Managing Methane Emissions
From Airplanes to UAVs to Ground Systems
Dr. Stephen Conley
Planes, drones, continuous, which to use?

Manned Aircraft

- Capable of measuring emissions from entire basins
- Perform “quick” surveys to identify super-emitters
- Measurements in areas where ground access is difficult.

Unmanned Aircraft

- Most accurate individual site quantification.
- Survey sites in much less time than OGI camera.
- Measure emissions of individual equipment on site

Continuous Monitoring

- Most cost-effective tool for rapid identification of super-emitters.
- Provide ”rough” localization of emission source.
- Watching for leaks 24 hours x 7 days per week
Project & Airplane Locations

Airplanes: California, Colorado, Texas, Scotland
How much methane is that?
Our approach to airborne LDAR is focused on **detection** and **quantification** using in situ chemical gas analysis.

**Quantifying emissions sources from the air:**

Calculating the emissions rate requires:

1) Chemical measurement
2) Accurate on-board wind speed and direction

How to measure winds from airborne platforms:

*(Conley et al., 2014)*

How to calculate emission from surface sources:

*(Conley et al., 2017)*

**We wrote the book on emission measurements!**
Understanding the detection problem

Every visit to the site costs $$$

• Last week, while flying for EDF, our aircraft discovered a 12 Ton per hour leak!

• Did it start 5 minutes before we arrived or five months?

• Whether using aircraft, OGI or UAVs, each measurement is costly. EPA estimates $600 per OGI inspection.

• Costs are primarily driven by the time it takes to get to the site.

How do we increase inspection frequency without cost?
Continuous Monitoring Eliminates Surprises

Meet SOOFIE – the $1500 continuous monitor that actually works!

SOOFIE Features

- Always watching, ever vigilant, SOOFIE makes sure you know about your leaks before anyone else does.

- Alarms based on calculated leak rate, rather than methane concentration.

- Sophisticated algorithms automatically identify anomalies and send alerts to designated recipients.

- Triangulation allows for identification of source location

- $30 per month monitoring fee.
Notice what happens to methane when the wind dies?

Basing alerts on methane concentration can result in false alerts every time the wind stops!
SOOFIE’s First Confirmed Save…

March 5, 2020 – Somewhere in Texas

6:15PM - SOOFIE-1 detects large emission rate (E winds)
9:00PM - SOOFIE-3 detects large emission rate (NE winds)

Probable Source: Flare on adjacent well pad
Result: Assist gas set too high. Repaired
Finding the silver bullet  
(spoiler alert – there isn’t one!)

- 1-Minute Data
- 15-Minute Leak Rates
- Customizable Alerts

$300 per site  
200 kg h\(^{-1}\)

$30 per site  
10 kg h\(^{-1}\)

$30 per site  
10 g h\(^{-1}\)

$600 per site  
10 g h\(^{-1}\)

$30/Month  
1 kg/hr