

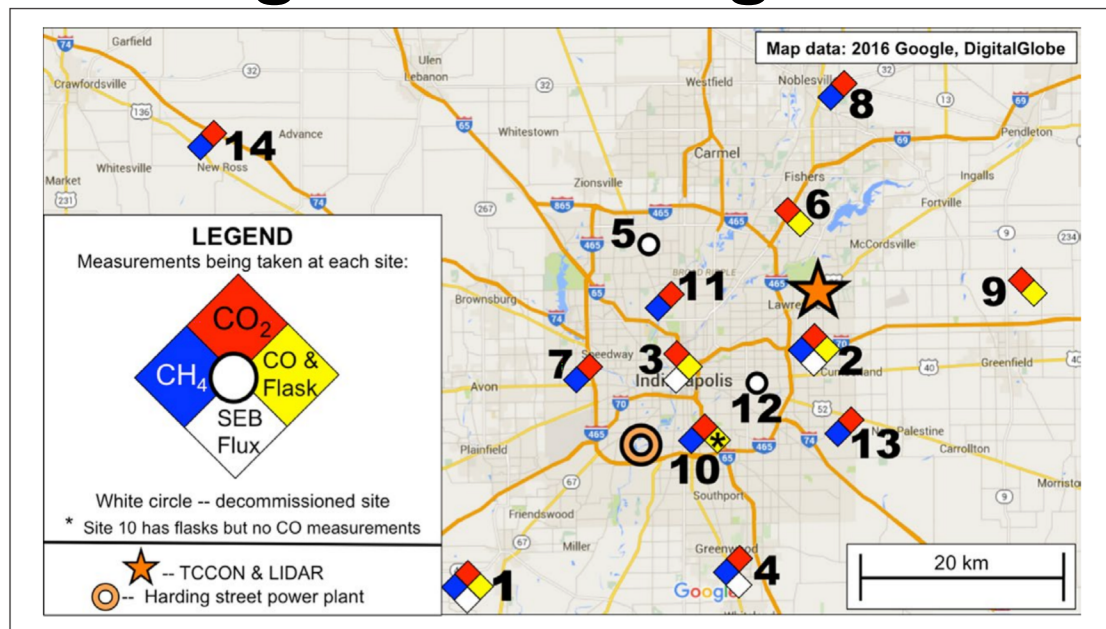


PennState

Indianapolis Flux Experiment – Davis et al, 2017, Elementa



# INFLUX multi-method, multi-year greenhouse gas emissions quantification

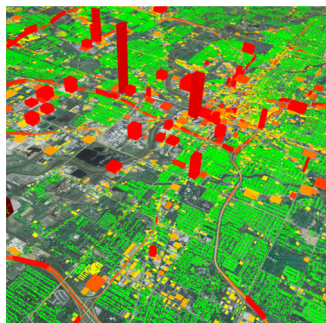


## Tower-based GHG measurements

- 8 years of continuous observations
- Communications towers ~100 m AGL
- 12 Picarro CRDS sensors: (CO<sub>2</sub>, CH<sub>4</sub>, and CO)
- 6 NOAA automated flask samplers (<sup>14</sup>CO<sub>2</sub>, other trace gases)

## Fossil emissions inventory

- Hestia - 250m resolution, daily and seasonal cycles
- utility, residence, aircraft, commercial, traffic sectors



## Airborne sampling

- 54 mass balance flights over 10 years, CO<sub>2</sub>, CH<sub>4</sub>, and CO, flasks
- Additional “grid” and eddy covariance flights



## Boundary layer monitoring

- NOAA Doppler LIDAR
- Eddy flux at 3-4 towers

## Modeling / inversion system

- WRF-Chem FDDA, 1 km
- Lagrangian Particle Dispersion Model
- Bayesian matrix inversion



NIST

ASU

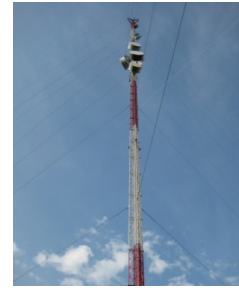
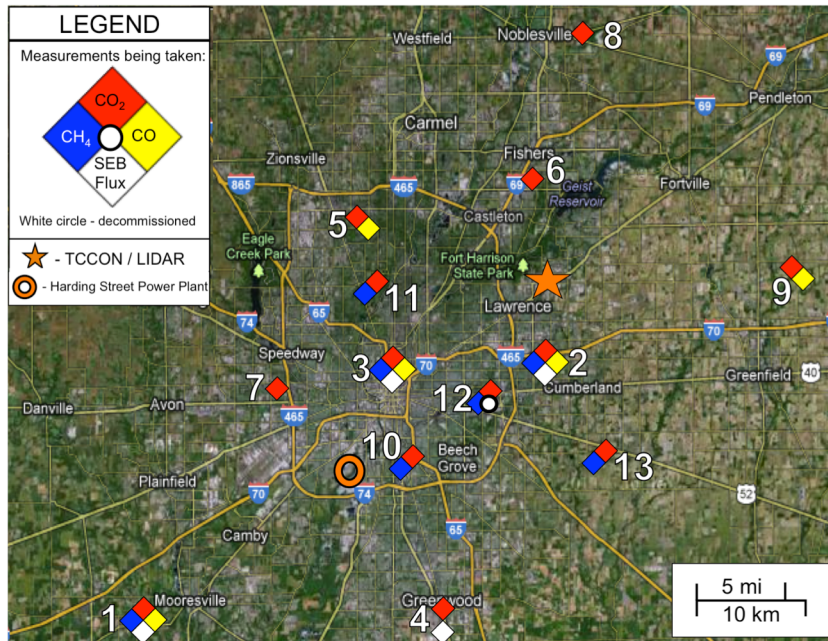


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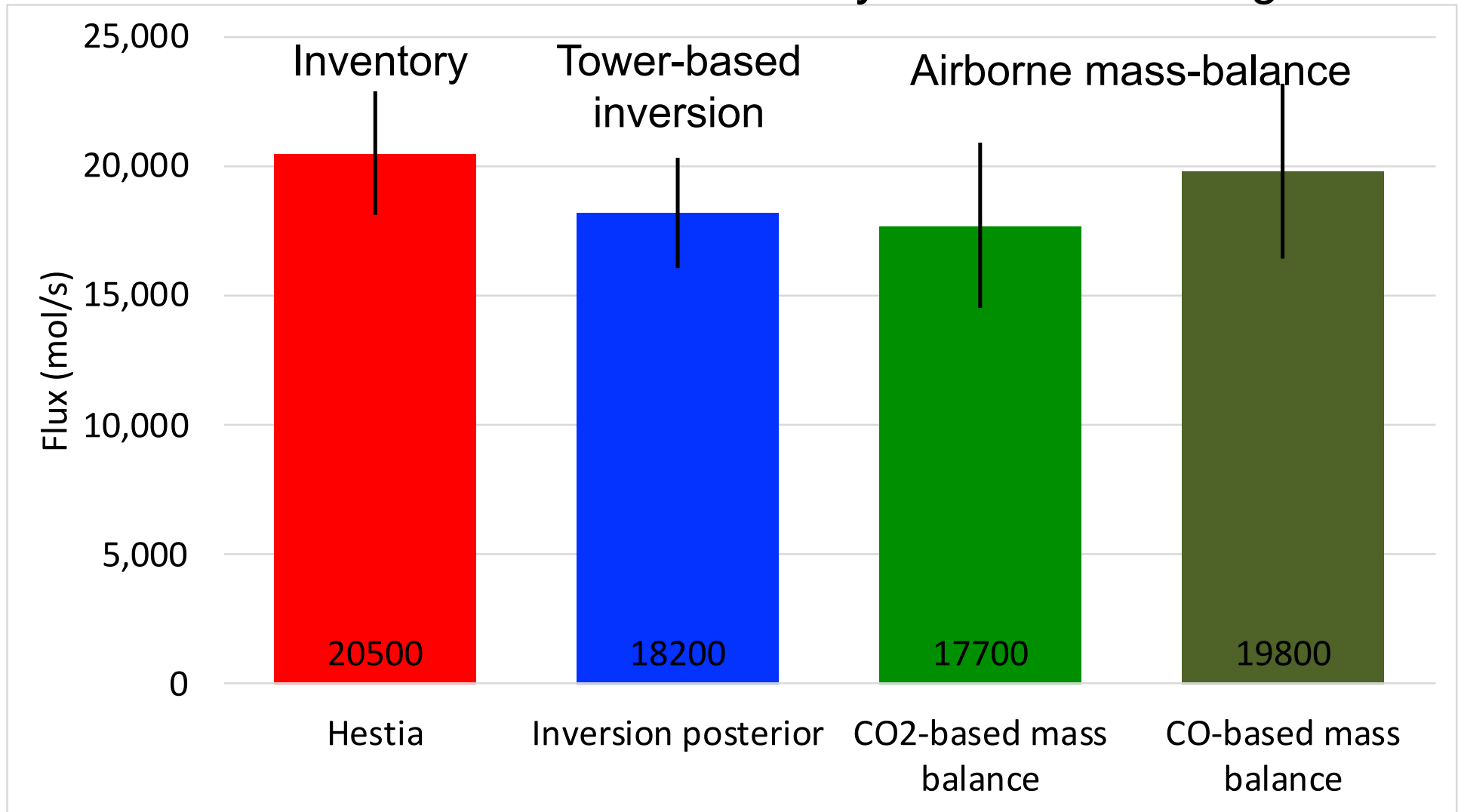
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# Indianapolis CO<sub>2</sub> emissions estimates converge to within 10%!

*Sufficient to evaluate whole-city emissions changes*

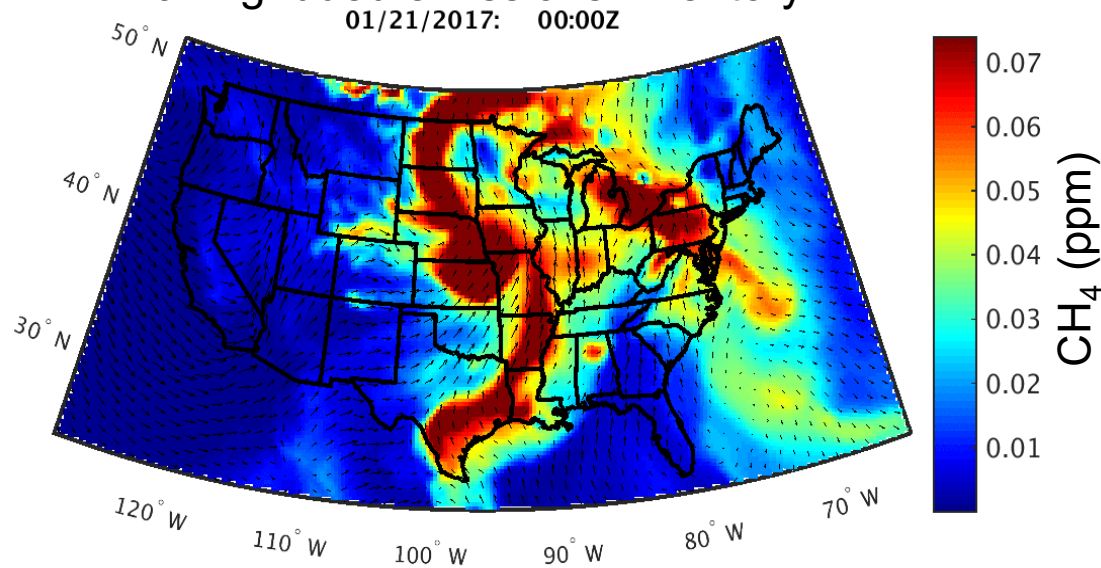


Fossil fuel CO<sub>2</sub> emissions, day, most of Indianapolis, Nov/Dec 2014.

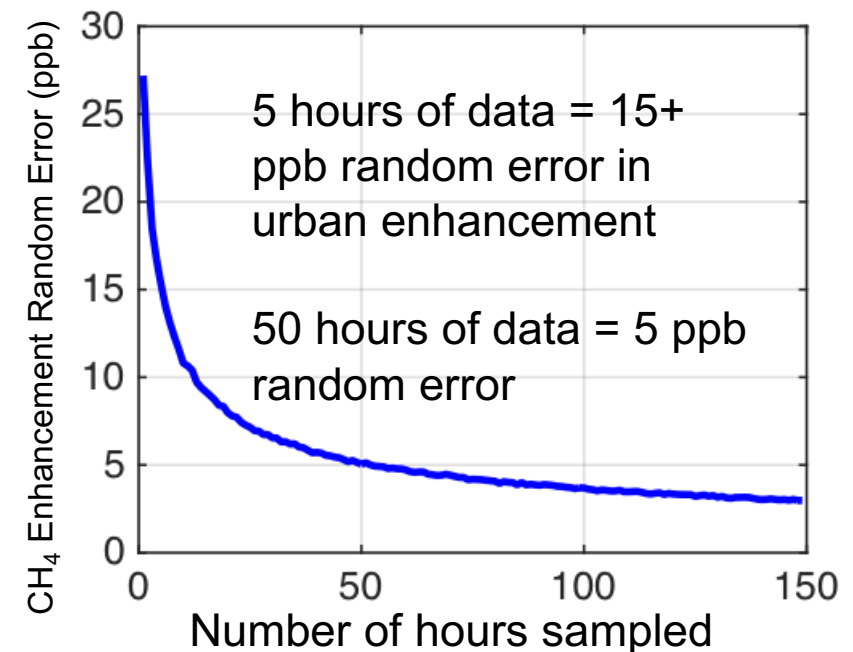
Area, time of day, non-fossil CO<sub>2</sub>, background corrections. Turnbull et al., submitted.

# Work on CO<sub>2</sub> trends, CO<sub>2</sub> and CH<sub>4</sub> background

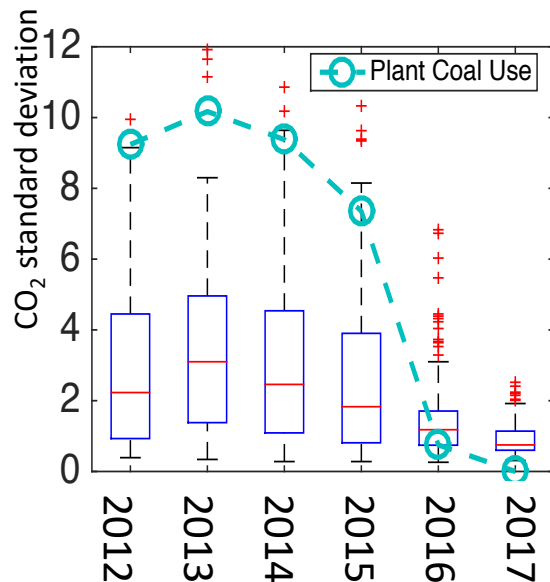
WRF-Chem boundary layer CH<sub>4</sub> with EPA  
2012 gridded emissions inventory



SW wind – similar for other directions



Winds from the West



- CO<sub>2</sub> variability drops as power plant switches from coal to gas
- CO<sub>2</sub> enhancement triples in summer, enhancement changes by 100% with changing summer background site.

CO<sub>2</sub> Enhancements

