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

Aircraft Instrumentation and Flight Plans

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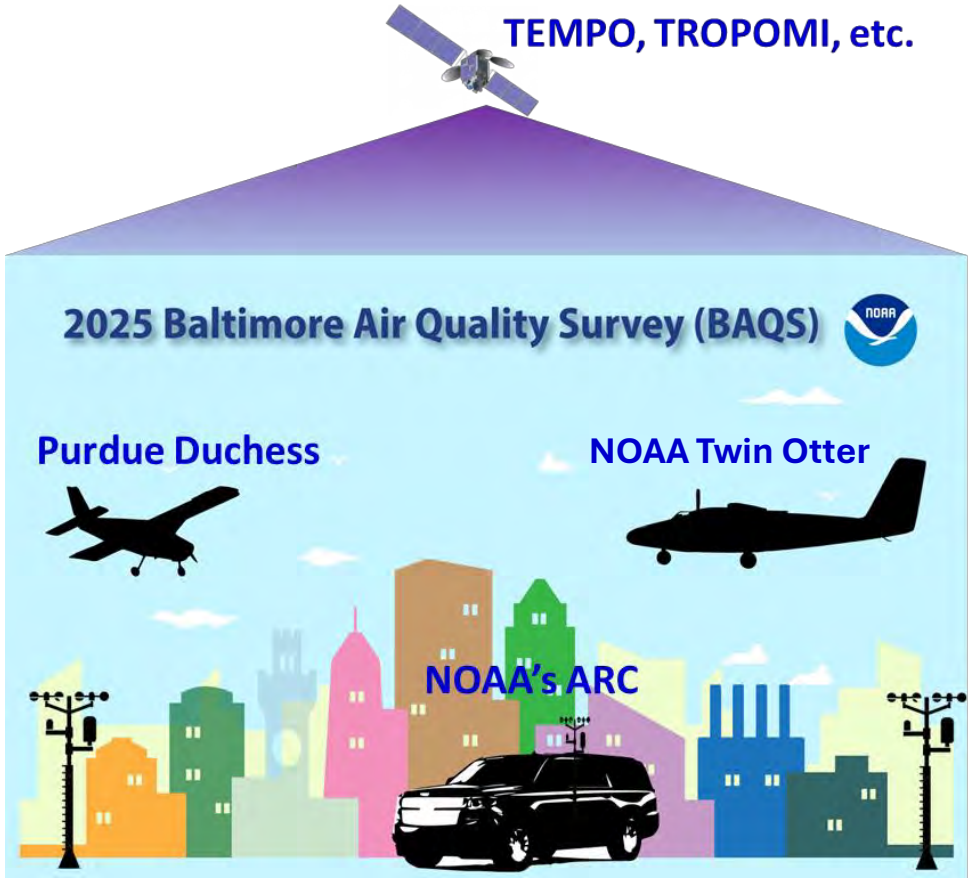
AiRMAPS Coordination Workshop
Sept. 3-4, 2024

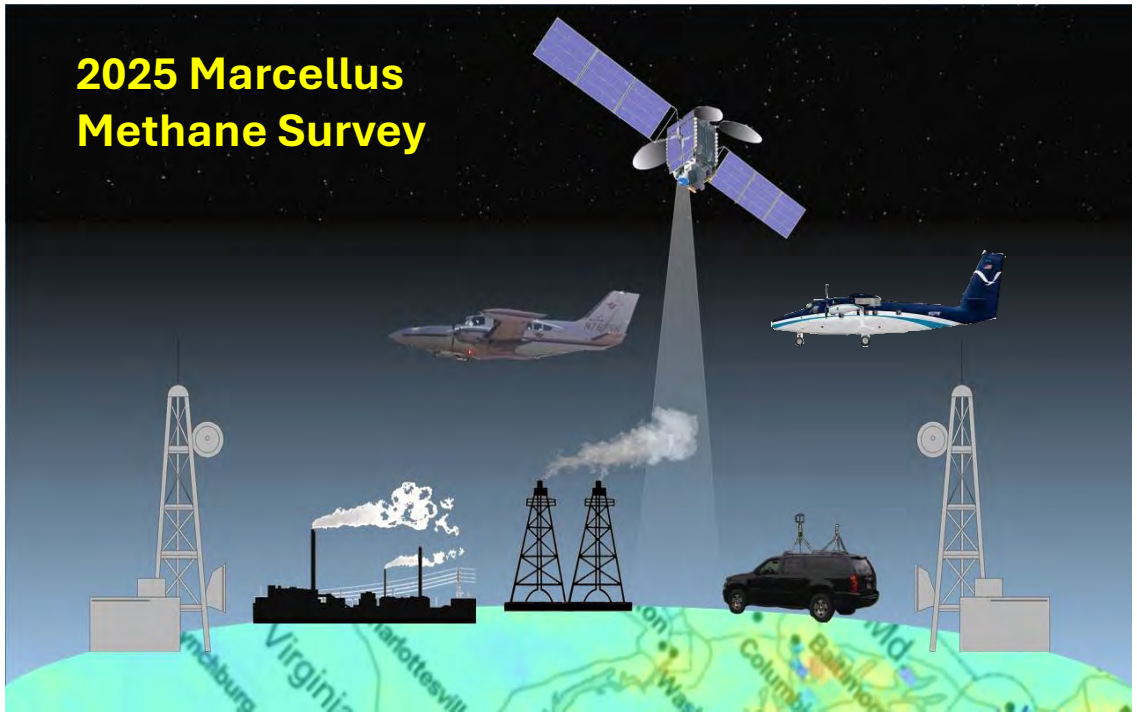
Maryland
Department of
the Environment

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

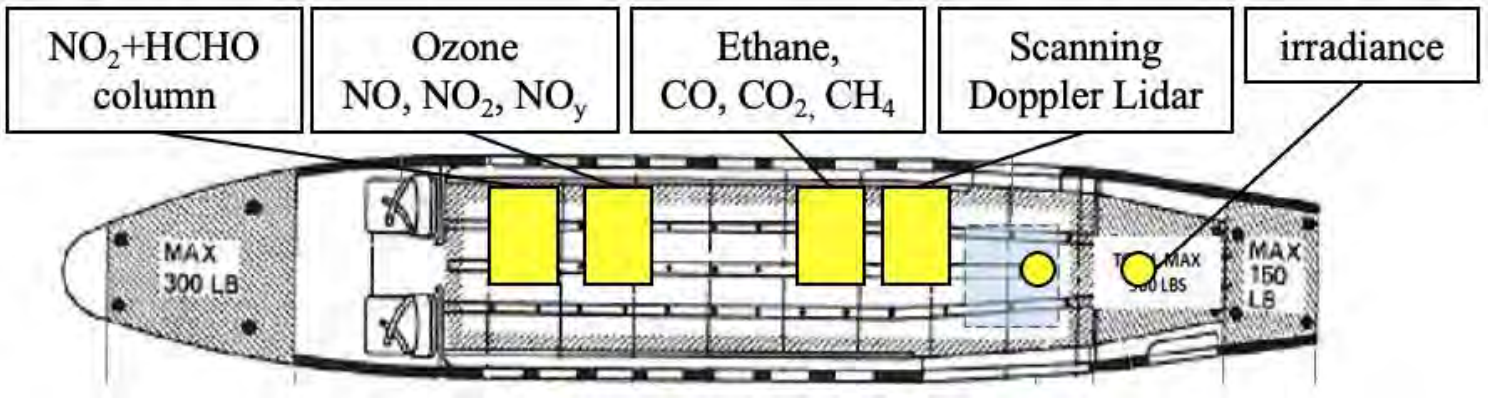


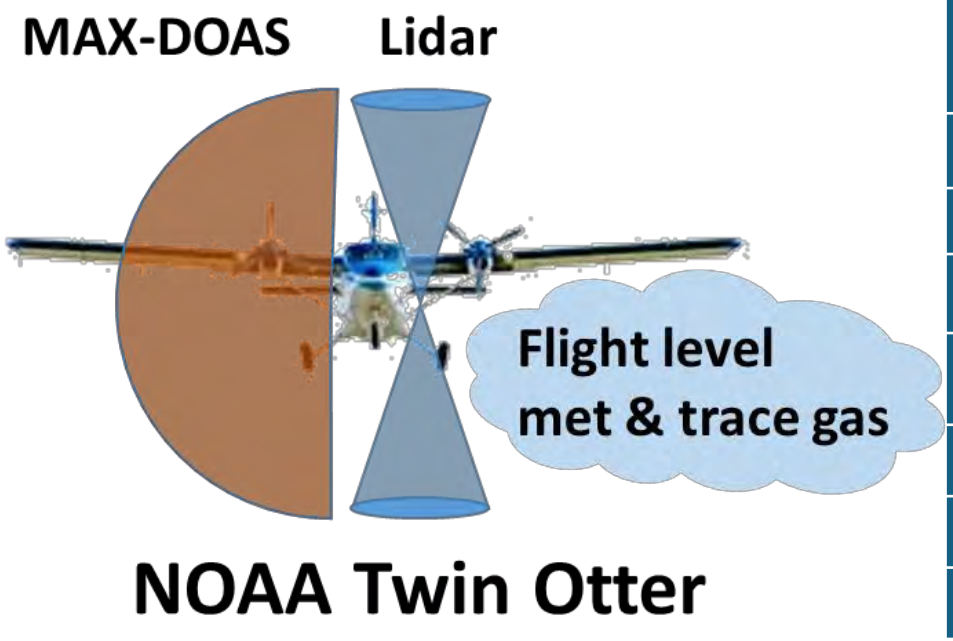


Objectives

- 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

Proposed NOAA Twin Otter Payload for AiRMAPS 2025



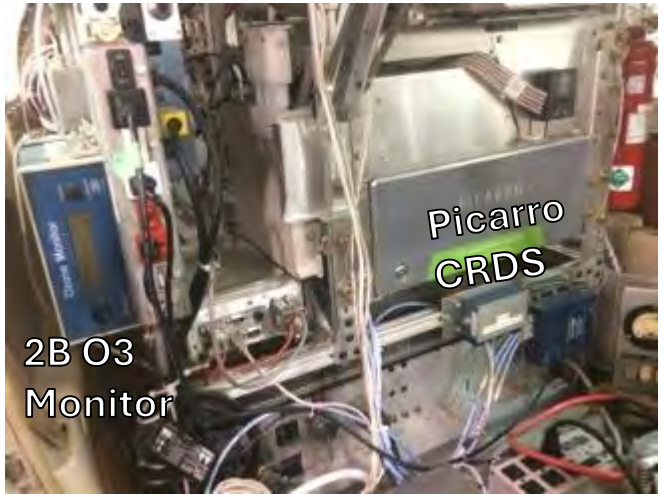


Instrument	Measured species
Scanning Doppler Lidar	3-D Wind and Aerosol Profiles, Boundary layer depth
Picarro G2401-m	CO_2, CH_4, CO and H_2O
Aeris Ultra	C_2H_6
CRDS/CAPS	NO, NO_2, NO_y
2B UV Analyzer	O_3
Radiometers	Irradiance, surface temperature, jNO_2
AIMMS probe	Flight level temperature, pressure, winds
Airborne MAX-DOAS*	NO_2 and formaldehyde column

* AMAX-DOAS participation will depend on funding availability.

Duchess Airborne Laboratory for Atmospheric Research (ALAR)

GRIMM aerosol spectrometer



- Picarro Cavity Ring Down Spectrometer (CO, CO_2, CH_4, H_2O)
- Los Gatos Research NO_2 Analyzer
- GRIMM Aerosol Spectrometer (0.25 – 1 micron)
- 2B Ozone Monitor
- Best Air Turbulence (BAT) Probe (3D wind vectors) and air pressure
- 3 Thermistor Temperature Probes
- Radiometer
- GPS/INS system

NOAA Twin Otter Logistics during AiRMAPS 2025

Duration: mid-June to mid-August

Aircraft integration/test flights during the first 2 wks

Science flights for ~6 wks

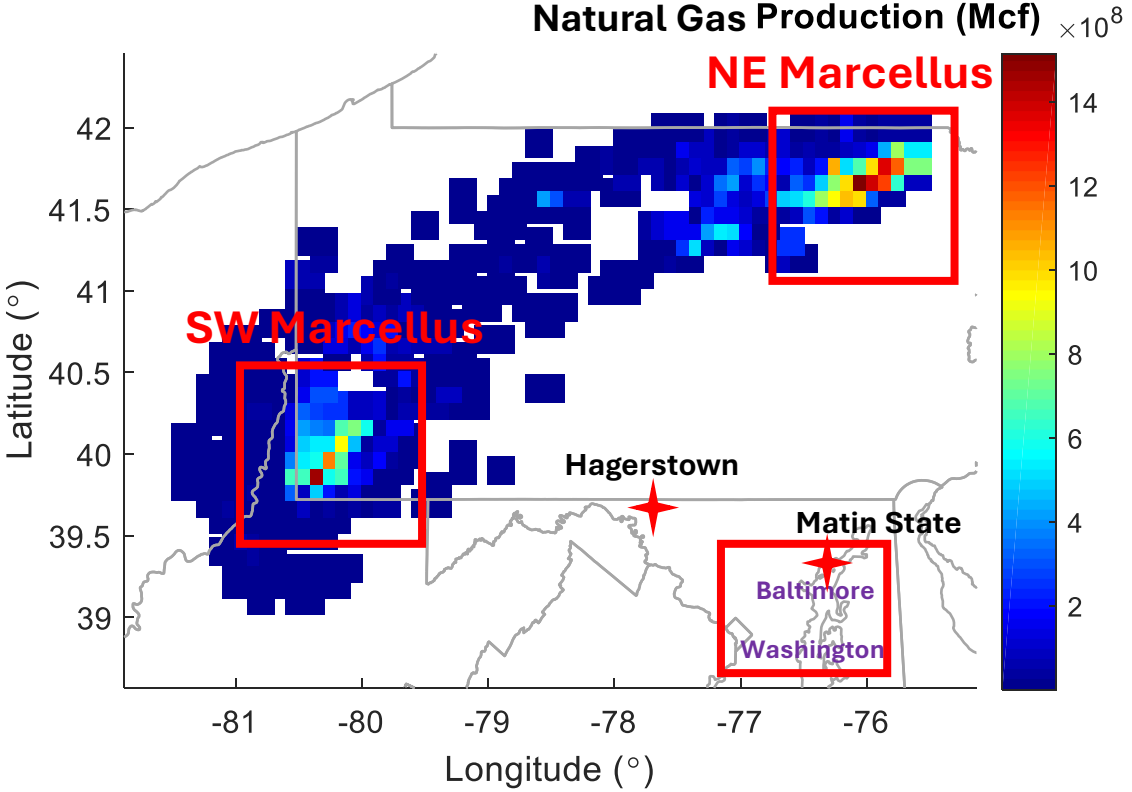
Total flight hours: 180

~80 hrs for DC-Baltimore

~100 hrs for Marcellus

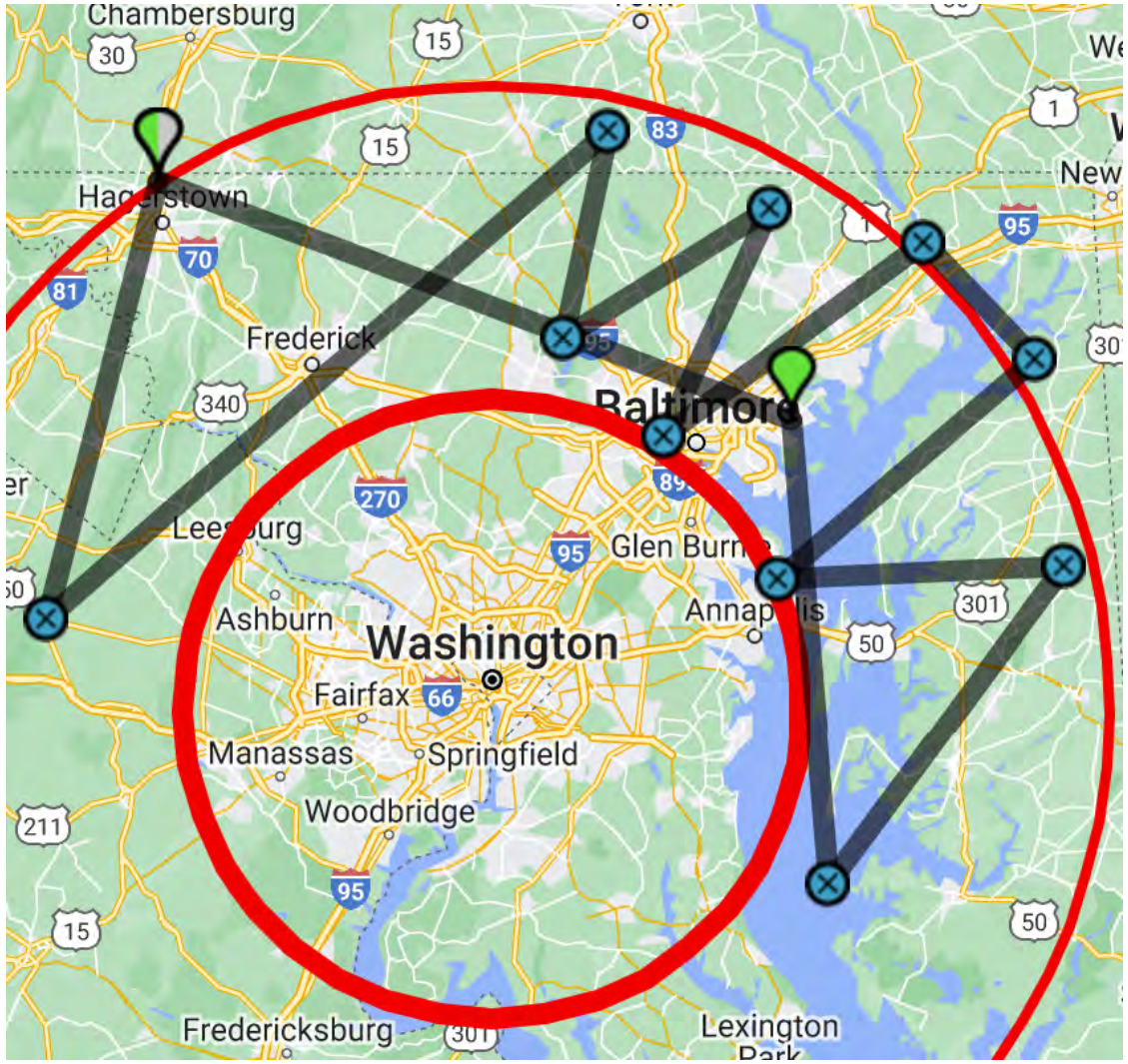
Twin Otter Base: either Hagerstown or Martin State Airport

Flight Plans: Mass Balance or Air Quality flights



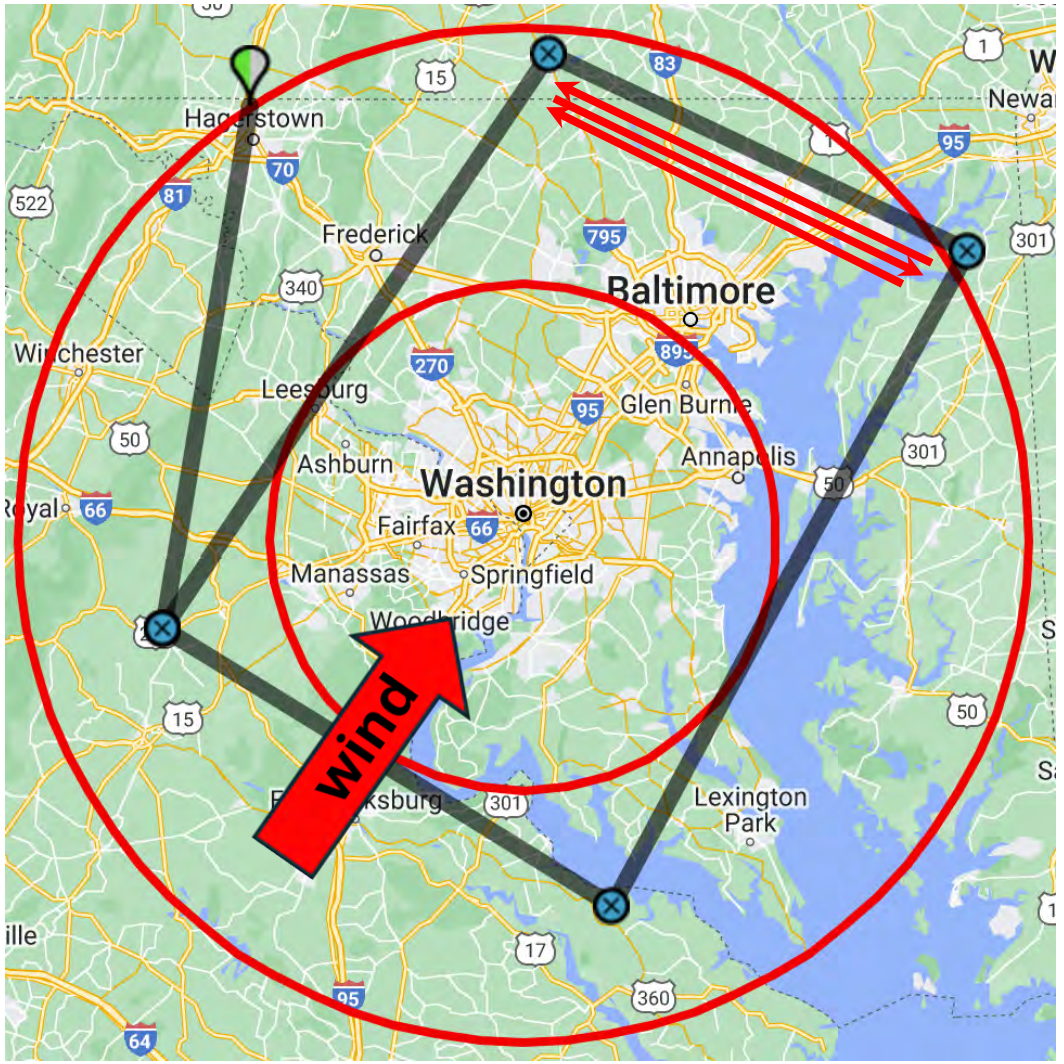
Example Flight Plans in DC-Baltimore

Air Quality flights



Waypoints: KHGR CLADD JAMRA FOUST TAYLO THOLE SUDOY KEVIA HOOOK PRICE VPAXI KMTN KHGR

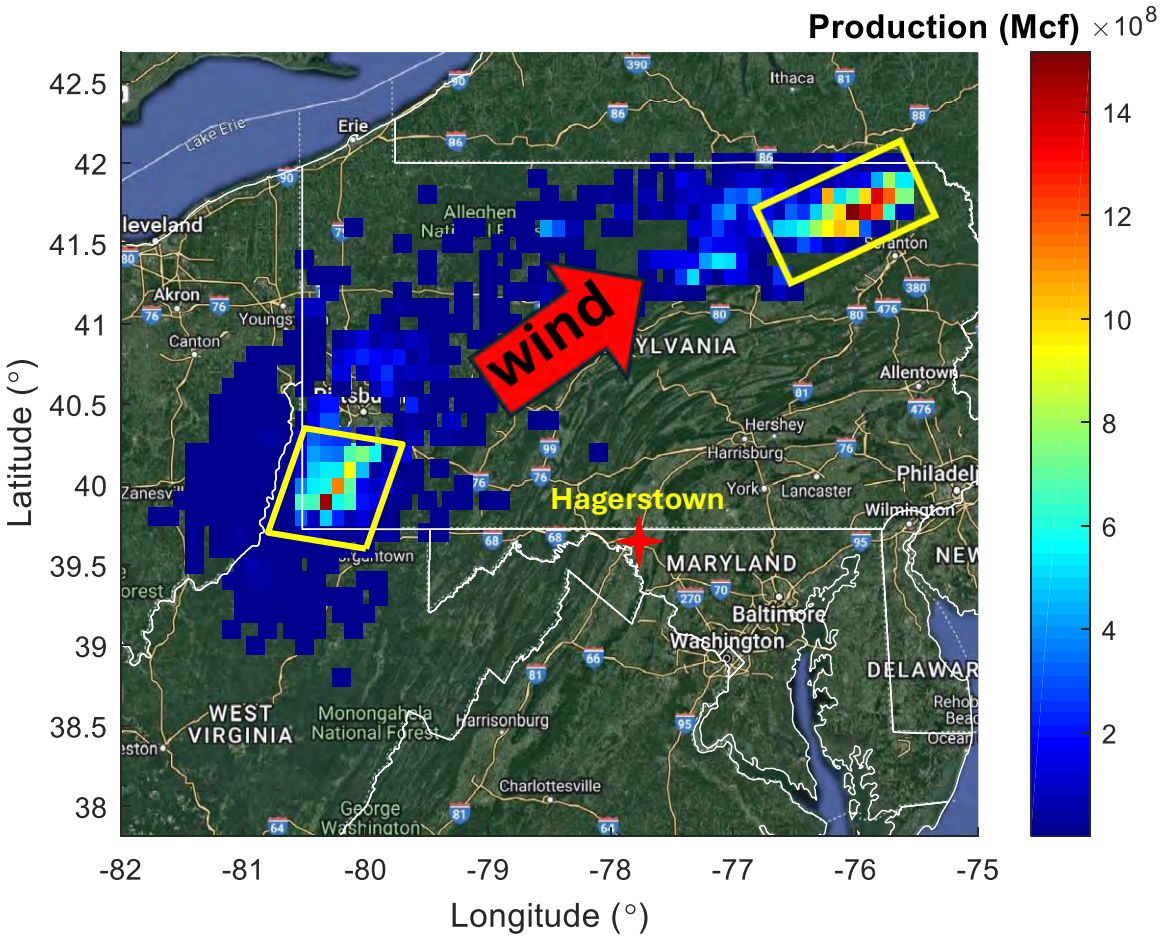
Mass balance flights

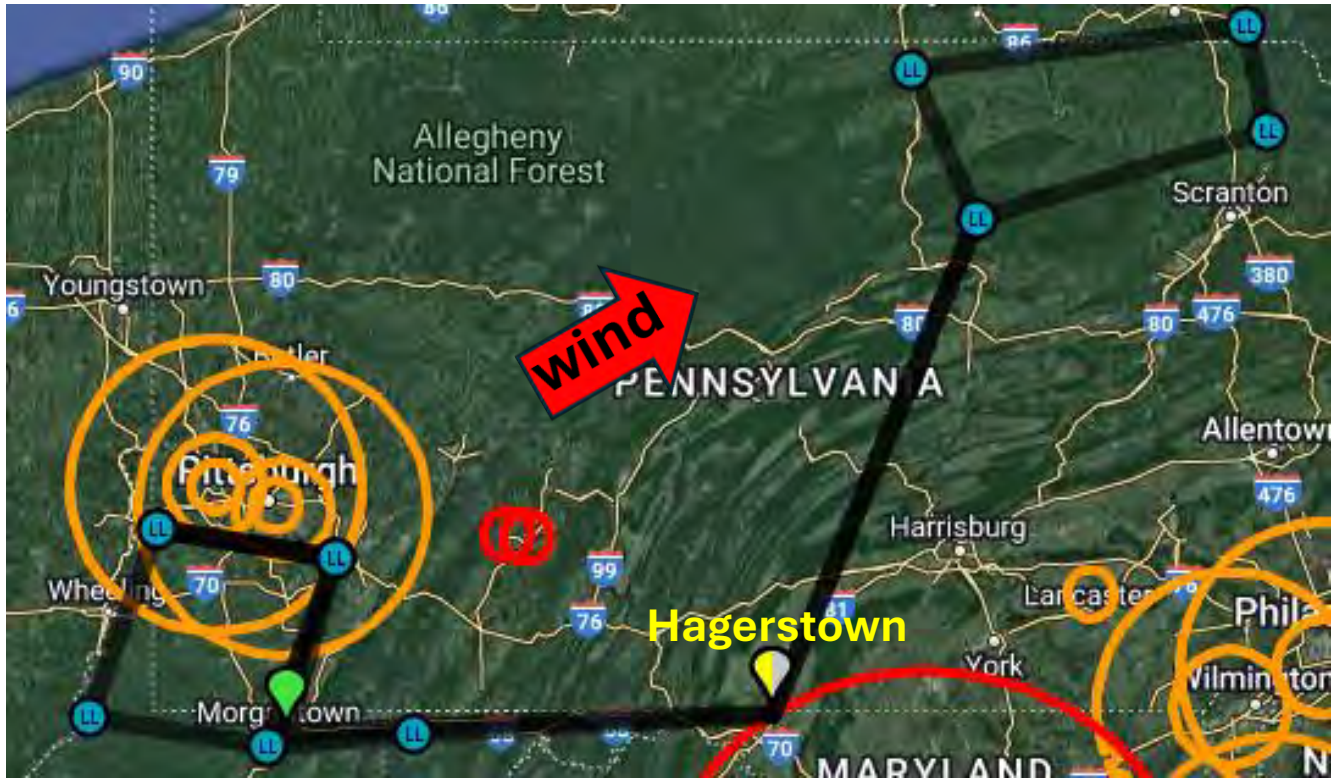


Waypoints: KHGR GRNDA VPACE KEVIA UNWET KEVIA UNWET RUBNZ KHGR

Example Flight Plans in Marcellus Shale

Mass balance flights





Waypoints of SW Marcellus: KHGR 39.64/-79.34 39.6/-80 39.7/-80.8 40.35/-80.5 40.25/-79.7 39.6/-80 40.25/-79.7 40.35/-80.5 40.25/-79.7 KMGW KHGR

Waypoints of SW Marcellus: 41.4/-76.8 41.9/-77.1 42.05/-75.6 41.7/-75.5 41.4/-76.8 KHGR

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 methene 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