

## Detection of Surface Fluxes of Thermogenic CH<sub>4</sub> at HVHF Sites in Morgan Co., TN

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### Intro

Methane (CH<sub>4</sub>) is the primary component of natural gas; it is also the second most abundant greenhouse gas, with a global warming potential 86 times greater than carbon dioxide on a 20-year horizon [1]. In the last decade, the United States has become the global leader in the production of natural gas, largely due to the increased use of technologies such as high volume hydraulic fracturing (HVHF) and horizontal drilling.

### Methodology

To evaluate the potential for CH<sub>4</sub> leakage, we used a dynamic chamber with a Picarro CRDS to measure the surface fluxes of CH<sub>4</sub> at HVHF sites in Morgan Co., TN. We made numerous measurements of methane concentration [CH<sub>4</sub>] and carbon isotopic composition ( $\delta^{13}\text{C-CH}_4$ ) in soil gas at three HVHF sites and three corresponding control sites. The majority of measurements were made within 9.5 m of the wellhead. Additionally, two treatments were employed: the chamber was placed on the natural surface (unexcavated) and the chamber was placed in a pit (excavated) 0.15-0.30 m deep in an effort to assess how microbial activity in the near-surface could affect results.

### Results & Discussion

We found positive fluxes (CH<sub>4</sub> leaving the subsurface) and higher [CH<sub>4</sub>] at all HVHF sites relative to control locations. Moreover, one of the three HVHF sites showed the presence of thermogenic CH<sub>4</sub> ( $\delta^{13}\text{C-CH}_4 = -38 \pm 9\%$ ). Ethane and propane were also detected at this HVHF site, further reinforcing the presence of thermogenic gas. Furthermore, from the comparative analysis of the unexcavated and excavated measurements, we discovered that the latter treatment is necessary to diminish the biogenic CH<sub>4</sub> signal and enhance detection of thermogenic CH<sub>4</sub>.

### References

Kang, M., Kanno, C. M., ... Onstott, T. C. (2014). Direct measurements of methane emissions from abandoned oil and gas wells in Pennsylvania. *PNAS*, *111*(51), 18173–7. <http://doi.org/10.1073/pnas.1408315111>