# Supplemental Materials

# Gathering pipeline methane emissions in Utica Shale using an unmanned aerial vehicle and ground-based mobile sampling

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## Calculation of dispersion coefficient

We use the Pasquill-Gifford correlation to estimate dispersion coefficients in the y and z directions. The specific equations are as follows [1].

$$\sigma_y(x) = \exp\left[I_y + J_y\, In\, x + K_y\, (In\, x)^2\right]$$

$$\sigma_z(x) = \exp[I_z + J_z\, In\, x + K_z\, (In\, x)^2]$$

I, J, K are all tabulated coefficients and depend on the atmospheric stability class. We estimate the stability class based on the wind speed and insolation measurements by the portable weather station 110-WS-25P-B (NovaLynx Corporation, Grass Valley, CA). Cloudiness is also logged every day and helps the determination of the stability class. The stability class is mostly B during the campaign.

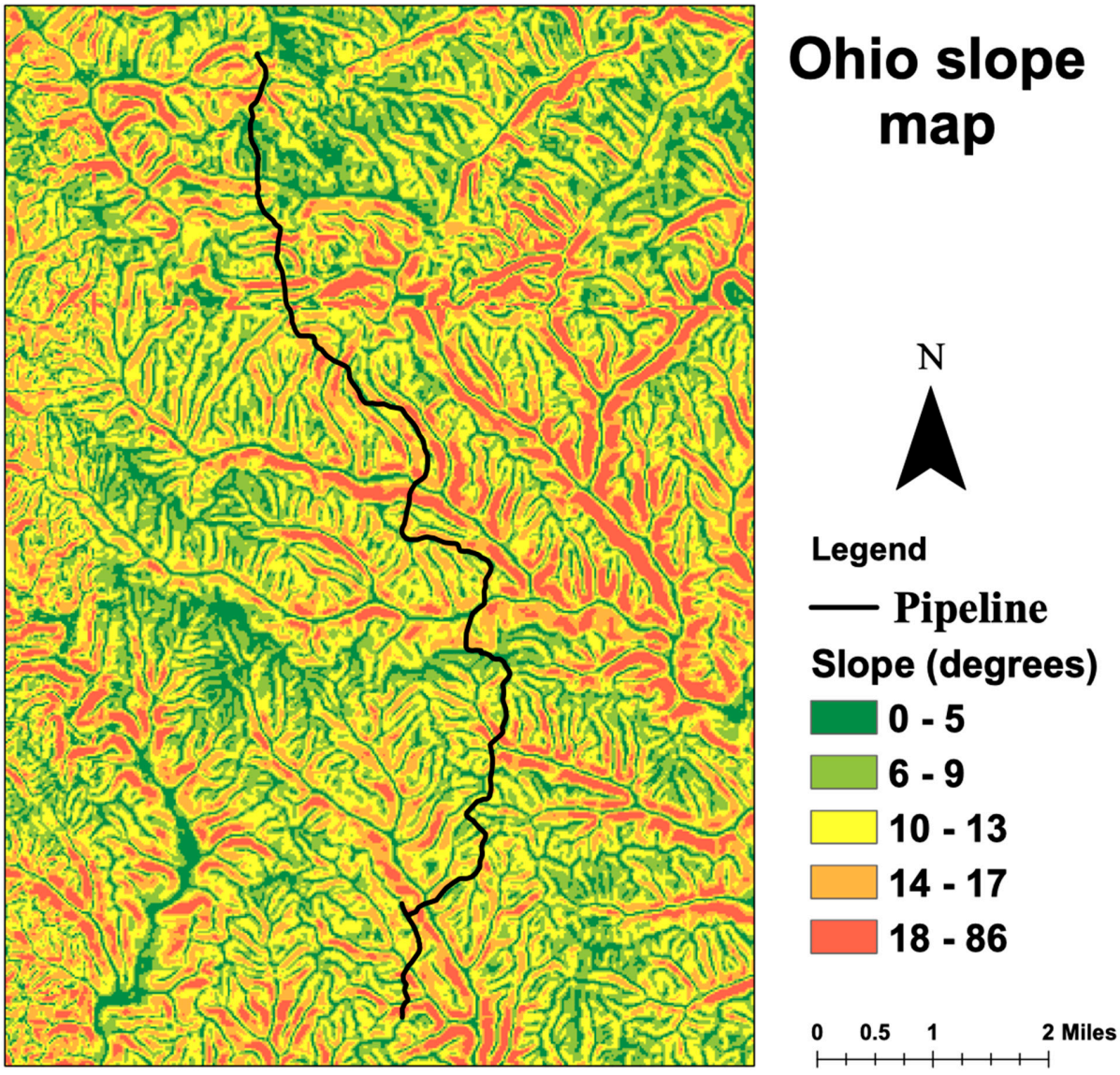


**Figure S1.** Slope map of the sampling areas' terrain in Ohio.

**Figure S2.** Portable weather station used to measure ground wind speed and direction.

(A)

(B)

**Figure S3:** (A) Methane leaks from the two screws on the gathering pipeline accessories. (B) Black plastic gathering pipelines were hanging over the trees to cross the road.

**Table S1.** Calibration check results for the LGR analyzer.

| Concentration (ppm) | Instruments | Response (ppm) |
|---|---|---|
| 4.80 | LGR | 4.76 |
| 250 | LGR | 233 |