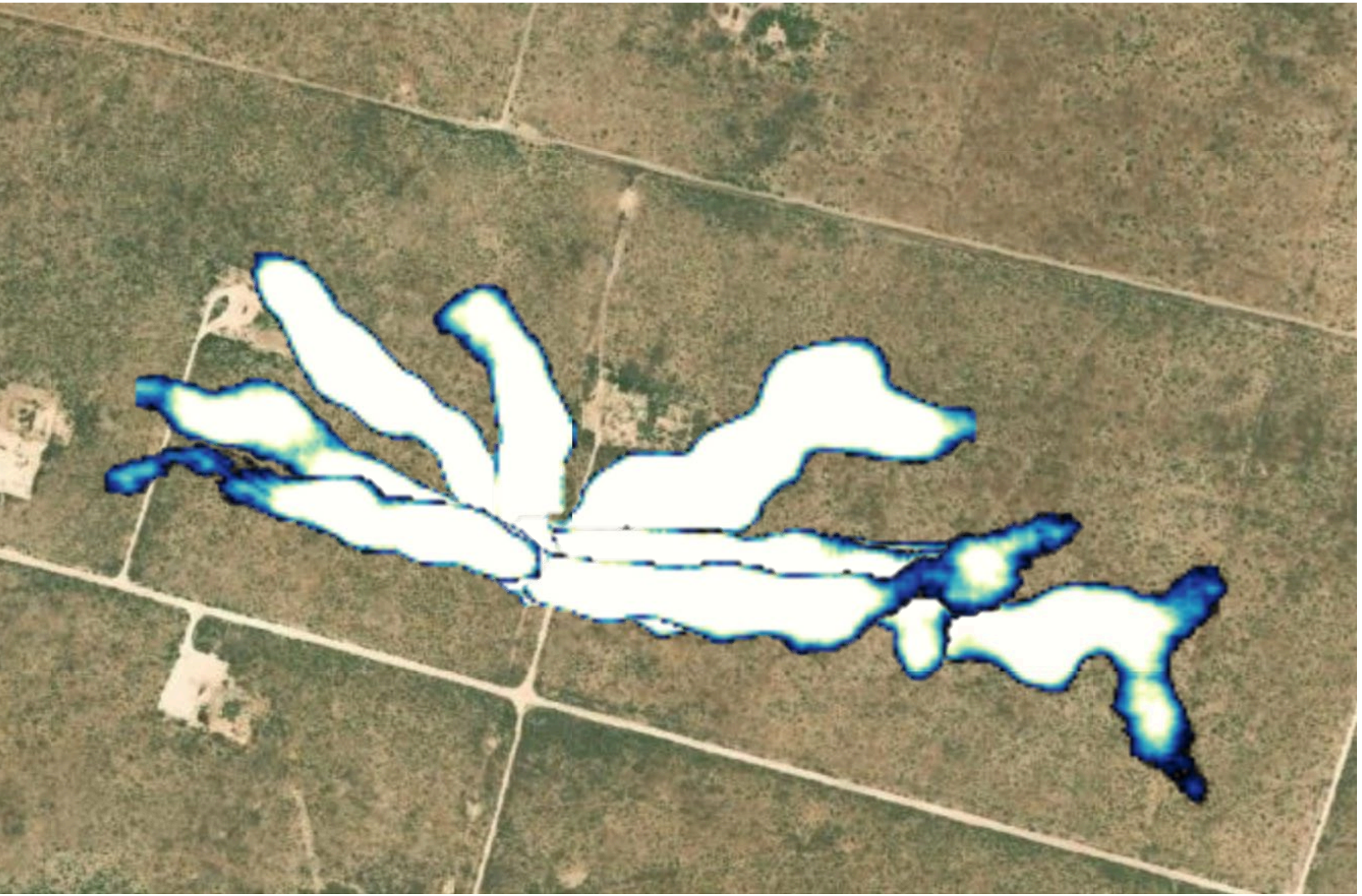
# We're just getting started.




Approx. Cusworth Study Area (21k mi²)

Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

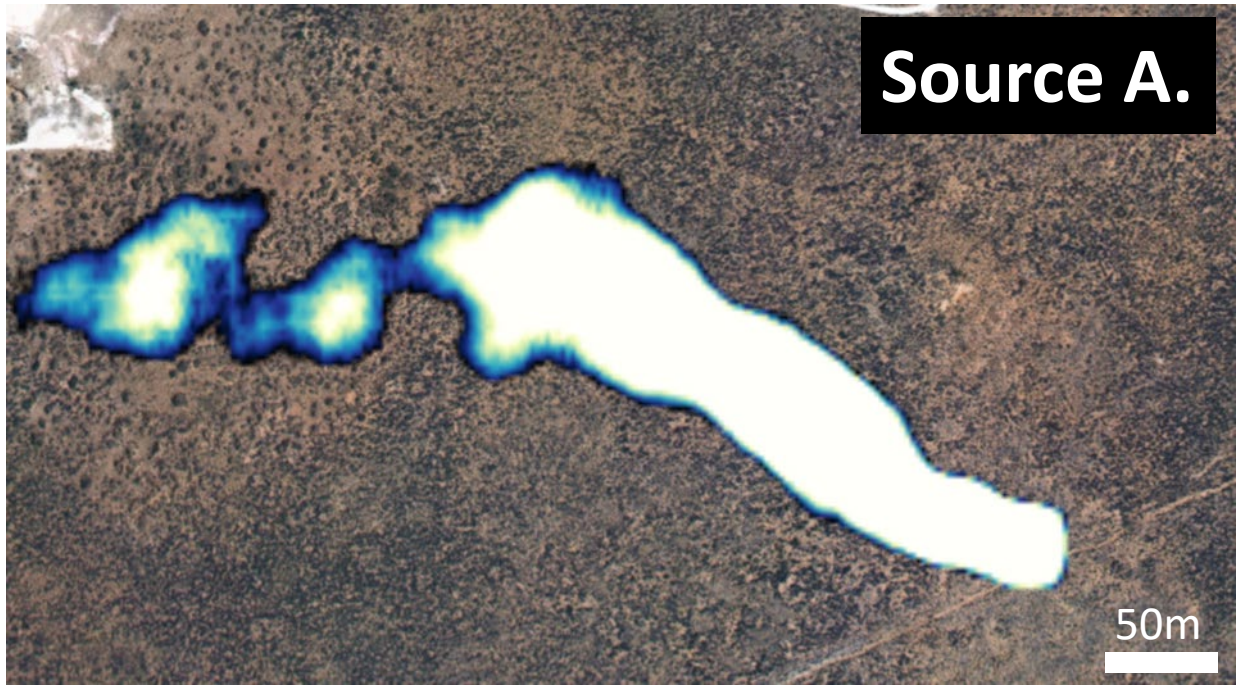
KAIROS AEROSPACE



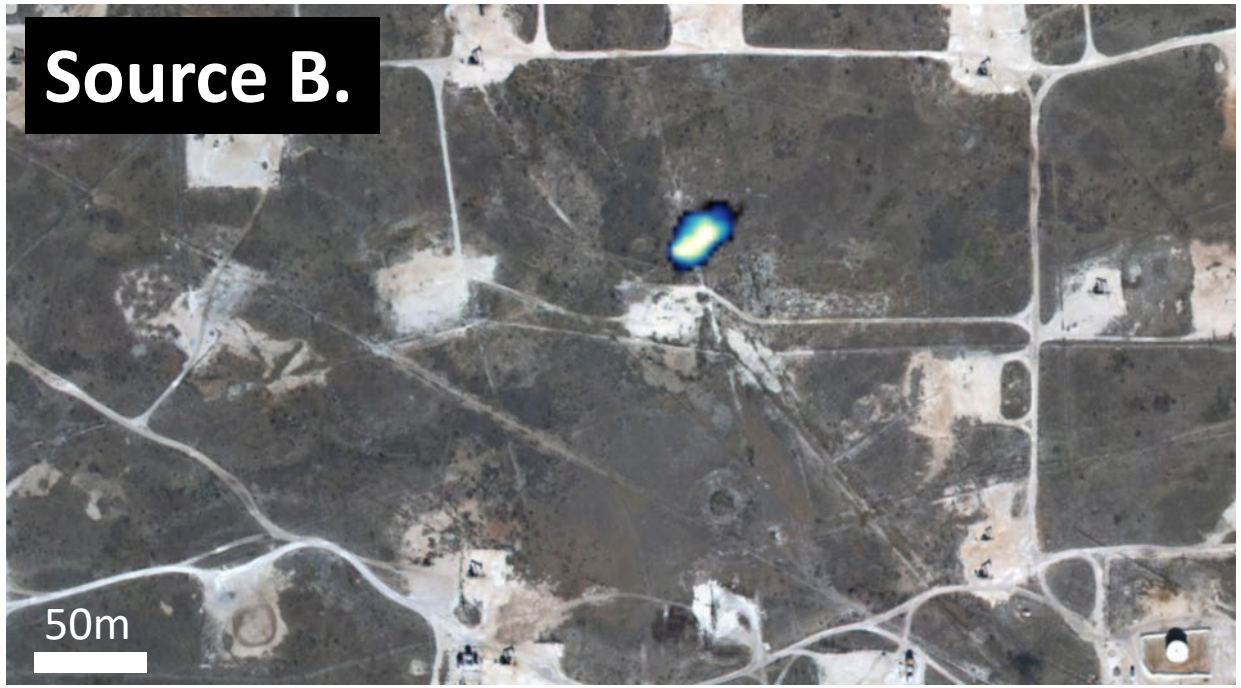
Observed:
1. Summer 2019
2. Spring 2020
3. Summer 2020
4. Fall 2020
5. Summer 2021

1,143 mcf/d
x
~2 years
=
798,000 MCF

# Smaller leaks become significant sources with infrequent inspection.



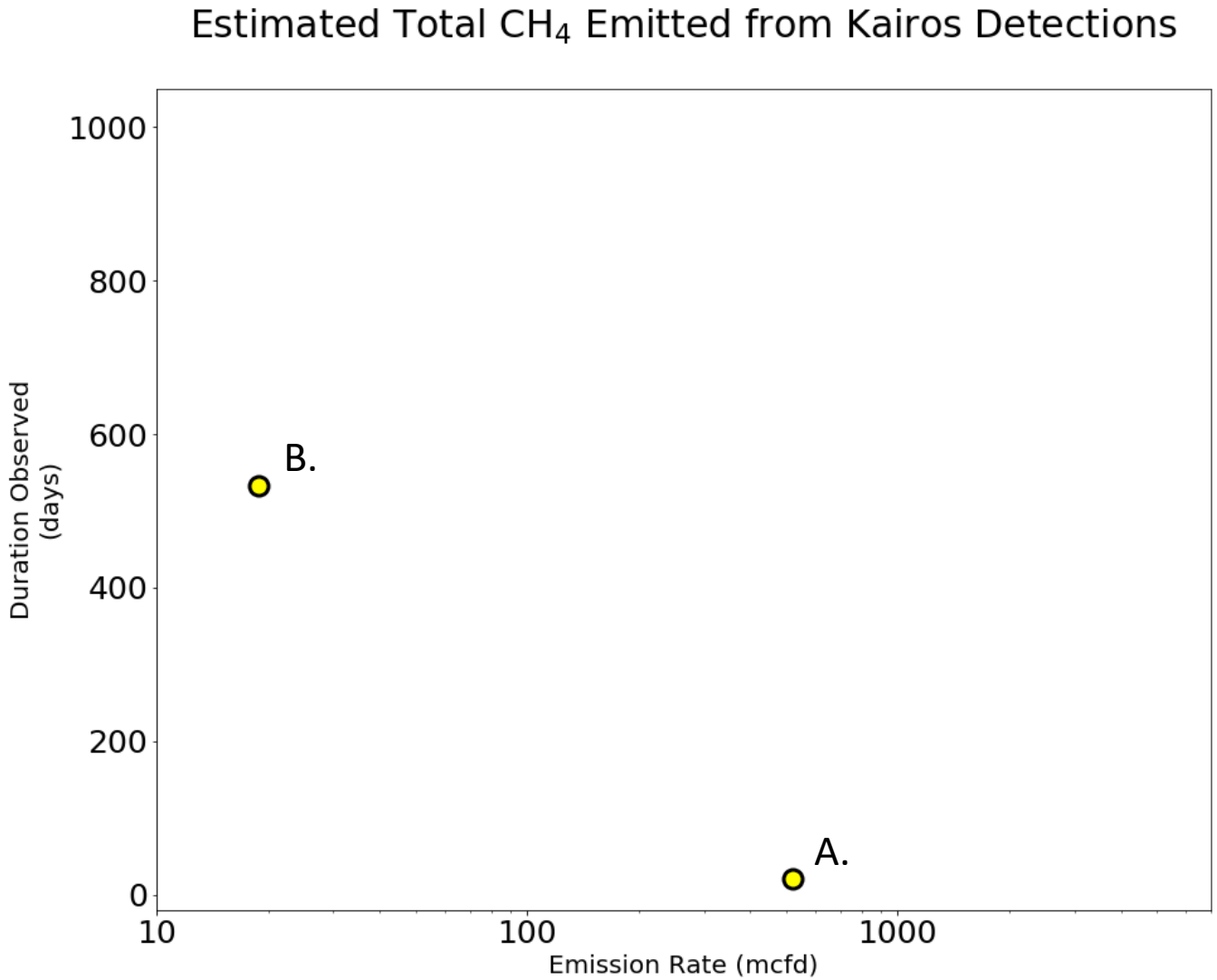

Rate: 521.0 MCF/d
Duration: 21 days
$CH_4$ Emitted: 10,940 MCF




Rate: 18.9 MCF/d
Duration: 539 days
$CH_4$ Emitted: 10,161 MCF

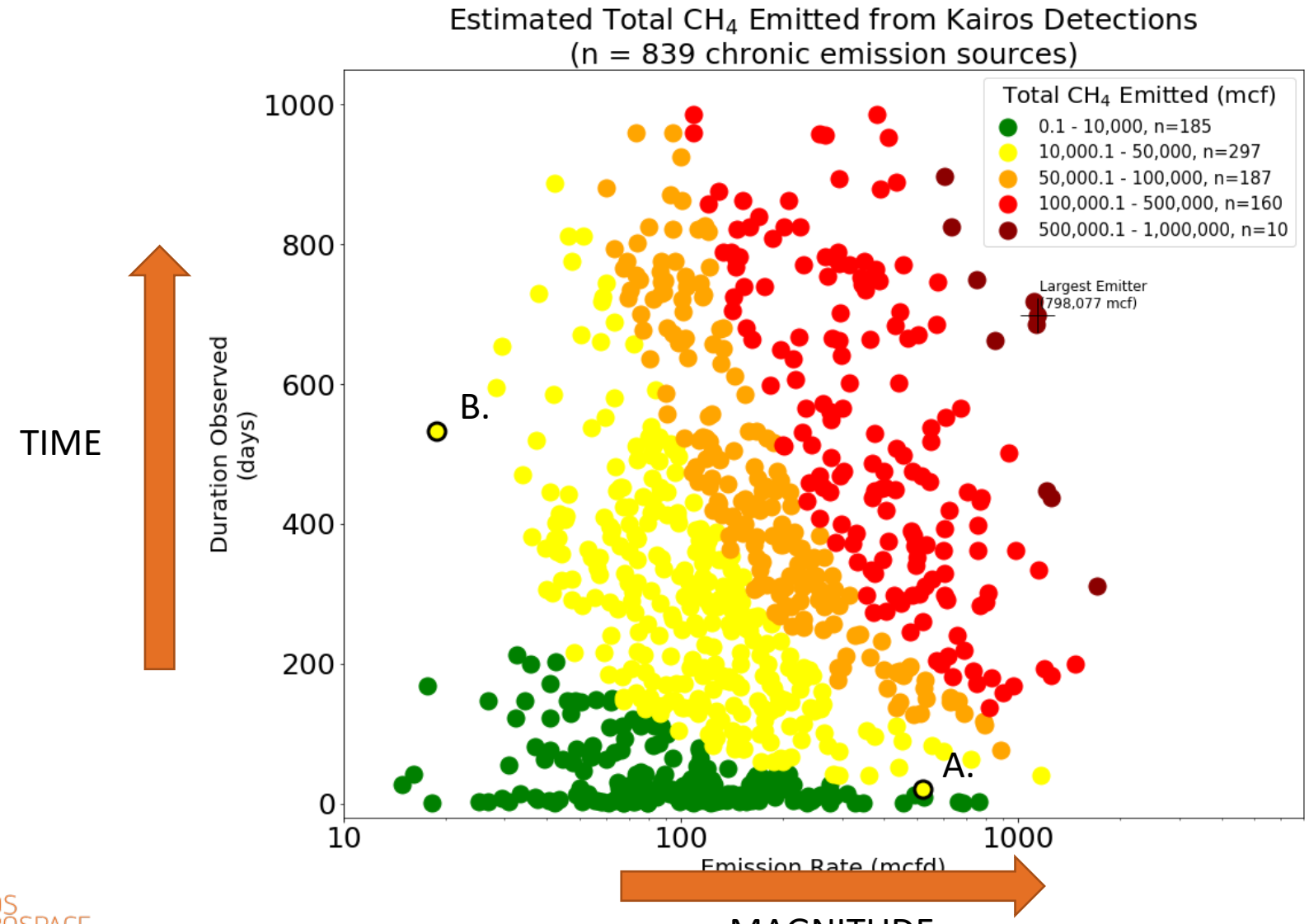
KAIROS AEROSPACE

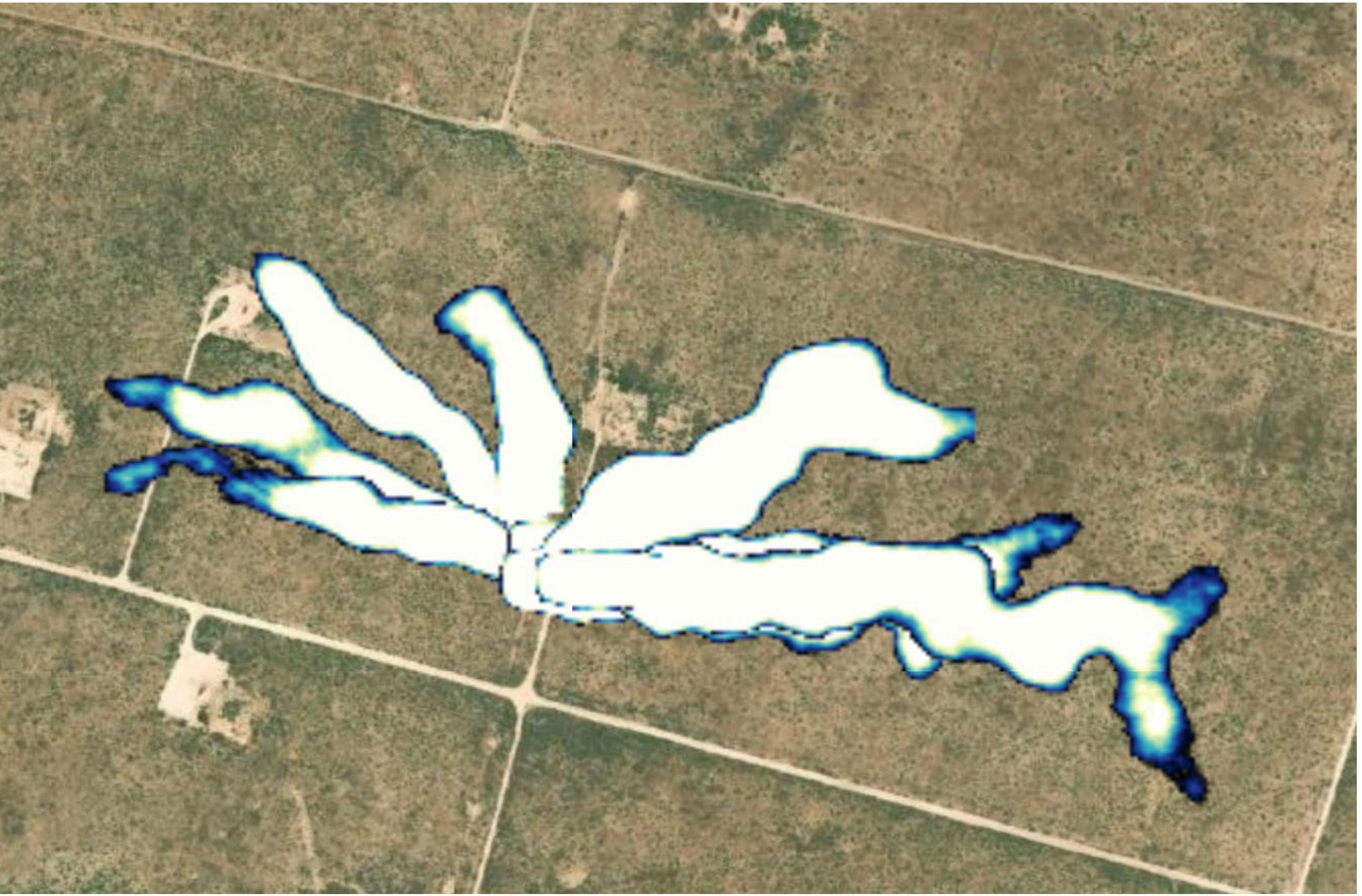
# Smaller leaks become significant sources with infrequent inspection.




KAIROS AEROSPACE

# Contributions of large emissions are minimized with rapid detection.





Inspection:
Summer 2021

KAIROS AEROSPACE

FIND THE LARGEST LEAKS. MAKE THE BIGGEST IMPACT.