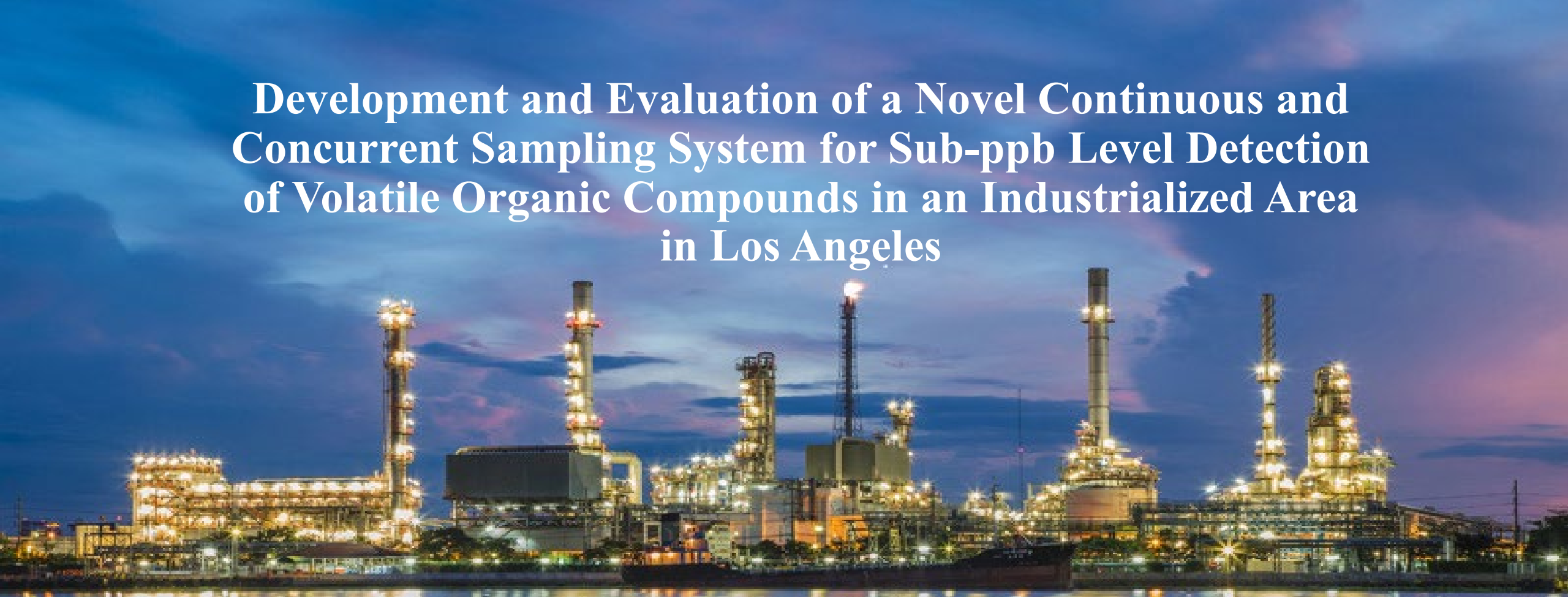
Development and Evaluation of a Novel Continuous and Concurrent Sampling System for Sub-ppb Level Detection of Volatile Organic Compounds in an Industrialized Area in Los Angeles



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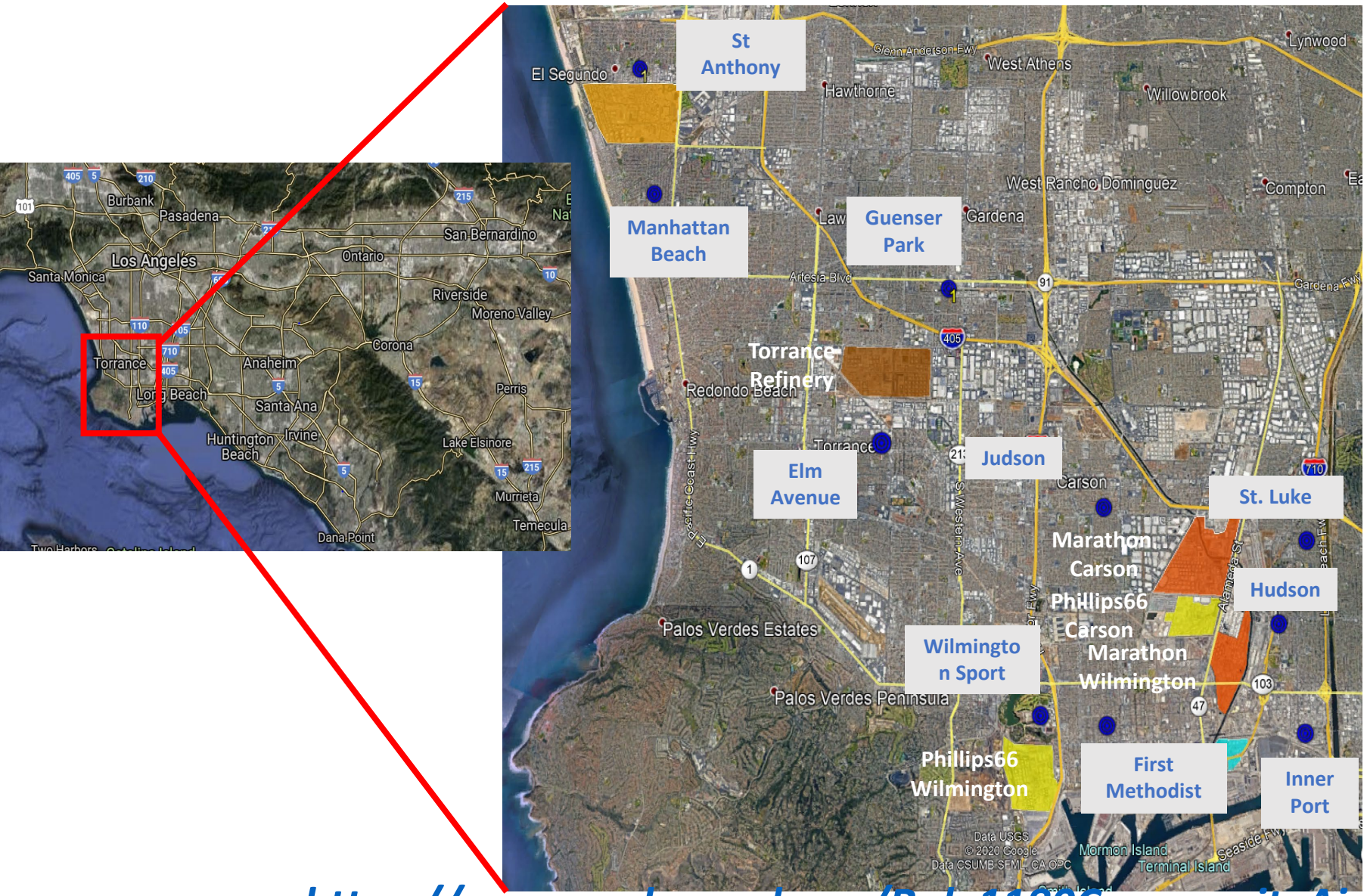
"Tricorntech Corp.

Objectives:

- Overview of Rule 1180 community network
- Detection and Characterization of VOC plume
- Development and demonstration of the Concurrent Sampling System (CSS)

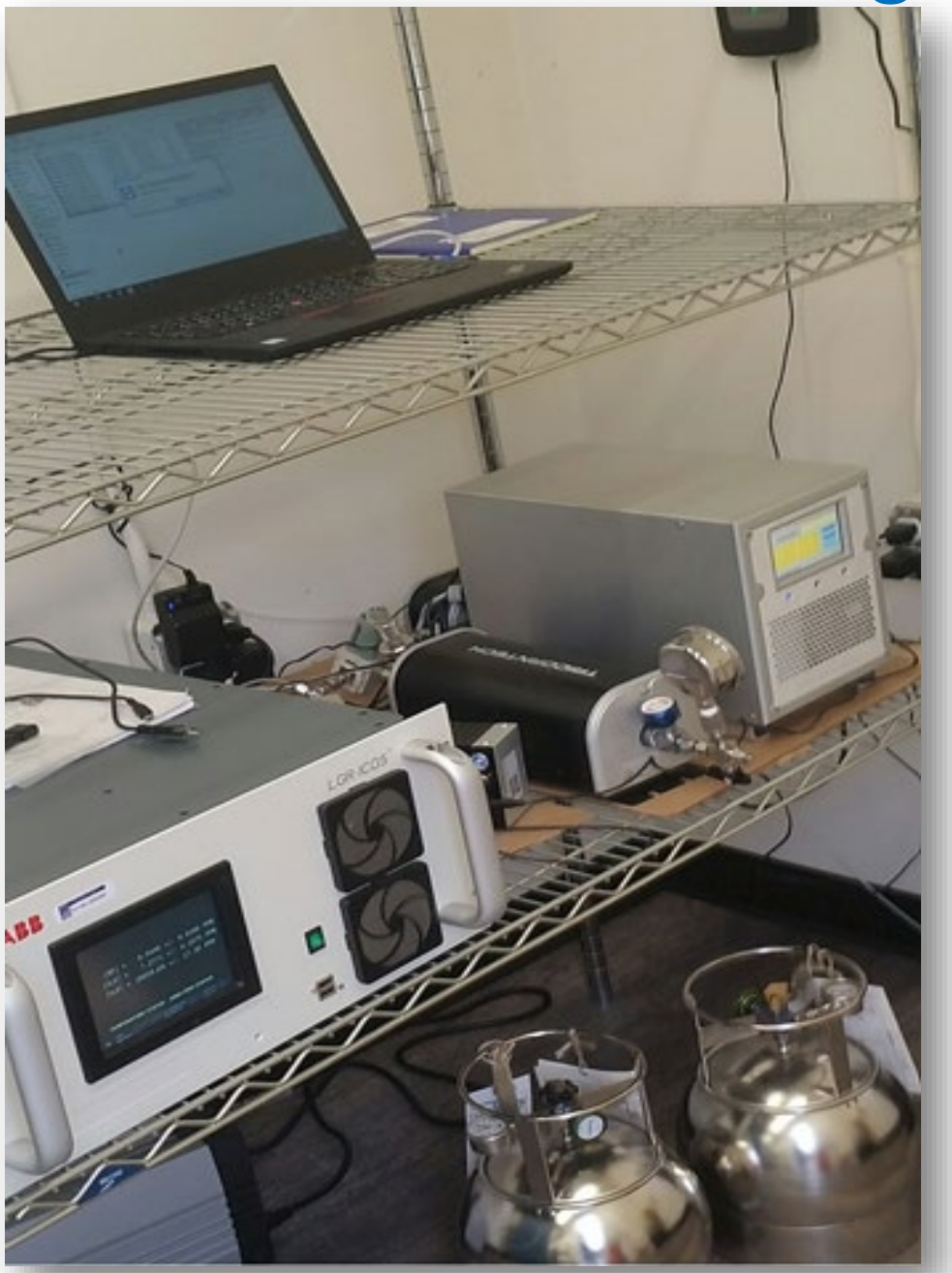
Rule 1180 monitoring at a glance



- ✓ 7 major refineries
- ✓ Community monitoring stations- 10 permanent sites
- ✓ Real-time monitoring for all Rule 1180 required compounds
- ✓ Dedicated public data portal and notification system

https://xappprod.aqmd.gov/Rule1180CommunityAirMonitoring/

Automated Gas Chromatography



Automated Gas Chromatography

- Continuous hourly averaged concentration
  - 40 minutes sampling followed by 20 minutes analysis
- Sub-ppb range detection capability on community level trace VOCs monitoring

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UV-DOAS Spectroscopy

UV-DOAS Spectroscopy

- Continuous high frequency time resolution measurement
- Minimal instrument maintenance
- Fast detection of short-lived VOC plumes

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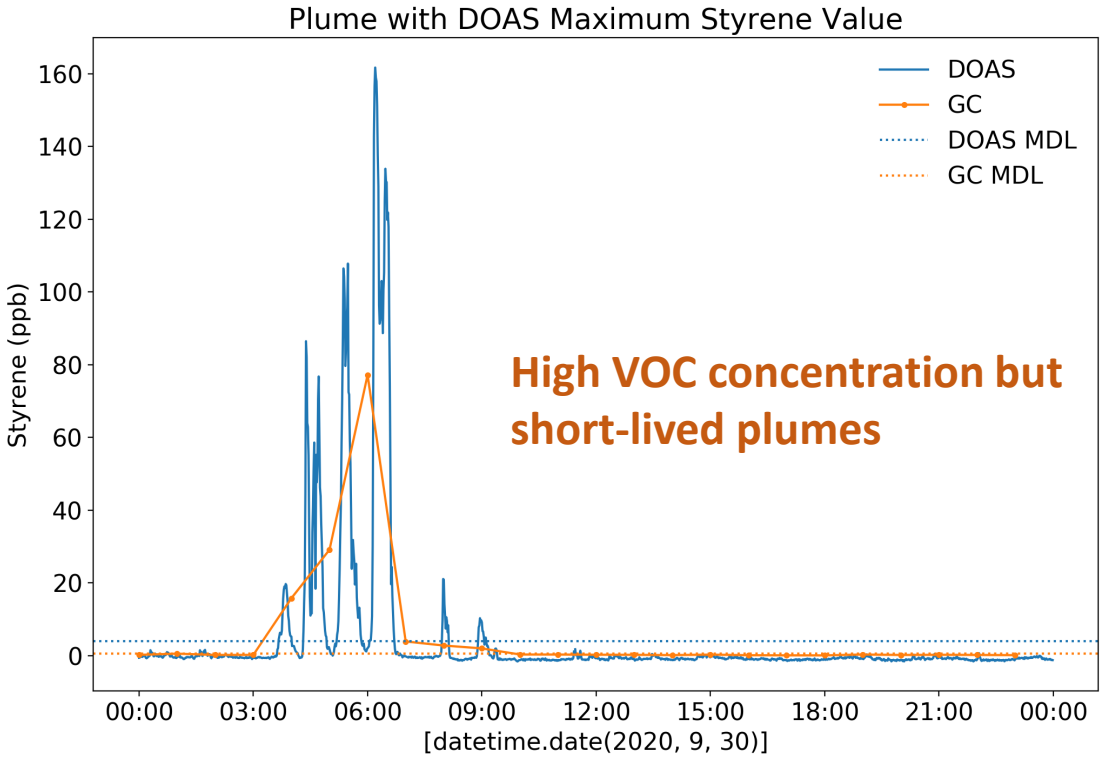
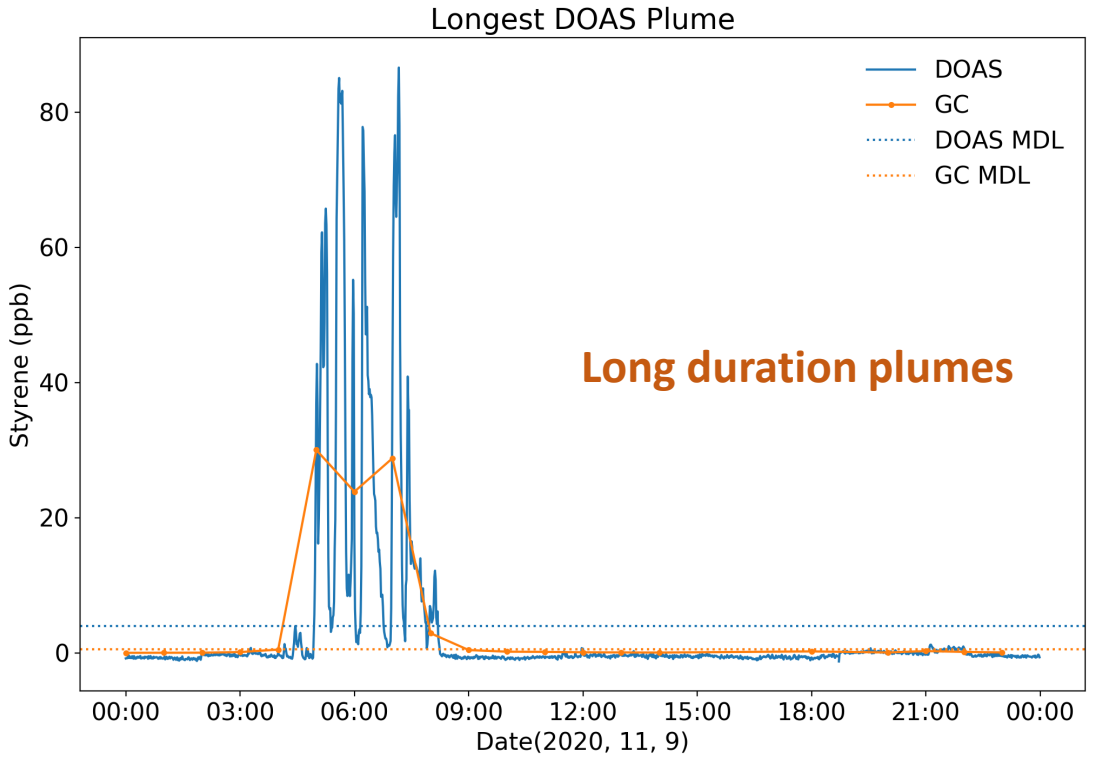
Detection and characterization of VOC plumes in the community





Styrene at the Inner Port Community site

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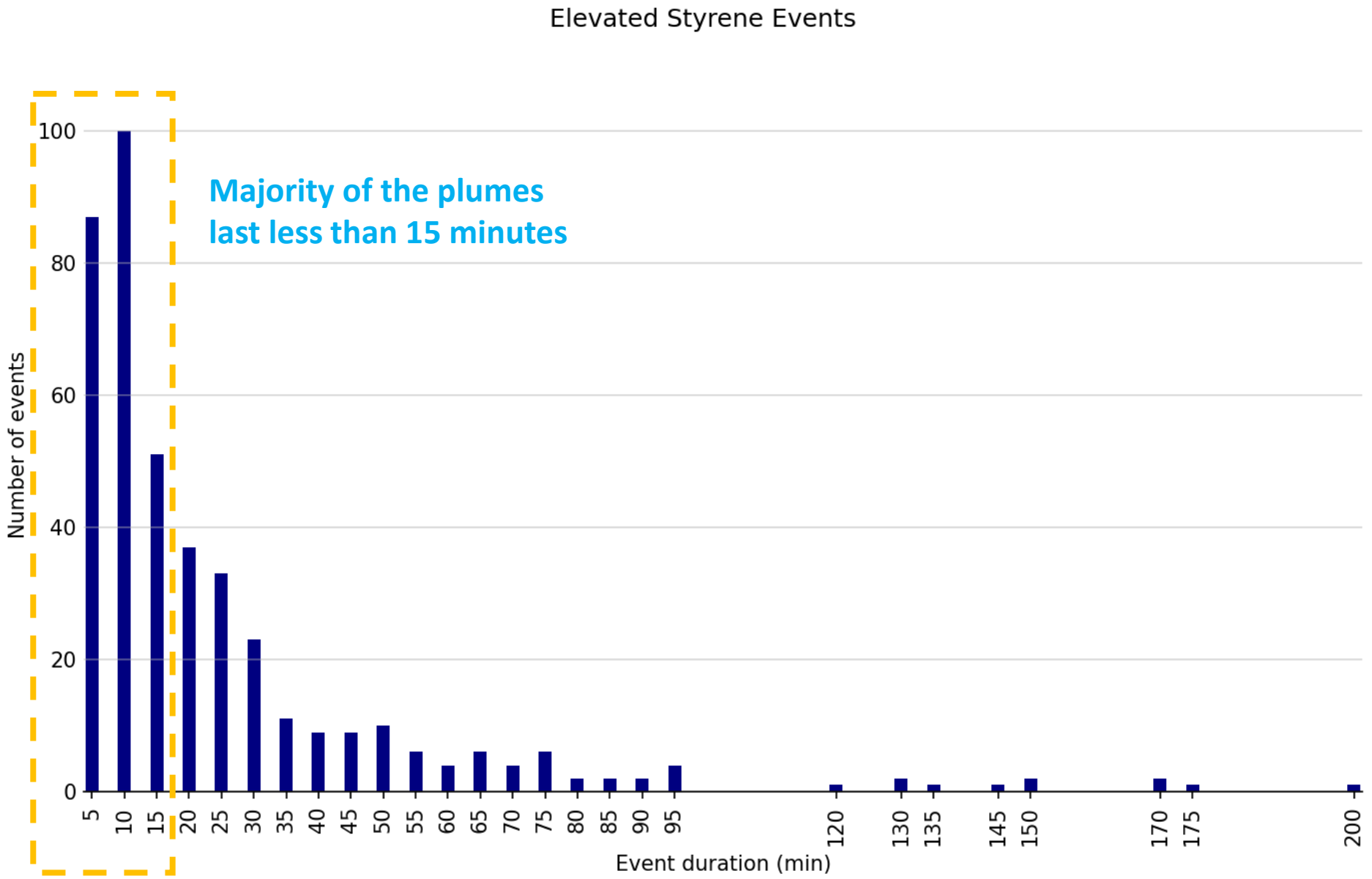
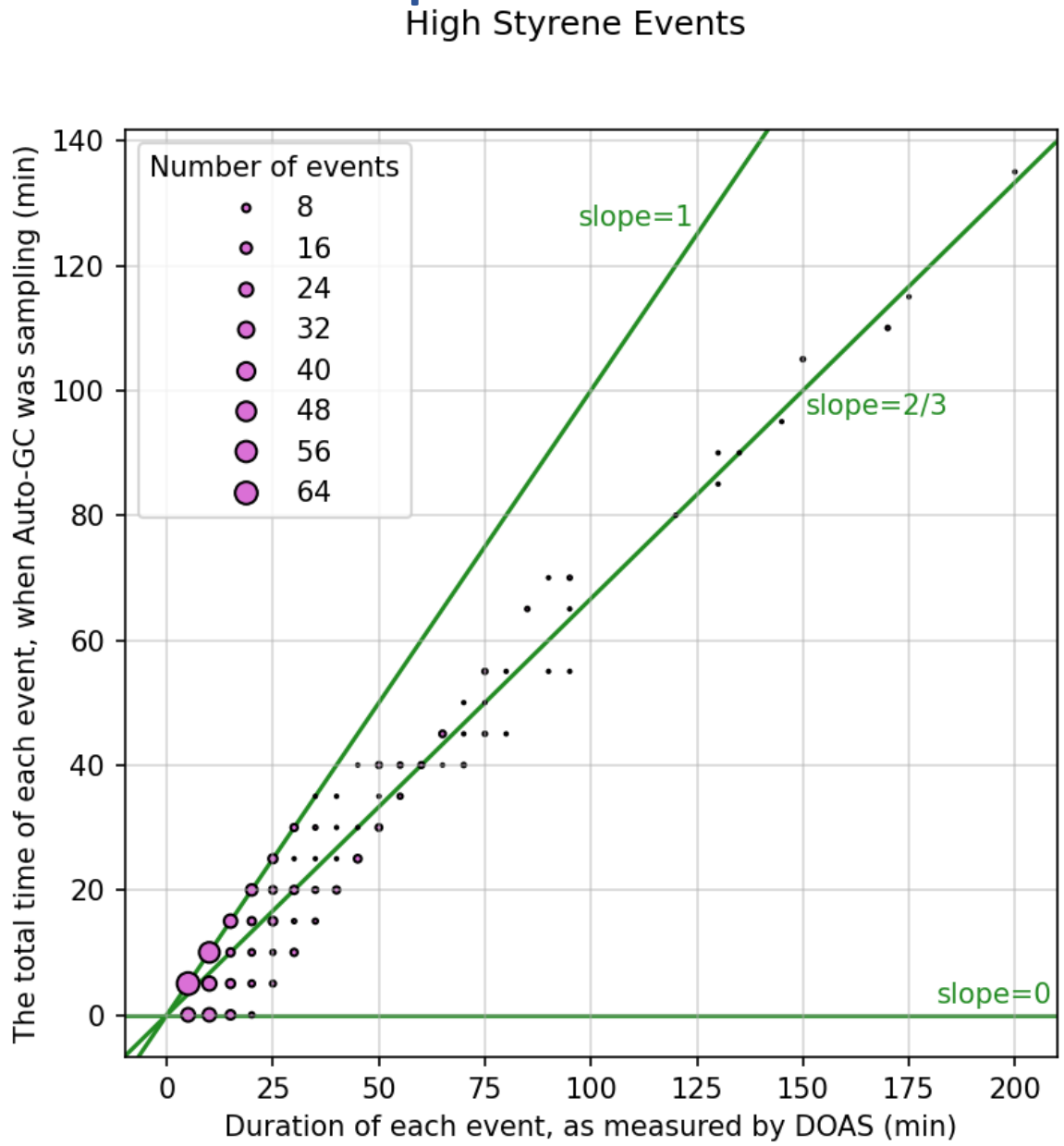
Distribution of VOC plumes duration



Short-lived VOC plumes detection



- Majority of the plumes Auto-GC detected ~66% of the plume, the point along and near the slope line 2/3
- Few plume events, along the slope line 0, are completely undetected by Auto-GC

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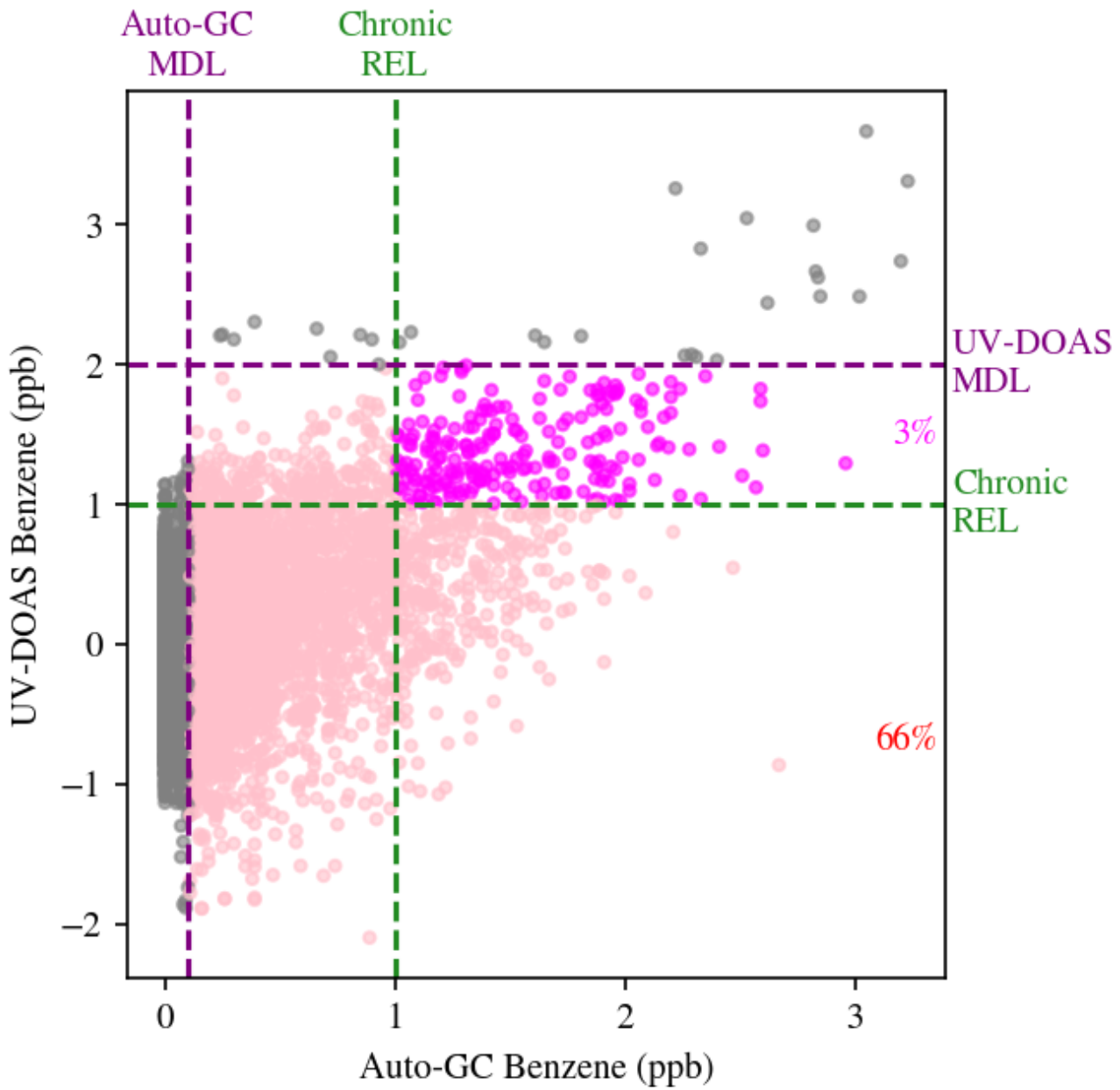
Low concentration long-term VOC detection



- 66% of the time hourly Benzene was above Auto-GC detection level but less than UV-DOAS detection level
- 3% of those hourly Benzene values were above Chronic REL.

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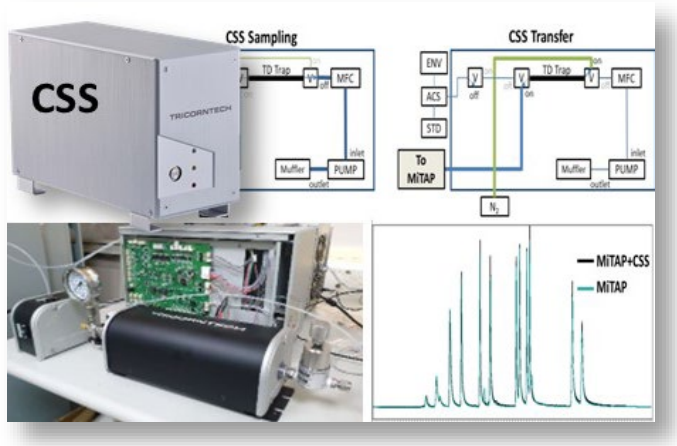
Concurrent Sampling System Development, Demonstration and Testing

Development of the CSS unit

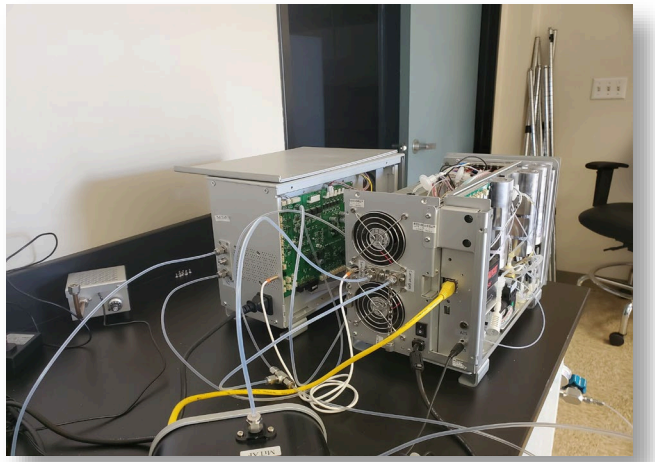
~ 6 months



Testing at the South Coast AQMD Lab

And Troubleshooting

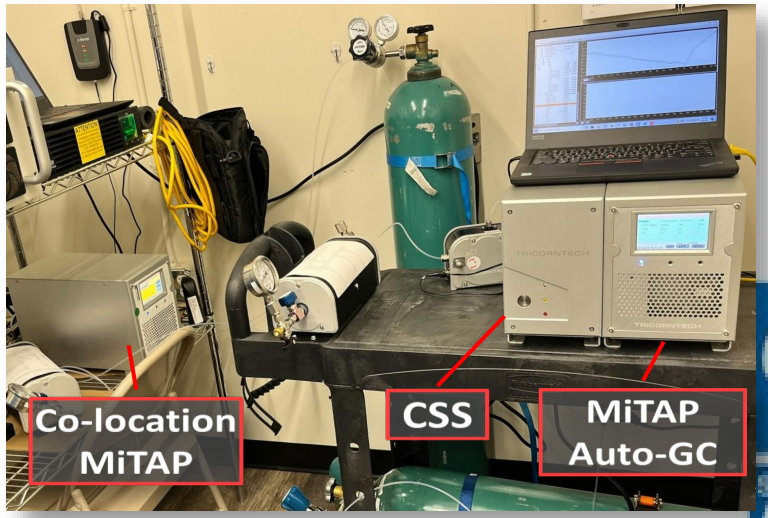
~ 4 months



Deployed at the Rule 1180 Community Monitoring Site for Co-location and Comparison

55 minutes sampling time (hourly data cycle)

15 minutes sampling time (20-min data cycle)



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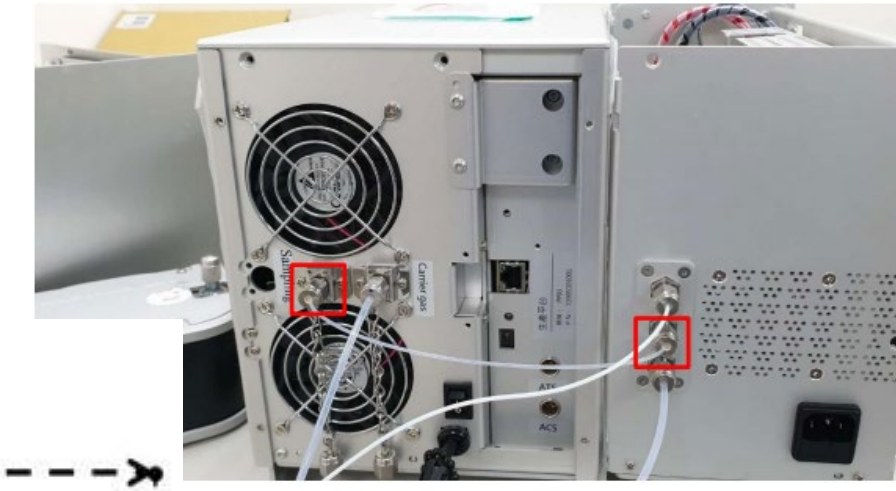
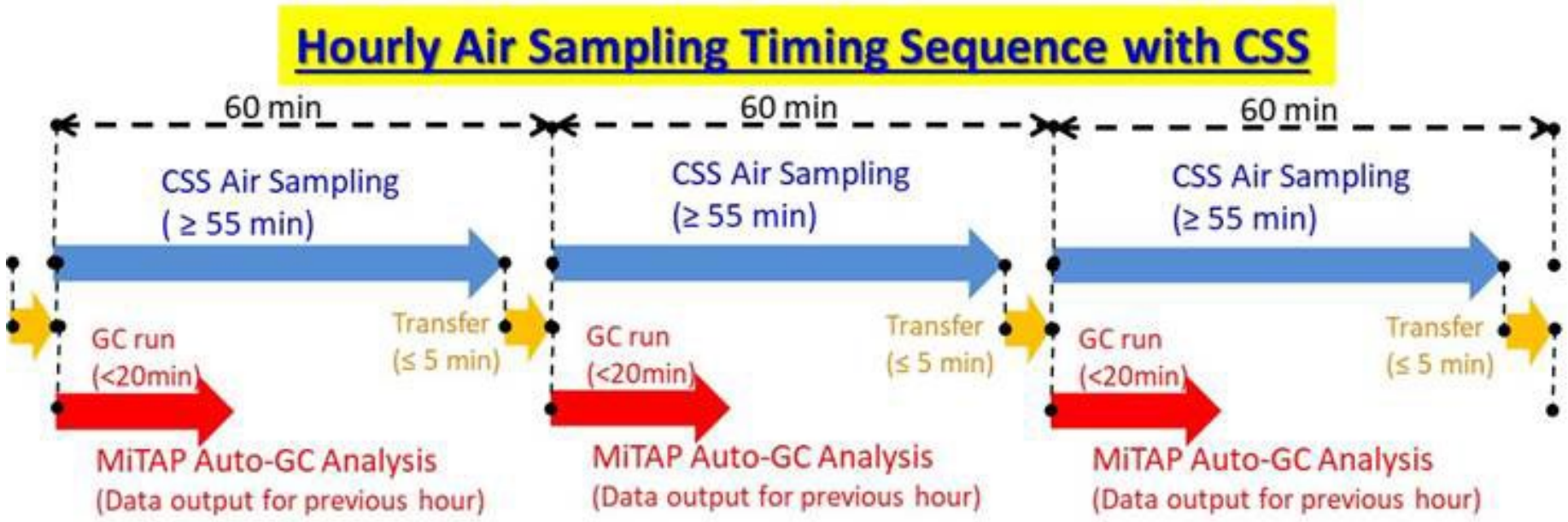
Concurrent Sampling System – 55-minute sampling





Concurrent Sampling Module-In Development and Demonstration Stage

55-minute sampling begun on March 19, 2022.

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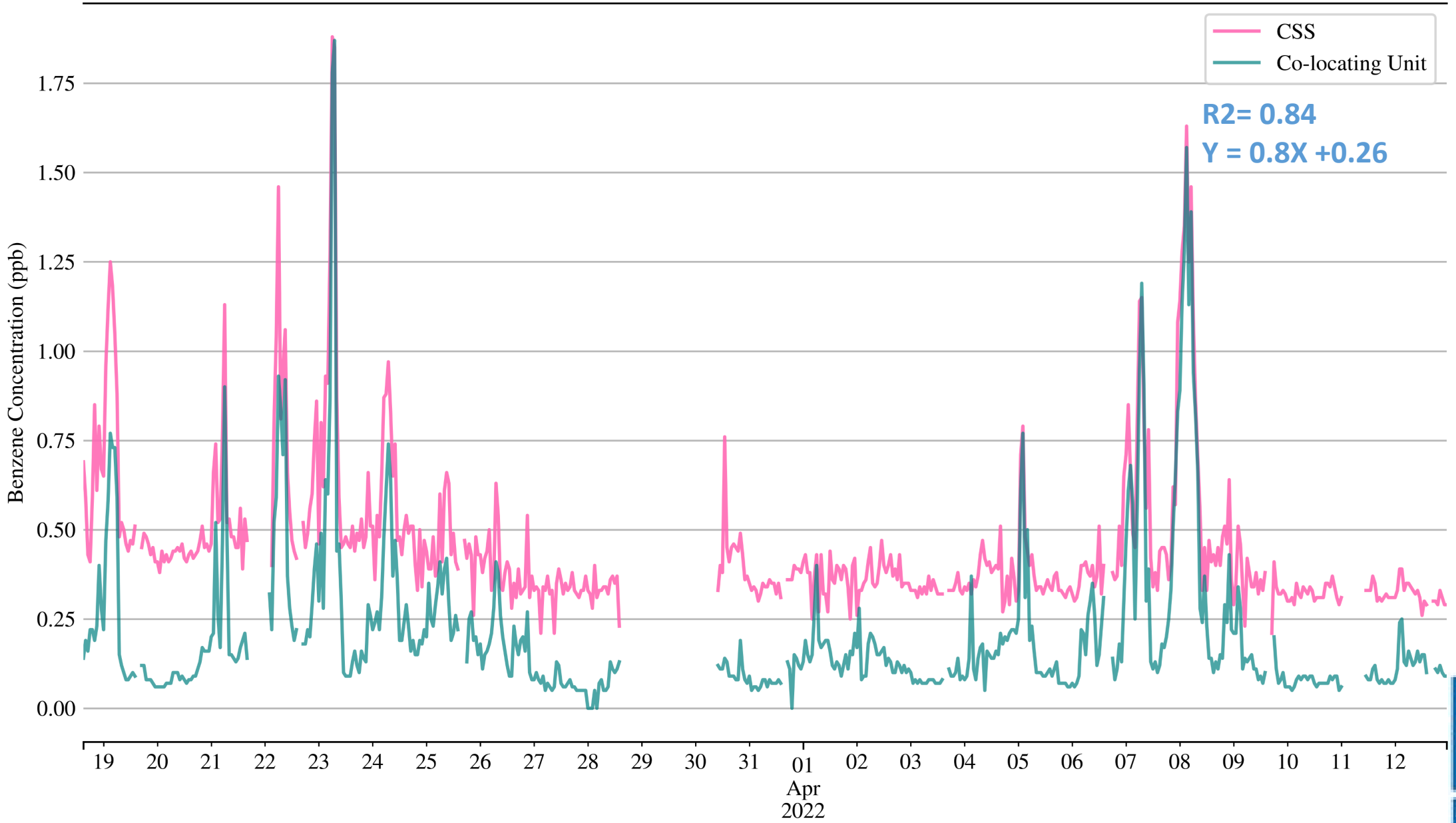
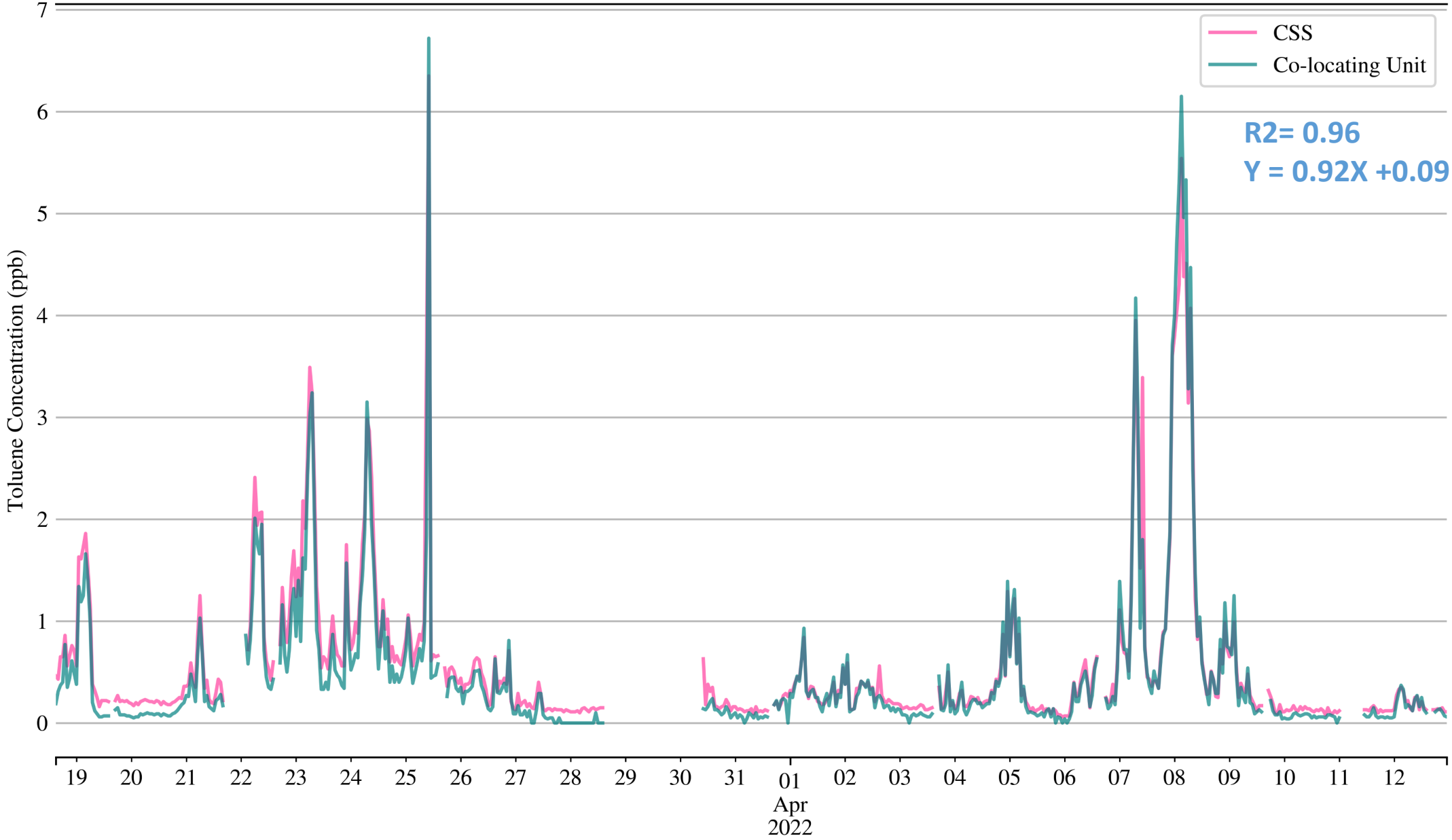
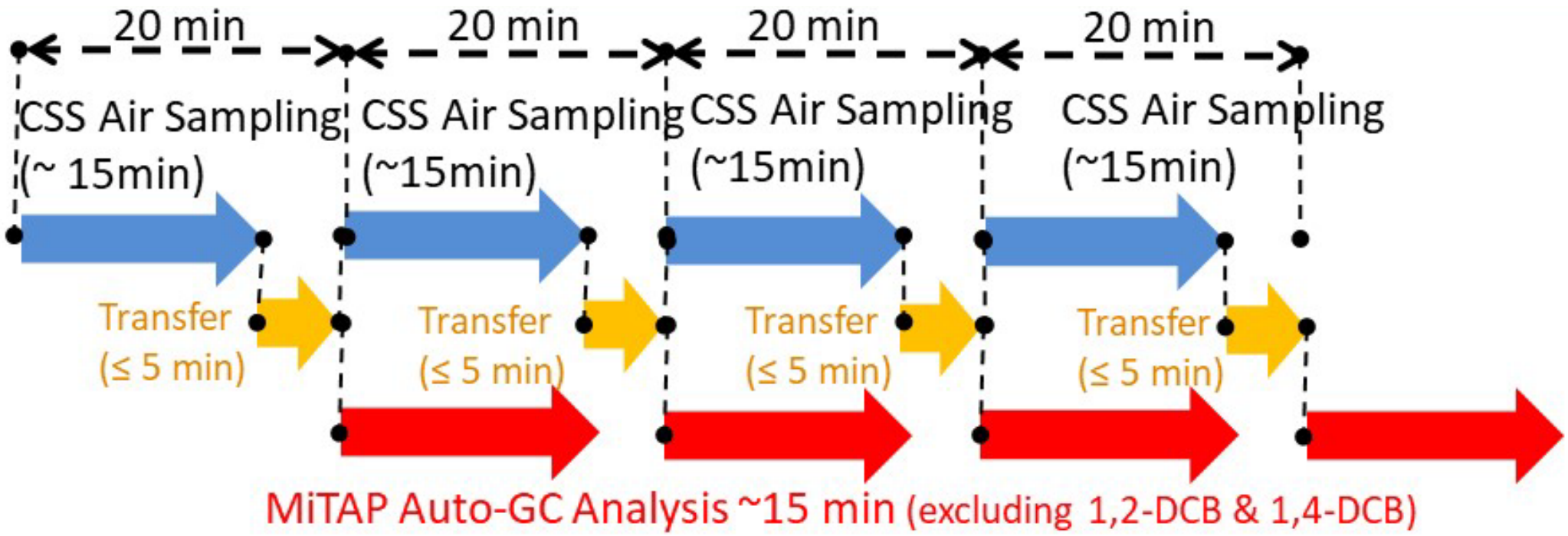
55-minute Sampling Cycle - Benzene



55-minute Sampling Cycle - Toluene



Concurrent Sampling System – 20-minute sampling



20-minute sampling begun on April 22, 2022.

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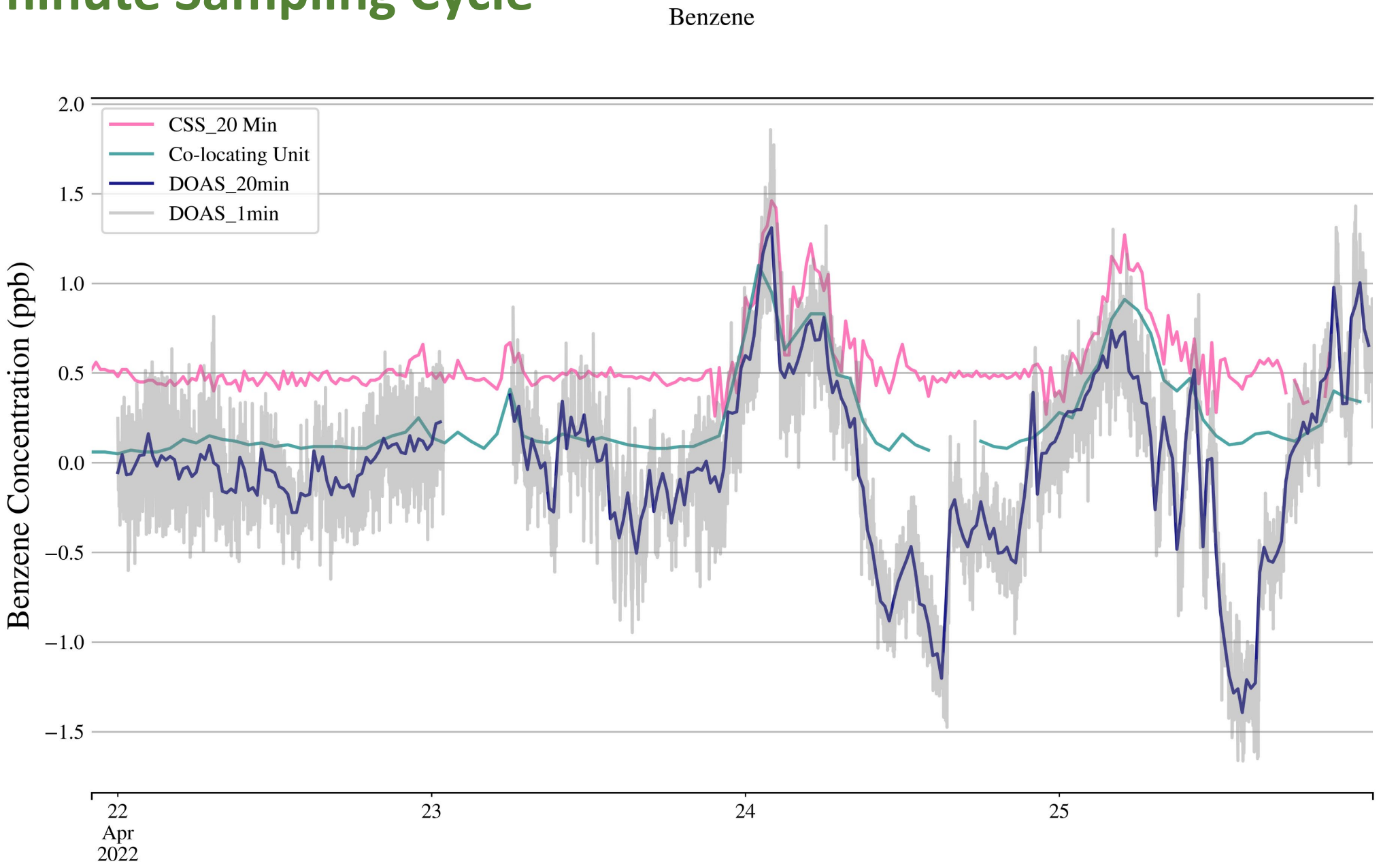
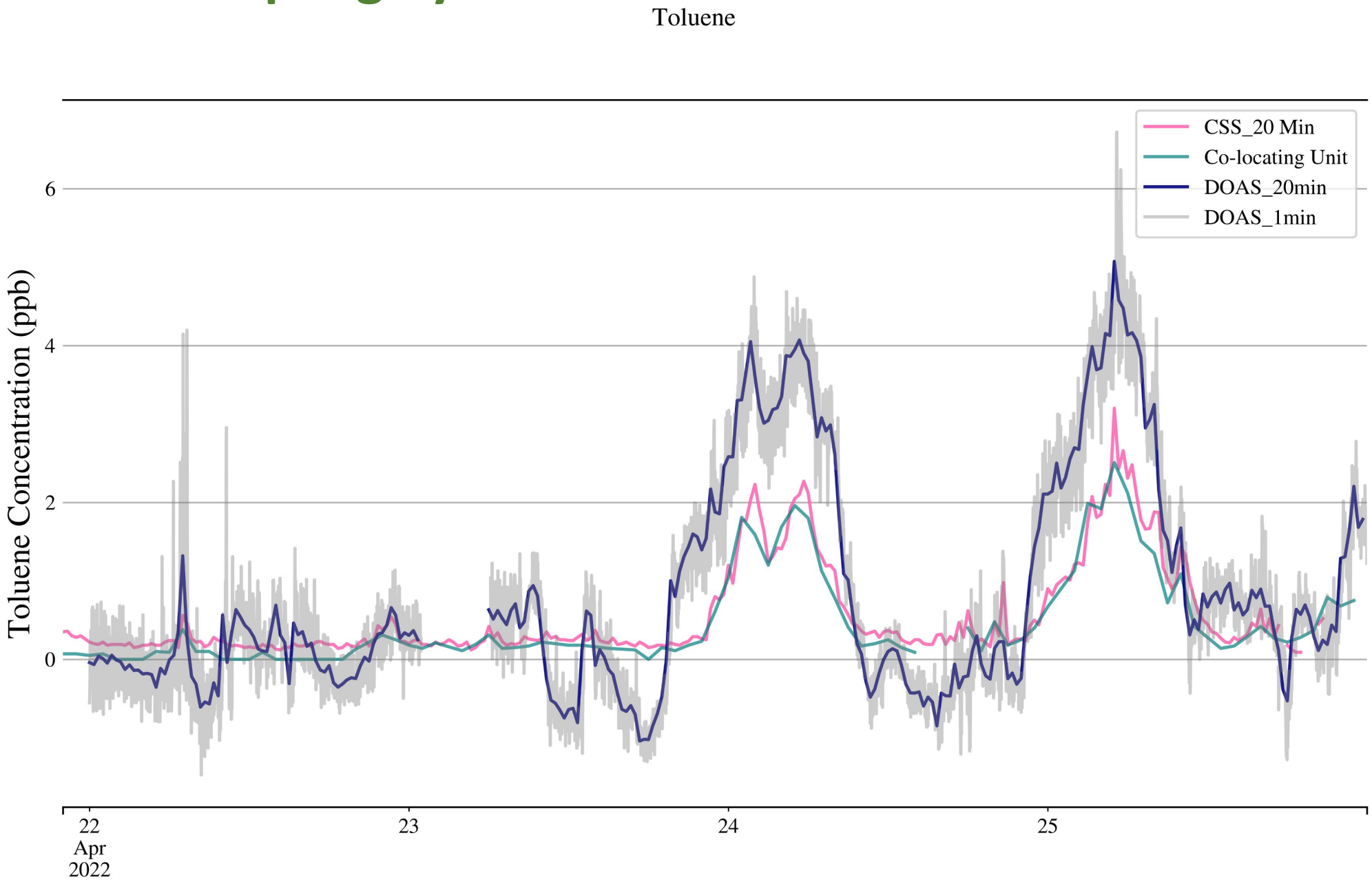
20-minute Sampling Cycle



20-minute Sampling Cycle



Summary

- Successful development and demonstration of the Concurrent Sampling System (CSS)

- CSS operates in two sampling modes:
- 55-minute sampling mode:
  - ✓ >90 % of air is being collected and analyzed
  - ✓ 1 sample point every hour
- 20-minute sampling mode:
  - ✓ 3 sample points per hour
  - ✓ Sub-ppb detection level

- Initial co-location with traditional 40-minute Auto-GC and UV-DOAS showed good agreement

- 20-minute sampling can be also useful for deployment on mobile platform

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