

A Spot Sampler for Concentrated Collection of Airborne Particles

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Aerosol Dynamics Inc.

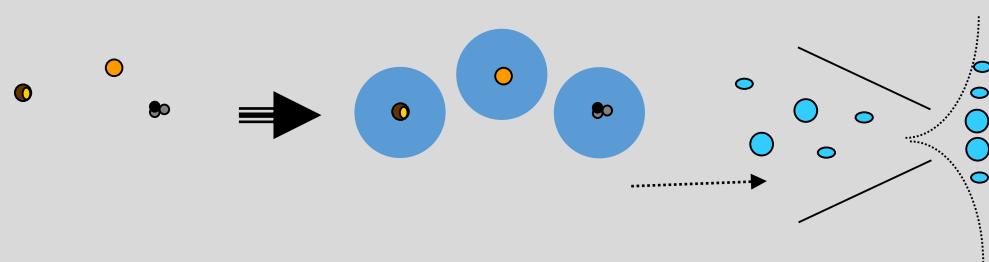
with A. Hecobian and Jeffrey Collett

Colorado State University

Acknowledgements:

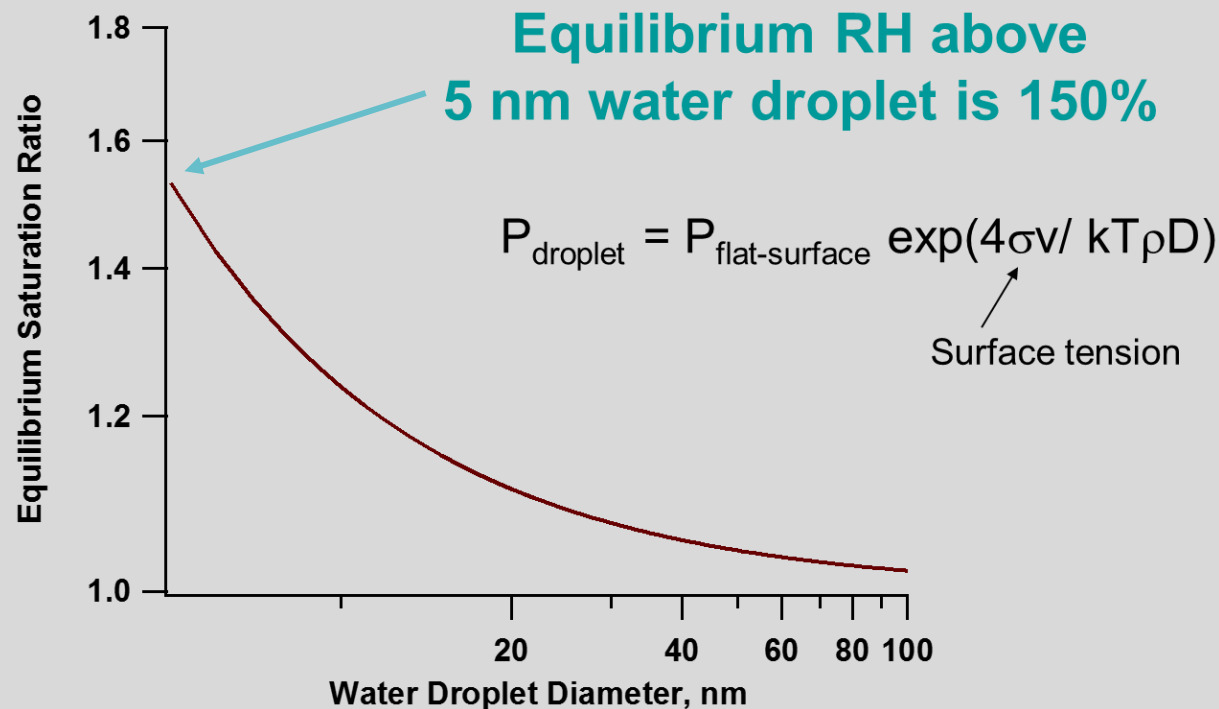
National Institutes of Health RC44ES014997, RC3ES019081, RC3ES4322523

How concentrated “spot” collection is done



Condensational growth --> droplet impaction

Condensational growth requires supersaturation



First systems:

mix steam into airstream, then cool

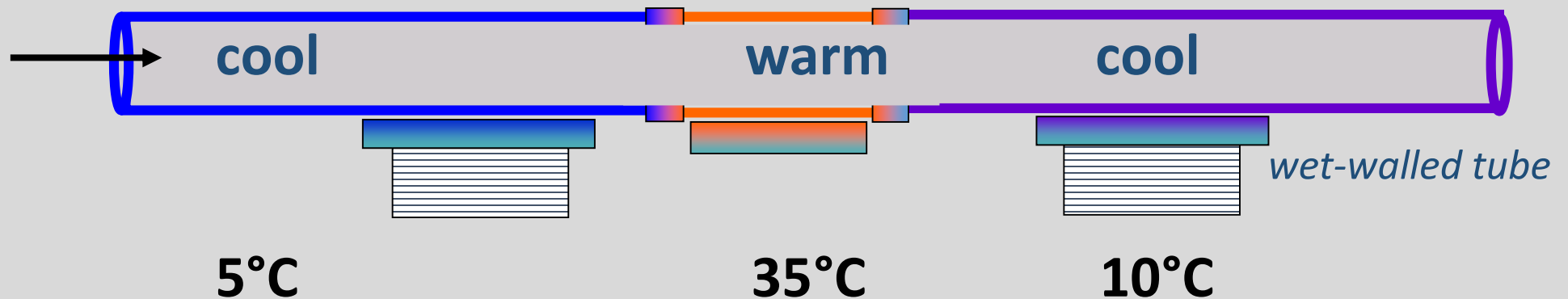
Maze Collector (Simon and Dasgupta)

Steam-jet Collector (Khlystov et al)

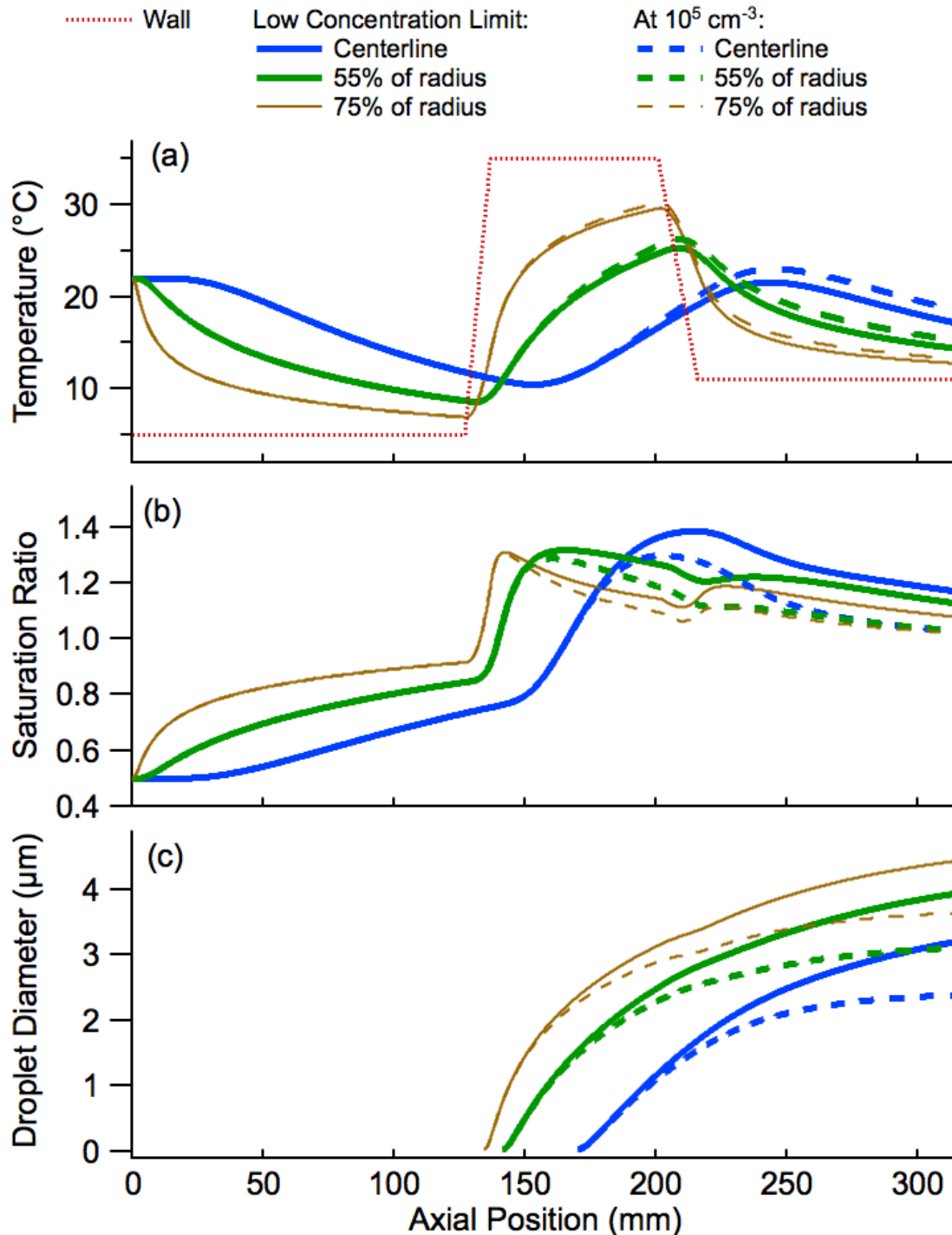
Particle in Liquid sampler (Weber et al)

These methods subject the sample to high temperatures

Our Approach: Moderated Growth Tube



Moderated approach



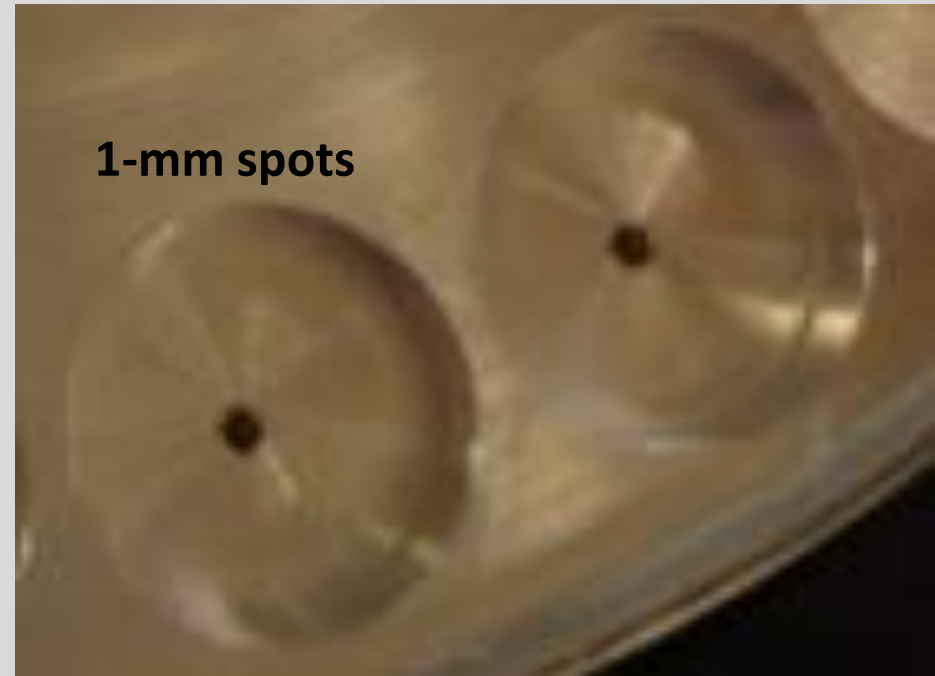
output temperature
 $< 18^{\circ}\text{C}$

output dew point $< 20^{\circ}\text{C}$

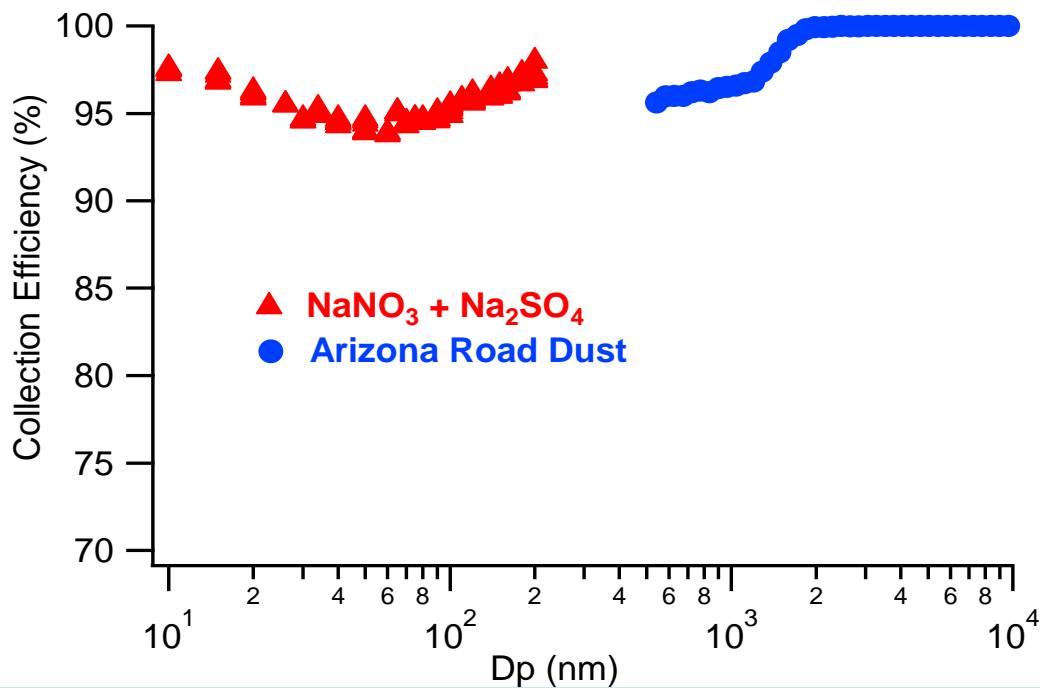
Droplet Size $> 2 \mu\text{m}$

Hering et al, 2014

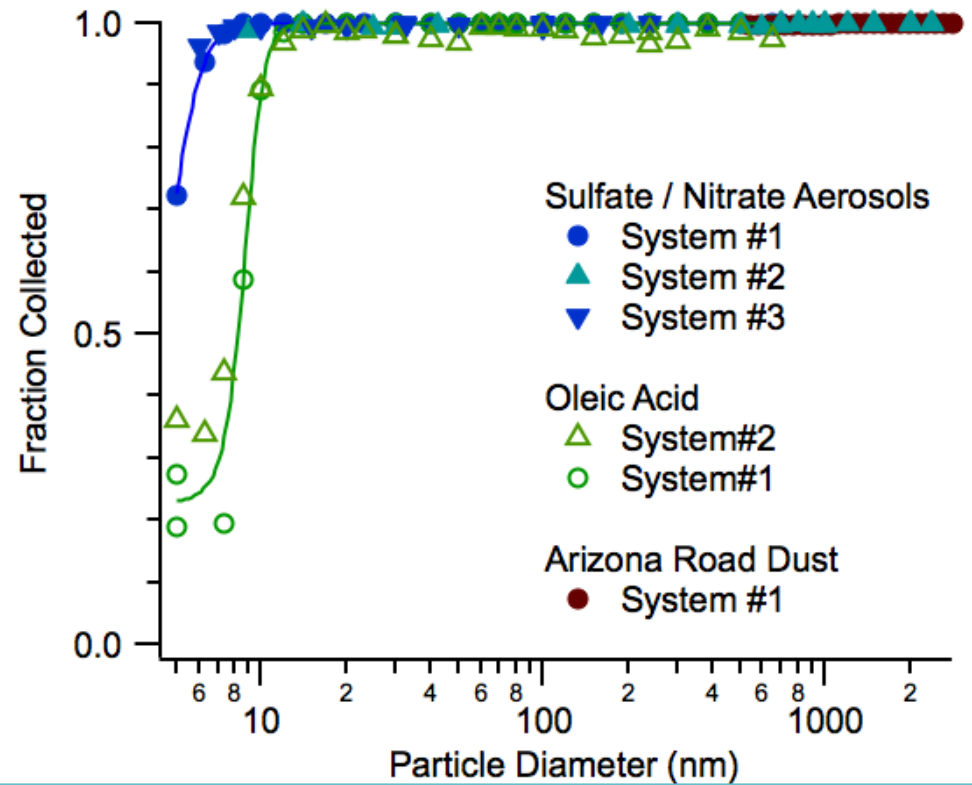
Collection into Liquid, or as Dry Spot



Collection Efficiency



Into Liquid

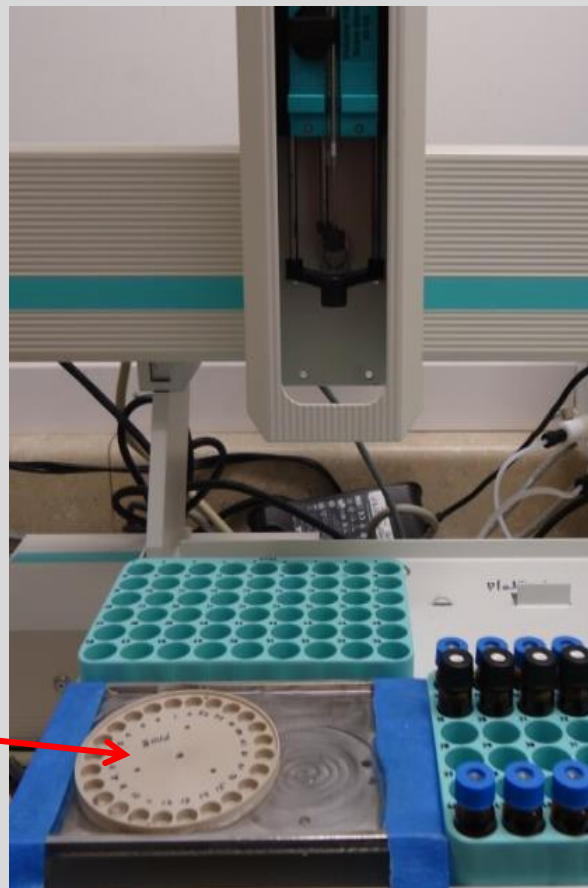


Dry Spot Sampler

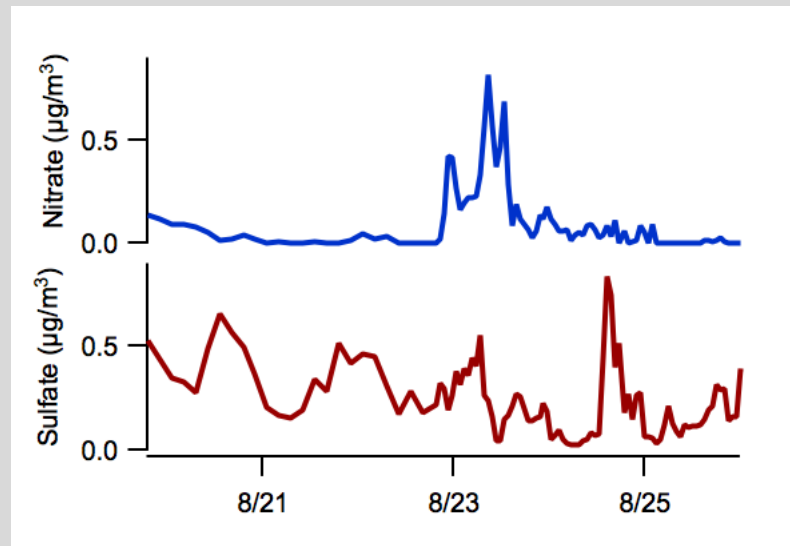
“Dry Spot” as a sequential sampler for monitoring



Field:
sequential collection
onto well plate



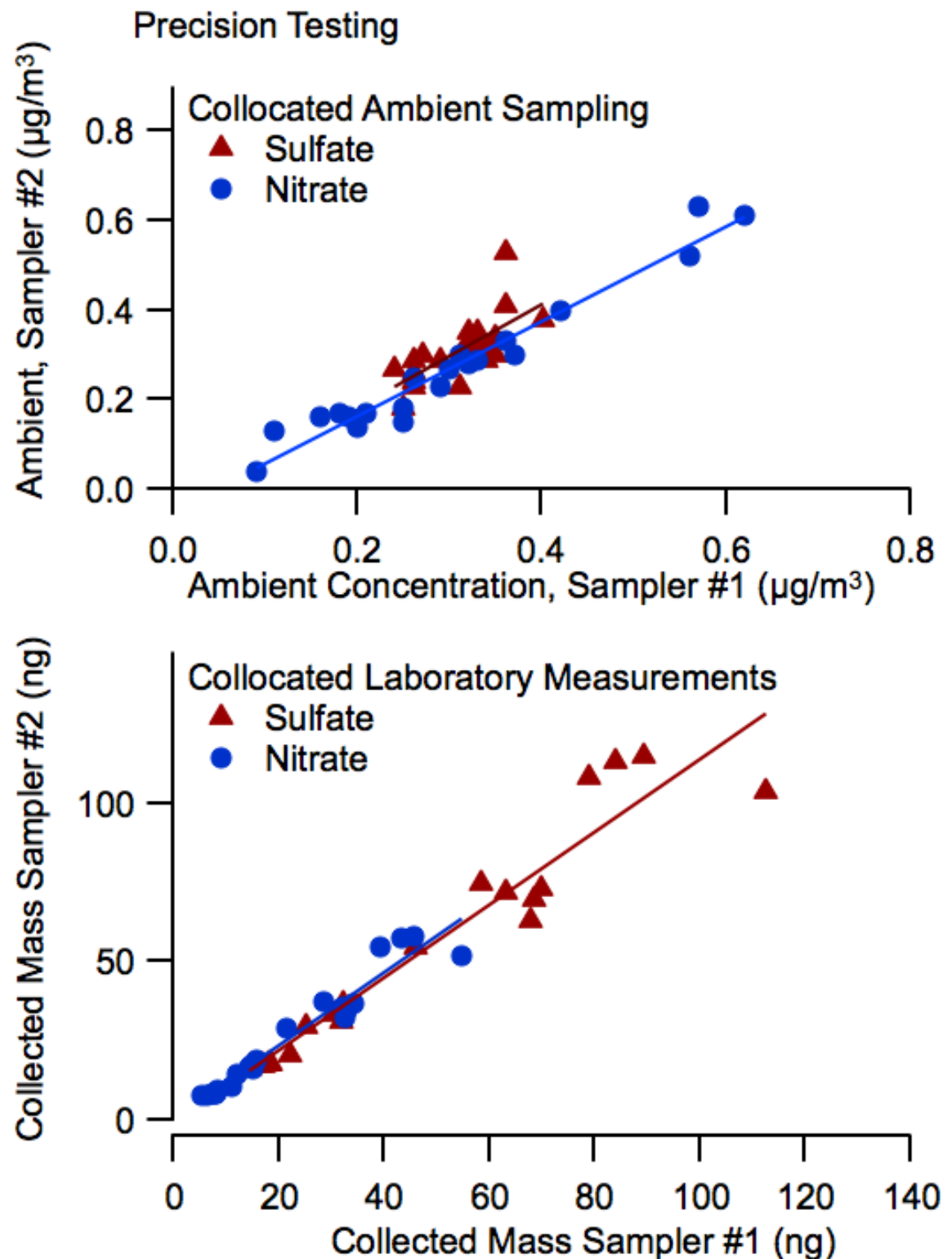
Lab:
place well plate on
autosampler, as it
came from the field.



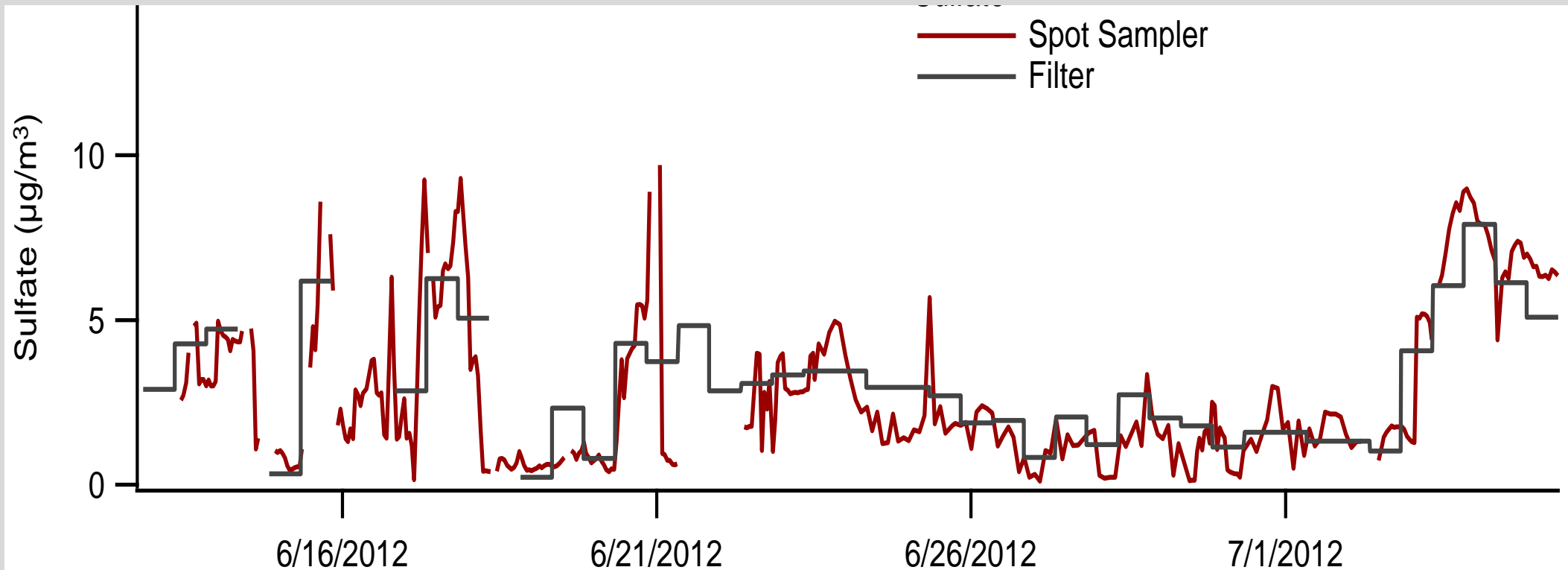
Results:
time-resolved sulfate, nitrate
concentrations.

autosampler adds internal
standard, eluent, handles
extraction and injection onto
liquid chromatograph

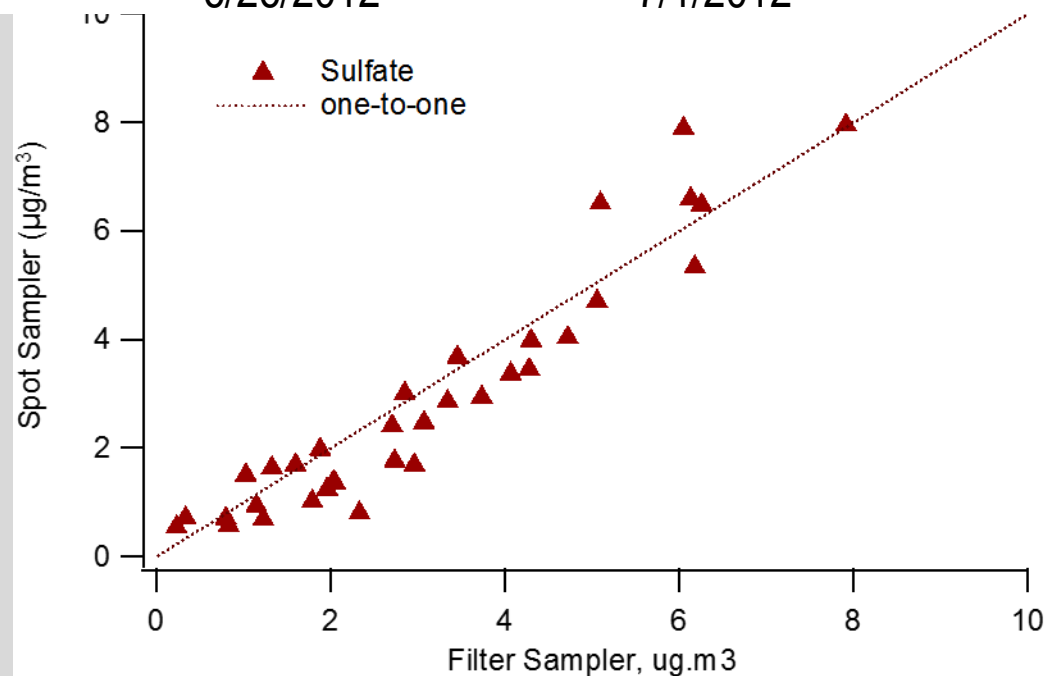
Precision Testing



Colorado State Field Study in Southern California

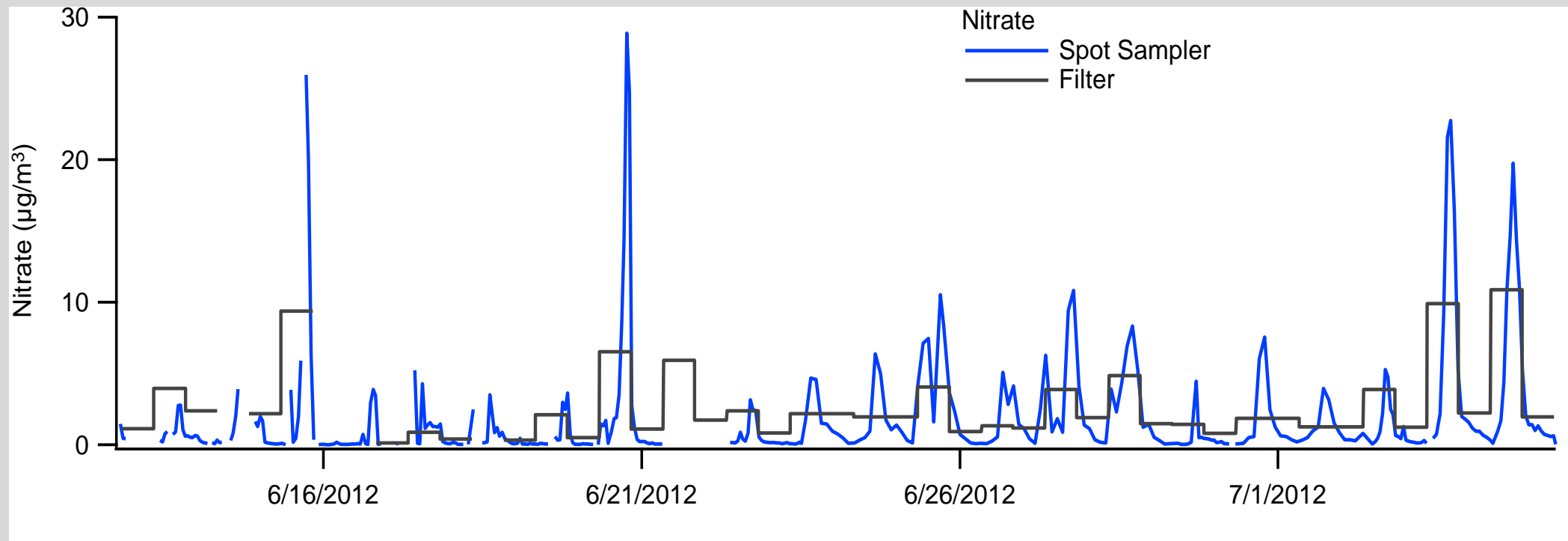


Sulfate:
Comparison to 12-hr
URG Filters

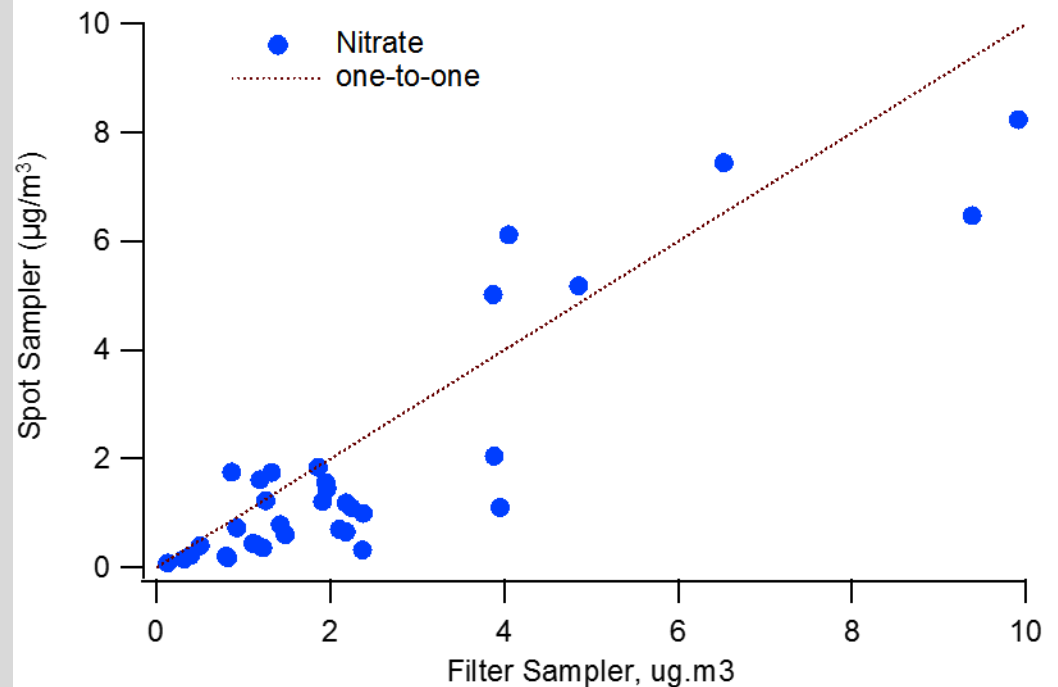


A. Hecobian et al, in preparation

Colorado State Field Study in Southern California



Nitrate:
Comparison to 12-hr
URG Filters



A. Hecobian et al, in preparation

Summary

- **Collection efficiency into liquid or as dry spot on solid surface**
- **Efficiency $> 99\%$ for a broad range of particle sizes**
- **Reproducibility & precision generally $\sim 3\% - 5\%$**
- **Anion Field Comparison: within 10% of filters**
- **PAH Field Comparison: $\rightarrow 15\%$ for individual PAHs**



*available commercially
from Aerosol Devices Inc.*

AerosolDevices.com