Estimating Urban CO_2 Fluxes at High Spatial Resolution from *In Situ* Observations

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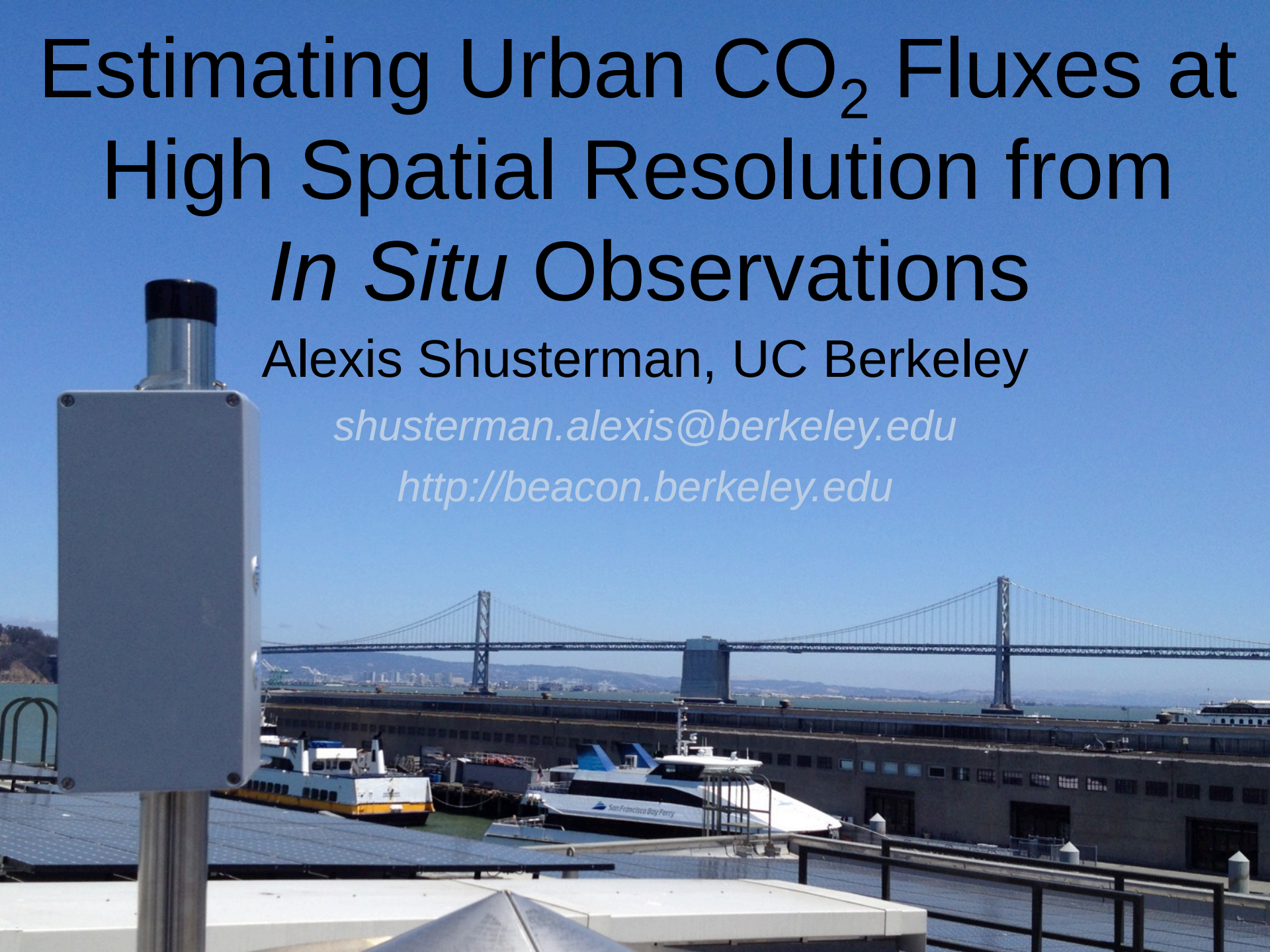
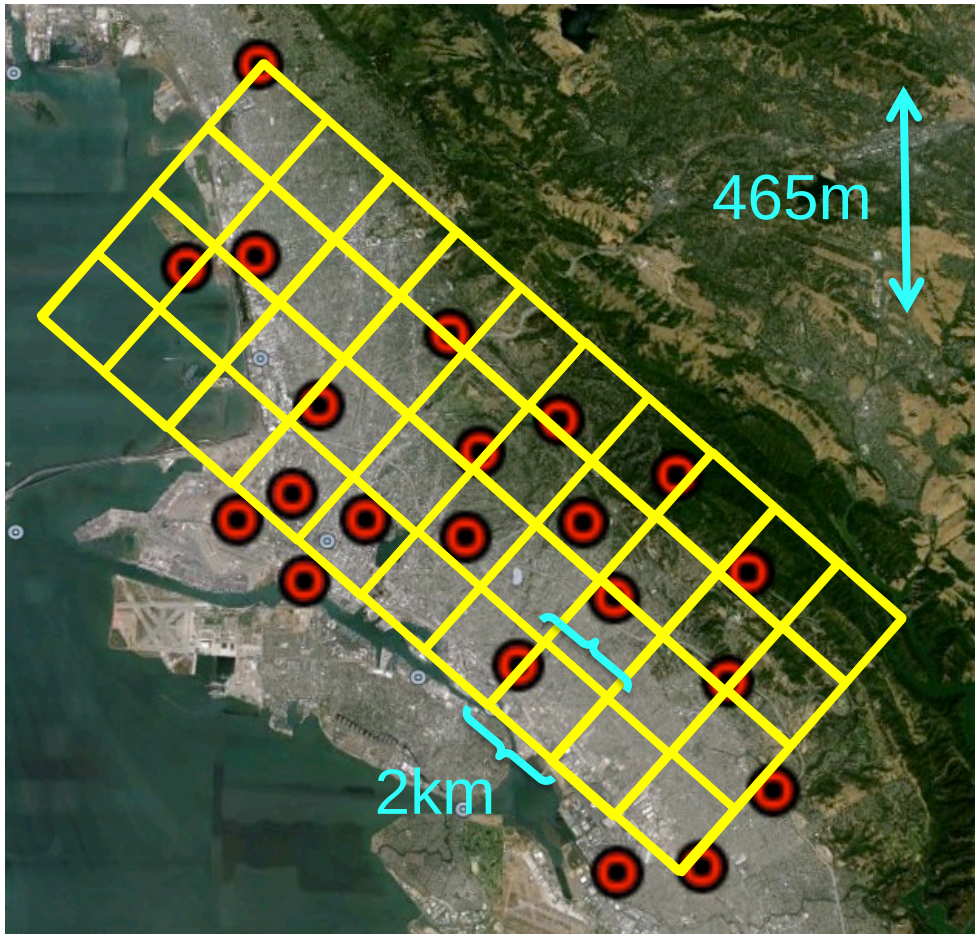
http://beacon.berkeley.edu



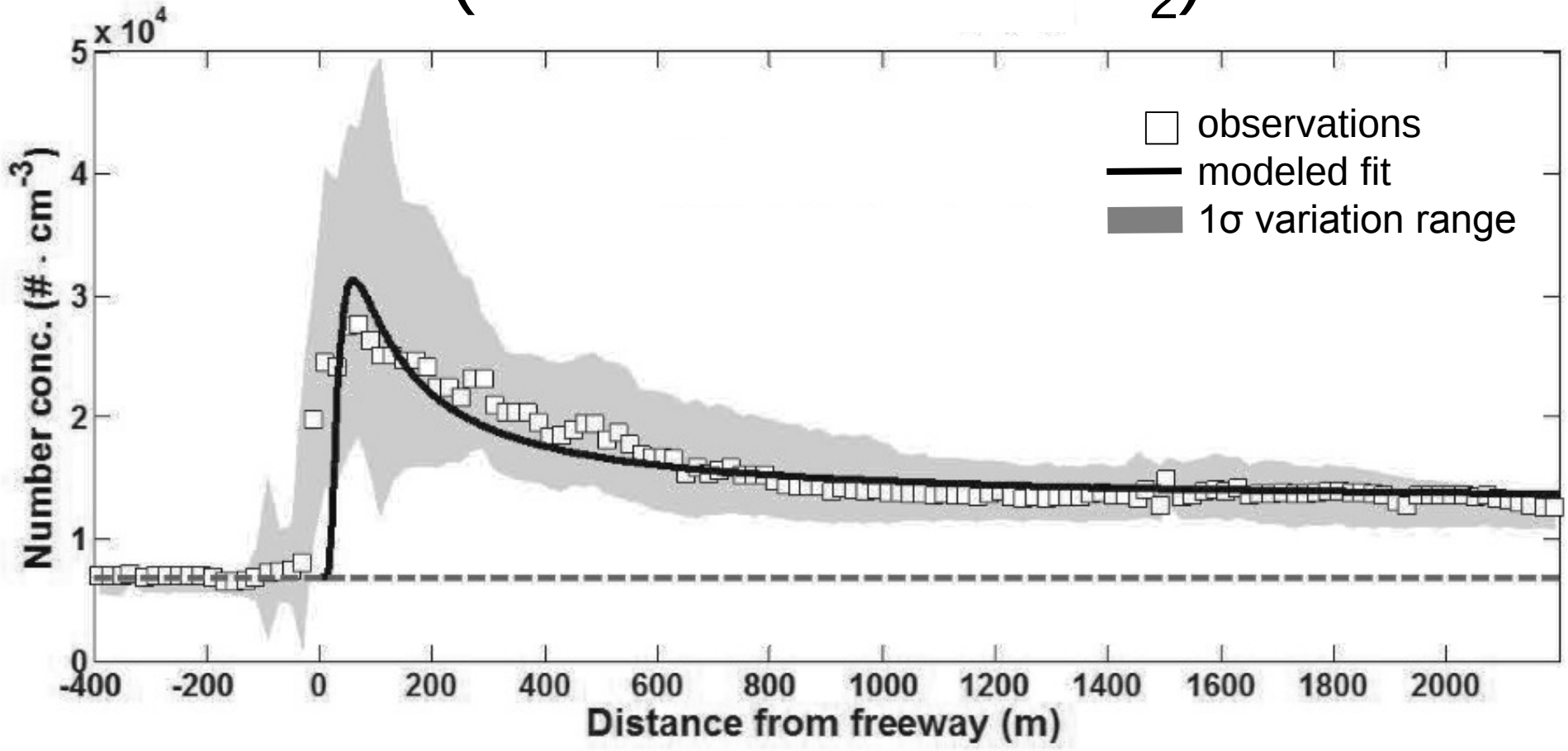


BErkeley Atmospheric CO_2 Observation Network

~25 independent air quality sensing “nodes” on museum and elementary school rooftops

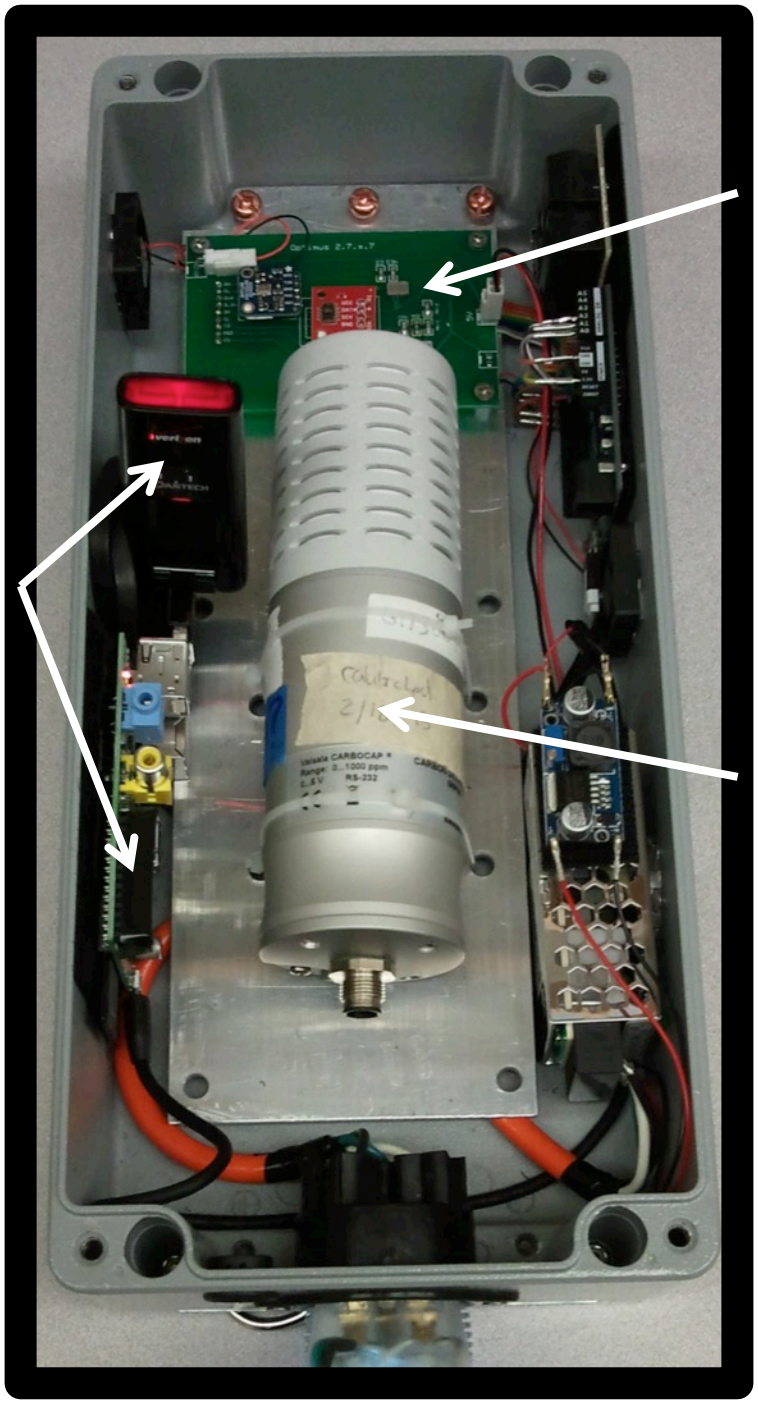
PI: Ron Cohen

Particulate Matter (co-emitted with CO_2)



from Choi et al. 2014

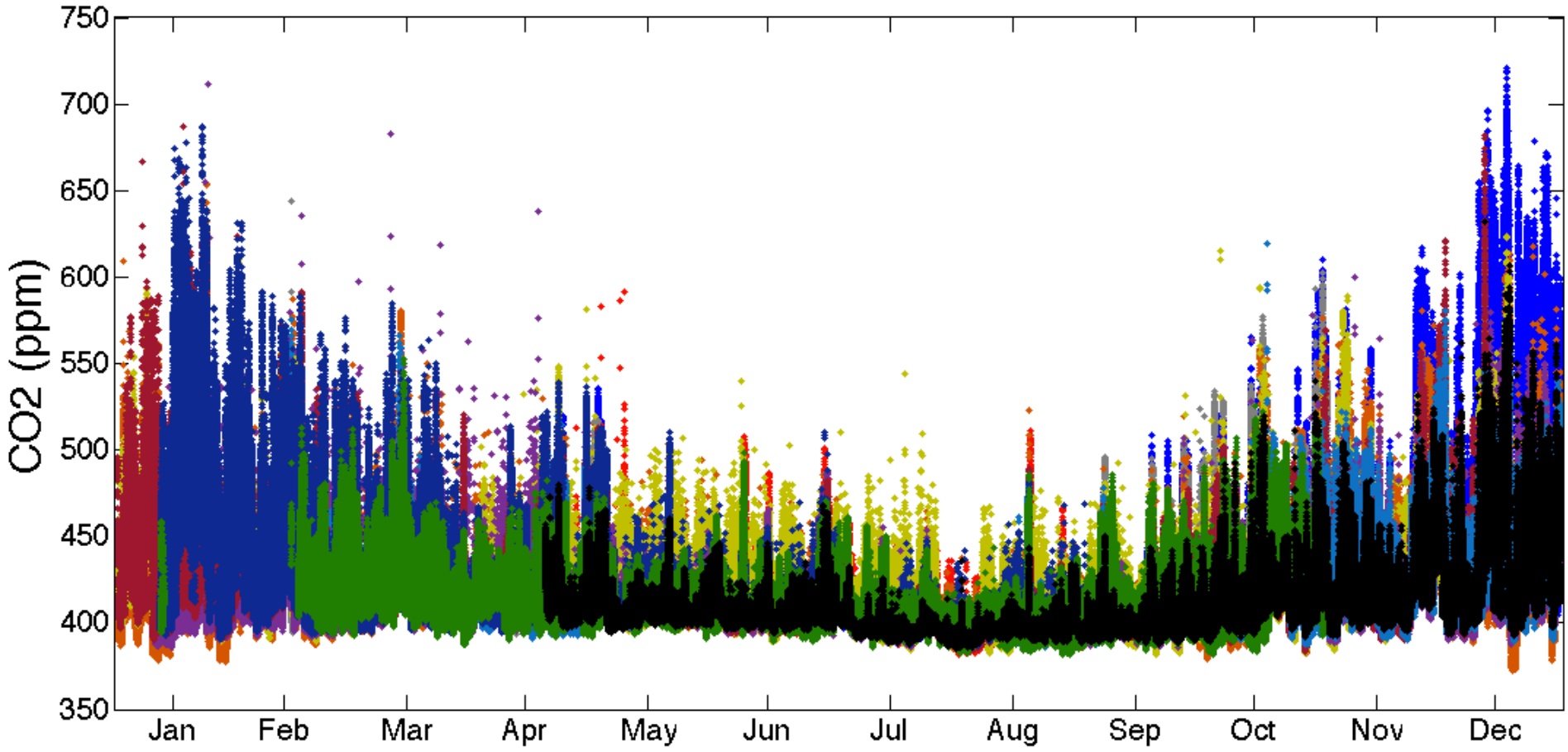
Meteorological Sensors for T, P & RH



Microcomputer w/ Cell Antenna

Vaisala GMP343 NDIR CO_2 Sensor

BEACO$_2$N Data Set 2013



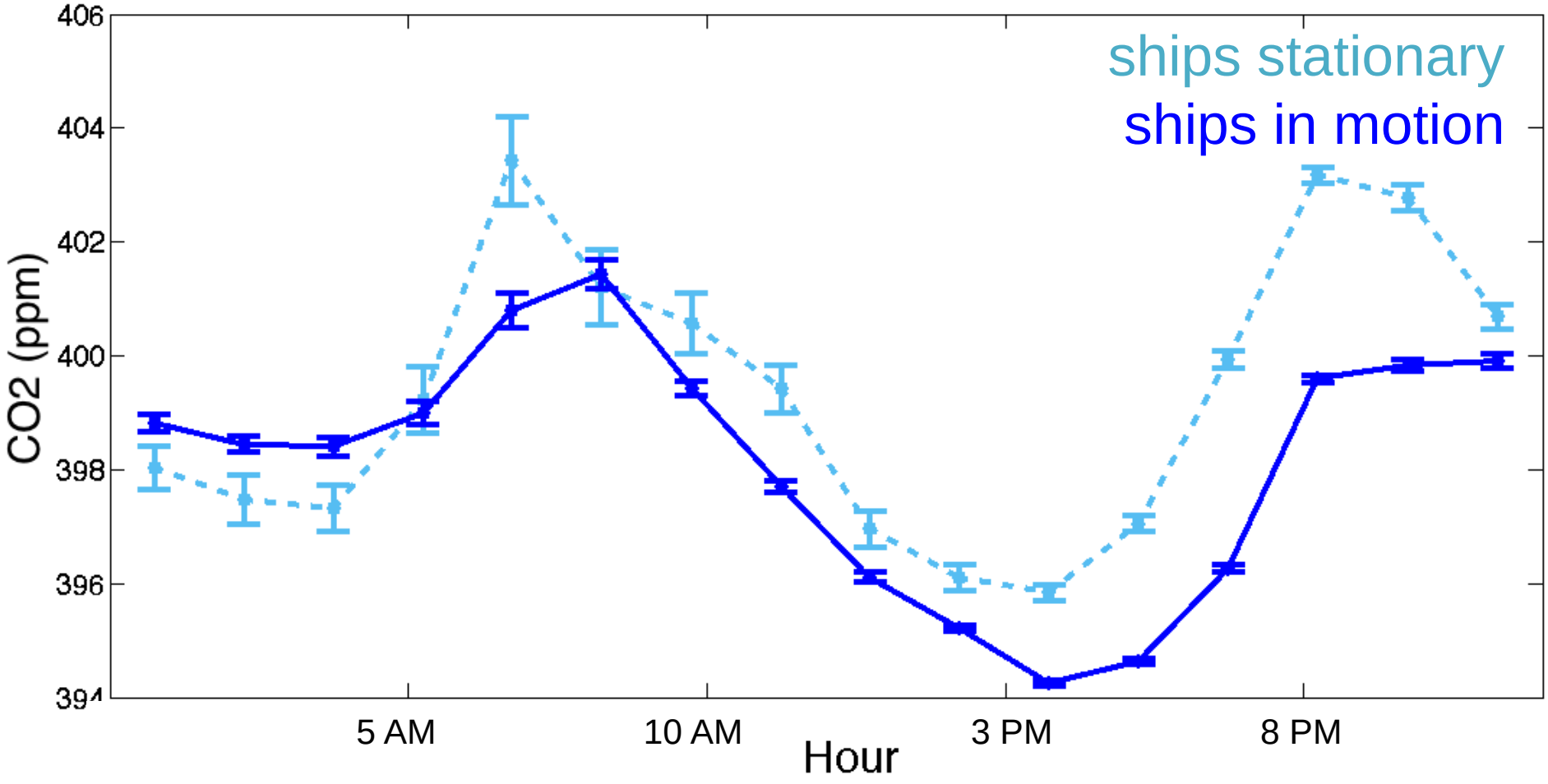
Sites:

Burckhalter
Prescott
Laurel
Kaiser
CollegePrep
Korematsu
ODowd
StLiz
HeadRoyce
ElCerrito
NOakland

Performance	Picarro G2301	Vaisala GMP343
Accuracy	± 1 ppm	± 7 ppm
Precision	± < 0.2 ppm (5s)	± 3 ppm (2s)
Drift	± 6 ppm/yr	± 8 ppm/yr
Weight	58 lbs	0.8 lbs
Price	$50,000-100,000	$3,000

Port of Oakland
wind
2km
Golden Gate
Rockridge
Temescal
Emeryville
Piedmont Avenue
Piedmont
Montclair
Canyon
Clawson
Grand Lake
West Oakland
Adams Point
Crocker Highlands
Oakmore
Joaquin Miller Park
Oakland
Glenview
Chinatown
Redwood Heights
San Antonio
Alameda Island
Fruitvale
Mills College
Millsmont
Seminary
Alameda
Eastmont
O.co Coliseum
Oakland Zoo
East 14th Street Business District
San Leandro
Oakland International Airport
Google

Daily CO_2 Levels at Port of Oakland

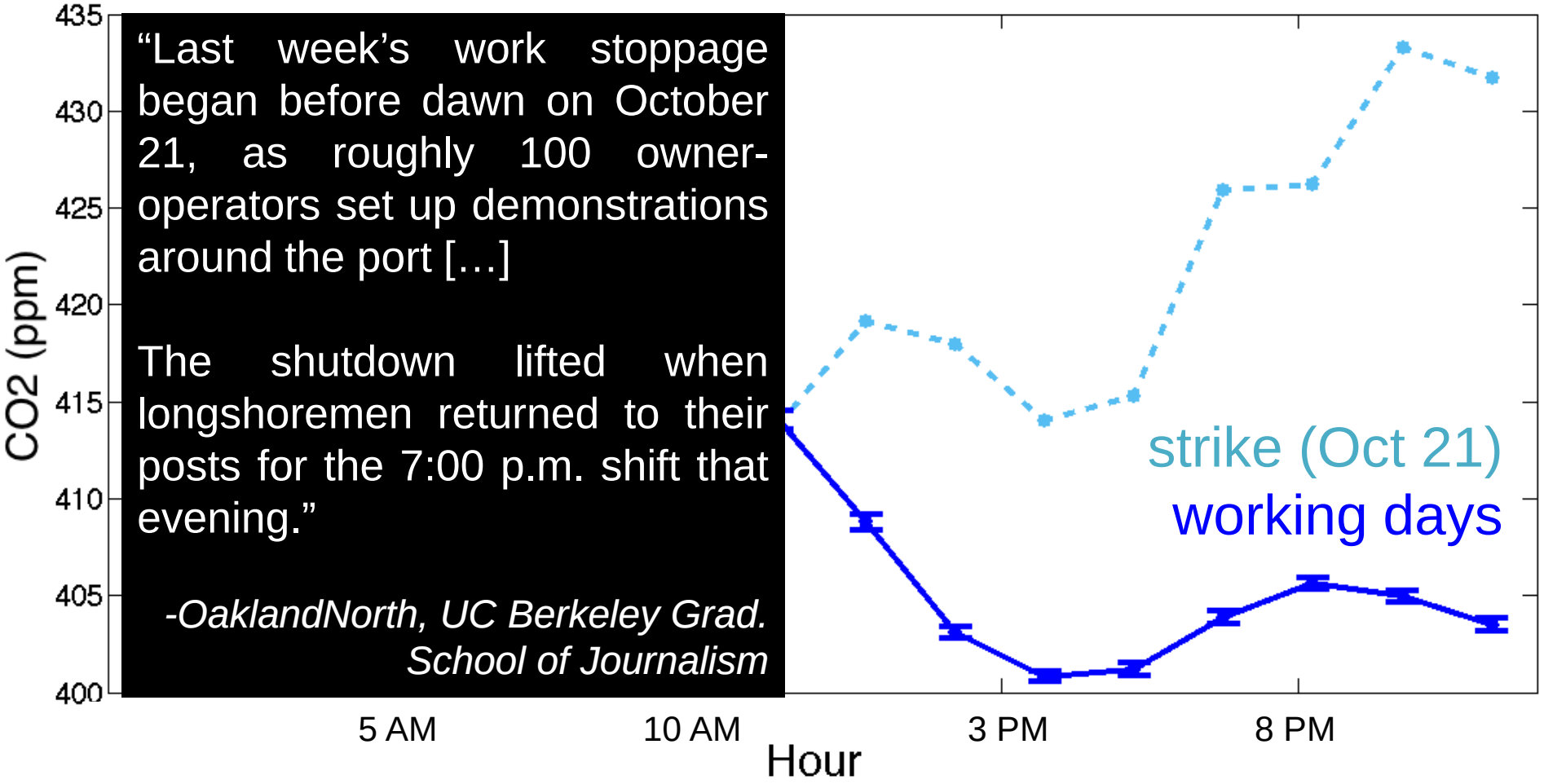


Daily CO_2 Levels at Port of Oakland

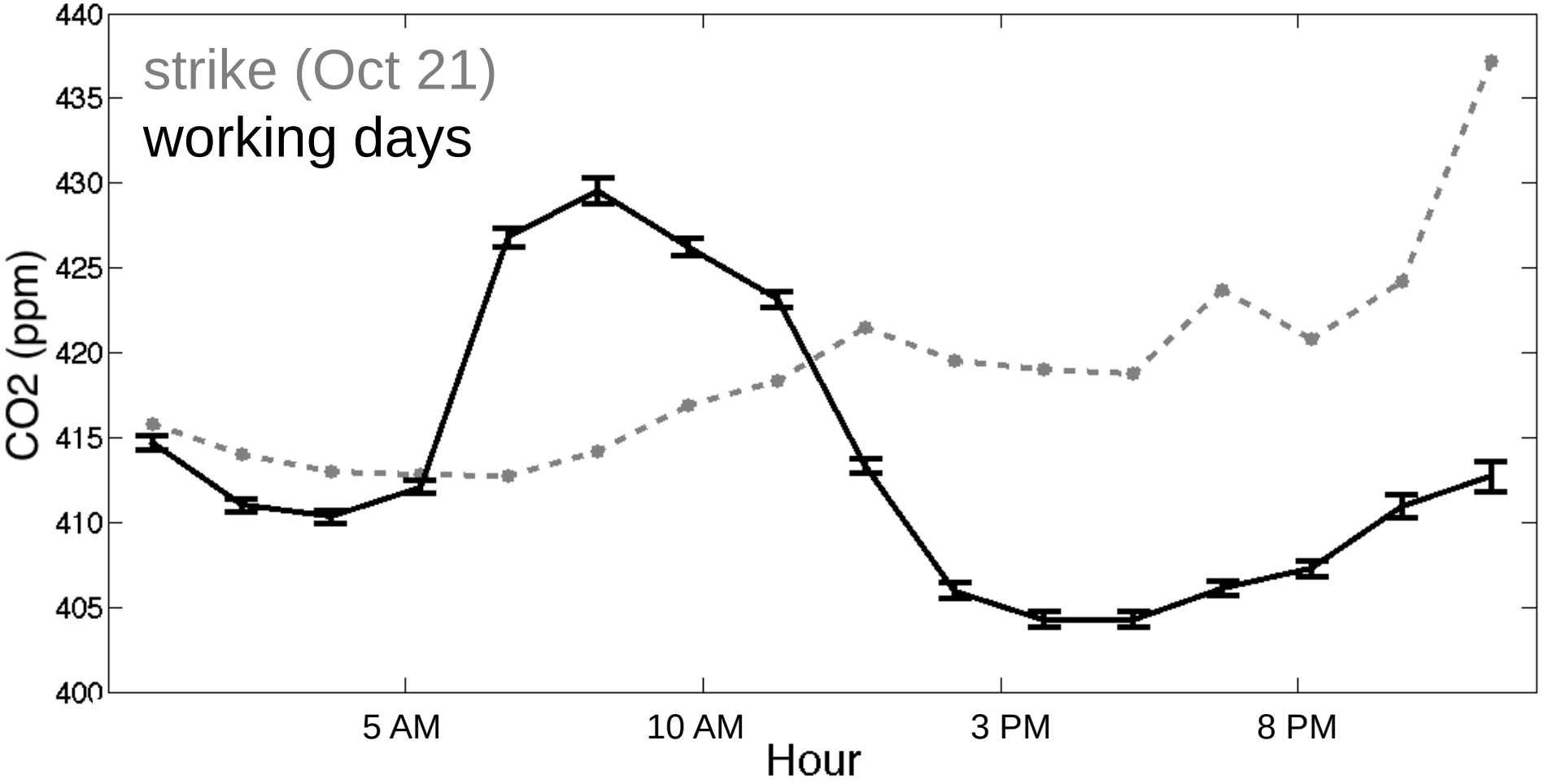
"Last week's work stoppage began before dawn on October 21, as roughly 100 owner-operators set up demonstrations around the port […]

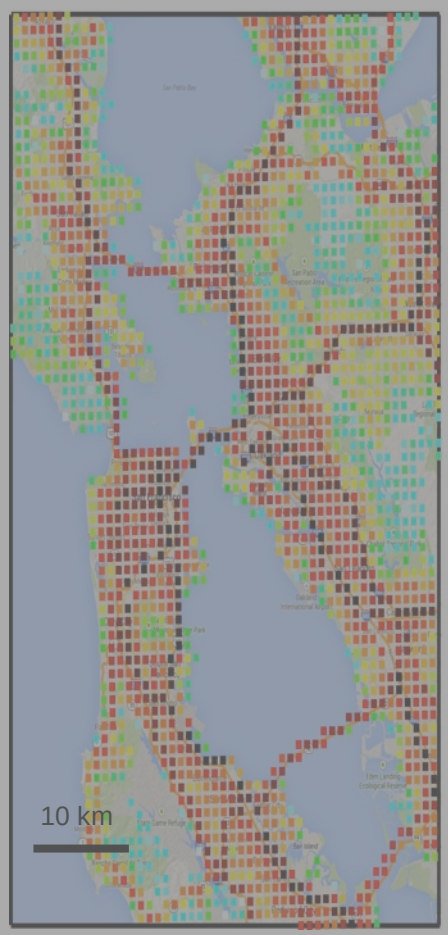
The shutdown lifted when longshoremen returned to their posts for the 7:00 p.m. shift that evening."

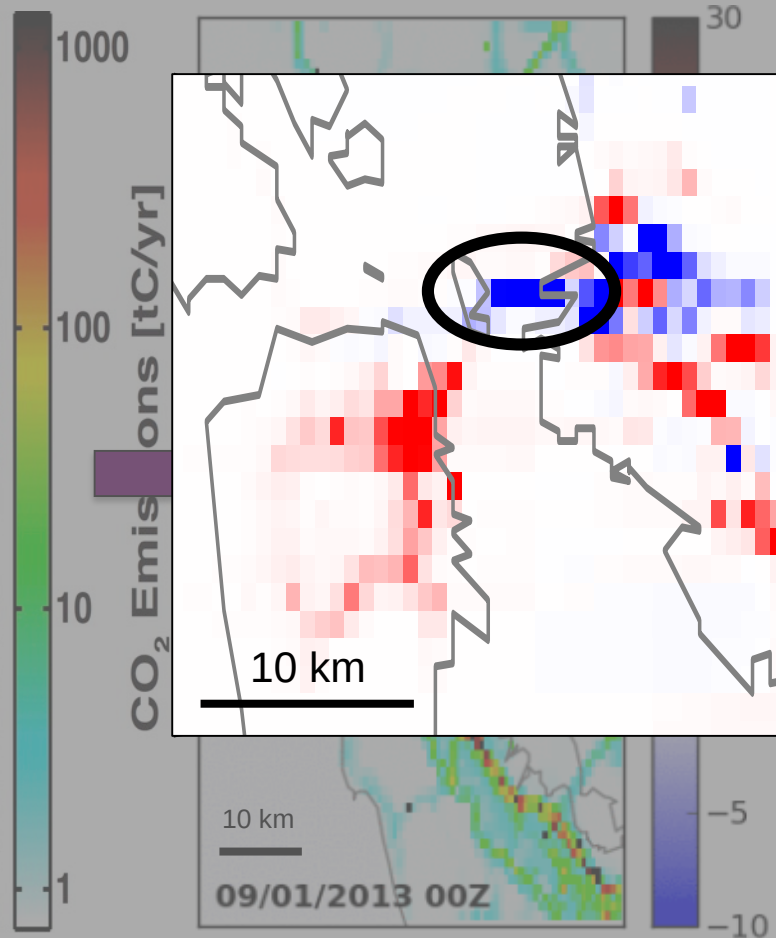
-OaklandNorth, UC Berkeley Grad. School of Journalism

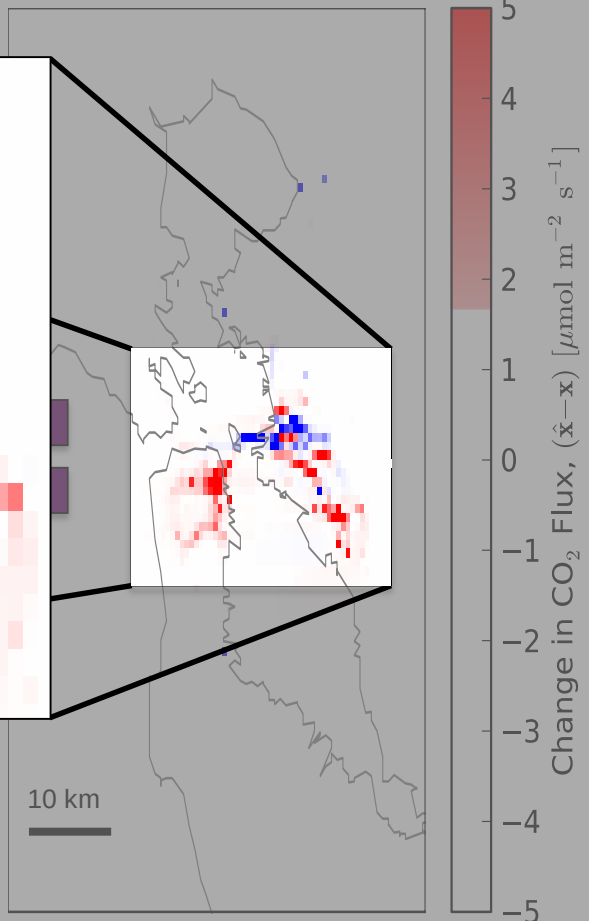


Daily CO_2 Levels Network Wide









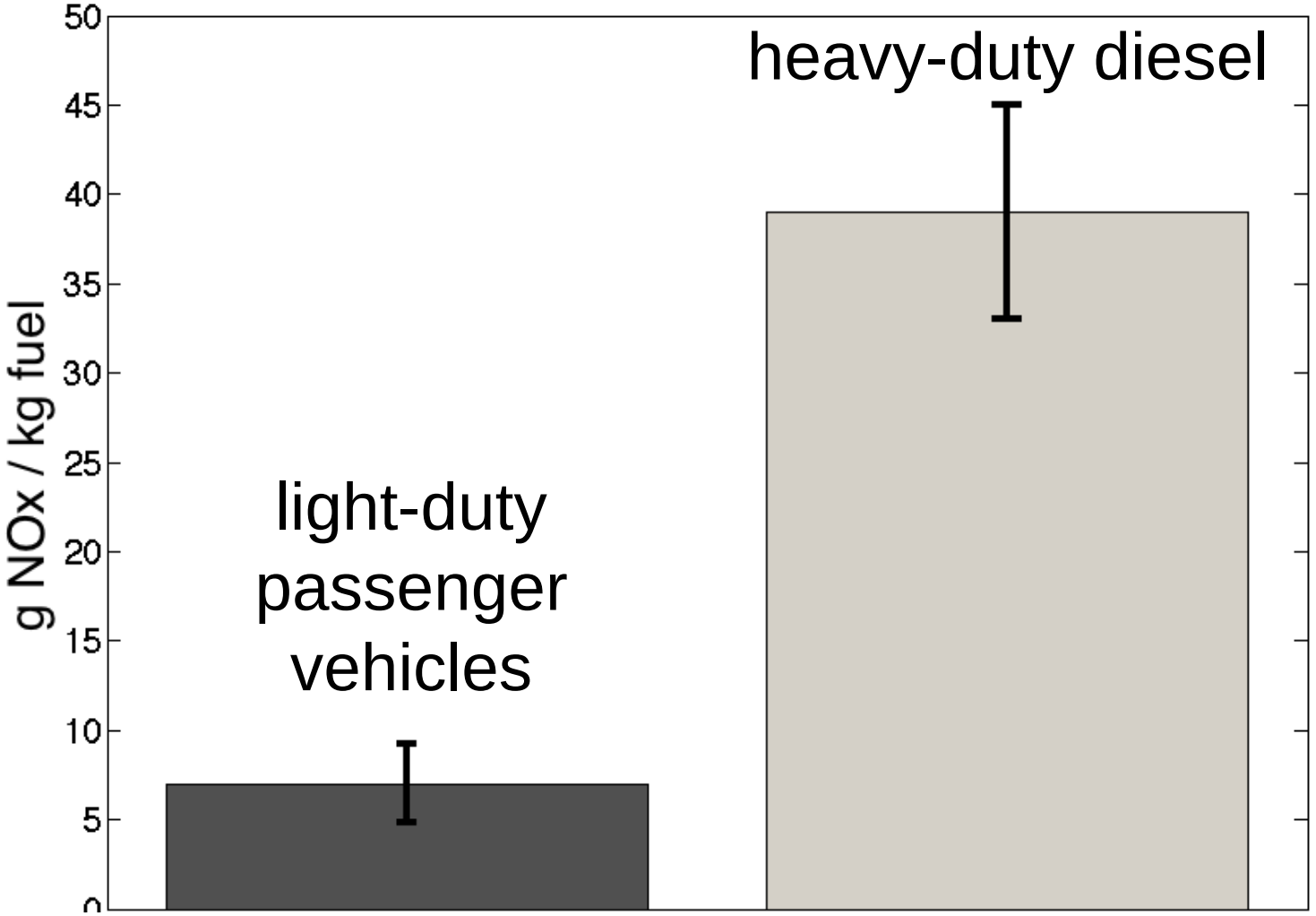
PRIOR

POSTERIOR

DIFFERENCE

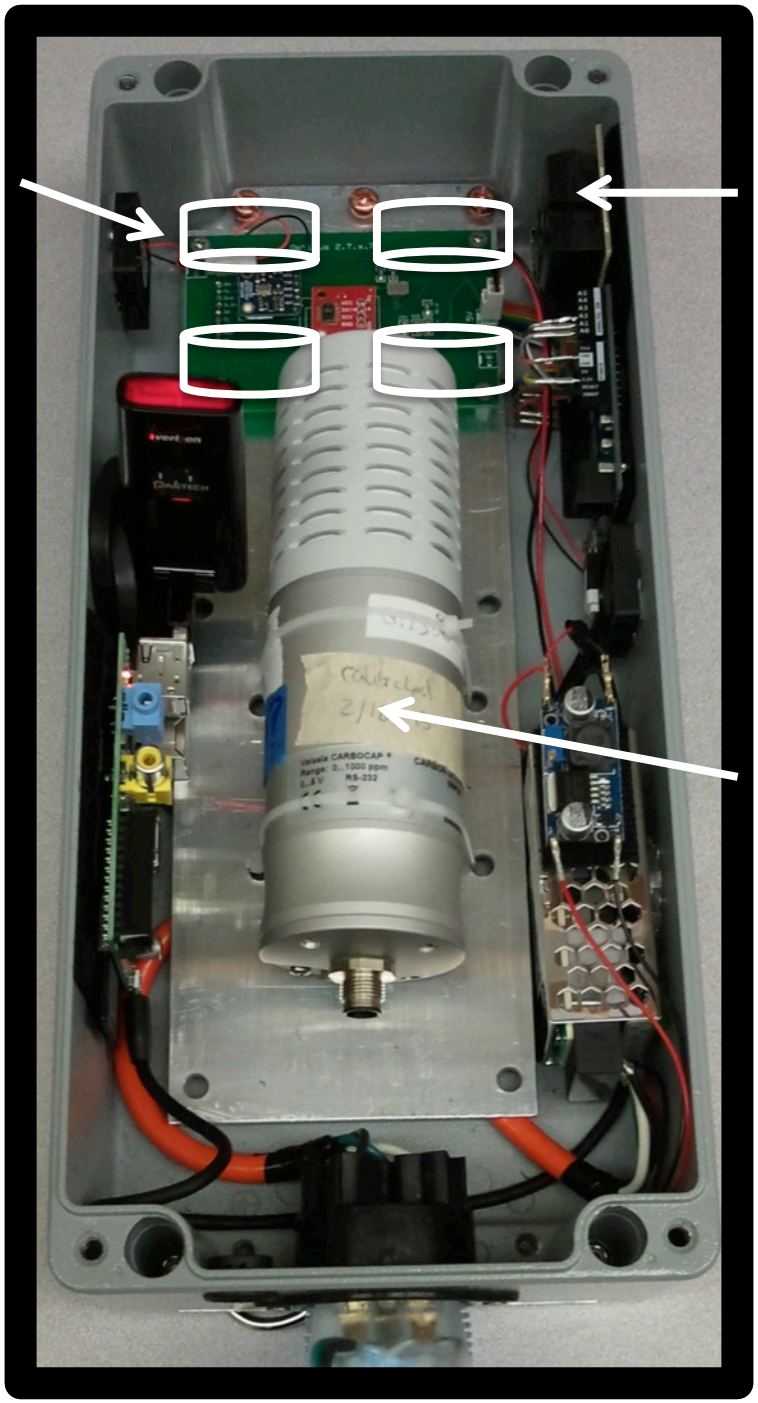
Alex Turner

1999-2000 Emissions Factors



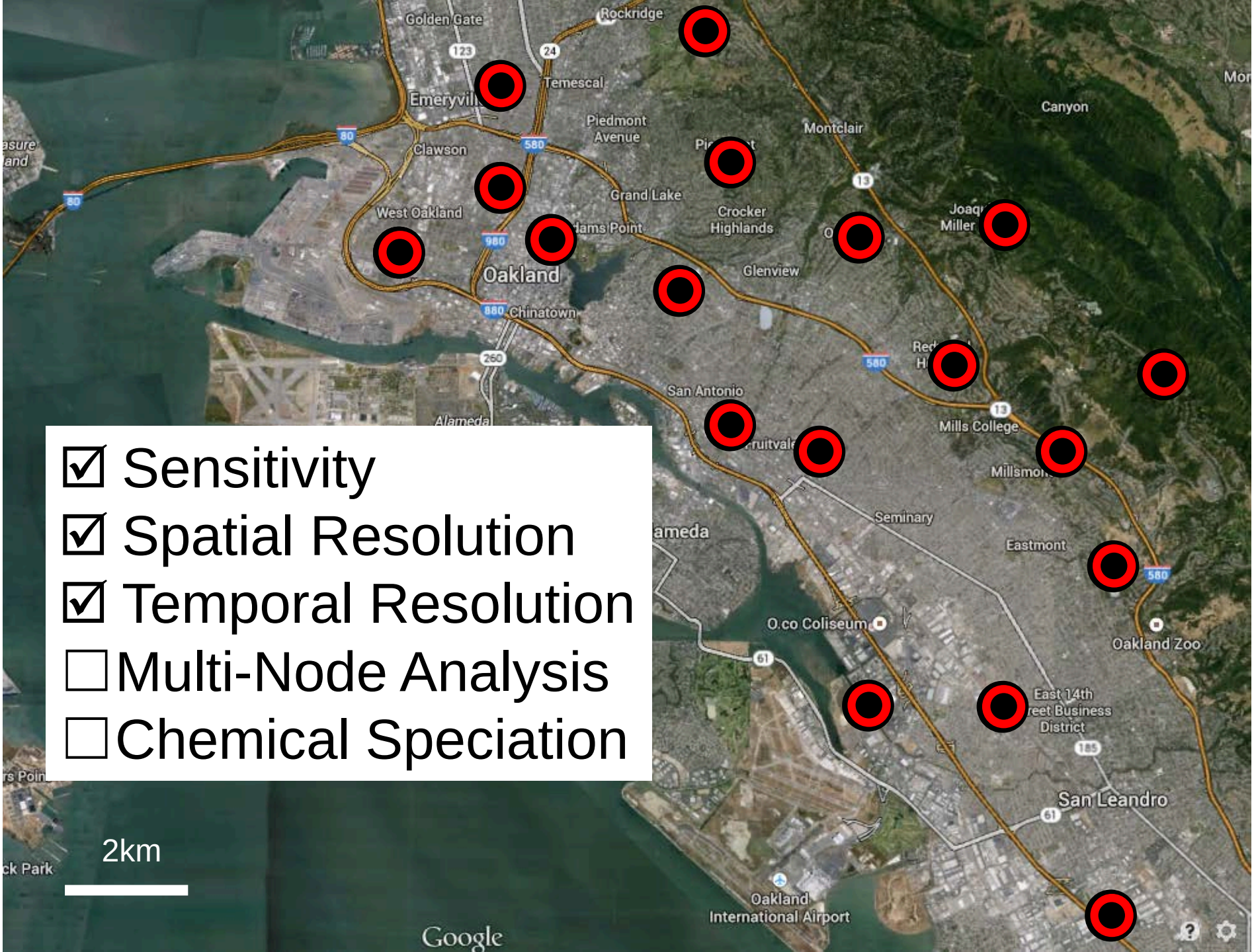
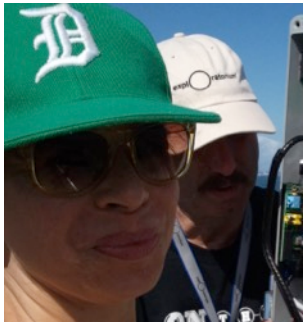
Harley et al. 2005

Electrochemical O_3, NO, NO_2 & CO Sensors



Shinyei Grove Particulate Sensor

Vaisala GMP343 NDIR CO_2 Sensor


☑ Sensitivity
☑ Spatial Resolution
☑ Temporal Resolution
☐ Multi-Node Analysis
☐ Chemical Speciation
2km
Google
Golden Gate
Rockridge
Temescal
Emeryville
Piedmont Avenue
Montclair
Canyon
Clawson
Grand Lake
West Oakland
Crocker Highlands
Oakland
Glenview
Chinatown
San Antonio
Mills College
Seminary
Eastmont
Oakland Zoo
East 14th Street Business District
San Leandro
Oakland International Airport
Alameda

Thank you!