

AiRMAPS 2025 - Baltimore Air Quality and Marcellus Methane Survey BAQMMS, Summer 2025

Mobile Instrumentation and Drive Plans

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AiRMAPS Coordination Workshop
Sept. 3-4, 2024



Maryland
Department of
the Environment

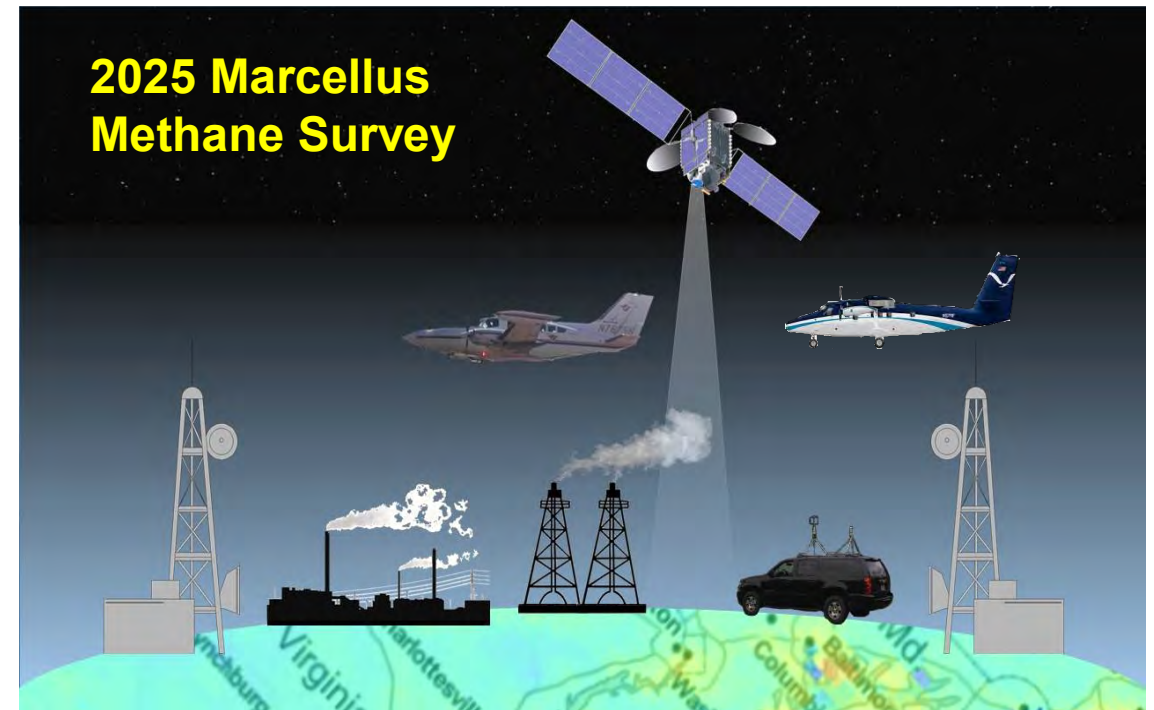
AiRMAPS 2025 - Baltimore Air Quality and Marcellus Methane Surveys (BAQMMS)



Summer 2025

ARL/CSL led mission on Twin Otter, Duchess & NOAA's ARC

Airborne Doppler wind lidar, In-situ & remote sensing measurements of air pollutants and greenhouse gases (GHGs) to characterize emissions and chemistry in Washington, DC-Baltimore and Marcellus



Objectives

- Assess emissions of greenhouse gases and air pollutants in Baltimore-Washington, DC
- Investigate photochemistry that leads to summertime air pollution (ozone and PM) in Baltimore-Washington, DC
- Quantify emissions of methane and air pollutants from the oil & gas operations in Marcellus Shale



ARL BAQMMS Mobile Team and Instrument Suite



Xinrong Ren - NOAA ARL



Winston Luke - NOAA ARL



Phil Stratton - NOAA ARL



Paul Kelley - NOAA ARL



Jiayang Sun - U. of MD



Hannah Daley - U. of MD

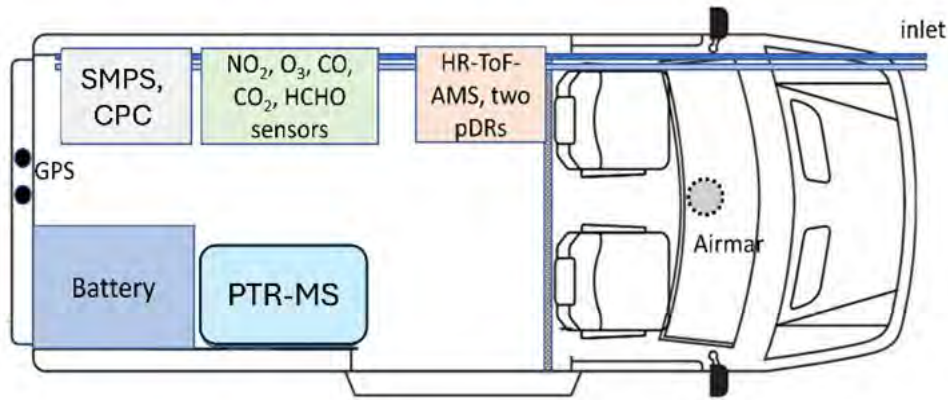


- Chevy Suburban
- 3 ECOFLOW battery generators with a capacity of 10.8 KWh
- 8-10 hours of measurement
- Two inlets, one for gases, the other for aerosols

GHG, Air Quality, and Meteorology Measurements

Instrument	Platform	Species
Picarro G2401(-m)	ARC / TO (m)	CO ₂ /CH ₄ /CO/H ₂ O
Picarro G2201-i	ARC	CH ₄ /CO ₂ /δ ¹³ C-CH ₄ /δ ¹³ C-CO ₂ /H ₂ O
Aeris Ultra MIRA	Both	CH ₄ /C ₂ H ₆ /H ₂ O
TECO 49C/2B Tech	Both	O ₃
Global Analytics G60	Both	NO/NO ₂ /NO _x
Teledyne N500 CAPS	TO	NO _y
AE43 Aethalometer	ARC	Black Carbon
Particle Plus	ARC	PM _{2.5} /PM ₁₀
Vaisala/RM Young	ARC	T/P/RH/2D wind with differential GPS

University of Albany Atmospheric Sciences Research Center Mobile Lab



Parameter	Instrument	Sampling Resolution
Ozone	Teledyne API Model 430	10s
NO ₂	Teledyne API Model 500U	10s
CO	Aris MIRA Ultra	10s
CO ₂	LICOR	10s
HCHO	Aris MIRA Ultra	10s
VOCs	Tofwerk Vocus PTR-MS	30s
Particulate component mass	Aerodyne HR-ToF-AMS	30s
Particulate total mass	Thermo Scientific pDR □ 500 (two)	1mins
Particle number	TSI CPC Model 3785	30s
Particle size distribution	TSI SMPS	5mins
Mobile meteorology	Airmar	10s
GPS	Airmar and GlobalSat GPS Receiver	10s



ASRC mobile lab



Long Island,
2023

- 2007 Dodge Sprinter Van
- 8 Lithium ion batteries with a fully charged capacity of 13.25 KWh + ECFLOW 7.2 KWh
- Around 6-10 hours measurement deployments possible
- Two inlets, one for gases, the other for aerosols
- Flexible payload configuration



WFM,
2017



PSP,
2017/2018



LISTOS,
2018/2019



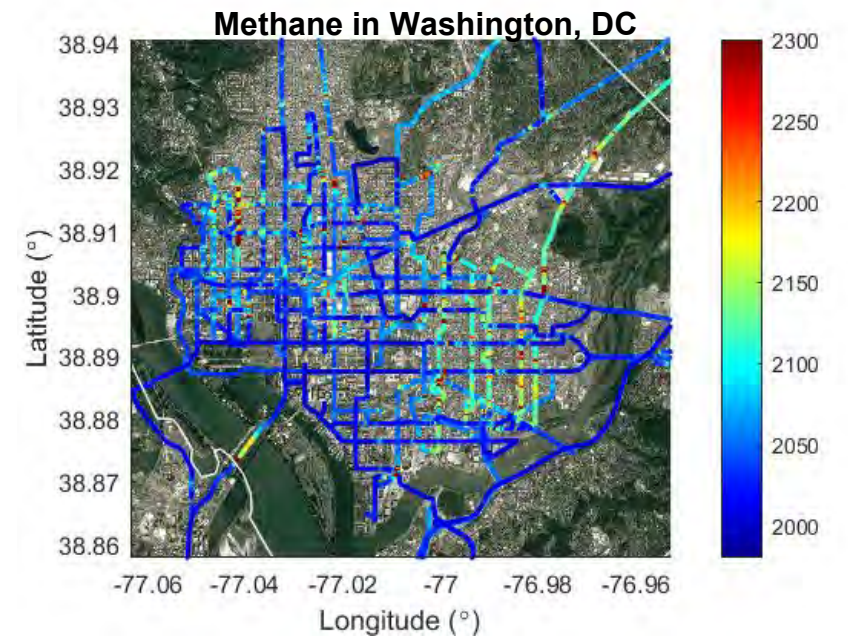
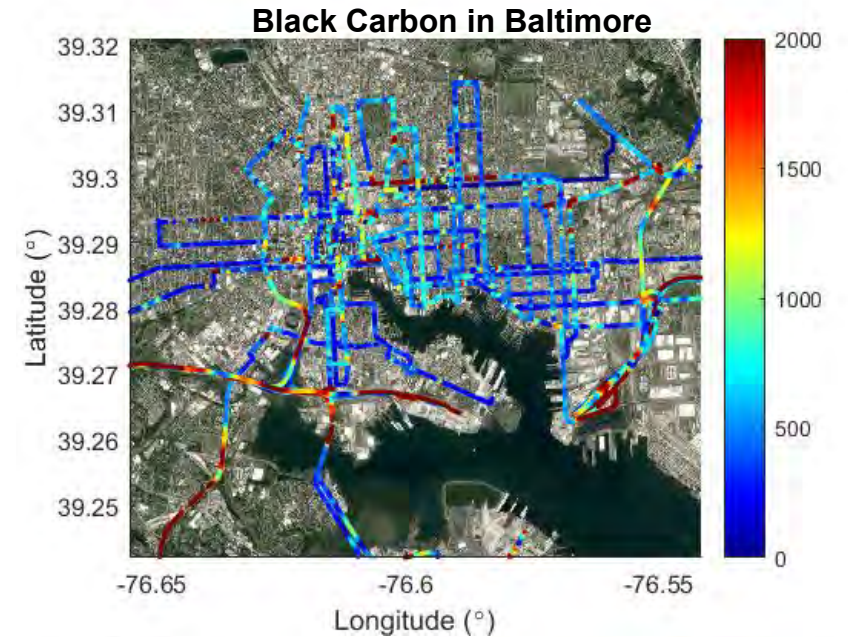
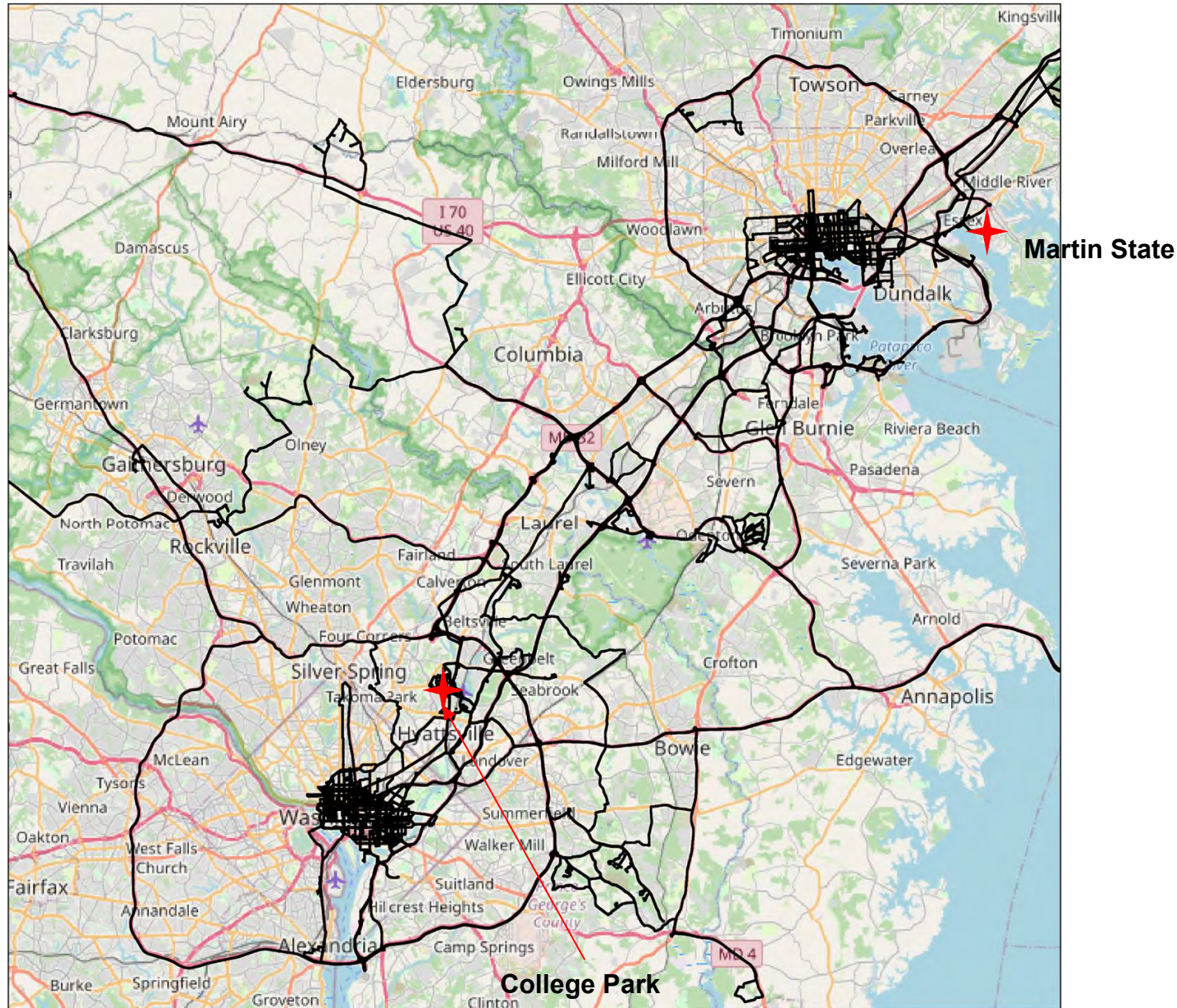
NYS-CH4,
2021/2022

The Johns Hopkins Mobile Laboratory



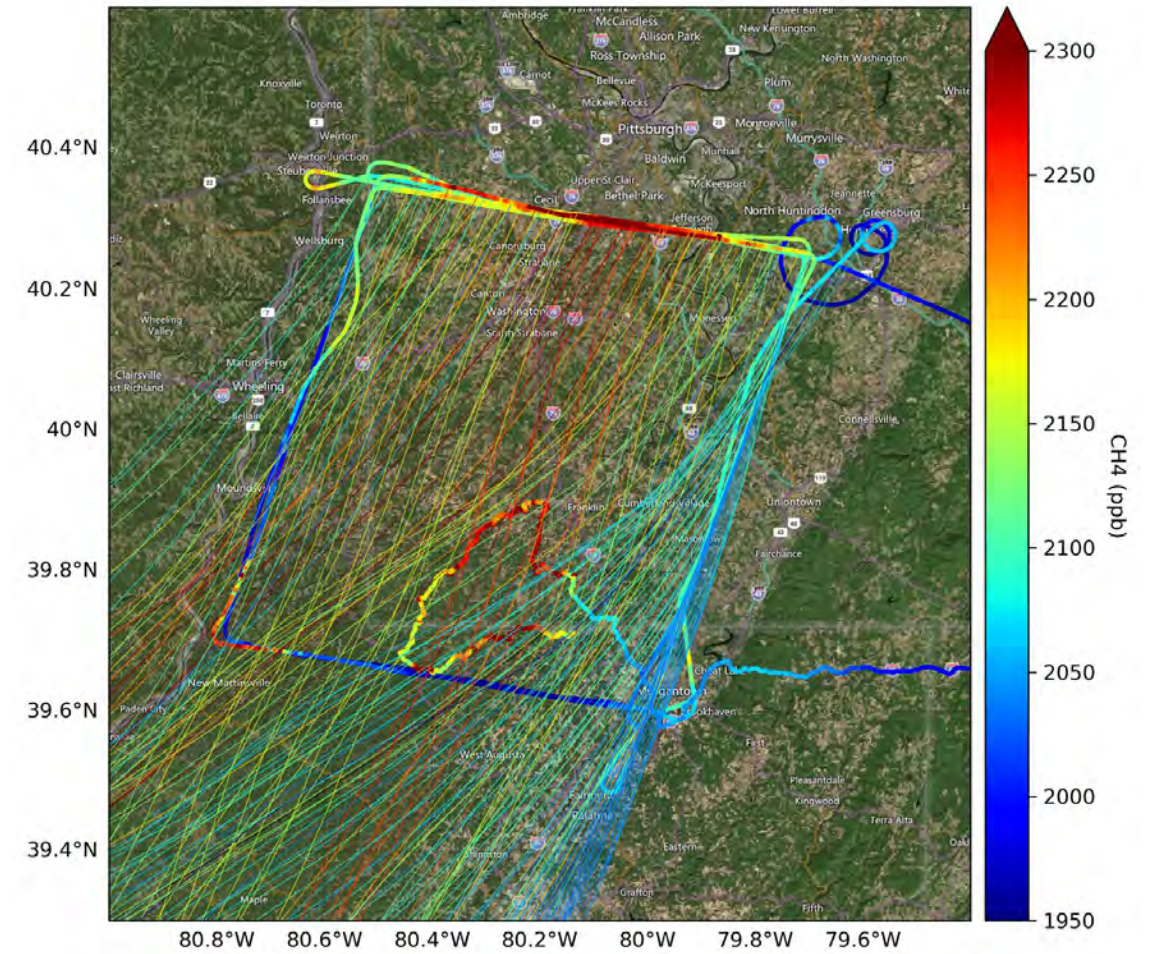
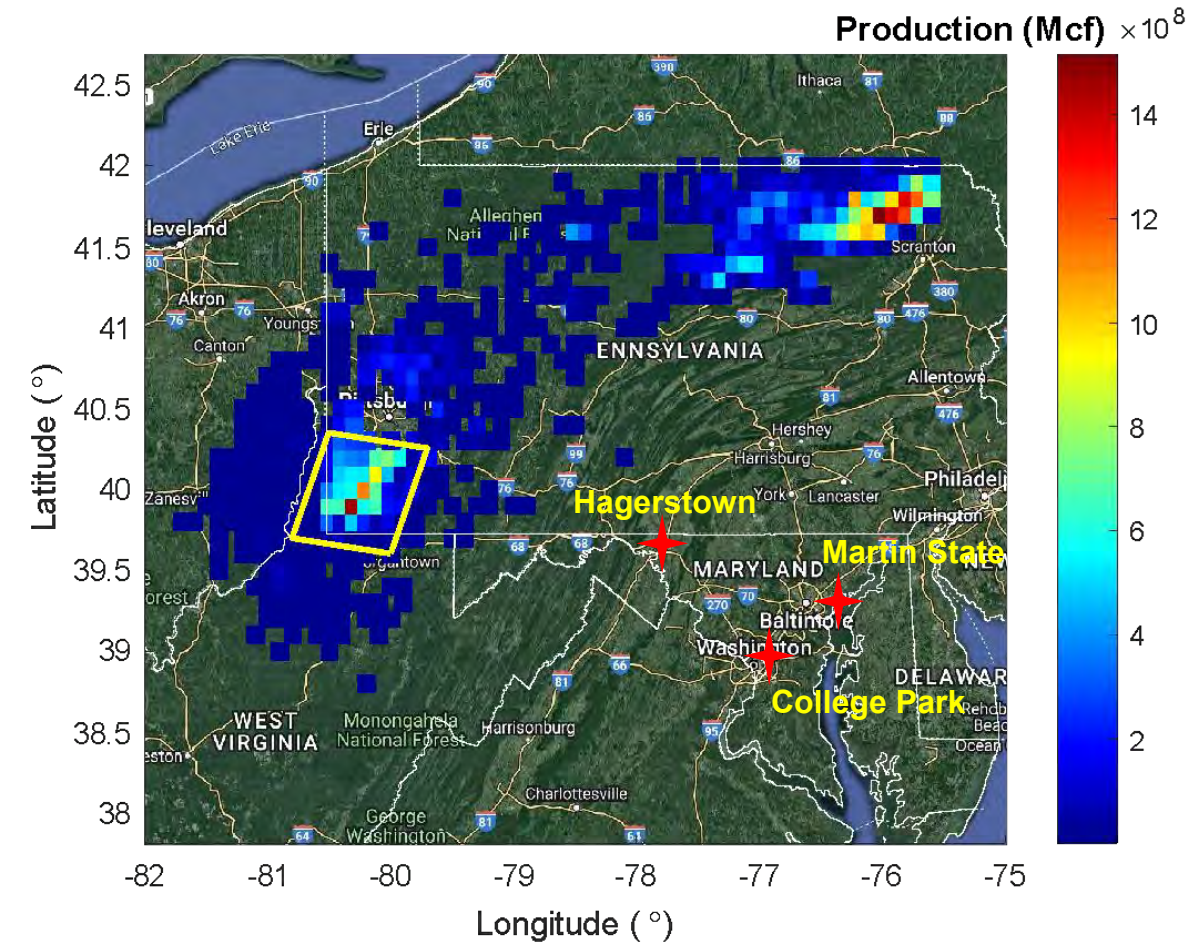
- Particle-phase measurements
 - Mini-AMS (OA, NO₃, SO₄, NH₄, nr-Chl)
 - Mini-Aethalometer (BC)
 - mSEMS (size distributions)
 - Magic CPC (particle #)
 - Dustrak (PM₁, PM_{2.5}, PM₁₀ mass)
- Gas-phase measurements
 - EC-TOF (PTR + GC, range of species)
 - CAPS NO_x
 - Picarro EtO, HCHO, NH₃, CO/CO₂/CH₄
 - 2BTech O₃
- Associated lat, long, RH, & T

NOAA's ARC AiRMAPS 2025 Building on 3 Years of Observations

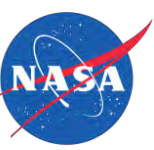


Example Combination in Marcellus Shale

Mass balance flight, Oct. 2022



Aircraft (square) and mobile (triangle) coincident measurements in SW Marcellus Play



Collaboration during BAQMMS 2025

U.S. GHG Center

NOAA/NESDIS, NOAA/GML, NOAA/CPO

JHU: Mobile lab & Surface Measurements

NIST: Tower-based GHGs & Open-path dual comb spectroscopy

DOE: BSEC/CoURAGE, Controlled Releases

EPA: GHG Inventory and Super Emitter

NASA: G-III & SARP flights, TOLNet Ozone Lidar, and Pandora

USGS: Coalmine methane emissions

MDE: Ground-based air quality monitoring

NCAR

Satellites: TEMPO, MethaneSAT, GHGSat, JAXA, MEDUSA, etc.

OSTP GHGMMIS

University of Colorado Boulder

University of Maryland

Purdue University

Harvard University

NSF: GOTHAAM

University of Alabama Huntsville

Carbon Mapper

SUNY Albany

Columbia University



Maryland
Department of
the Environment

