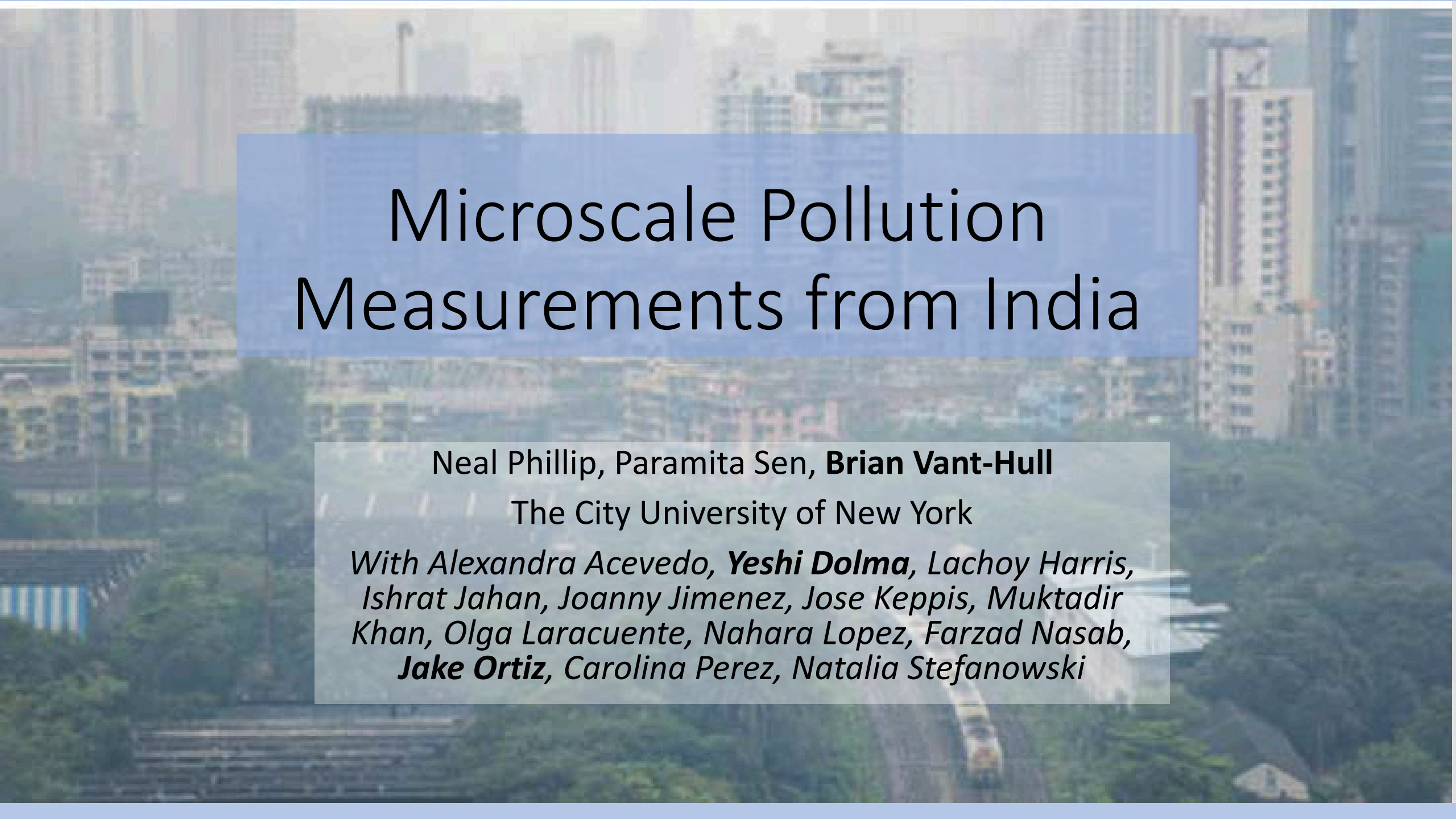


Microscale Pollution Measurements from India

Neal Phillip, Paramita Sen, **Brian Vant-Hull**

The City University of New York

*With Alexandra Acevedo, **Yeshi Dolma**, Lachoy Harris, Ishrat Jahan, Joanny Jimenez, Jose Keppis, Muktadir Khan, Olga Laracuente, Nahara Lopez, Farzad Nasab, **Jake Ortiz**, Carolina Perez, Natalia Stefanowski*

Goals of the Overall Project

- Introduce students to research in an international environment
- Compare aspects of pollution between upscale and slum environments in two cities in India, a country with the worst air quality issues on earth.
- Develop a low cost air pollution sensor pack that could be used by other projects.

Our Crew

Meeting with the Governor of Maharastra

We were fascinated with the cows

Our Mobile Instrument Packs

LabQuest

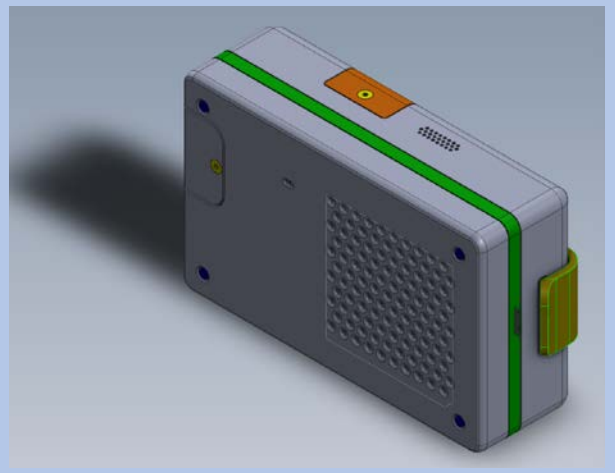
Temperature

Relative Humidity

Carbon dioxide

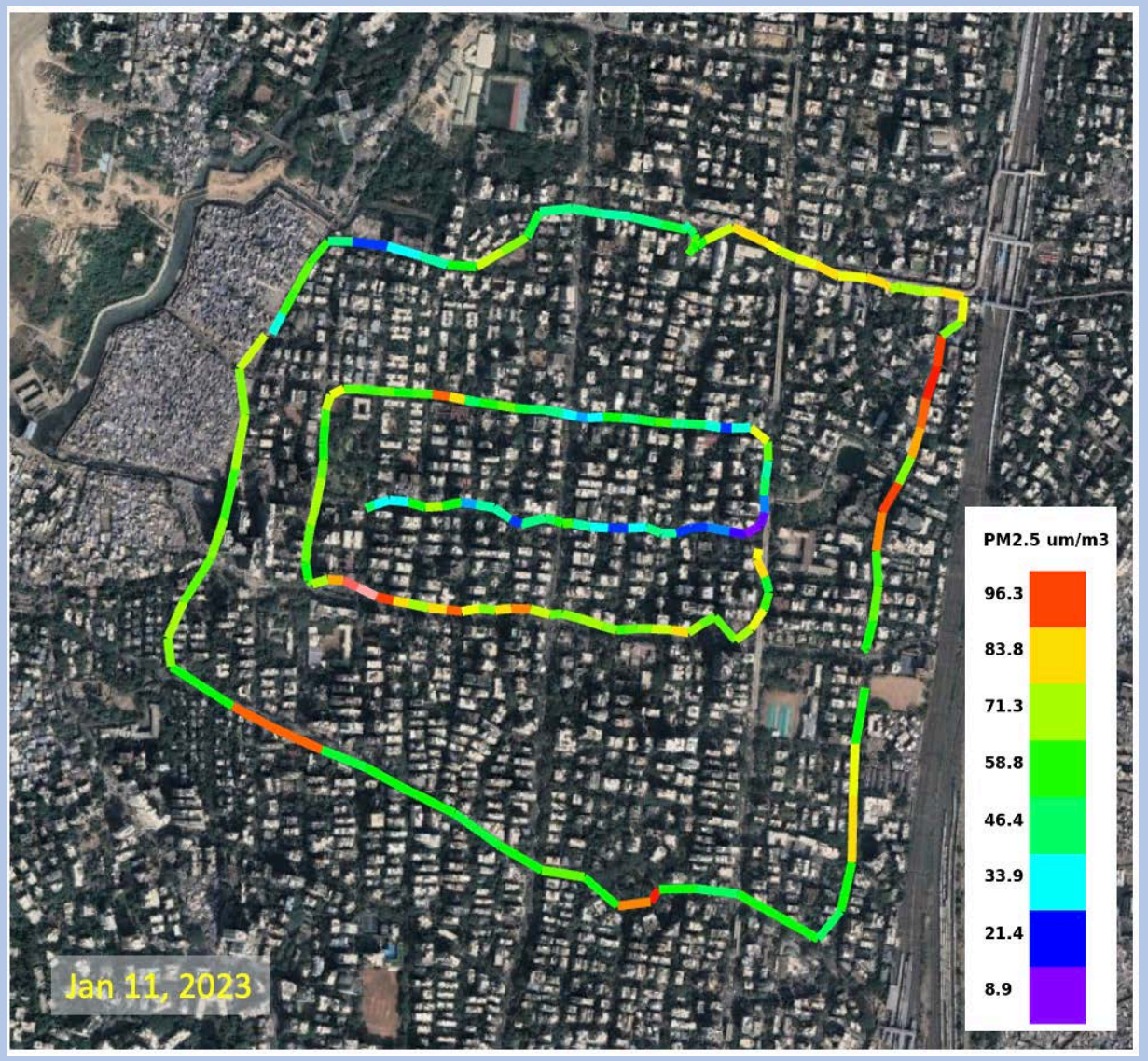
- Provides real time feedback
- GPS with lat, lon
- fast response temperature
- Dark RH and temperature probes must be shielded from sunlight (foil)

MCCI Custom Sensor Pack



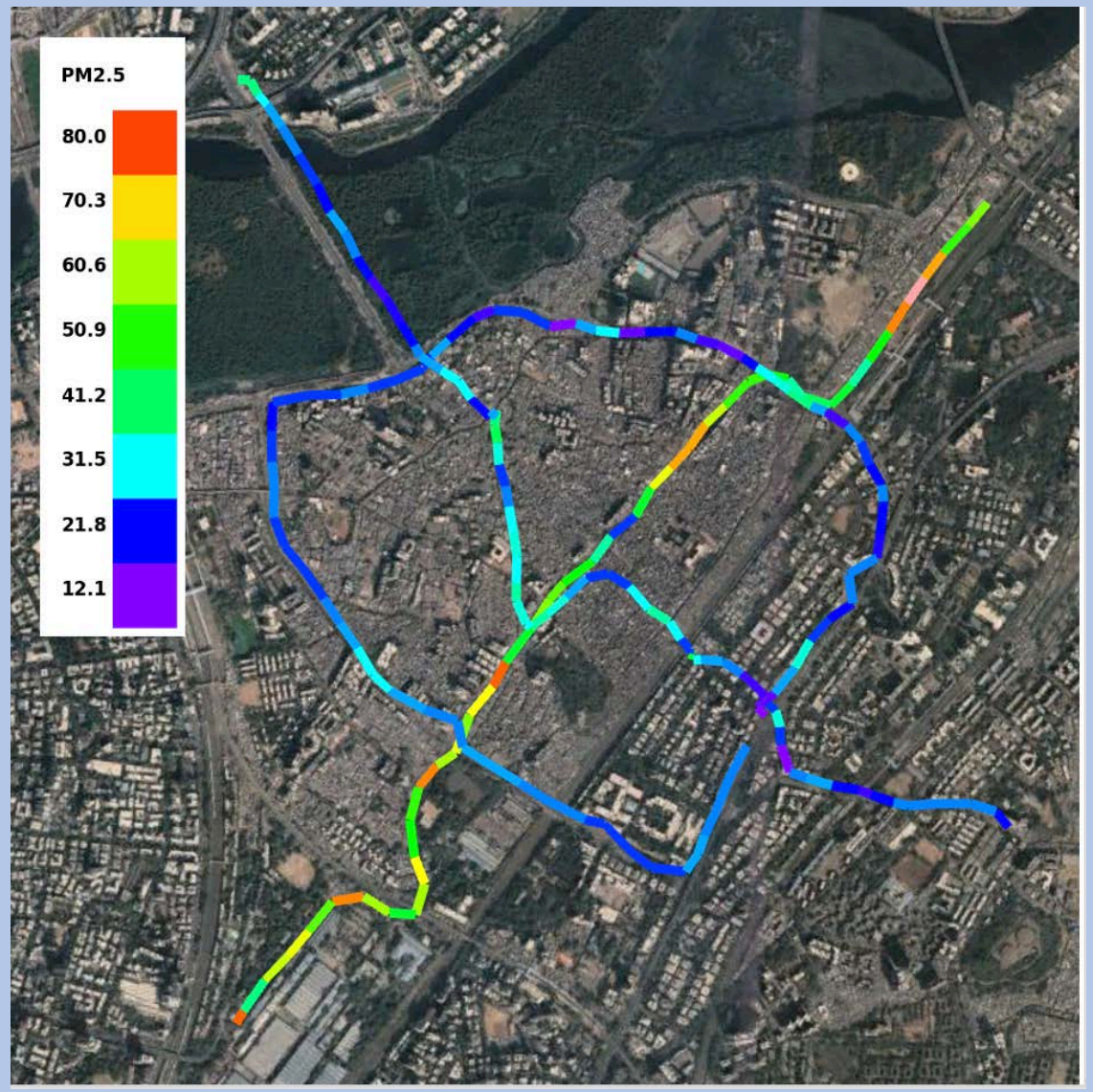
- T, RH
- CO, O_3, NO_2, SO_2
- GPS with lat, lon
- Particulate Matter (PM) in bins from 0.1 to 10 micron diameter
- Can be fixed for realtime broadcast
- T sensor too embedded for quick response.

A Tale of two Neighborhoods



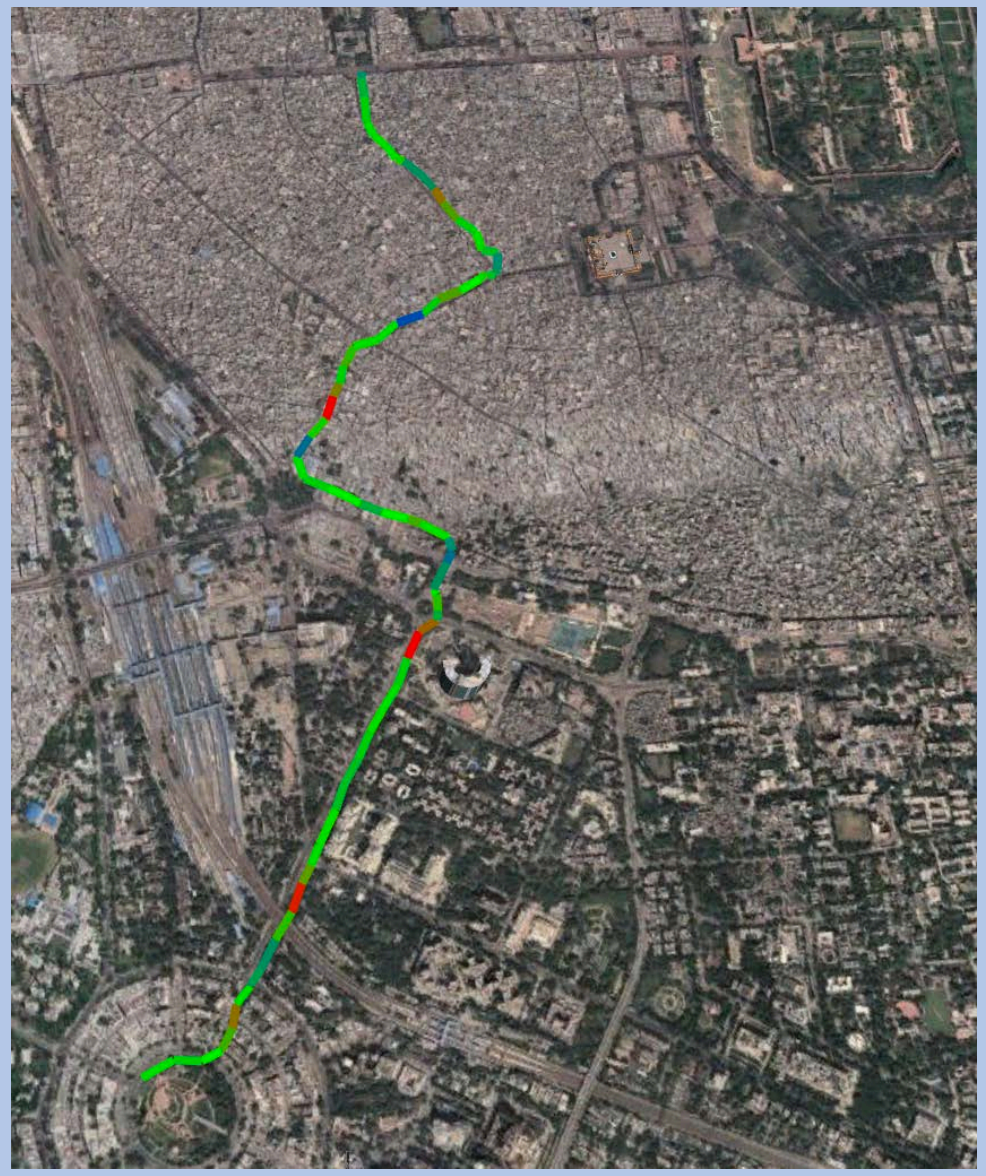
Santa Cruz

Red is high, Blue is low.



Dharavi Slum

Particulate Matter: New to Old in Delhi

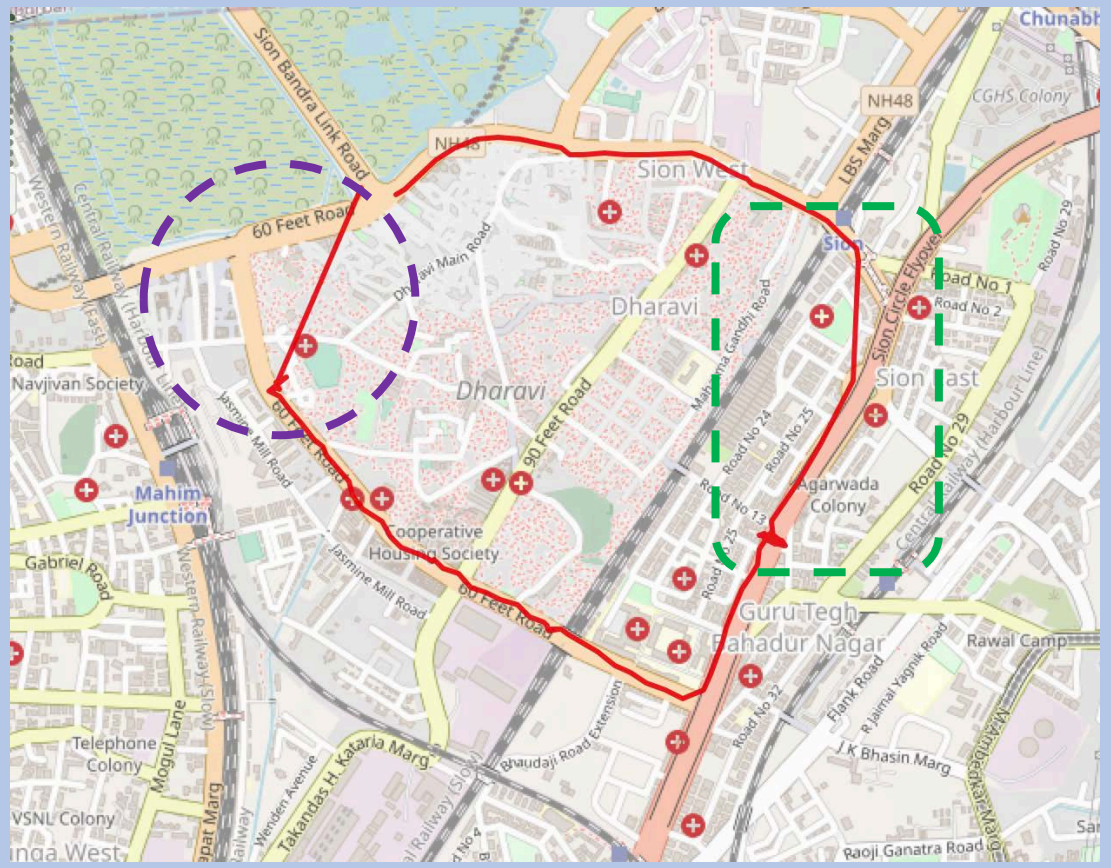


Instrumentation Issues

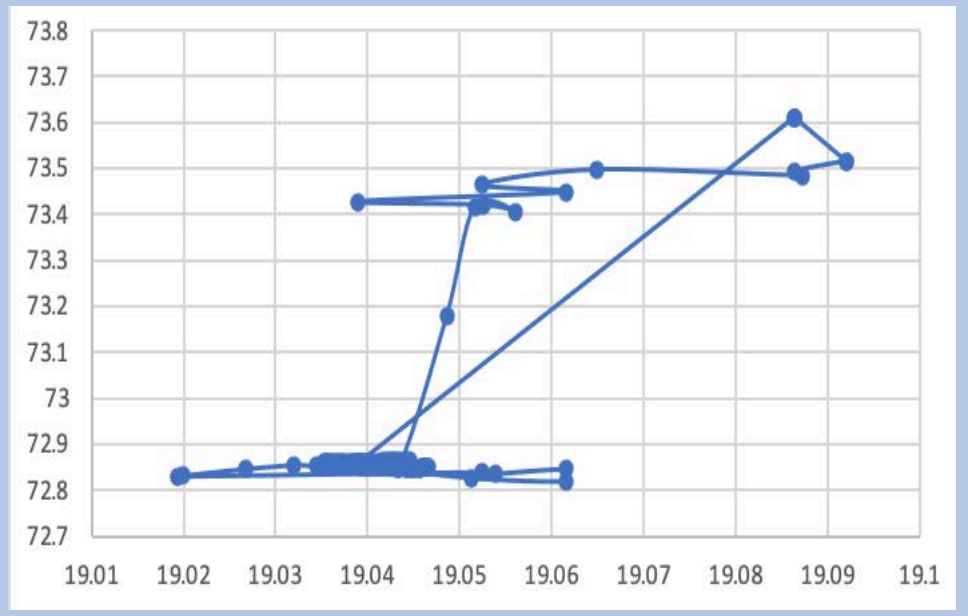
- On our main instrument the GPS would take some time to acquire satellite positions, and we had no way to tell when it was ready.
- The analog gas sensors were not properly grounded so the values were shifted. They also took time to acclimate once turned on.
- Instruments were often dropped, leading to misalignment of optical sensors.

Fixing GPS Data

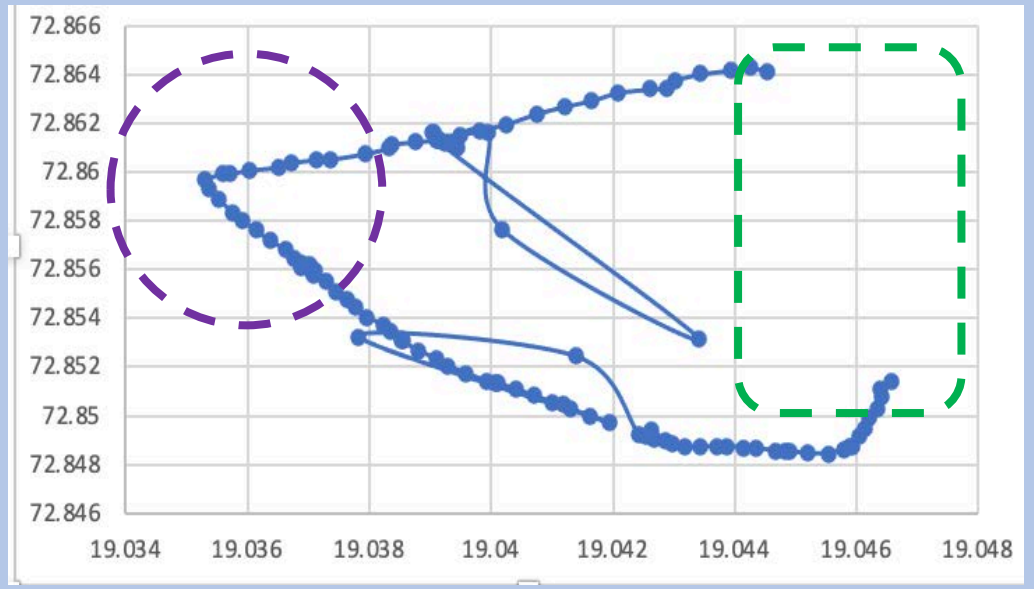
combine best of two instruments



Labquest mapped via gpsvisualizer.com



Raw White box data mapped in excel



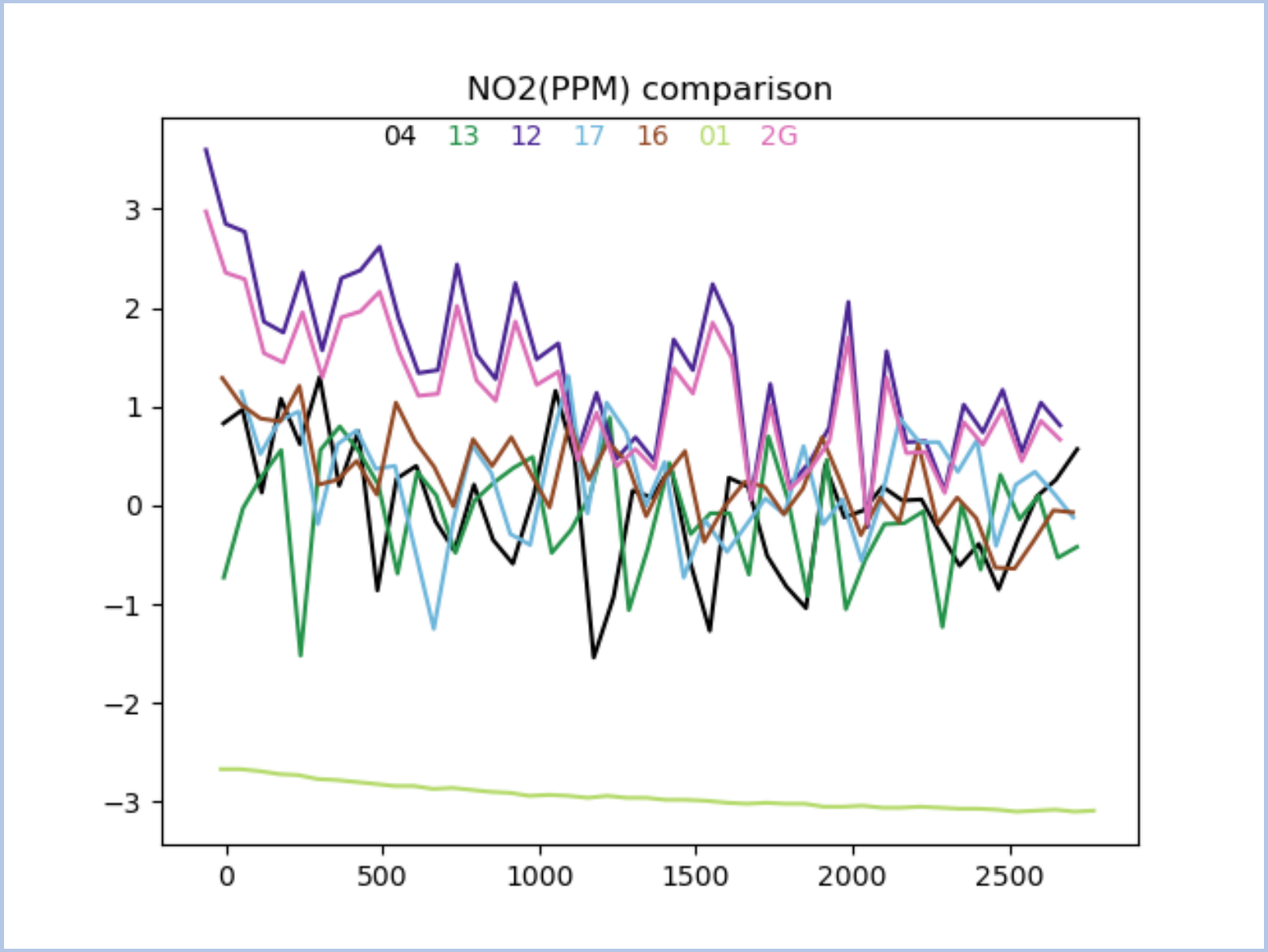
Filtered White Box data mapped in excel

Nitrogen Dioxide

Detected by electrochemical effects. The detector was rarely left on for a long enough period of time to settle.

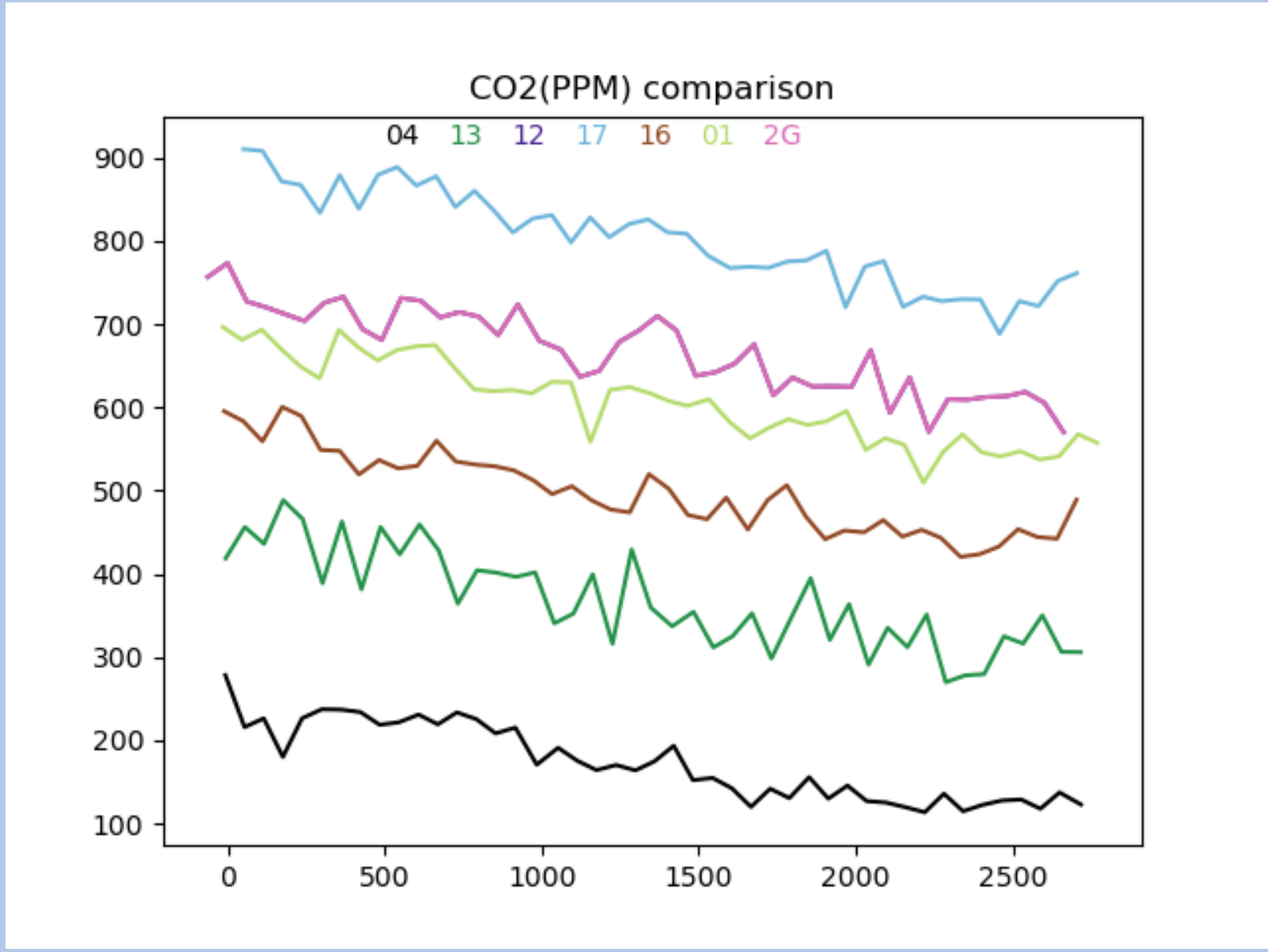
The dark blue and purple is before and after factory calibration is applied.

Though most of the sensors are comparable, the one in light green is clearly unusable.



Carbon Dioxide

This is an optical measurement of absorption of a very short path length of gas. No doubt the sensors were calibrated when they left the factory, but after being dropped and jarred the light beam and target must go out of alignment. Usually this means less signal so a larger implied absorption. This could only get lower if the initial alignment was not optimized.



General Direction for the Summer

We want to evaluate the data we've collected, finding out what is good, what is bad, and what can be salvaged. It takes a combination of math and common sense to identify data problems and solve them. Jake and Yeshi were there, and can provide guidance on what makes sense.

After the data is cleaned up, the next steps are looking for consistent patterns and relating our data to external data of government sensors and satellites. There's plenty to do!

Tasks to be done this summer

- Create maps and plots of all data produced to see what can be saved, merged, discarded.
- Compare student observations of surroundings along routes, including satellite estimates of vegetation.
- Normalize data and compare patterns to see how consistent they are through time.
- Create and compare histograms of merged data between neighborhoods and times of day. Are there changes in the distributions?
- Compare data to that found by government sensors and satellite estimates.
- Evaluate refurbished instruments to see if original problems recur.

Questions?


DAILY GRILL
New items
Half Full
Pollution Veg. Momos 110/- 180/-
Pollution Paneer Momos 130/- 220/-
Pollution Chicken Momos 150/- 280/-
Pollution Chaap 180/- 320/-
Pollution Paneer 200/- 330/-
Pollution Chicken Tikka 240/- 400/-
Pakistani Peshawari Chicken ----- 400/-
CHICKEN SOUP : 50/-
NEW YEAR OFFER
ON ORDER OF
HALF RARA AND BUTTER CHICKEN