Single Particle Measurement with Event Trigger on a Mobile Platform

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Allen Robinson, Ryan Sullivan, Albert Presto and Neil Donahue*

AMS Users' Meeting 2016

Acknowledgements

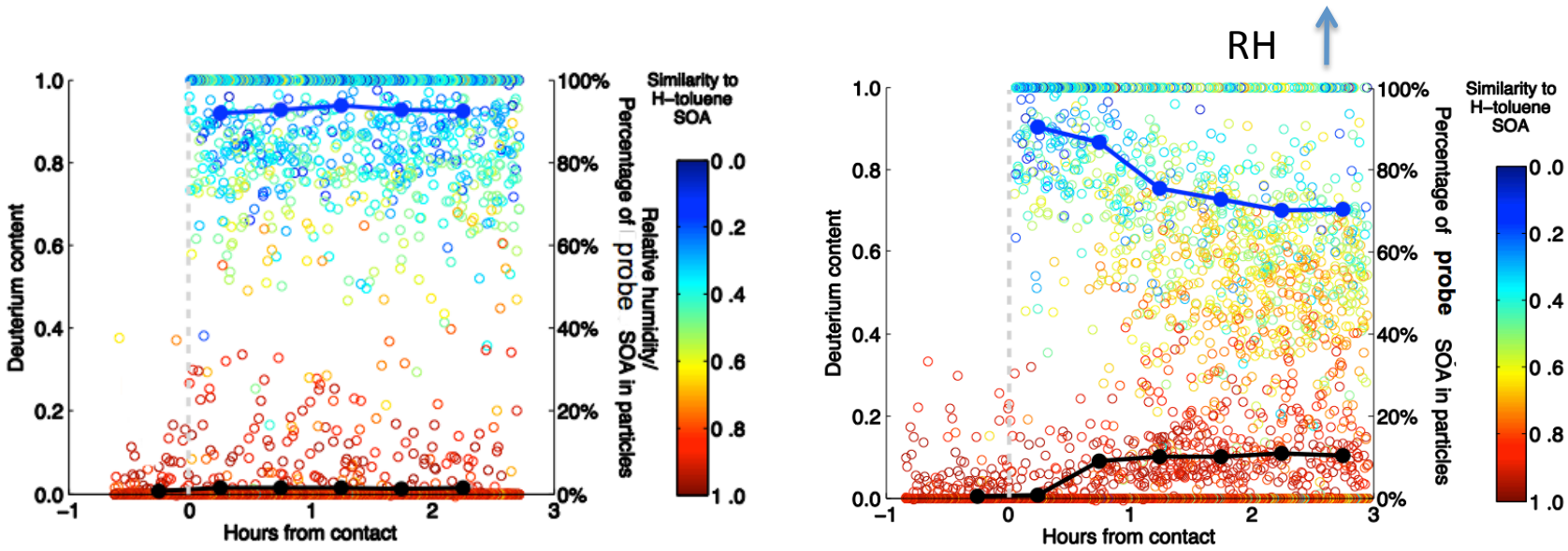
- Bill, Ed, Eben, Leah, John, Joel, Tim, Donna and many others
- Harald, Magen Willis, Alex Lee and Chia-li Chen

Schlumberger

Single Particle Study with AMS at CMU

Light-scattering AMS

H8-toluene SOA and D8-toluene SOA mixing experiments



D content = 46/(43 + 46)

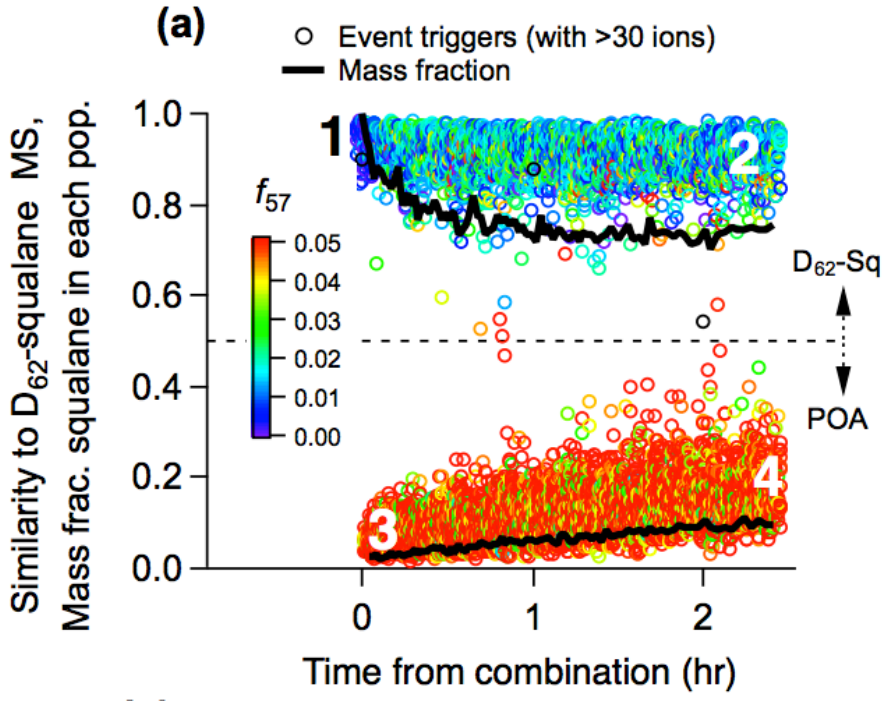
Q. Ye *et al.*, *PNAS*, 2016

Single Particle Study with AMS at CMU

Event-trigger

D62-Squalane OA and diesel POA mixing experiment

Constant ROI setting

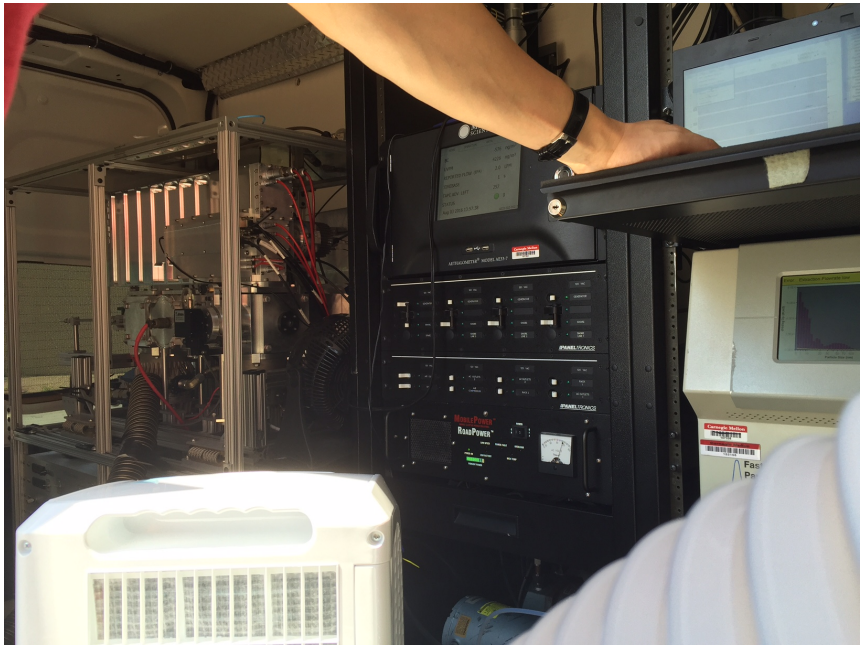


E. Robinson *et al.*, *Faraday Discussion,* 2016

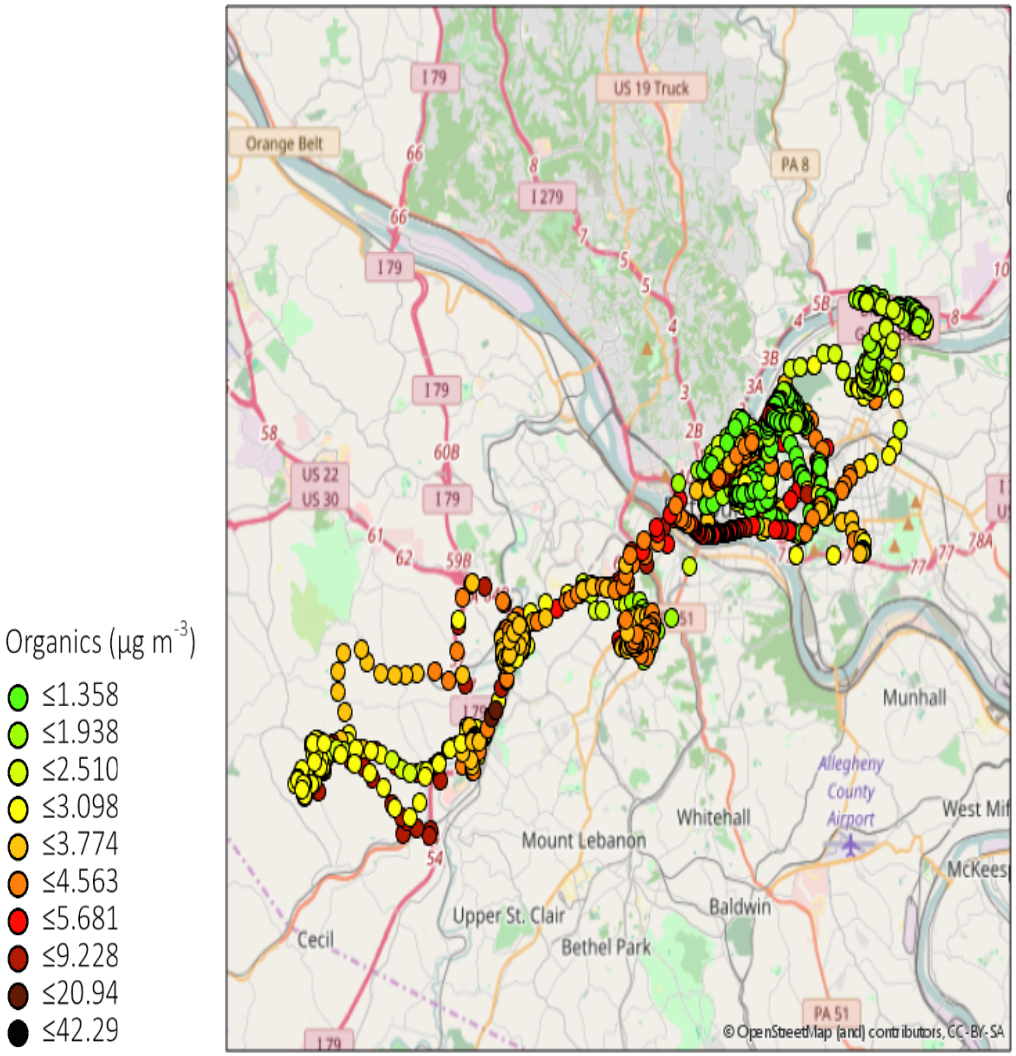
Event trigger in the field

Center for Air, Climate, and Energy Solutions (CACES)

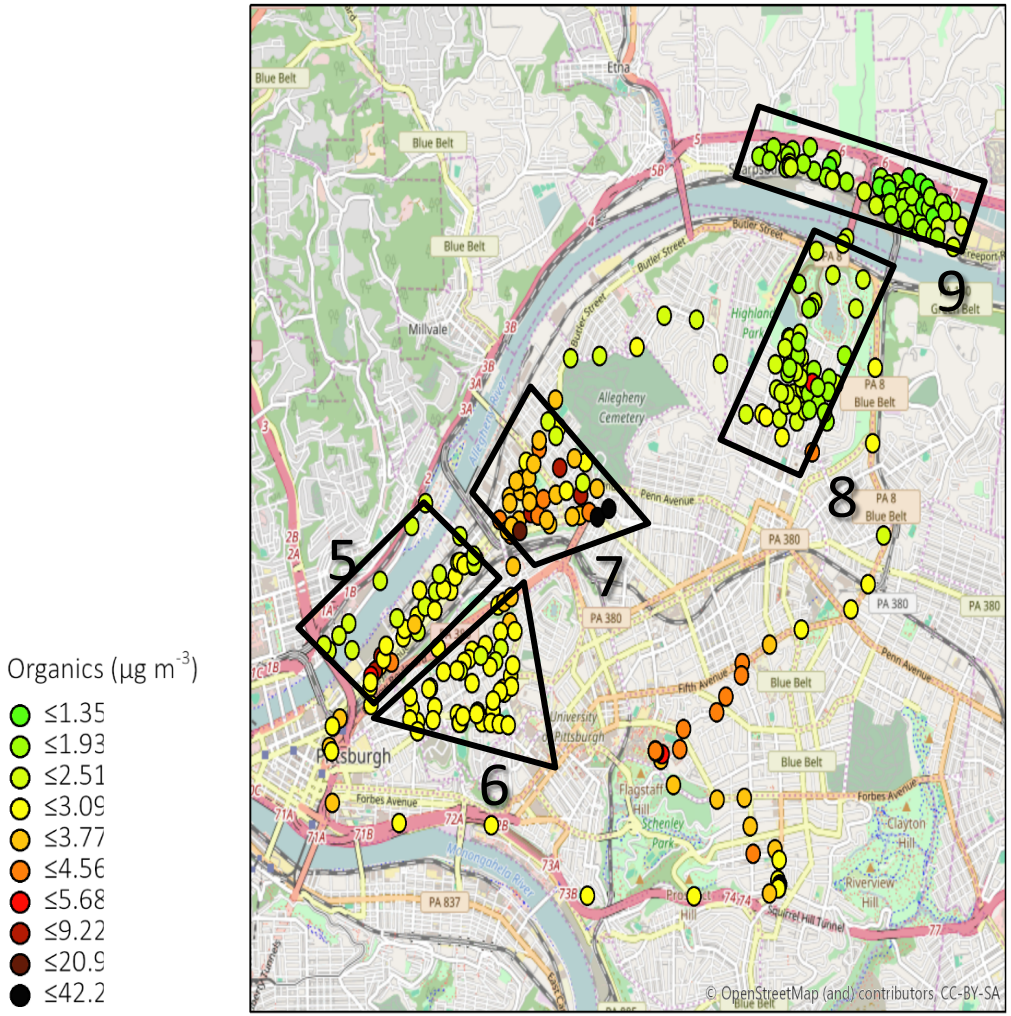
◆ **Characterize spatial (intra-city, urban-to-rural, and inter-city) and temporal distributions of multiple air pollutant species**



Urban Transect: OA concentration



~1km x 1km



5:Commercial site:
Restaurants & Traffic

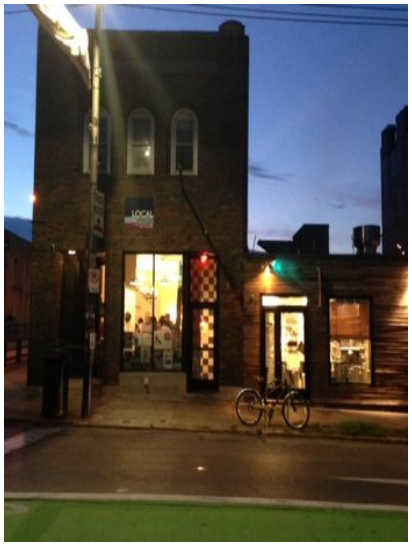
6: Residential

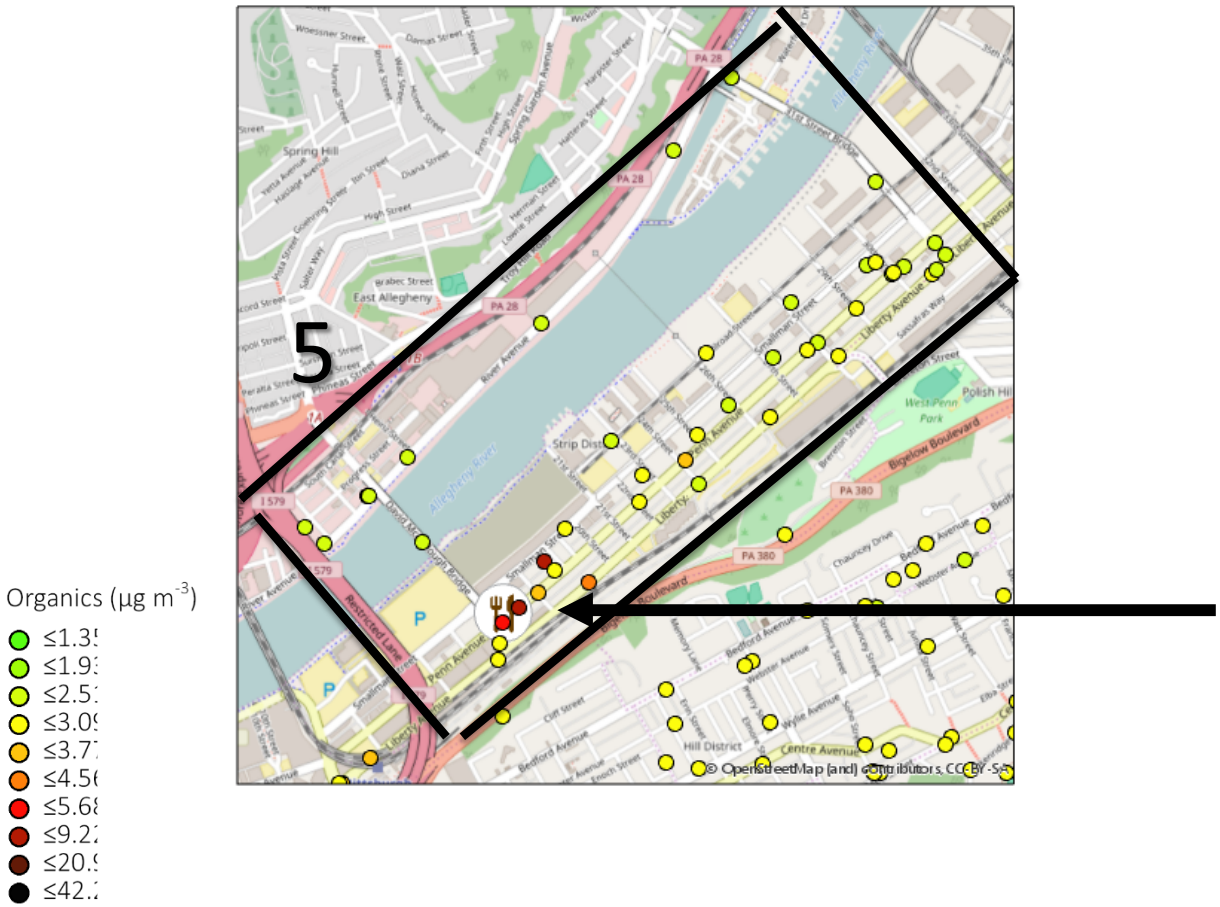
7: Restaurants

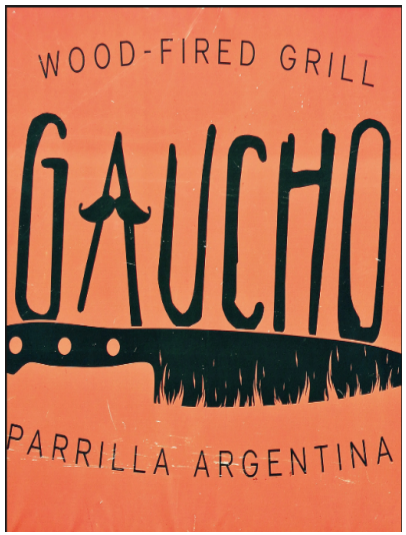
8: Residential
&Restaurant

9: Residential by
Highway

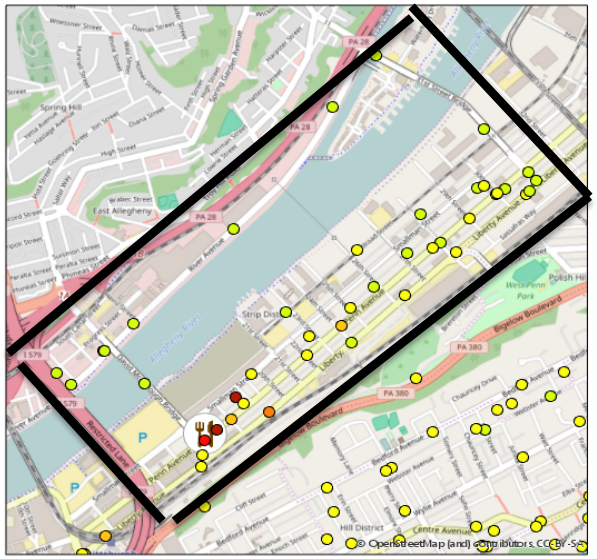
Interesting sub-grid variability





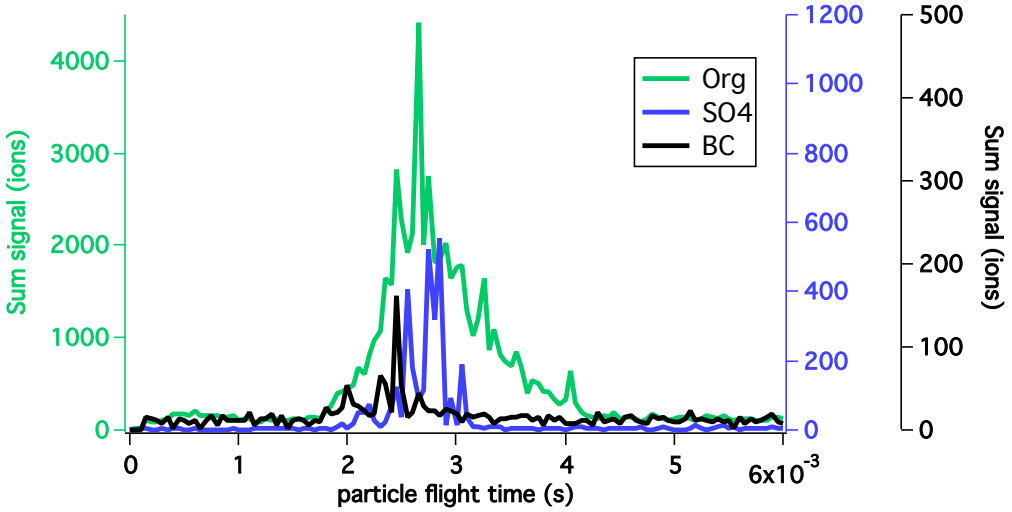


8:00-9:00 pm

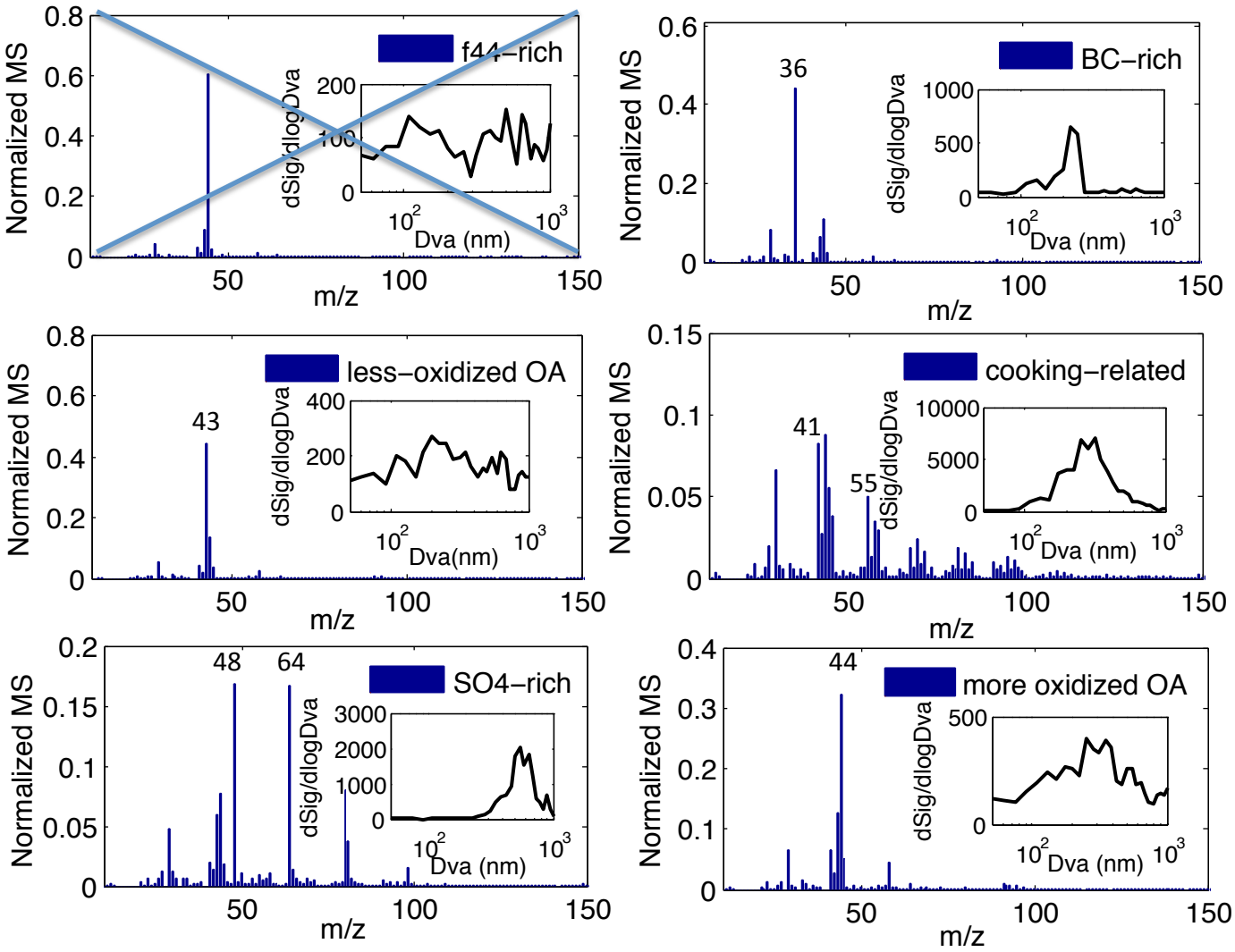


	mass range	threshold
ROI1	mz 41-100	5ions
ROI2	mz 36	2ions

6600 events were collected



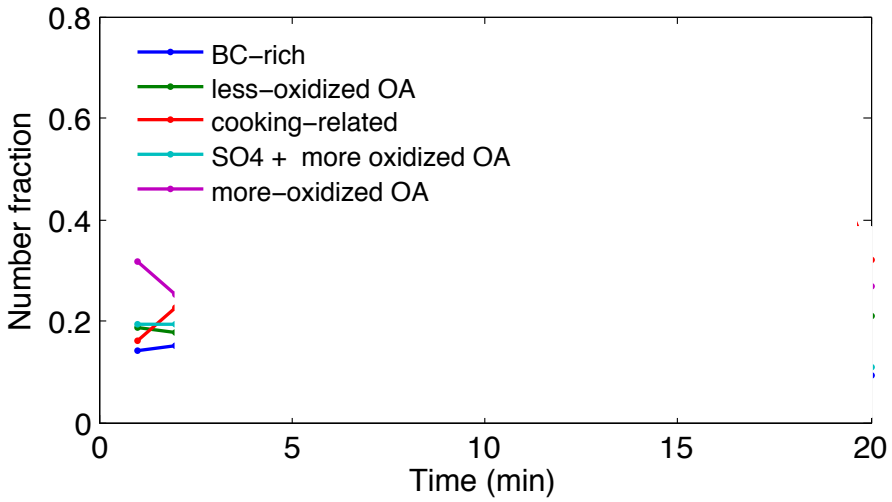
k-means clustering on all events

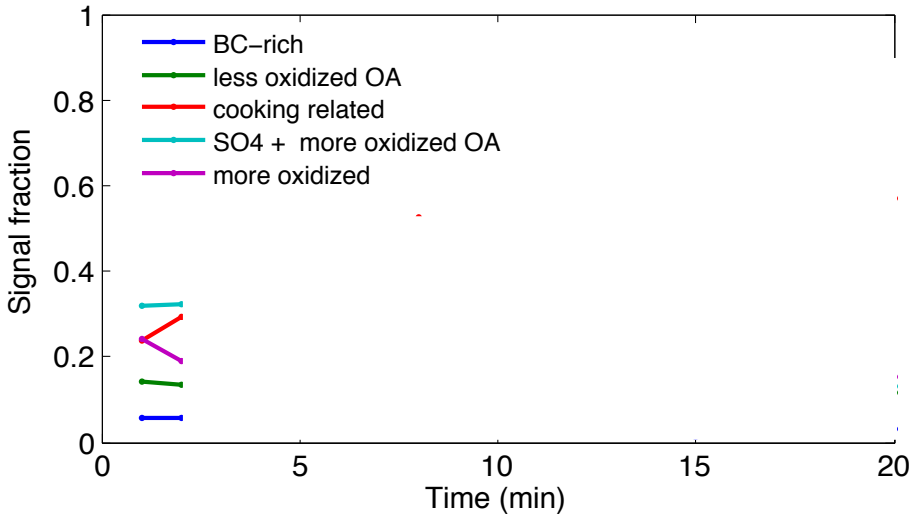



Gaucho Parrilla Argentina
4.8 ★★★★★ 199 reviews · $$
17 min
South American Restaurant

North


Veterans Bridge
Railroad St
Wigle Whiskey
Spruce Way
Smallman St
J. Marcus Company
Gaucho Parrilla Argentina
Sunfresh Food Service, Inc.
Action Truck Services Co
EQT CNG
Penn Ave
Lotus Food Company
4J Imports
S&D Polish Deli
Red Carpet Limousine
Art's Tavern
Spring Way
Liberty Ave
Nationwide Warehouse
Sassafras


Number fraction
Time (min)
BC−rich
less−oxidized OA
cooking−related
SO4 + more oxidized OA
more−oxidized OA


Signal fraction
Time (min)
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SO4 + more oxidized OA
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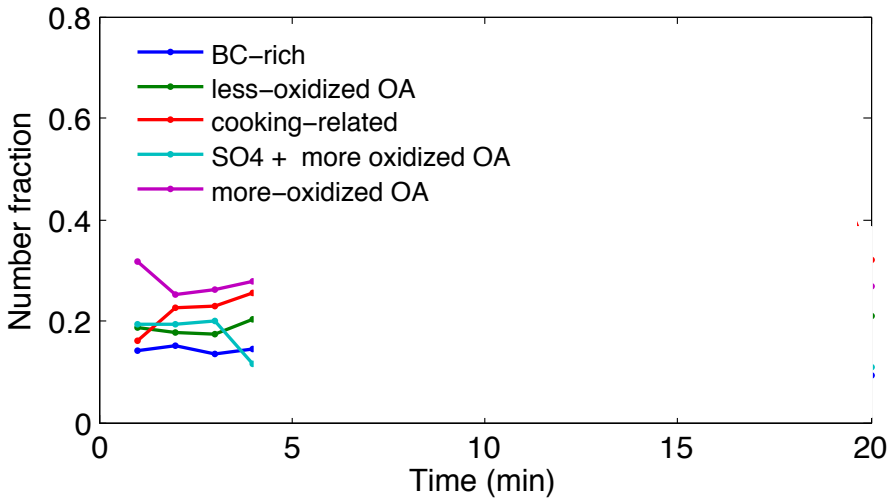
26th St
7th St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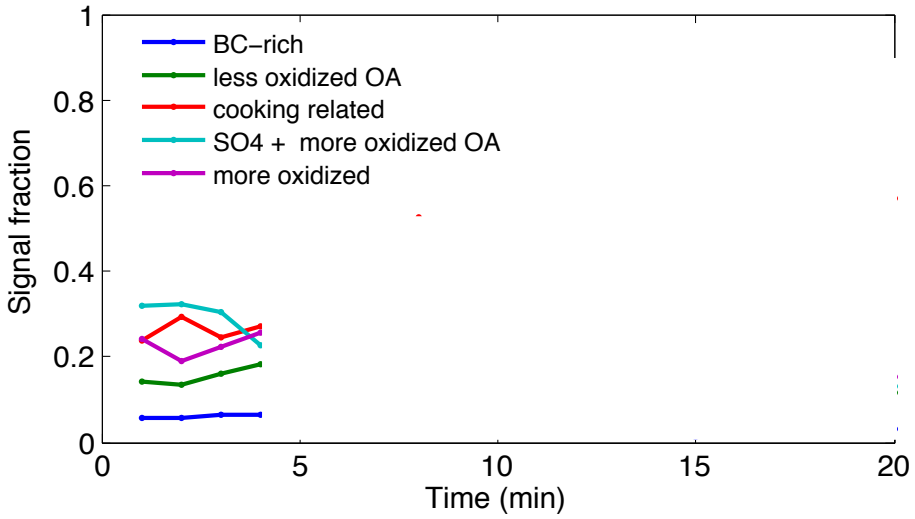
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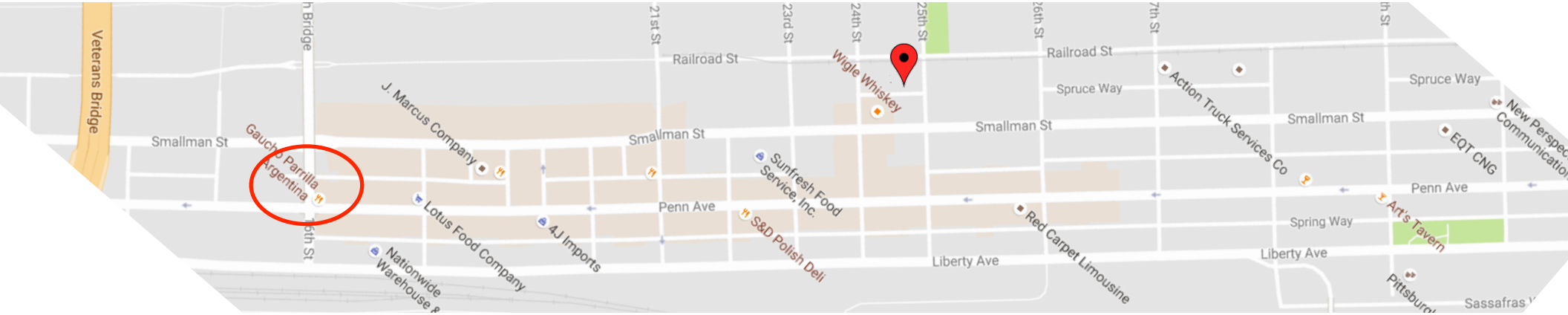
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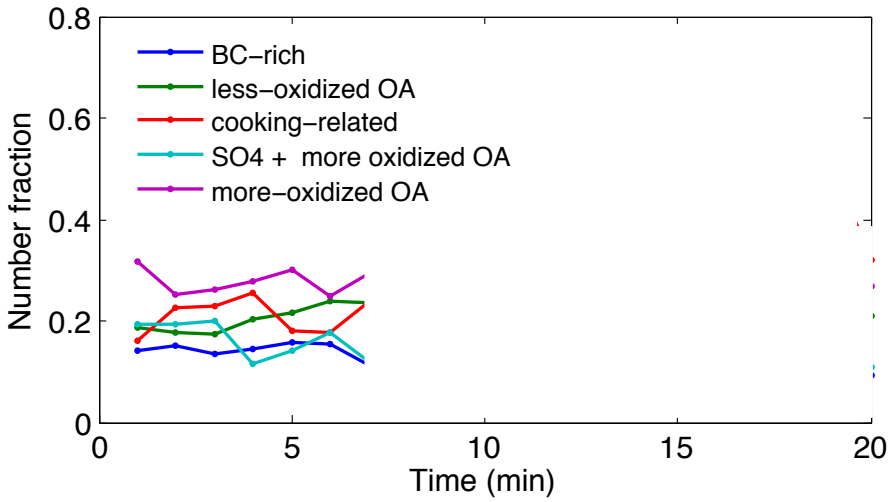
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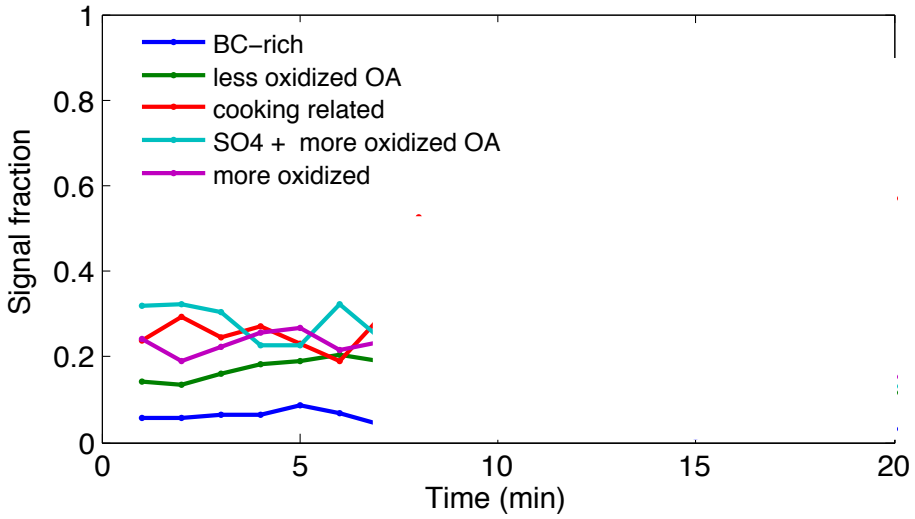
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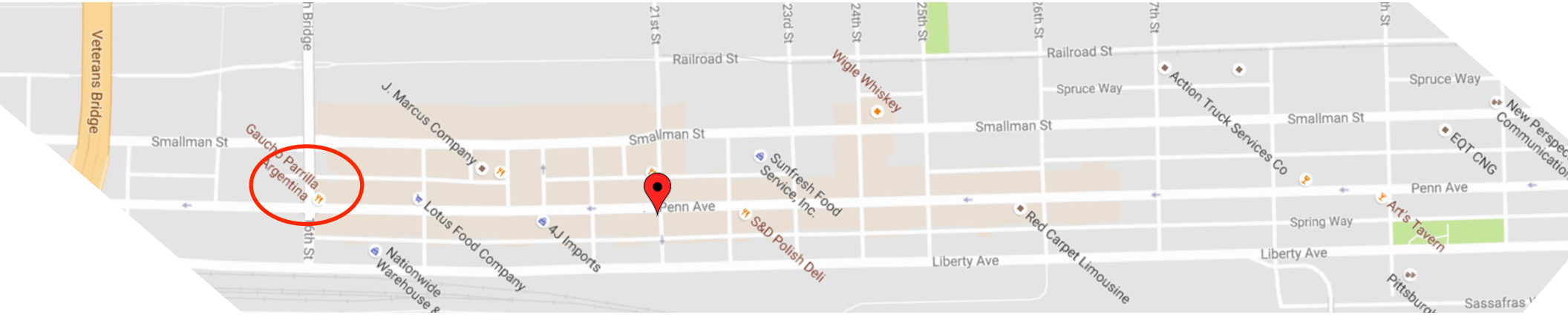
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26th St
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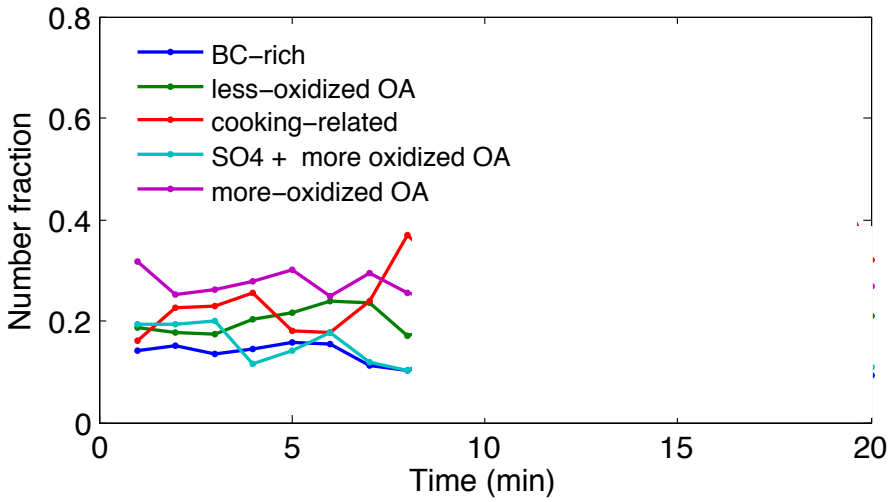
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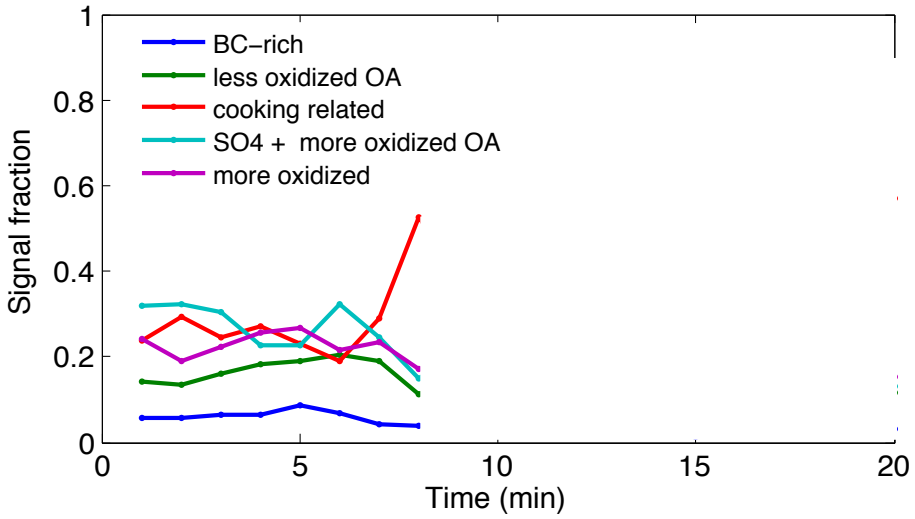
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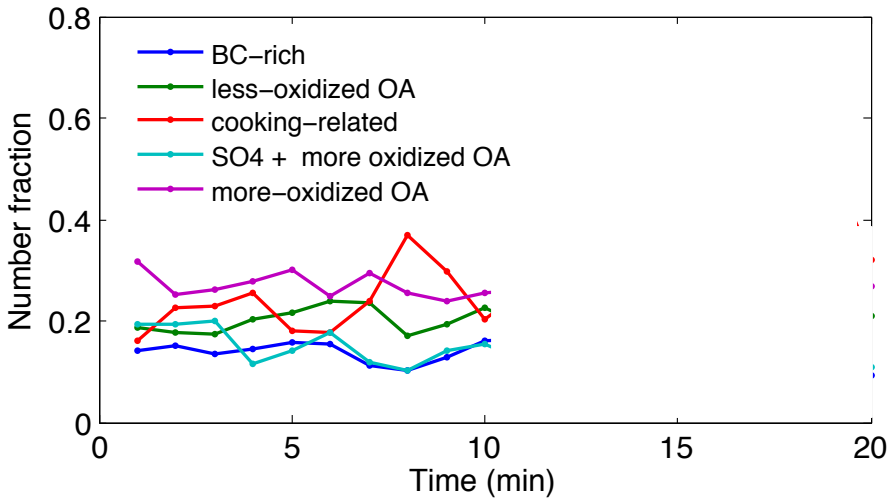
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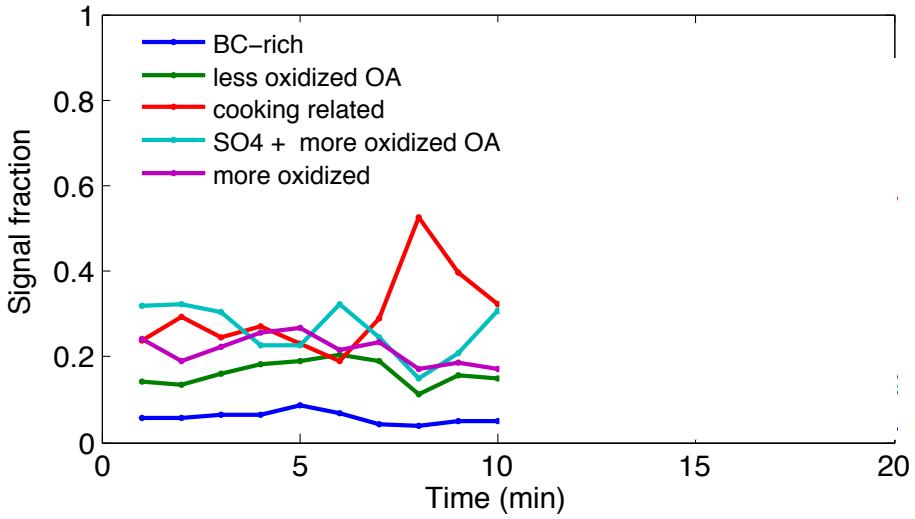
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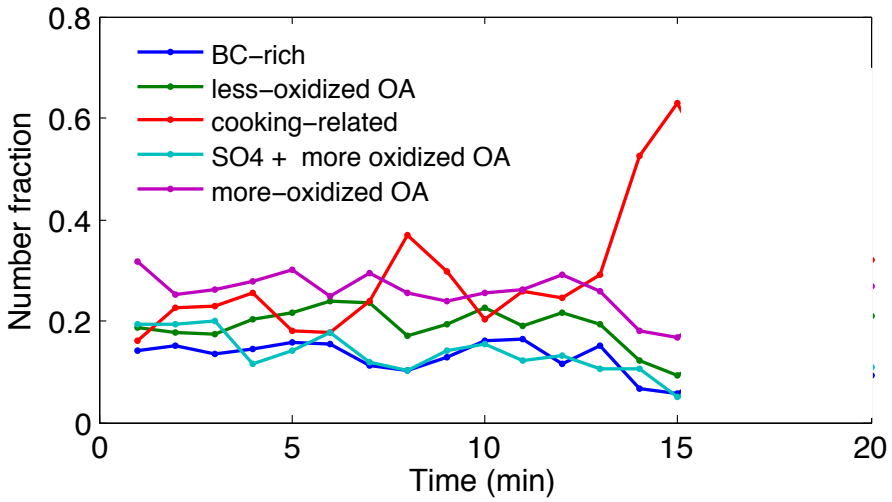
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Number fraction
Time (min)
0
0.2
0.4
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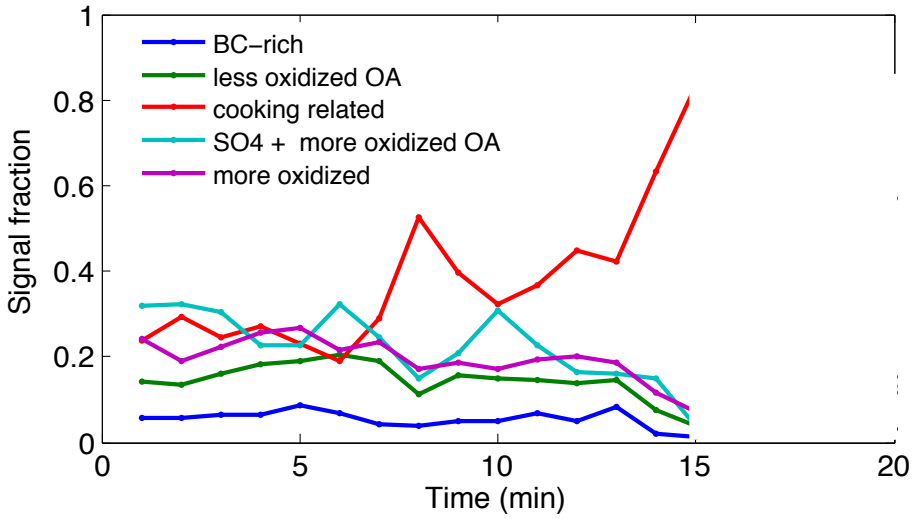
15
20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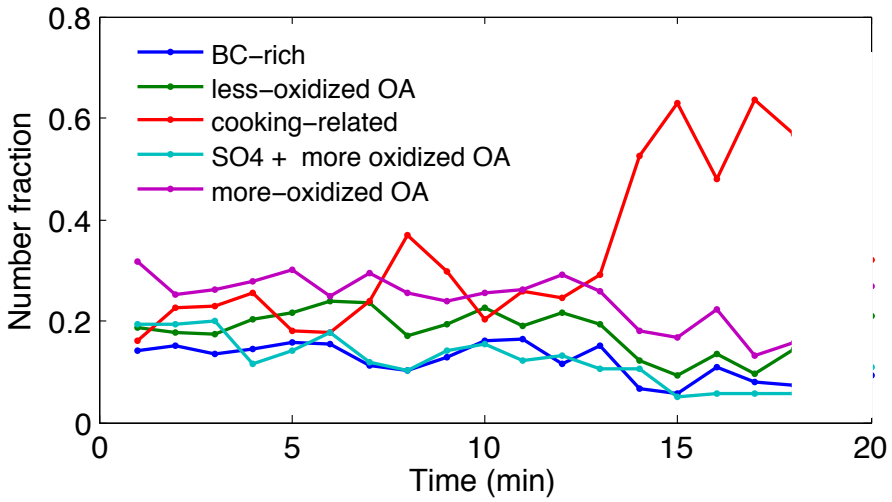
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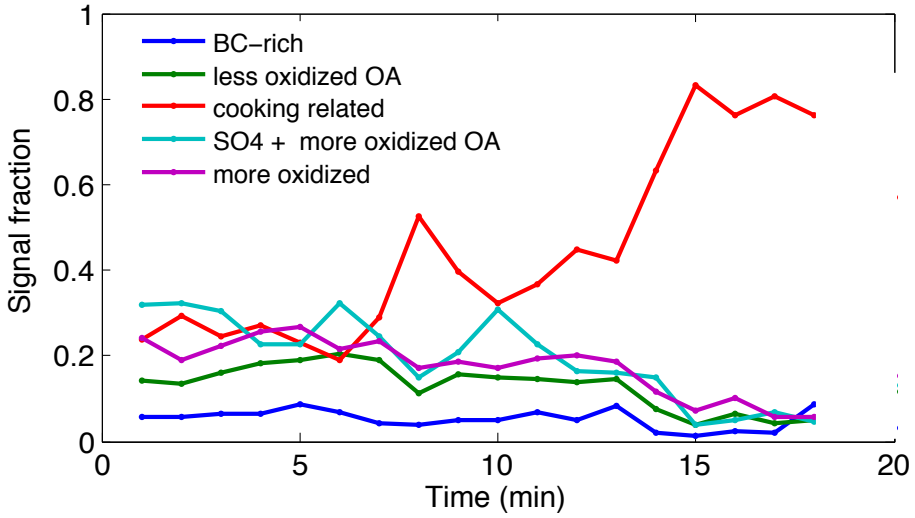
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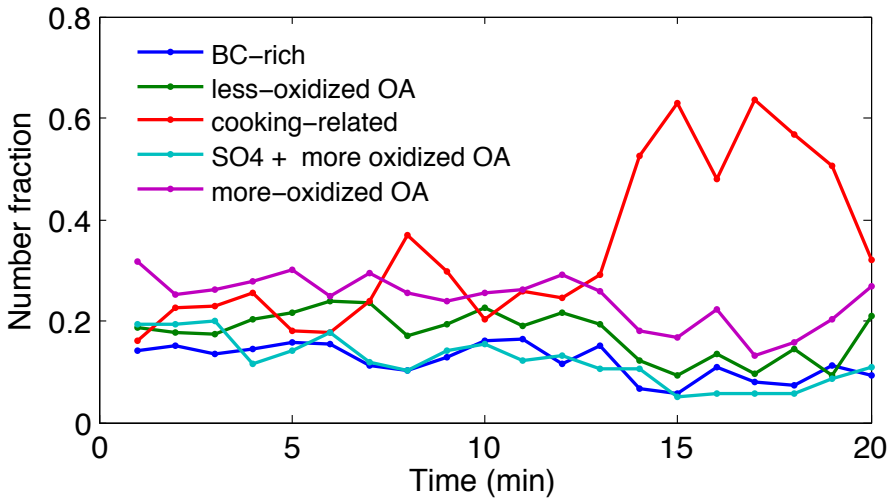
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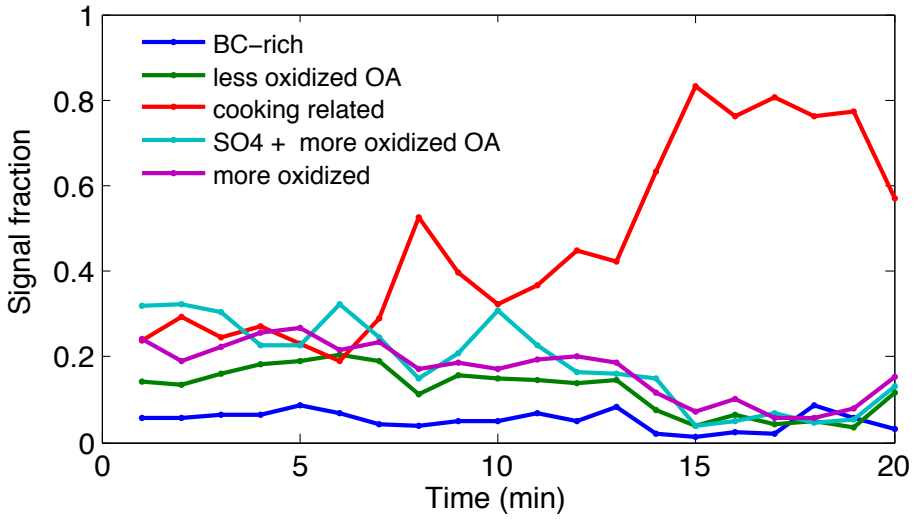
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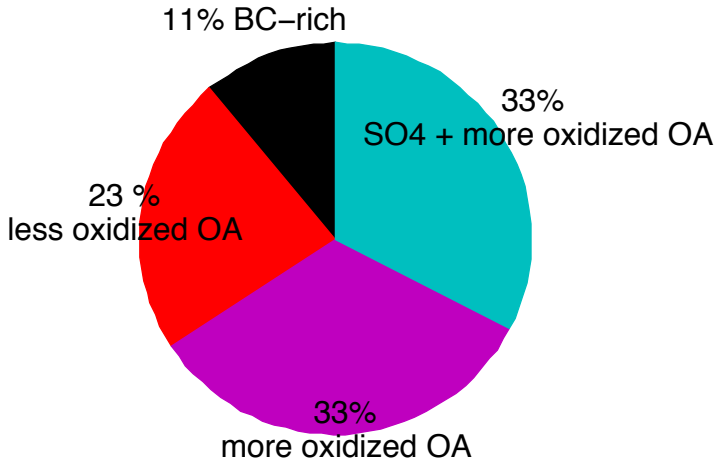
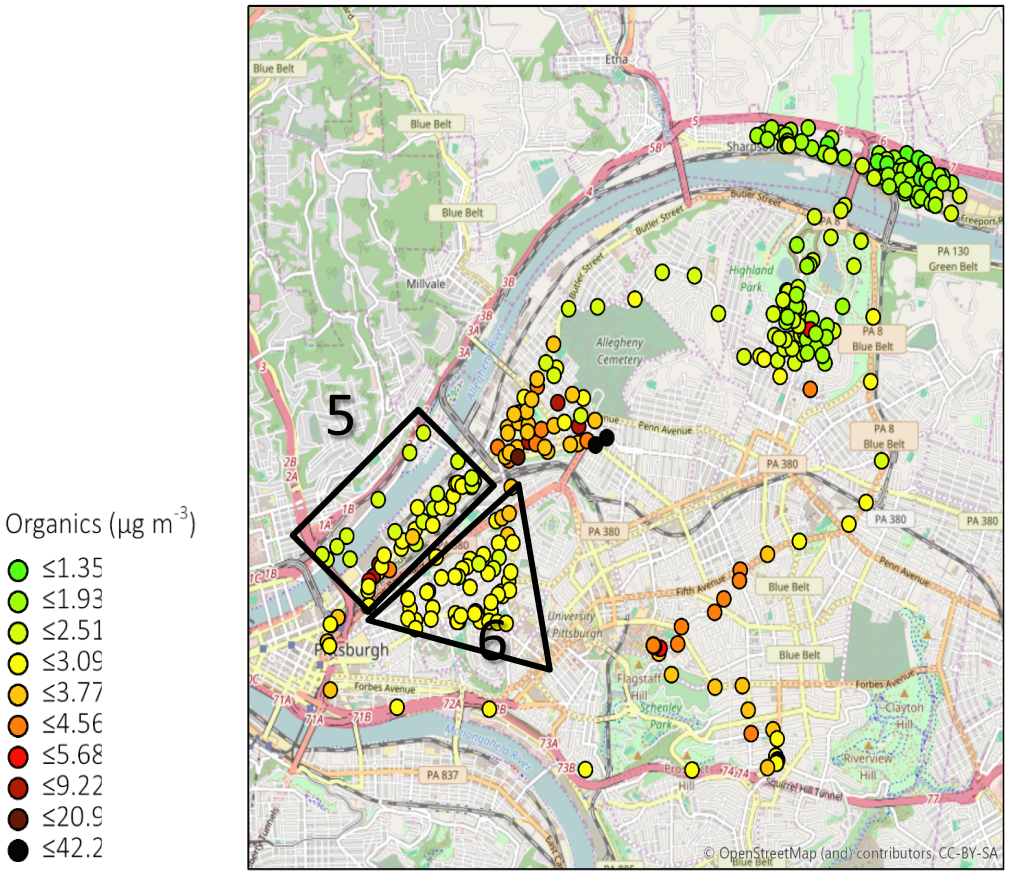
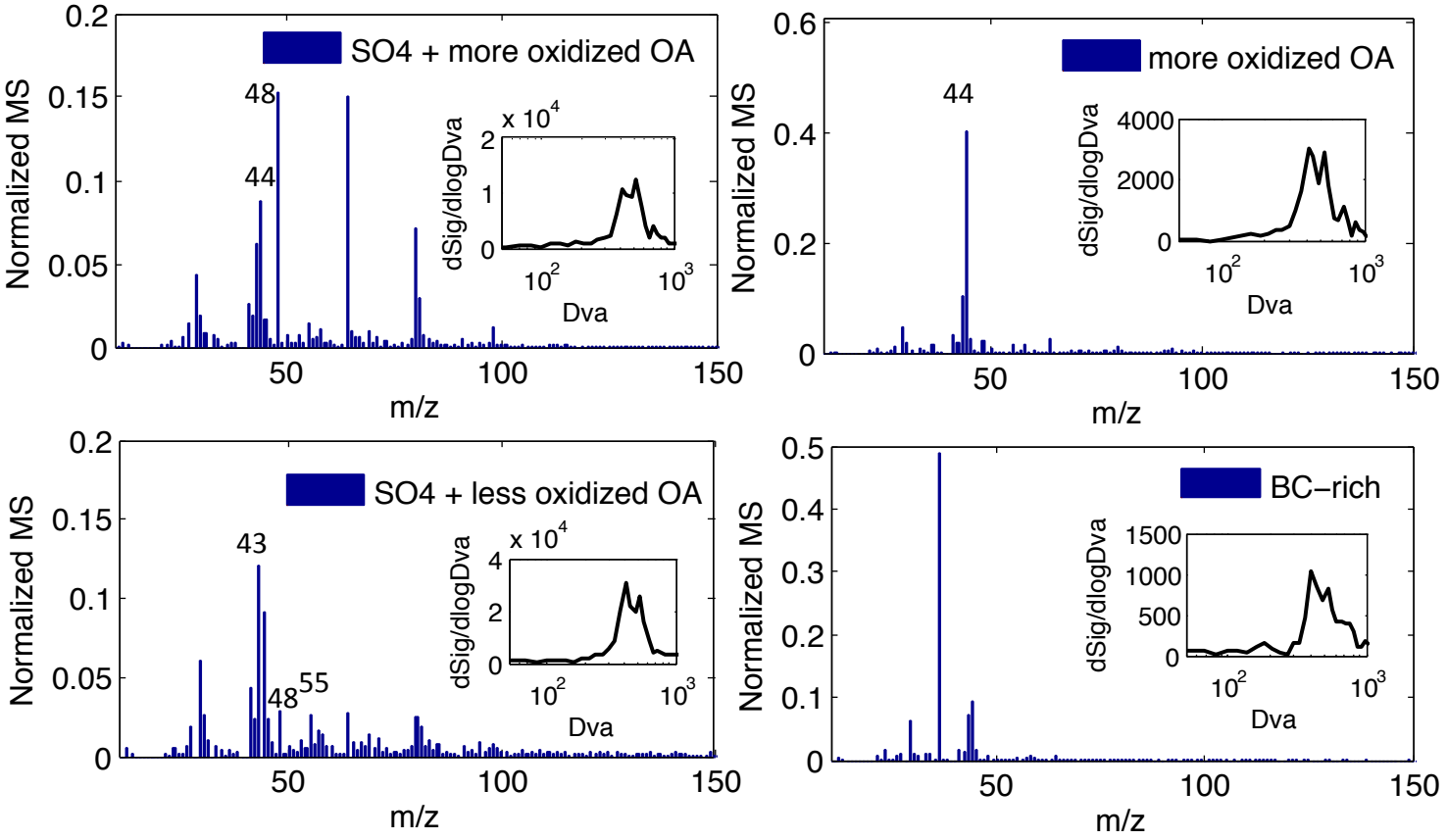
Take away COA-related cluster and look at the ‘’background’’ of this site

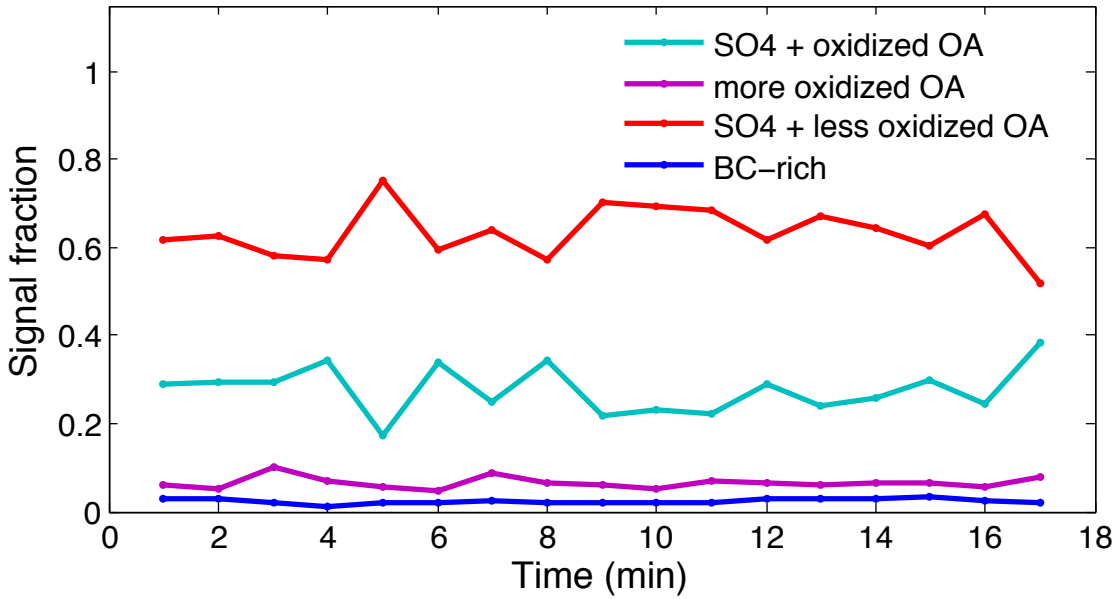


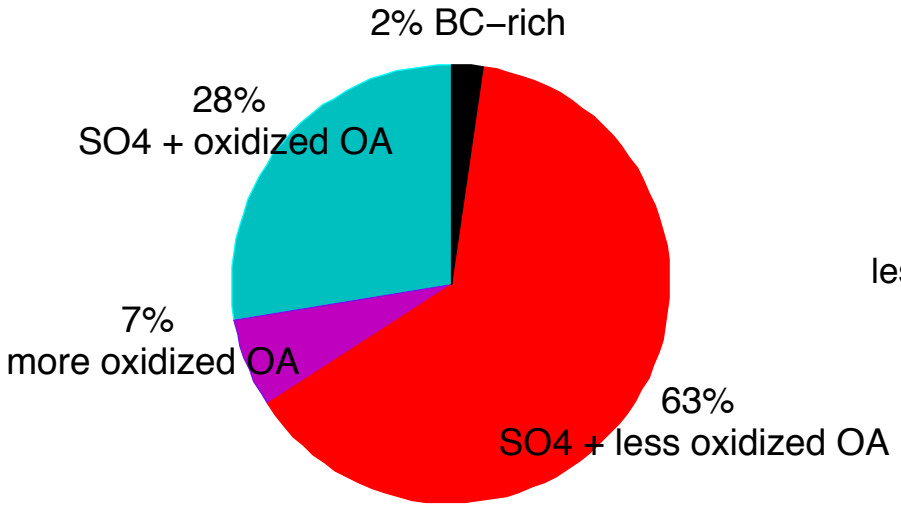


Site 6 is 1000ft away from site 5
~ 200 ft up
---residential

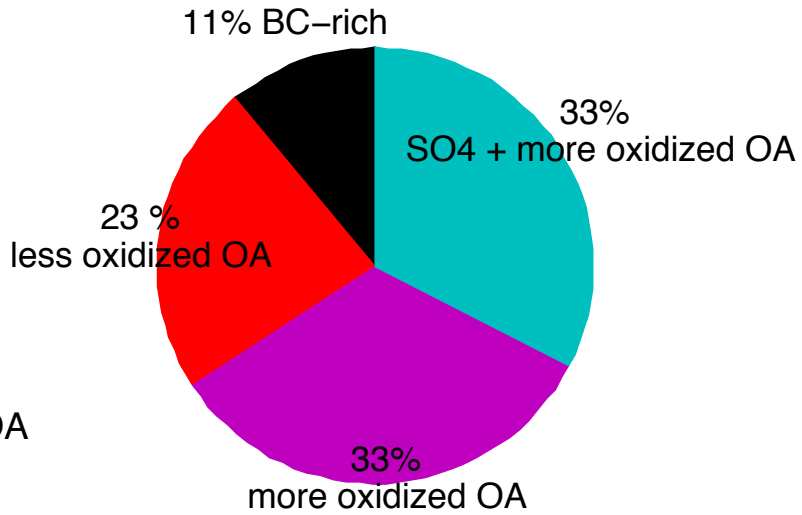
urban residential







Residential site



"background" of commercial site

Conclusion:

◆ Single particle measurement with ET is able to capture some interesting particle features, help to identify dominant local sources and spatial pattern of particle mixing state.

Future works:

◆ Technical: better data processing: false positive, reducing sampling bias, ROI design…

◆ Science questions:

Have/will have single particle measurement in most (if not all) part of Pittsburgh

1. How variable are “background” clusters?
2. How fast do ambient particles mix?
3. What do people breath? ---couple with population density