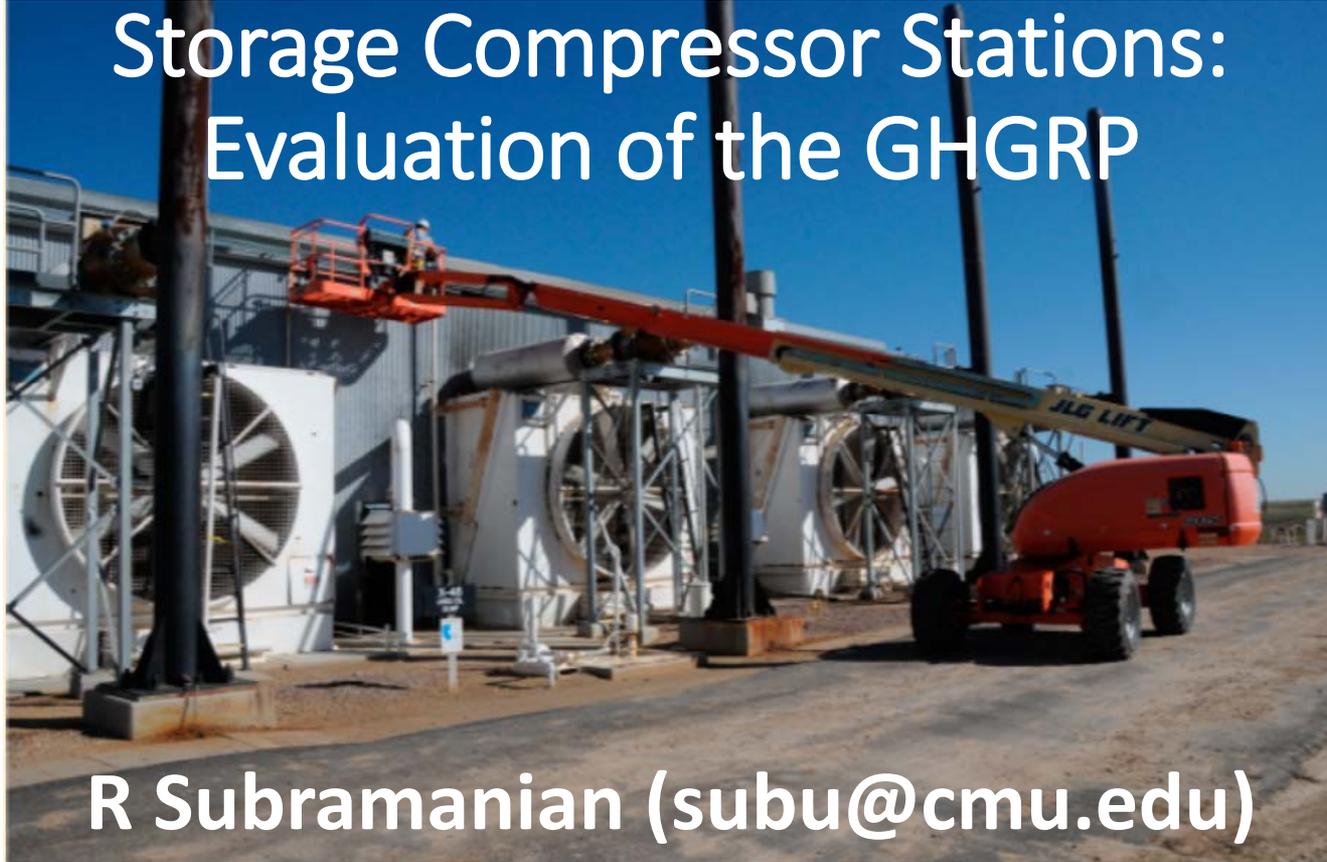


Methane Emissions from Transmission & Storage Compressor Stations: Evaluation of the GHGRP



R Subramanian (subu@cmu.edu)

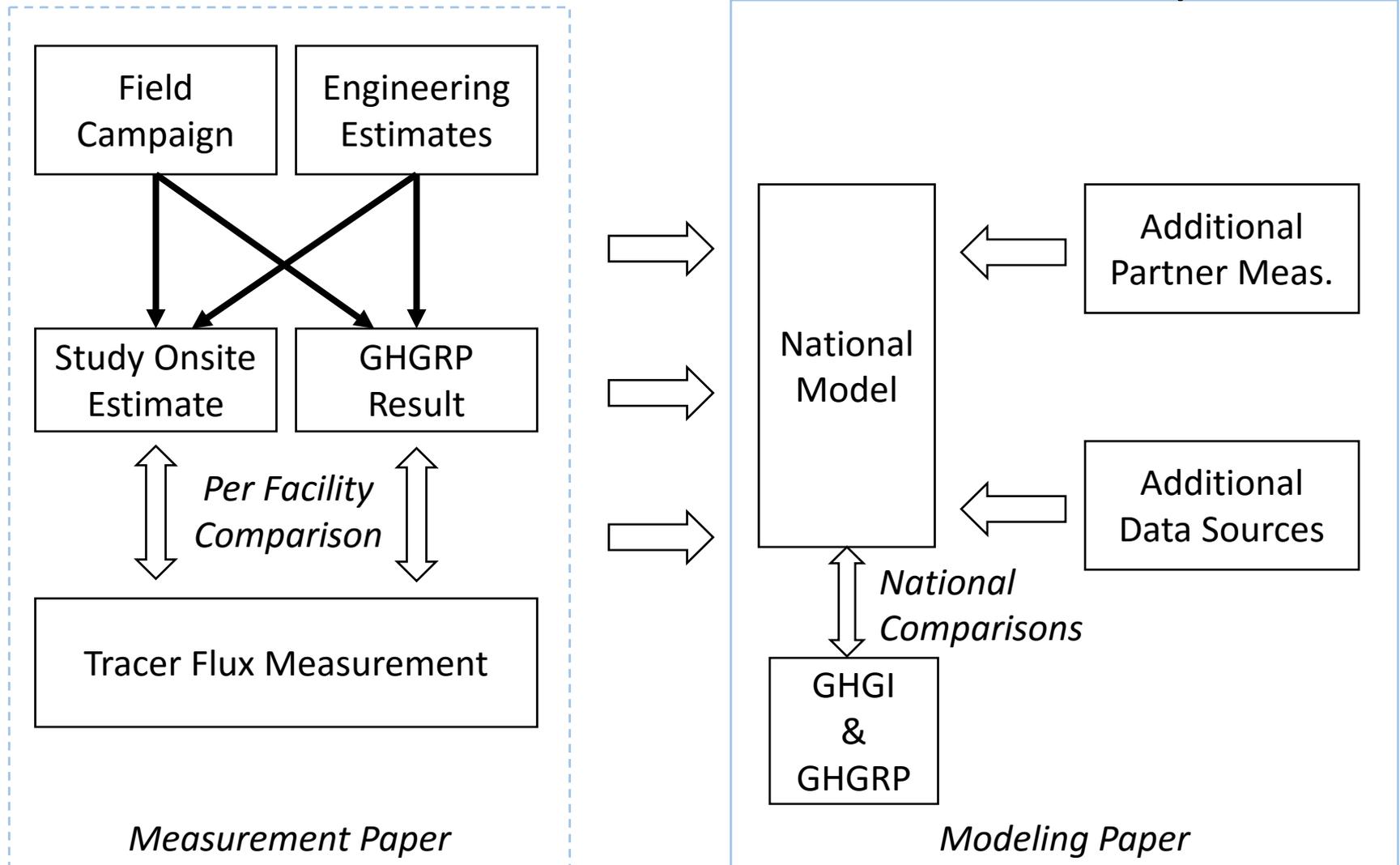
Daniel Zimmerle, Laurie Walker, Tim Vaughn, Melissa Sullivan,
Daniel Tkacik, Austin Mitchell, Tim Dallmann, Scott Herndon,
Rob Roscioli, Tara Yacovitch, Cody Floerchinger,
Allen L Robinson

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- Environmental Defense Fund
- Kinder-Morgan
- NiSource
- TransCanada
- Dominion
- Williams
- Enable
- Dow
- INGAA



Study Design: Toward an updated T&S methane emissions inventory



Unlocking the GHGRP database with paired top-down & bottom-up measurements

- Sixteen states, six partner companies, eleven weeks of parallel direct onsite and tracer flux measurements

			Compressor Types			
Category	Number	GHGRP reporters	Reciprocating compressors only	Centrifugal compressor only	Both types	Sites with at least one compressor running
Transmission	37	23	12	21	4	15
Storage	8 (10)	2	7	0	1	5
Total	45 (47)	25	19	21	5	20

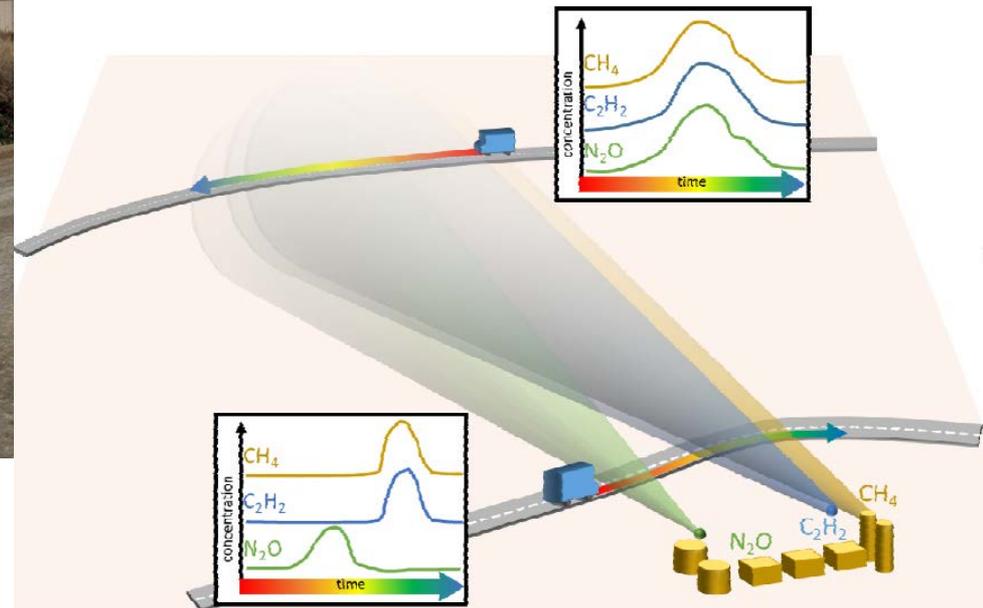
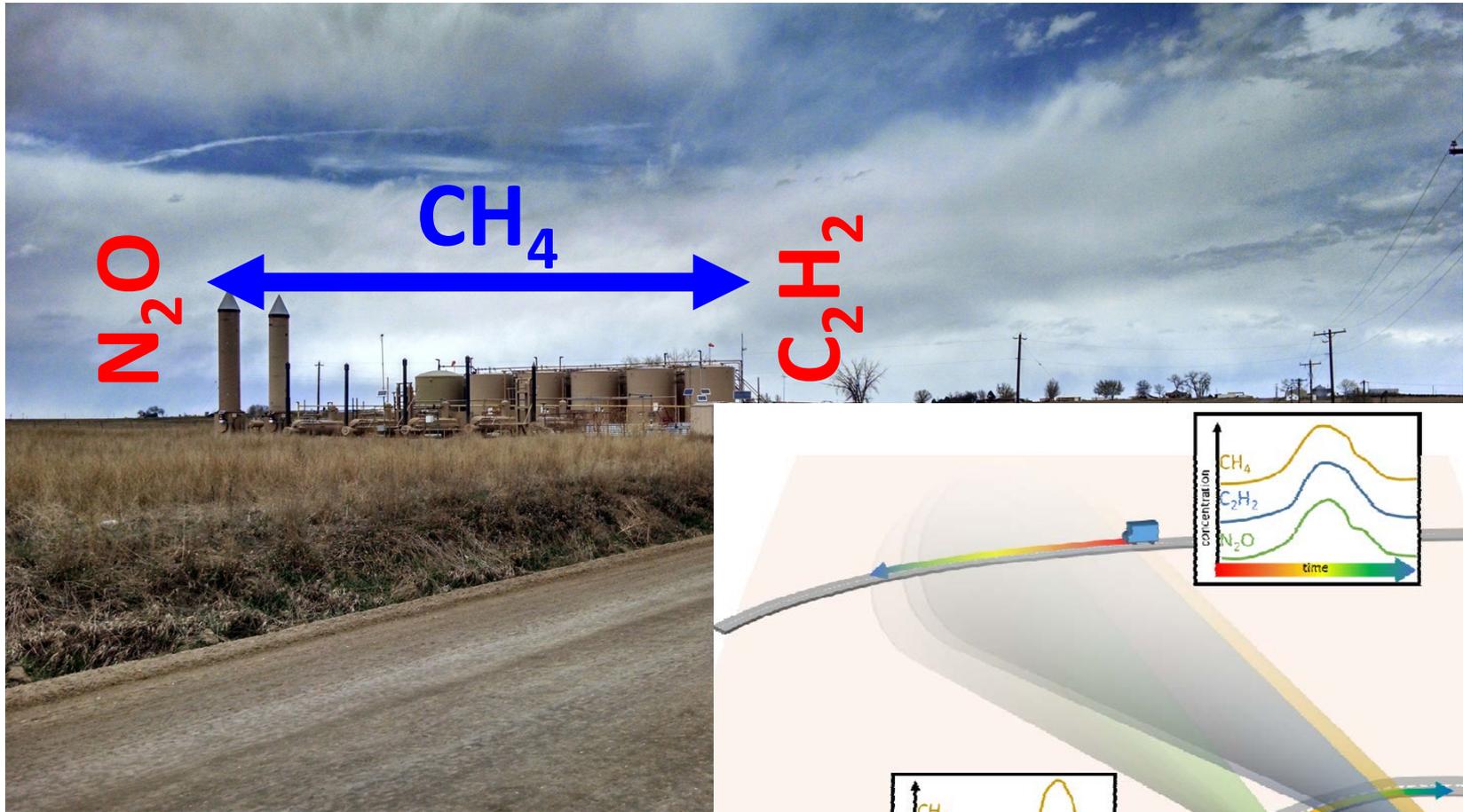
GHGRP reporters: facilities that emit over 25,000 MT-CO₂e/year

Bottom-up: Direct Onsite Measurement of Methane Emissions

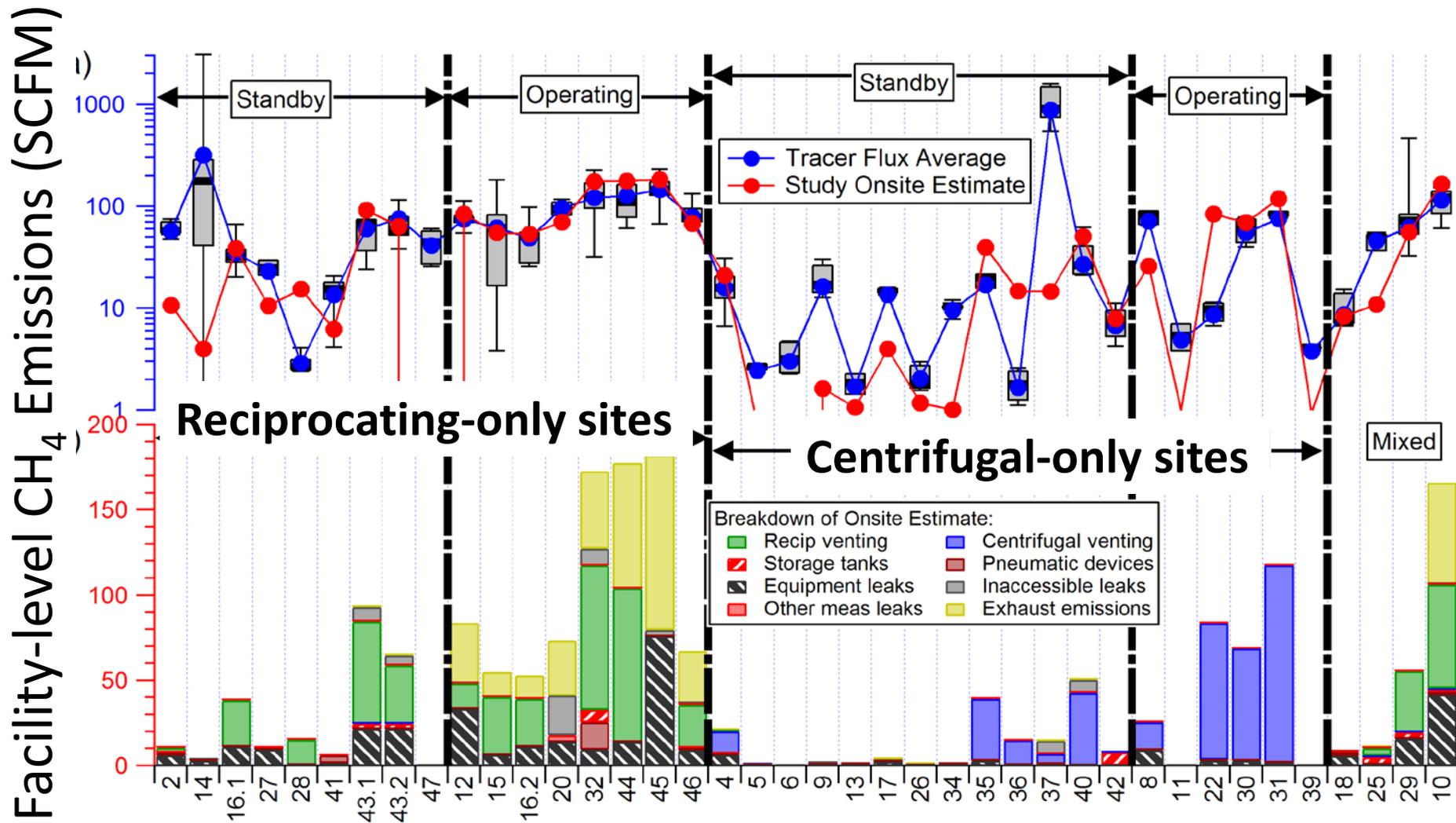
- Modeled on EPA GHGRP protocol, but more comprehensive
- Leak detection with FLIR thermal imaging
- Measure emissions with Hi-Flow, acoustic devices, turbine meters, bags
- Issues:
 - Accuracy of some techniques questionable
 - Some leaks may not be detected due to adverse wind
 - Not all detected leaks are safely accessible
 - Time-consuming for comprehensive measurements and at larger sites



“Top-Down” Downwind Dual Tracer Flux: Facility-Level Emission Rates

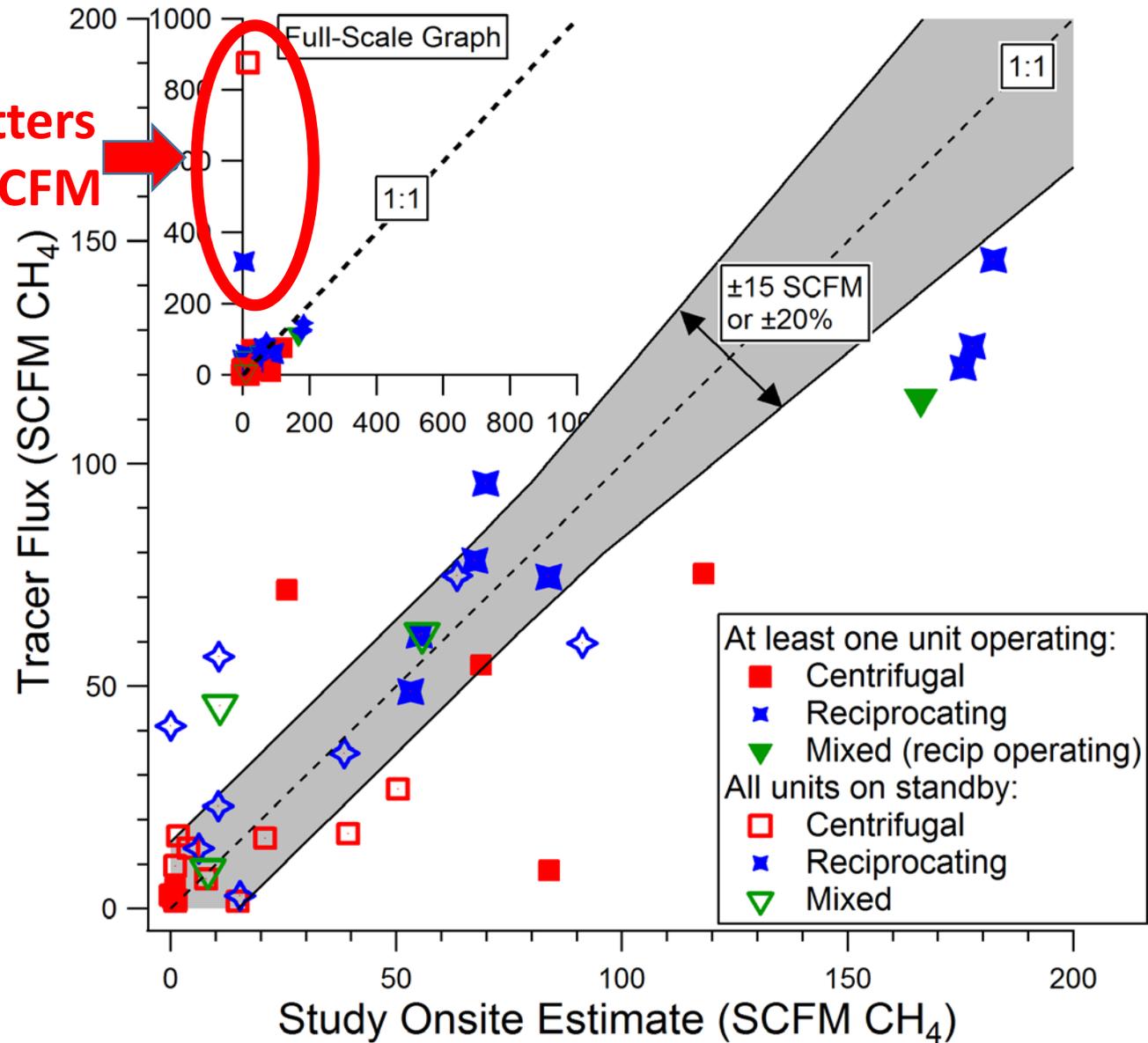


Onsite & Tracer Flux Data: Details

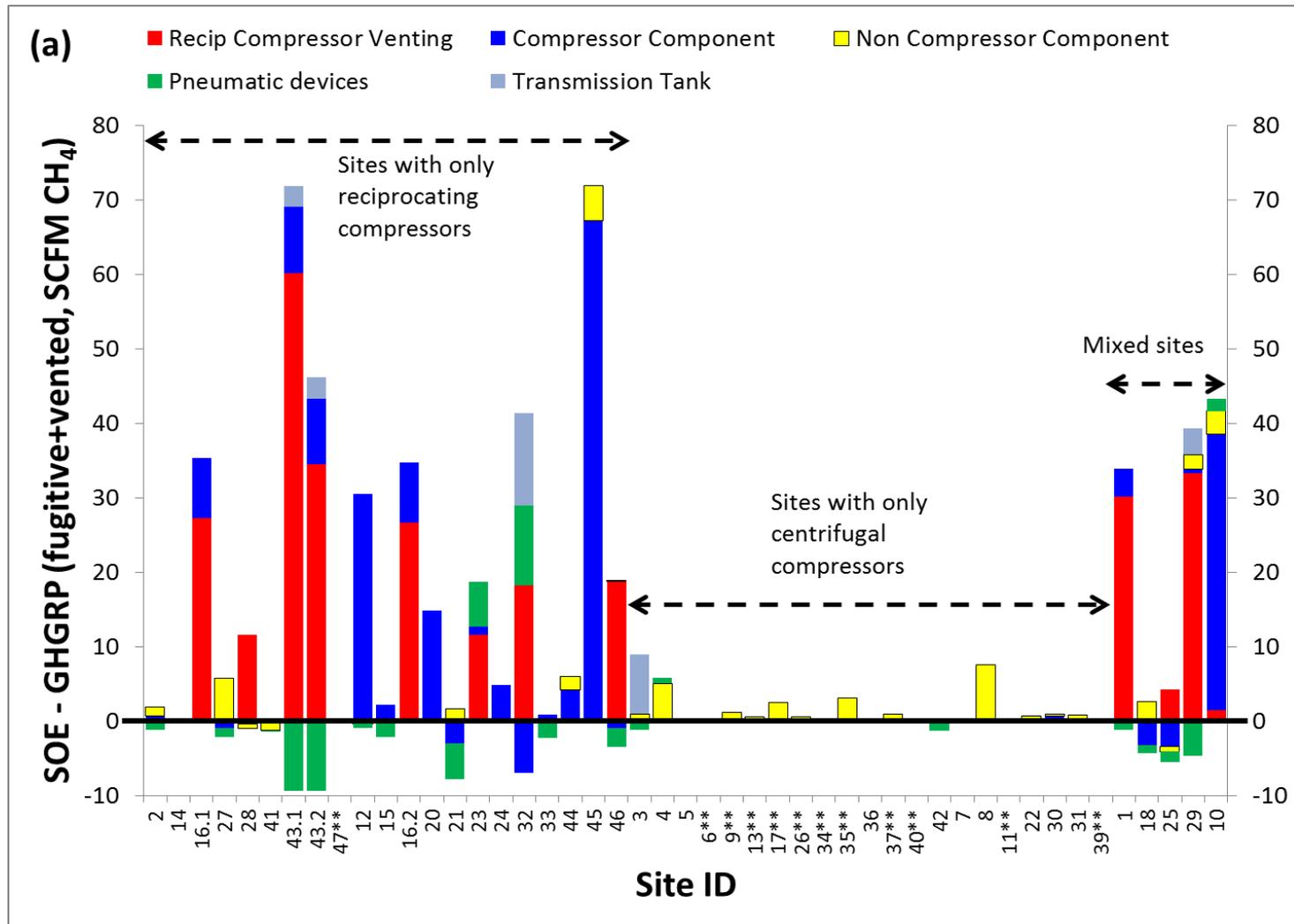


Direct Onsite vs Tracer Flux: Mostly Agree

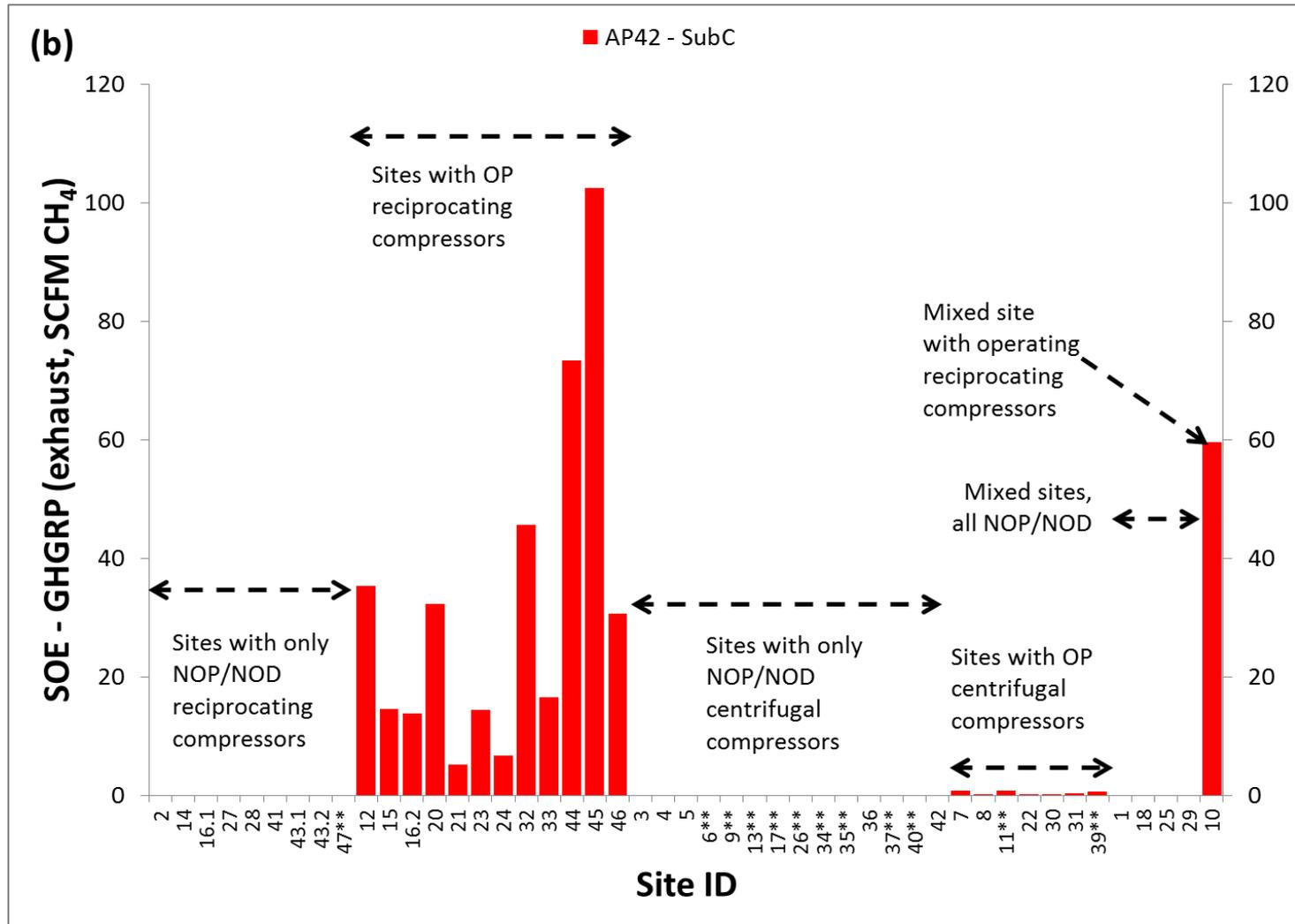
**Super-emitters
Over 300 SCFM**



GHGRP: NOP rod-packing venting not reported, OEL/connector emission factors low

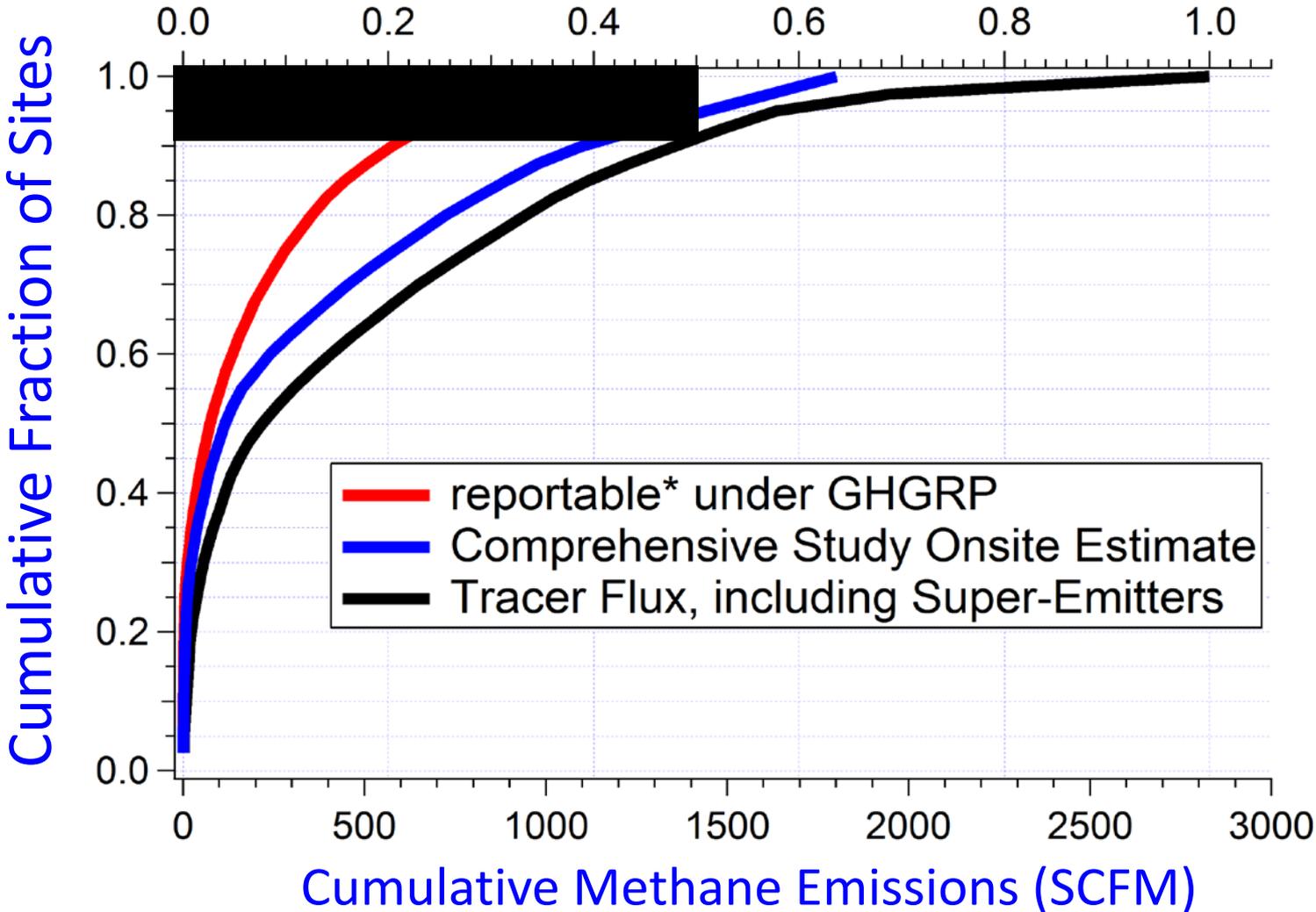


GHGRP emission factors not appropriate for engine exhaust methane



The fat tail: super-emitters skew emissions distributions

Cumulative Fraction of TF Methane Emissions



Summary

- Tracer flux quantifies site-level methane emissions
 - Includes* measurement of exhaust methane
 - Super-emitters
- Comprehensive bottom-up measurements, with AP-42 exhaust emissions estimates, “mostly OK”:
 - Matches top-down tracer flux for most sites
 - Do not capture super-emitter emissions
- Make EPA GHG Reporting Program comprehensive
 - Include all major sources of emissions
 - Use updated emission factors, if not direct measurements
 - Remove the 25,000 MT-CO₂e reporting threshold
- Need better identification and quantification of super-emitters: 10% of sites ~ 50% of emissions?

Questions?

Email: subu@cmu.edu

Click [here](#) for the open-access paper