Atmospheric CO2 and CH4 Monitoring

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Butterfly Photonics
Atmospheric Measurement: A Critical Component

Assets currently require atmospheric monitoring, soon more w/ IRA.

Fugitive CO2 and CH4 leak detection uses overlapping techniques and are proxies.

Monitoring frameworks are multiscale, dynamic, and evolving.
Ground Based In-Situ: Hyperlocal Point Sources
Sources measured at near scales (<100m) can be characterized.

Lower cost, distributed networks provide a “smoke alarm” approach.

Machine learning could improve characterization techniques.
Ground Based Mobile: Science of Signatures

Mobile platforms are complementary to airborne, remote sensing, and in-situ monitoring.

“Fingerprinting” sources is possible using multi-species measurement.

Source disaggregation is a valuable analysis ability.
Los Alamos National Lab: Science of Signatures

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Basin Scale Monitoring: Total Column Measurement

Collect direct sunlight data in ground-based sensors

Analyze spectra for total column concentration

Less sensitive to local fluxes

Gisi et al, 2012
Satellite scale measurement at lower cost

Broader spatial footprint fills measurement gaps
STILT Back-trajectories Identify Source Footprint/Influence

Particles released on “slant columns”

Time spent over grid cell is proportional to potential source influence

Wu et al, 2018
Slant Columns Identify Basin-Scale Sources for Triage

Salt Lake Valley total column measurements
Slant Columns Identify Basin-Scale Sources for Triage

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Multi-Scale Network Approach Will Provide Advanced MVA

Satellite Remote Sensing

Ground Based Mobile

Ground Based Remote Sensing

Ground Based In-Situ

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