

Methane Emission Flux from Indianapolis, IN: Identification and Contribution of Sources to the Total Citywide Emission

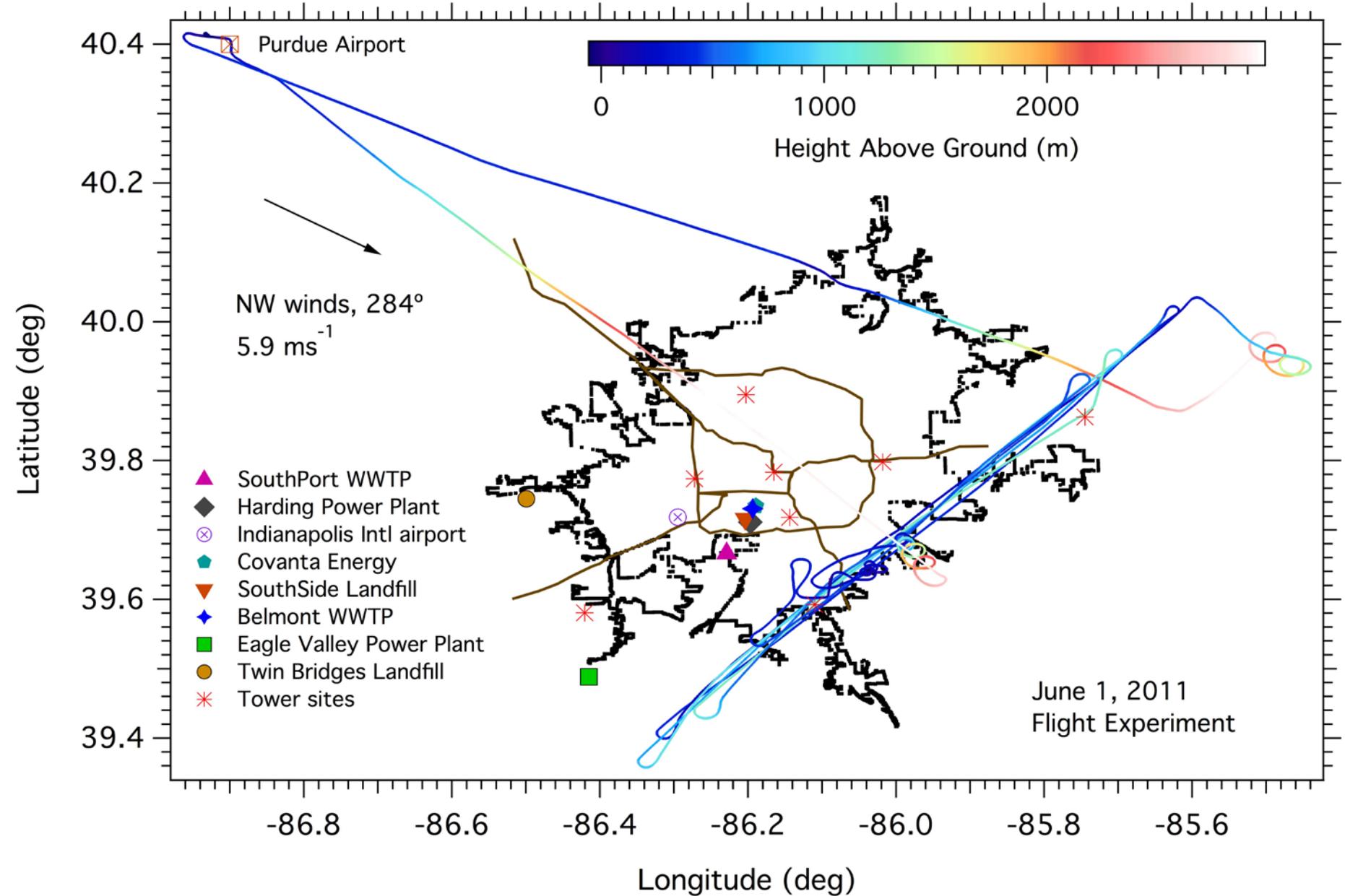
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Motivation

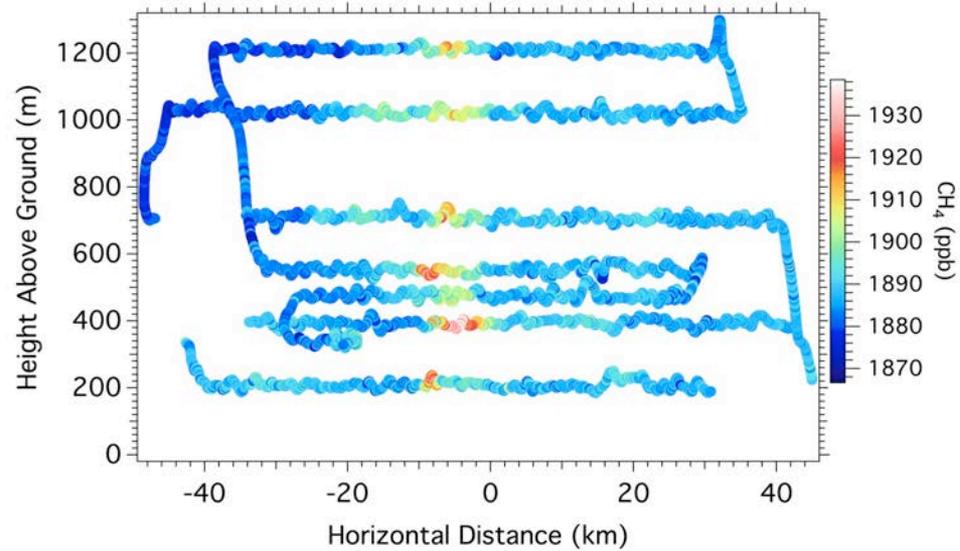
- INFLUX is probing the Urban air shed of Indianapolis to identify and quantify sources
 - Aircraft mass balance approach
 - Surface mobile measurements
- Combination of Measurement and Modeling
 - To provide priors to inverse modeling

Flight Path on June 1, 2011

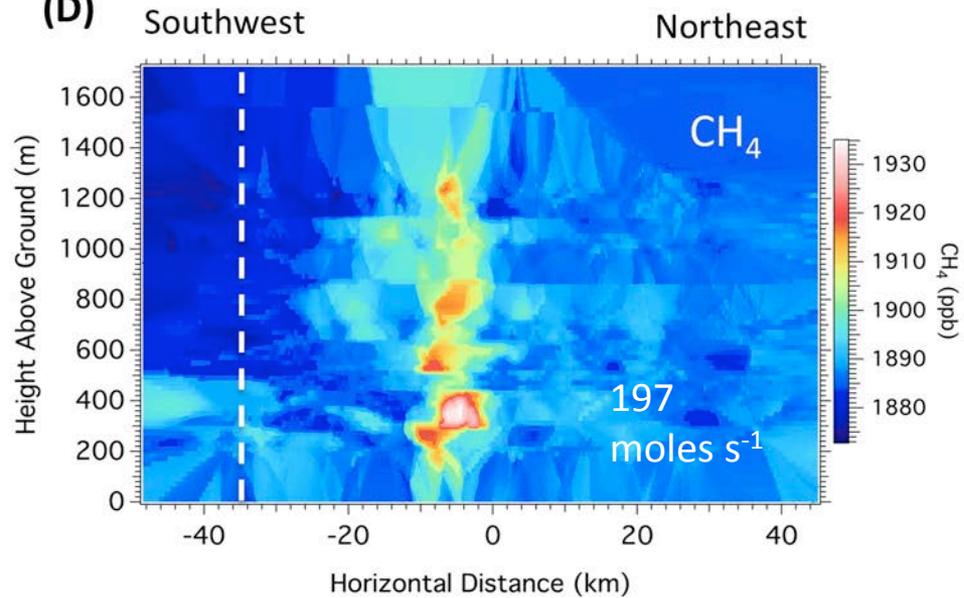


Two-dimensional distributions of observed and interpolated CH_4 data on June 1, 2011

(B)



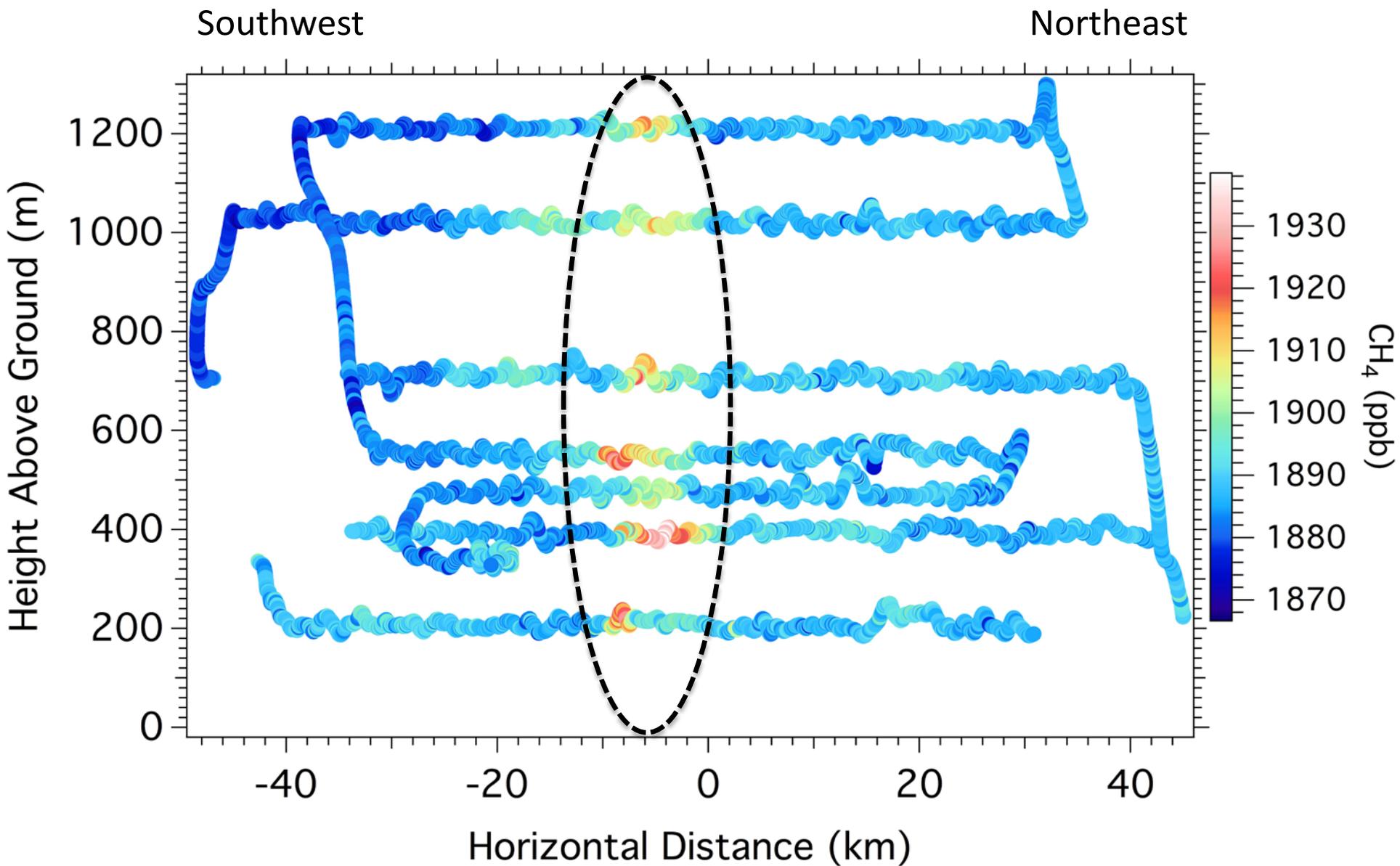
(D)



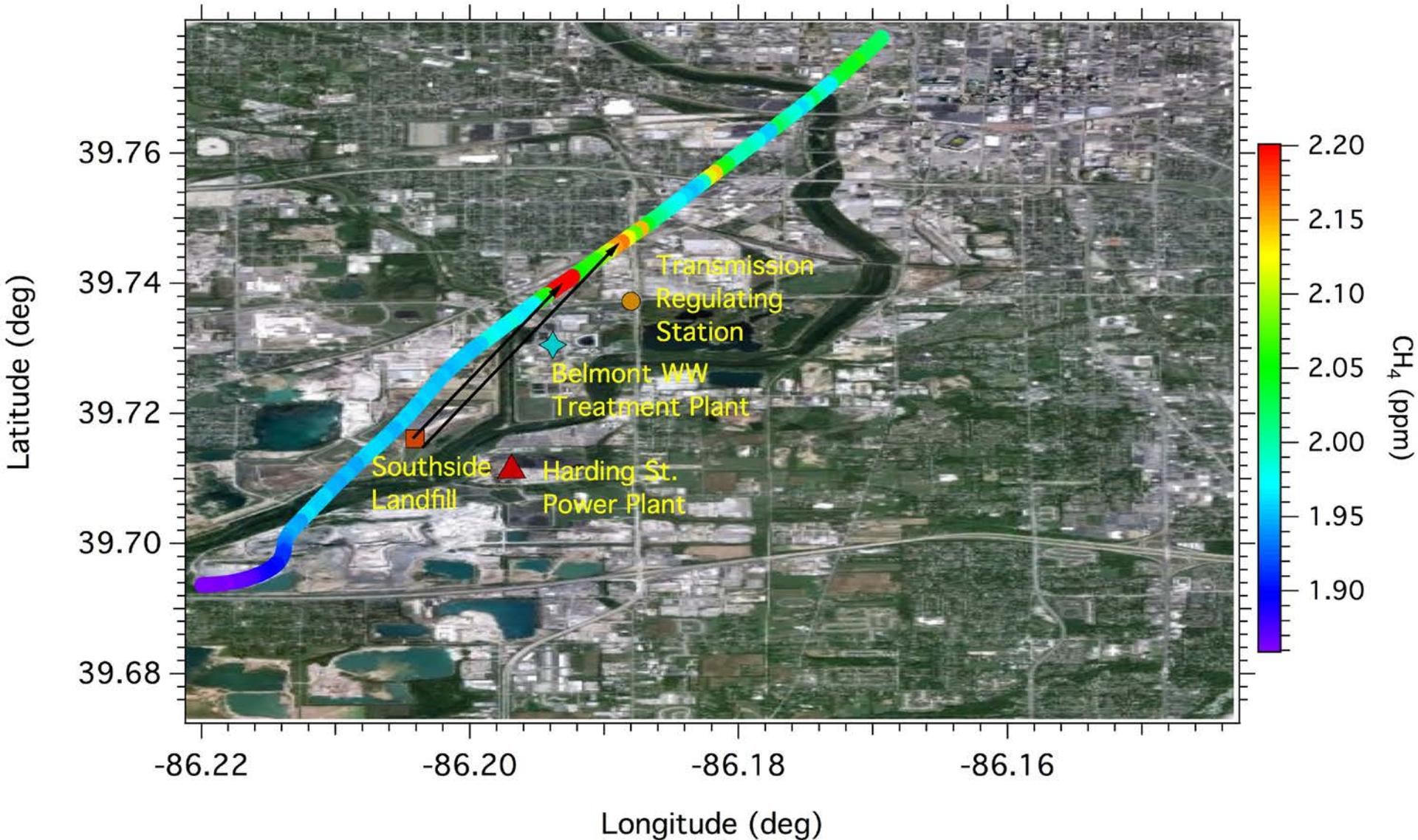
Result of Methane Flux Calculations

Study	City	Year	Emission, mol s ⁻¹
This work: Mar 1, Apr 29, Jun 1, July 12 flights	Indianapolis	2011	150 ± 65
Mays et al., 2009	Indianapolis	2008	102 ± 73
Wennberg et al., 2012	SCAB, Southern CA	2010	870 ± 297
Wunch et al., 2009	SCAB, Southern CA	2007-2008	792 ± 198

June 1, 2011 CH₄ transect data



Following the plume upwind in a separate flight experiment on March 1, 2011. . .



Initial Result from Footprint Analysis . . .

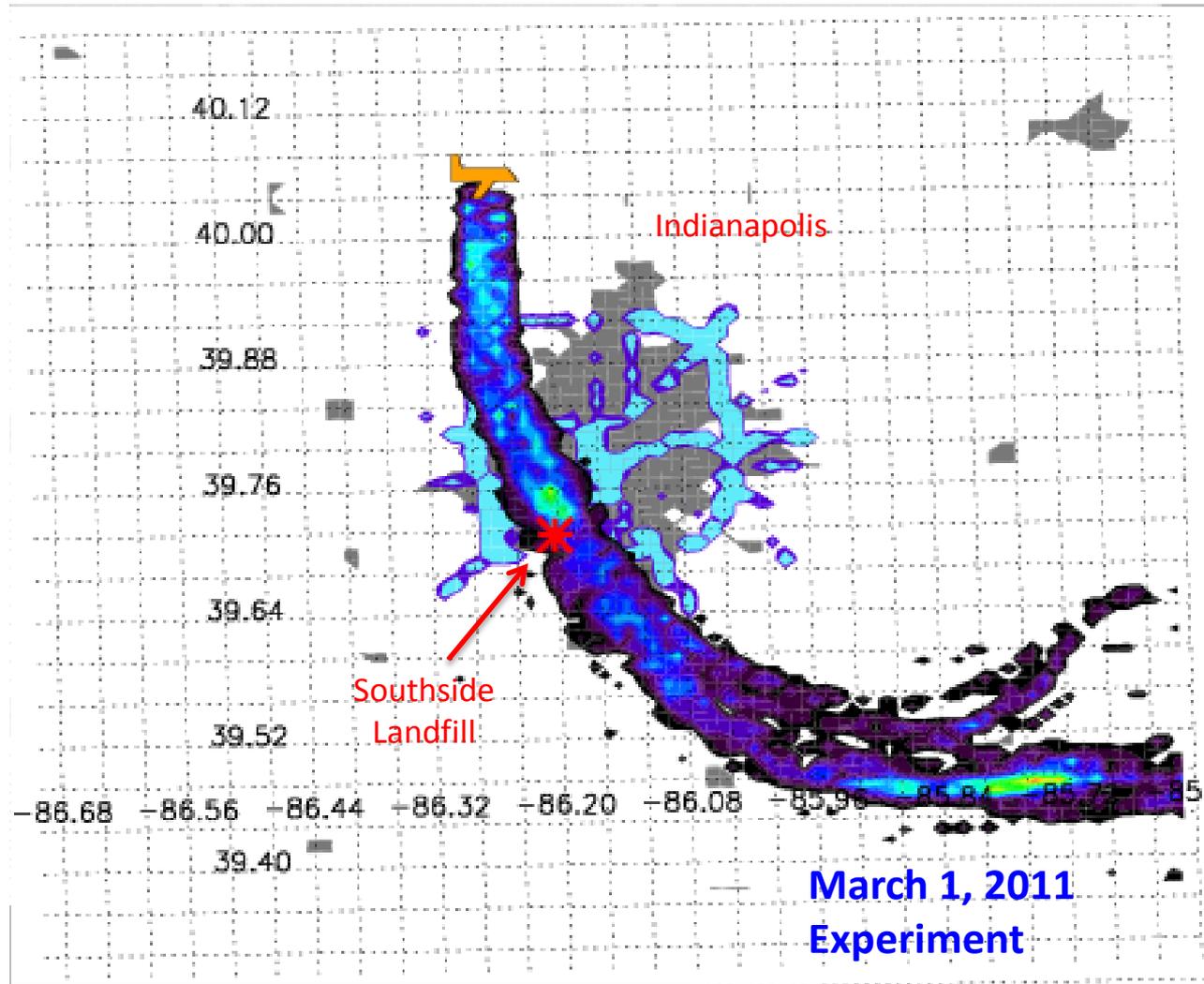
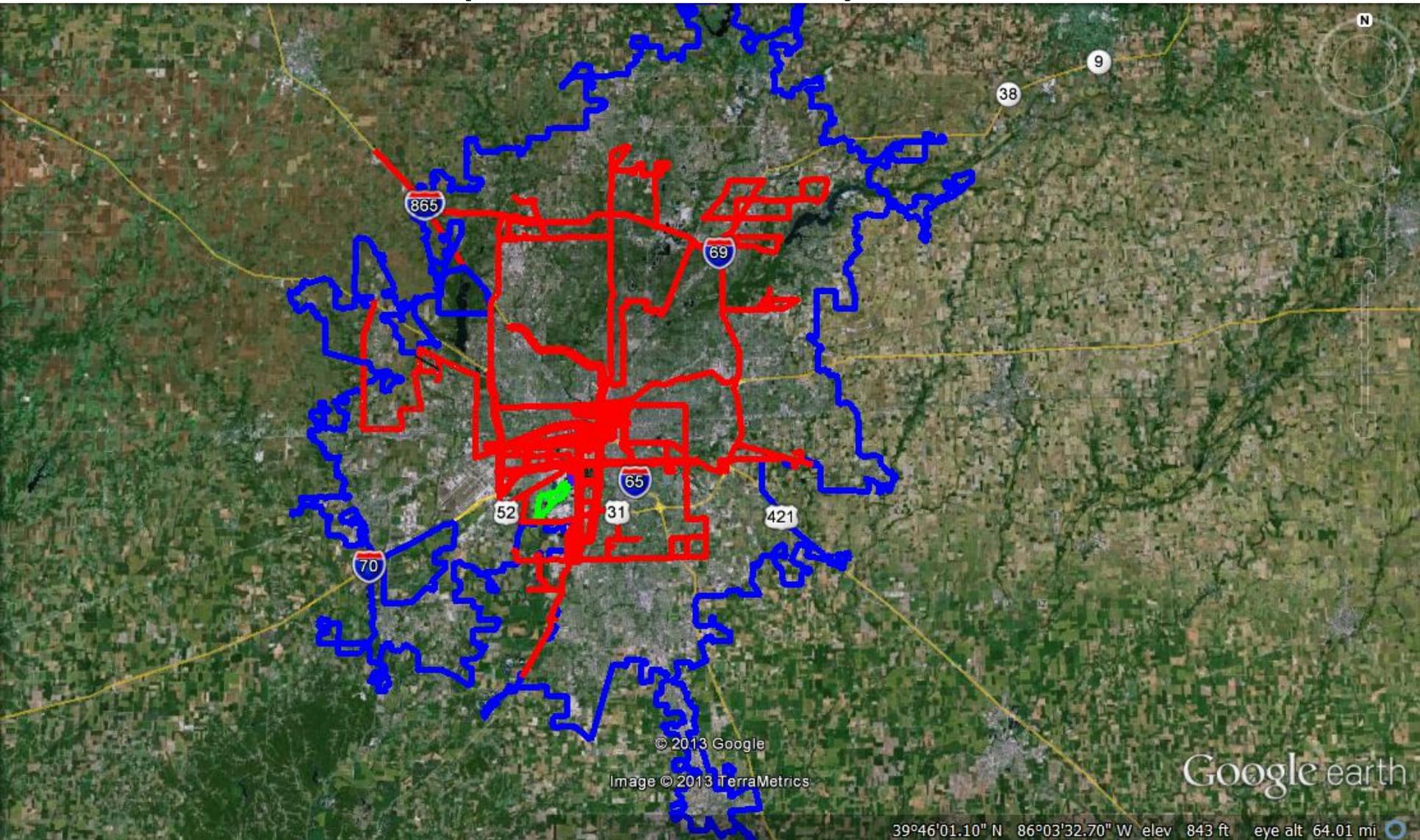


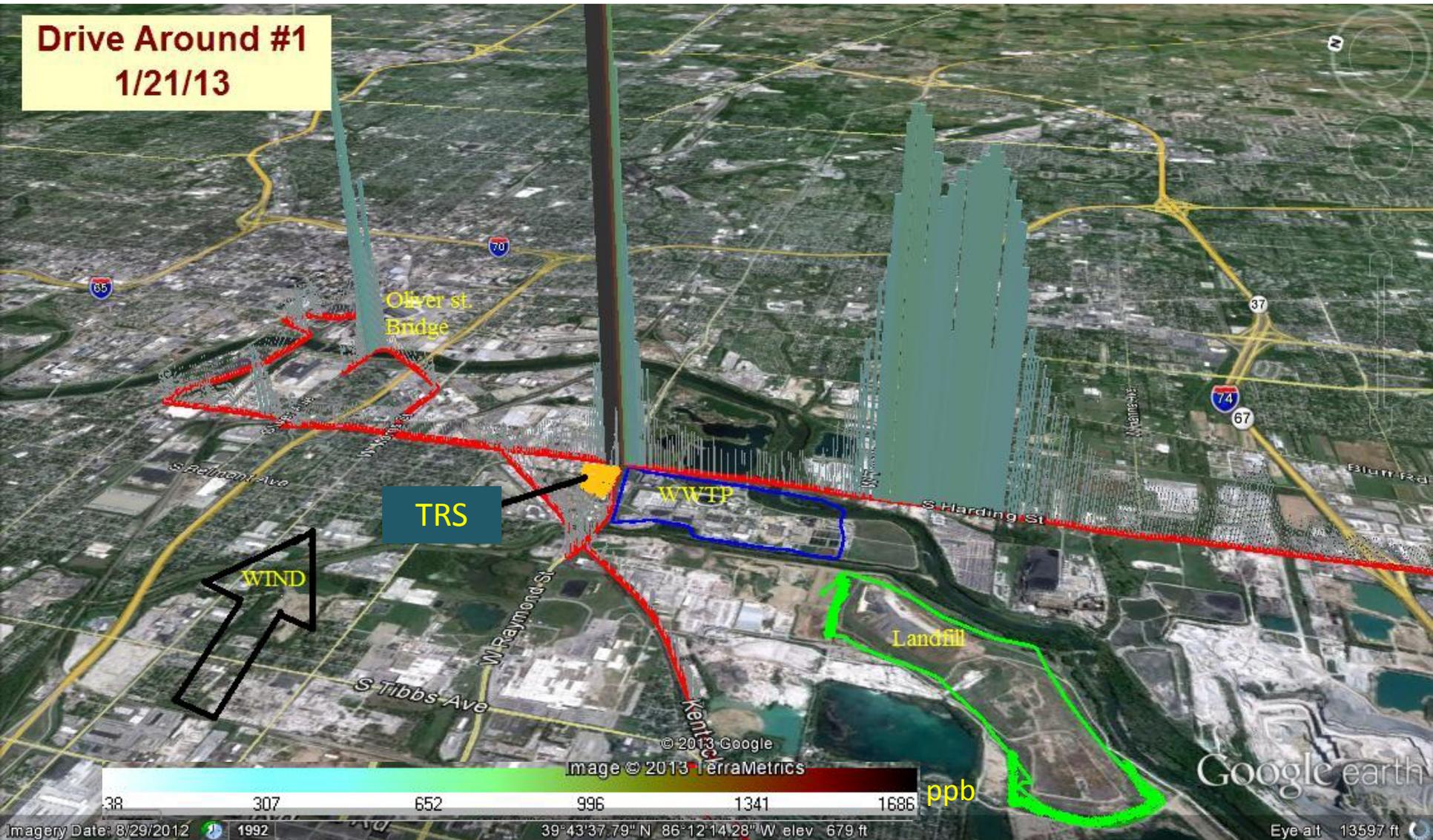
Figure courtesy of Thomas Lauvaux, The Pennsylvania State University

Surface Mobile Measurements to Date: Total drive paths as of May 14, 2013

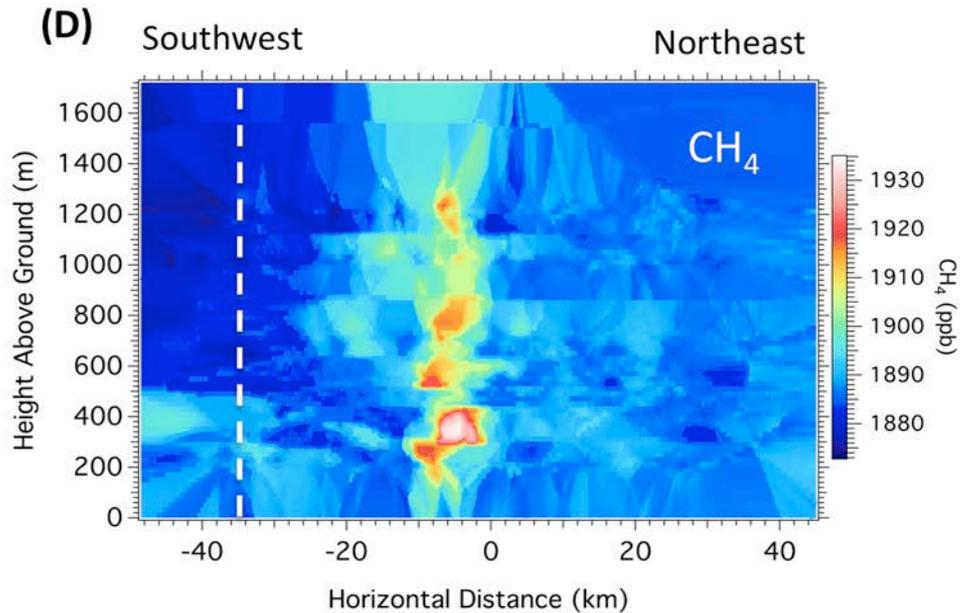
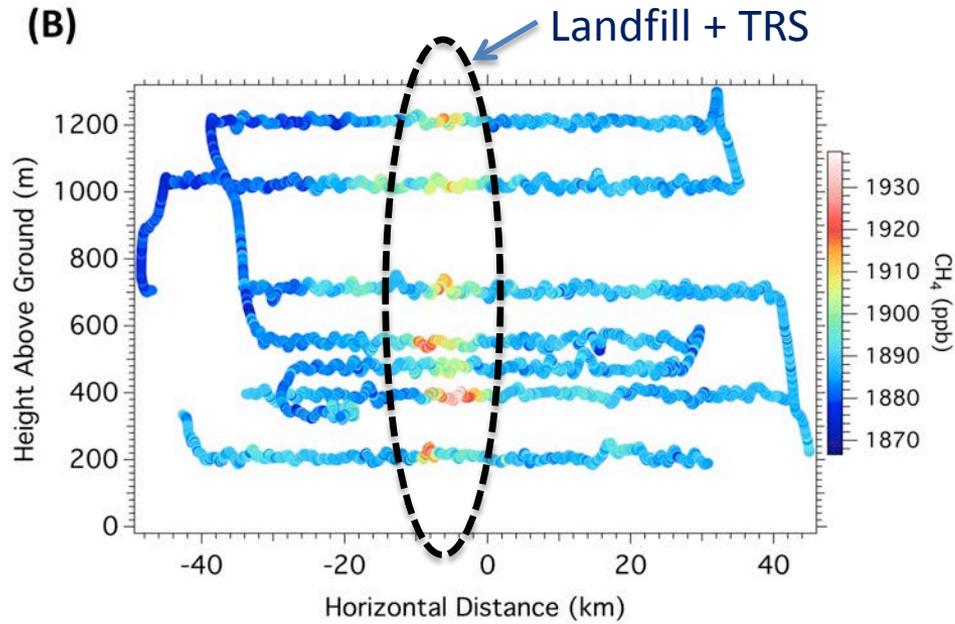


Methane Sources on Southwest side of the city: Landfill and a Transmission Regulating Station (TRS)

Drive Around #1
1/21/13

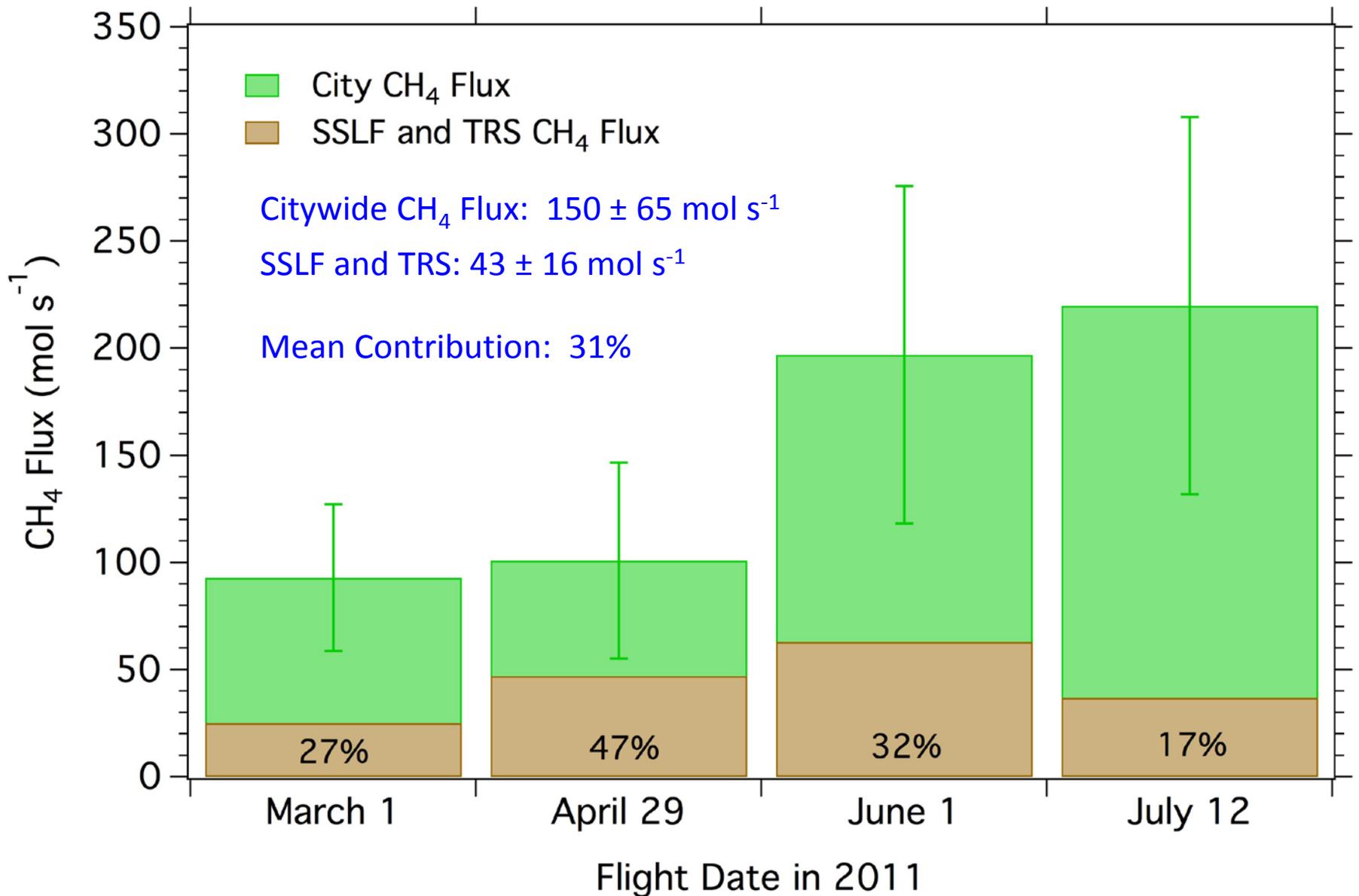


Two-dimensional distributions of observed and interpolated CH₄ data

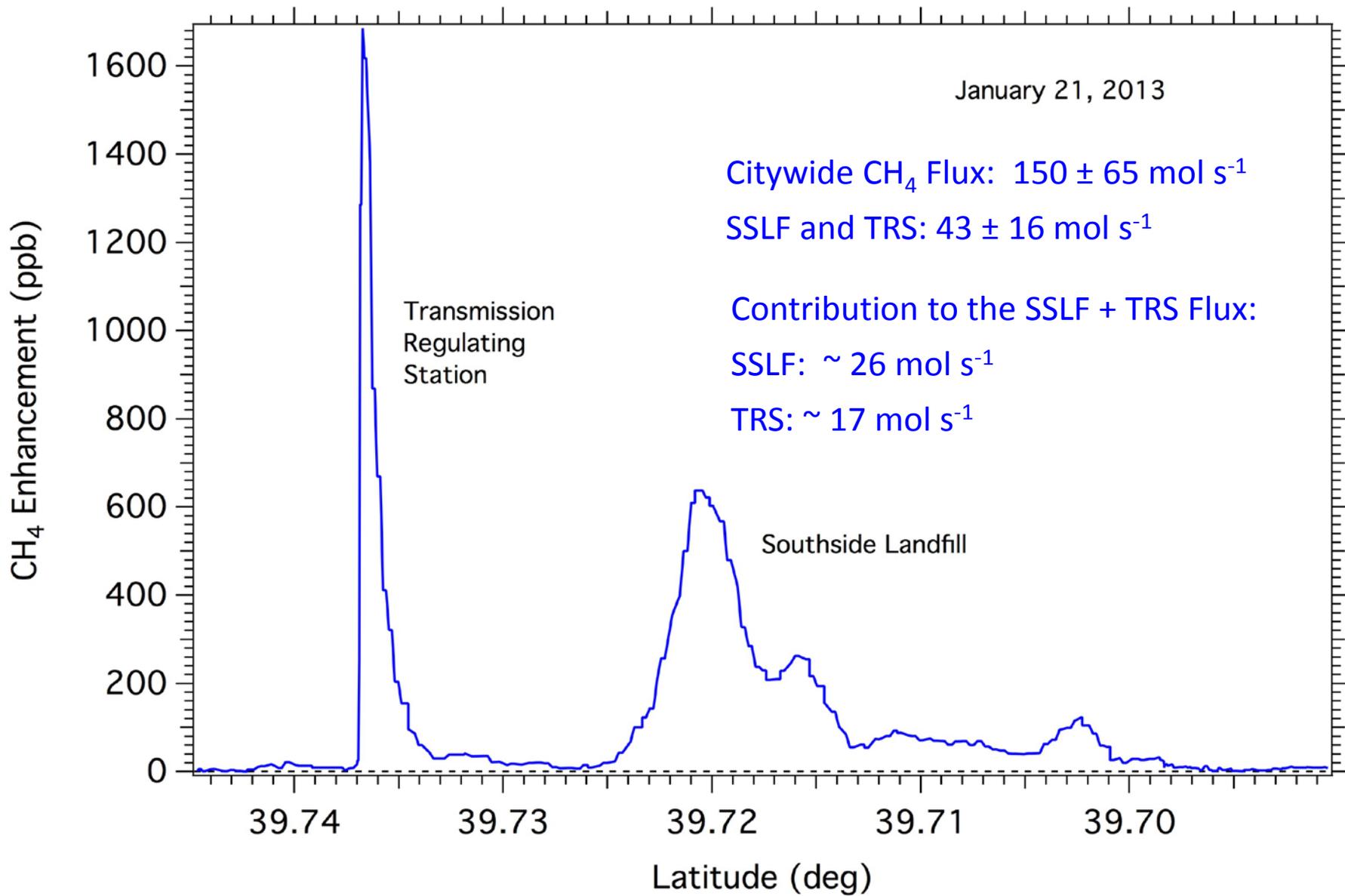


LF + TRS: at least
2 standard
deviations greater
than the mean
city concentration

Contributions from Landfill and Transmission Regulating Station to the Citywide CH₄ Flux



To further partition the contribution: use the distinct Plumes from the Landfill and TRS

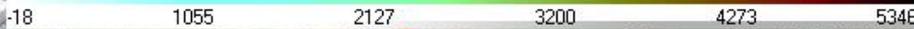


SSLF + TRS contribute ~30%, what are the sources contributing to the remaining 70%?

Indy drive around
4/8/2013

SW Winds

Panhandle
Eastern
Pipeline
Station



© 2013 Google

Imagery Date: 8/29/2012 39°55'52.66" N 86°15'00.57" W elev 893 ft eye alt 8155 ft

Google earth

CH₄ on a bridge



Future Outlook

- Continuing our mobile surface survey to partition the remaining sources representing ~70% of the Indianapolis methane flux
- INFLUX is collaborating with the Environmental Defense Fund and Washington State University for an intensive field campaign involving 5 instrumented vehicles to survey the entire city for 10 days in June
- NIST (Kuldeep Prasad) is now using our surface mobile measurement data in a model to quantify the emission and identify the source



PICARRO