

CIMS MEASUREMENTS OF GAS AND PARTICLE ORGANIC COMPOUNDS DURING CLEARFLO – DETLING UK

ASR Meeting 2012
Breakout Session

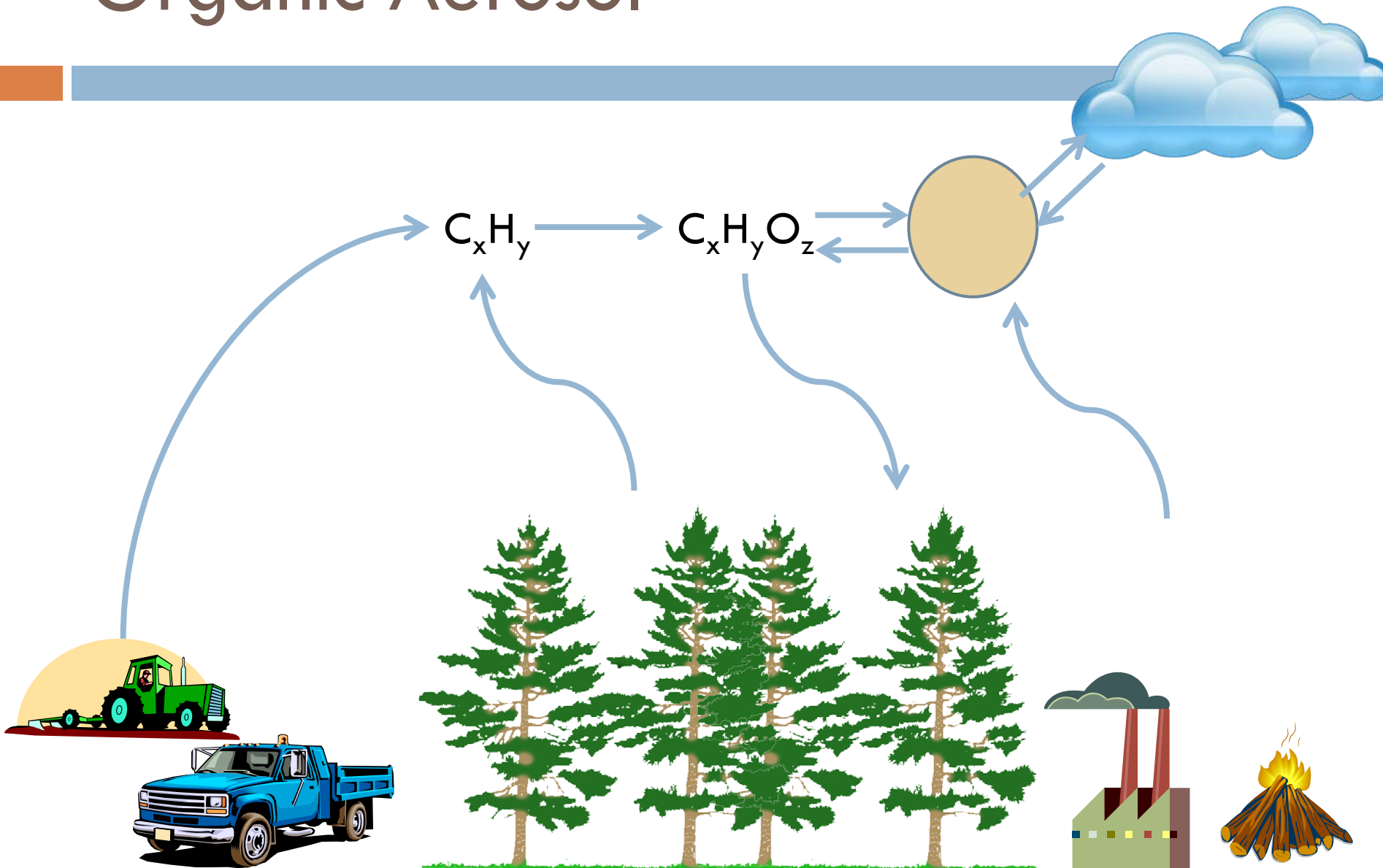
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Acknowledgements

- DOE ASR!
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- Georgia Tech (Sally Ng)
- LANL Group (Manvendra)
- Berk Knighton (Montana)
- Amon Haruta, Kim Nitschke
- U.K. collaborators

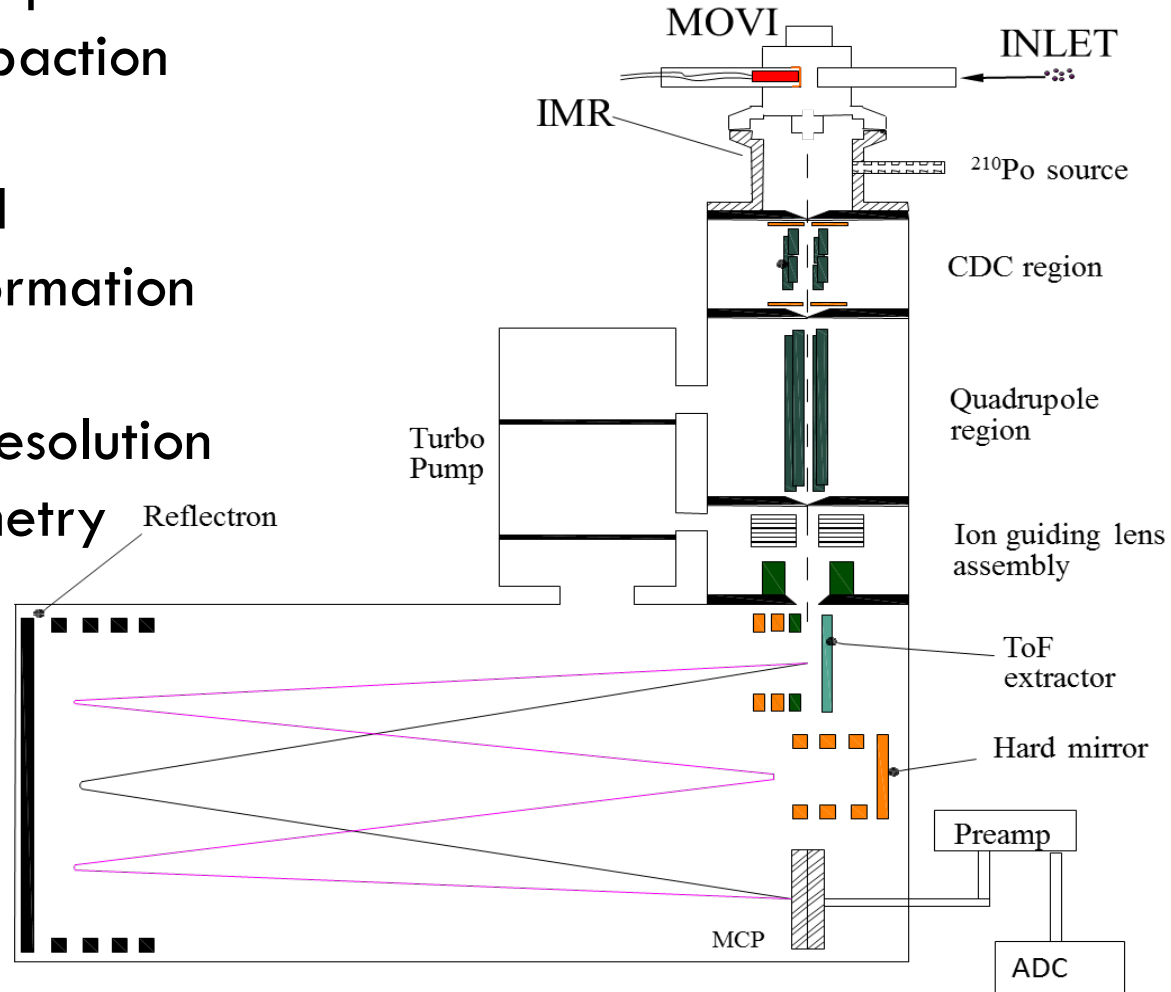


Organic Aerosol

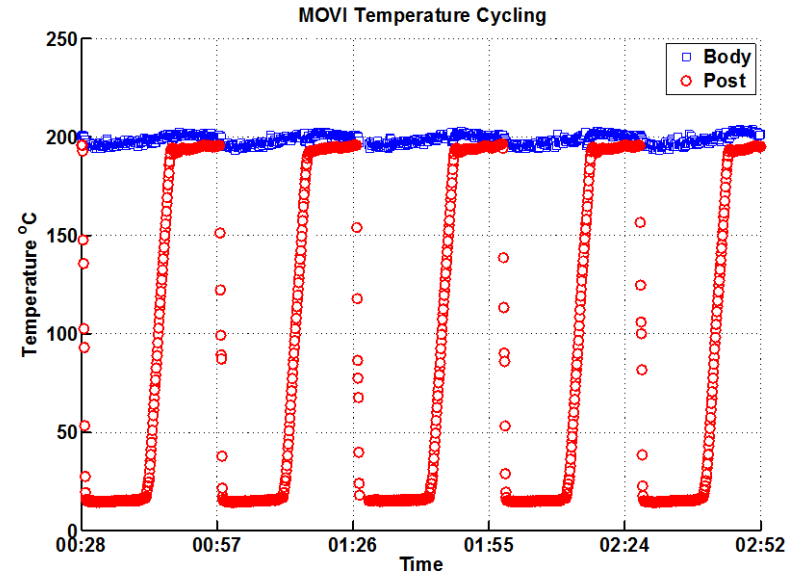
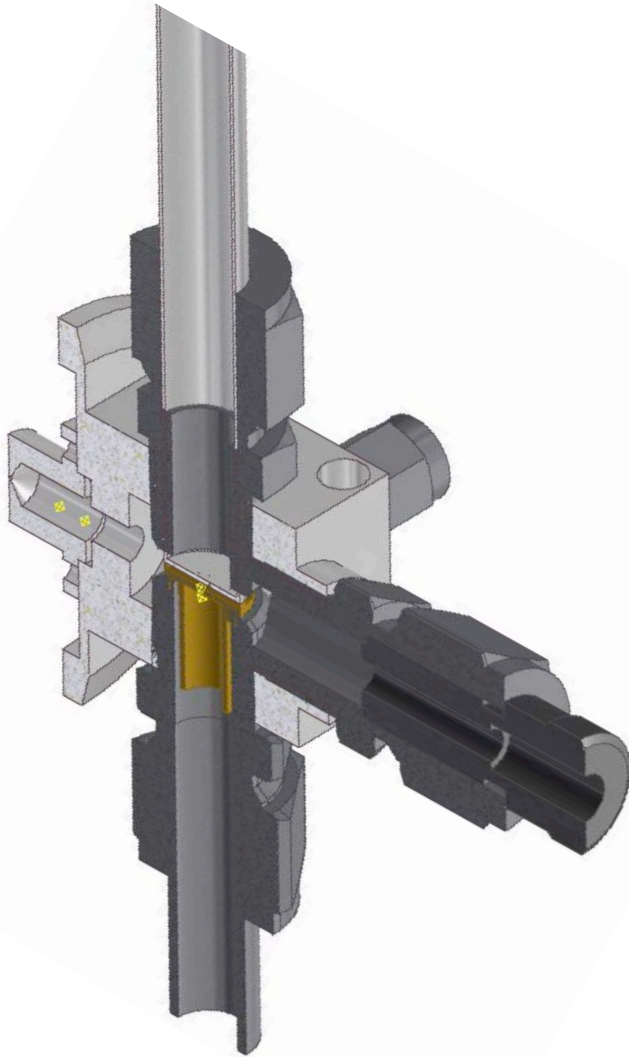


MOVI-HRT_oF-CIMS

- Pre-concentration and gas-particle separation using inertial impaction
- Temperature-programmed desorption for volatility information
- Chemical ionization high-resolution time of flight mass spectrometry

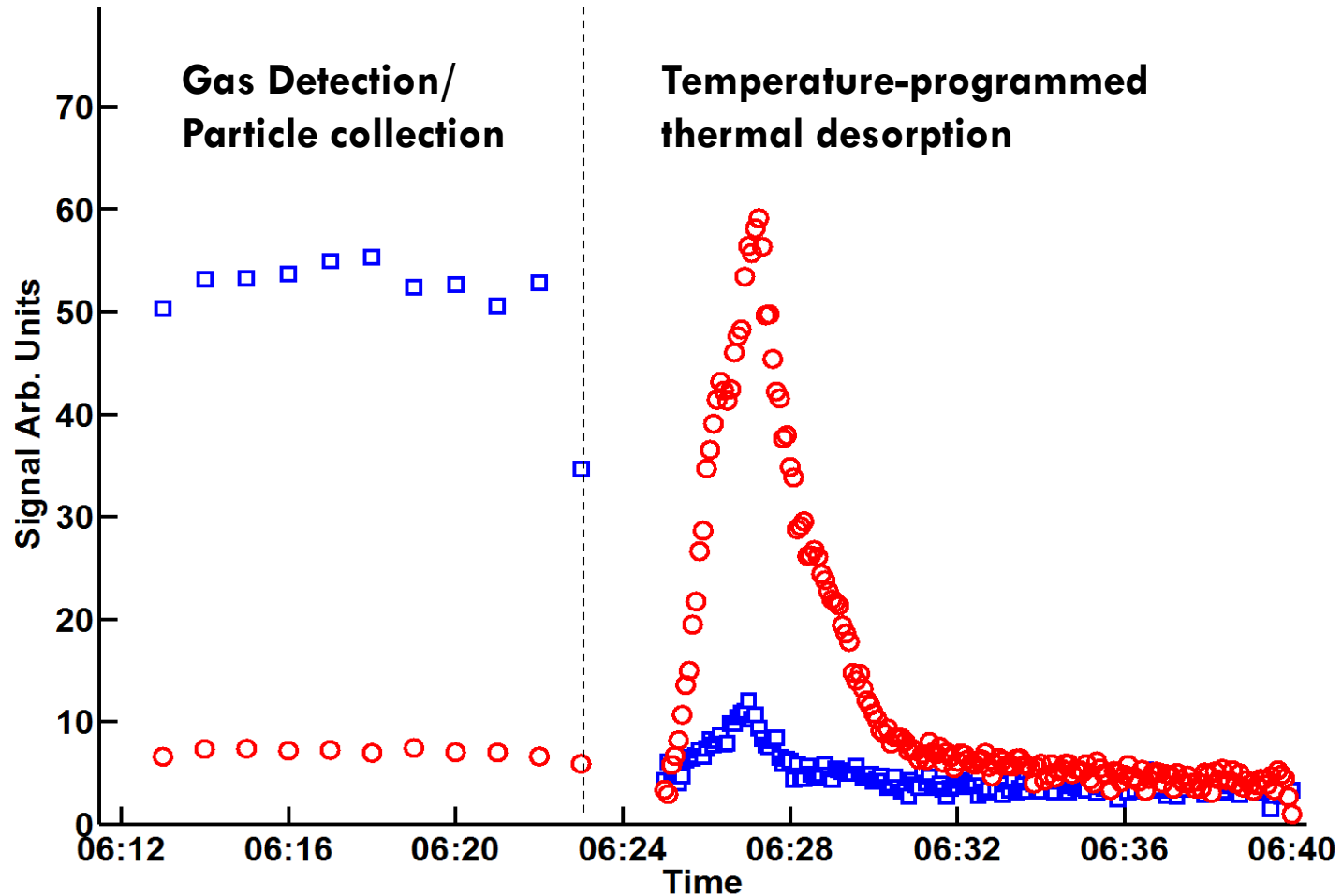


Micro-Orifice Volatilization Impactor



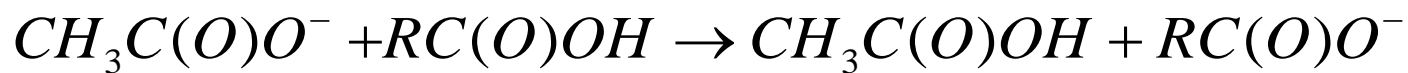
Thermally isolated impactation post
130 nm cut-point
10% pressure drop from ambient
10 slpm sample flow

Micro-Orifice Volatilization Impactor

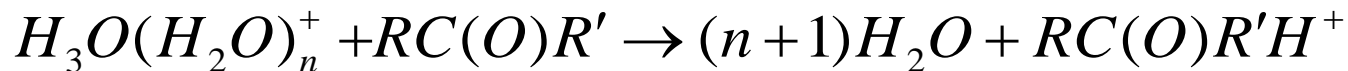


Cl Schemes Used

- Proton abstraction – selectively reacts with acids

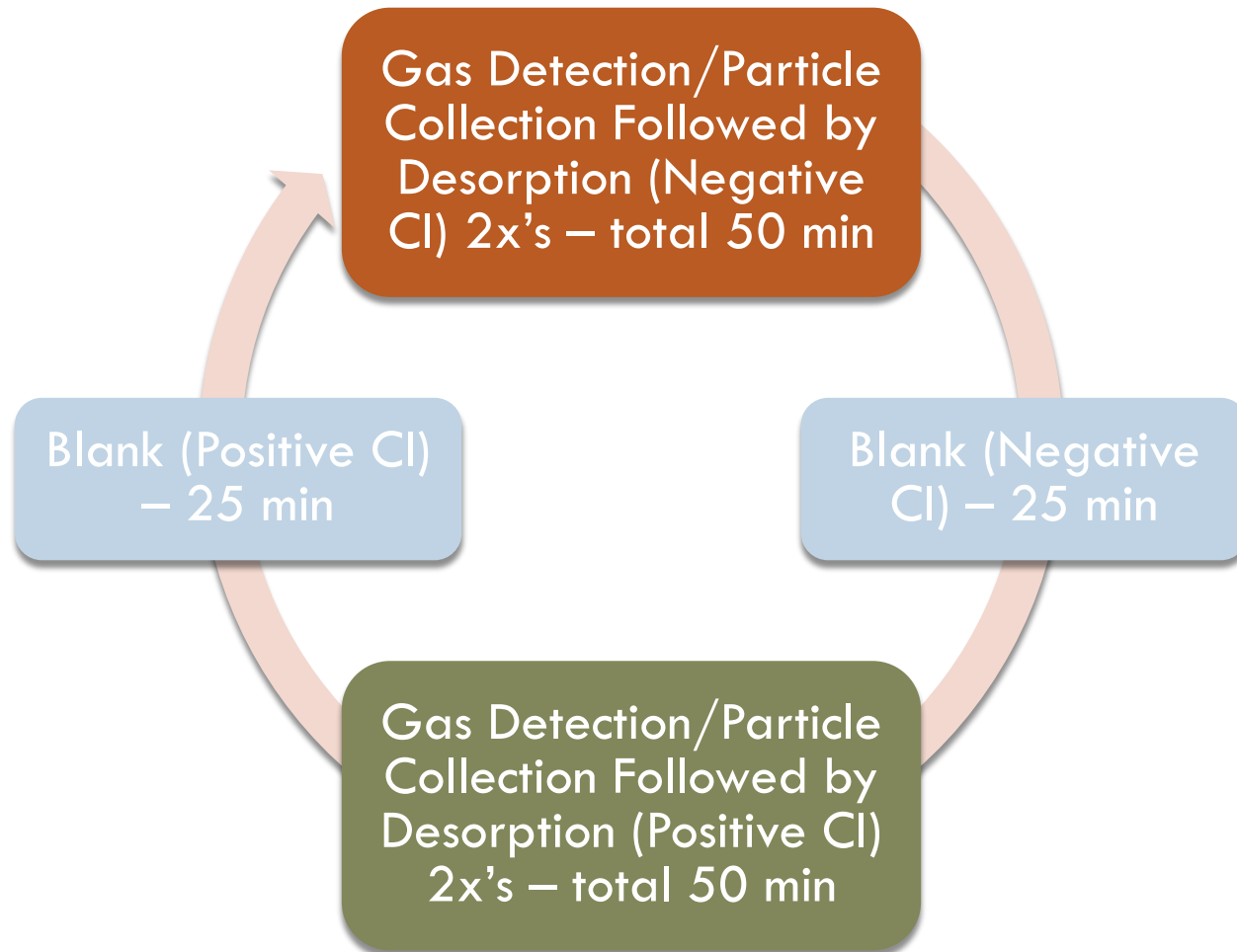


- Multifunctional Carboxylic acids, phenols, inorganic volatile acids (HNO₃, HCl, H₂CO₃...)
-
- Proton transfer – more general, polar organic compounds

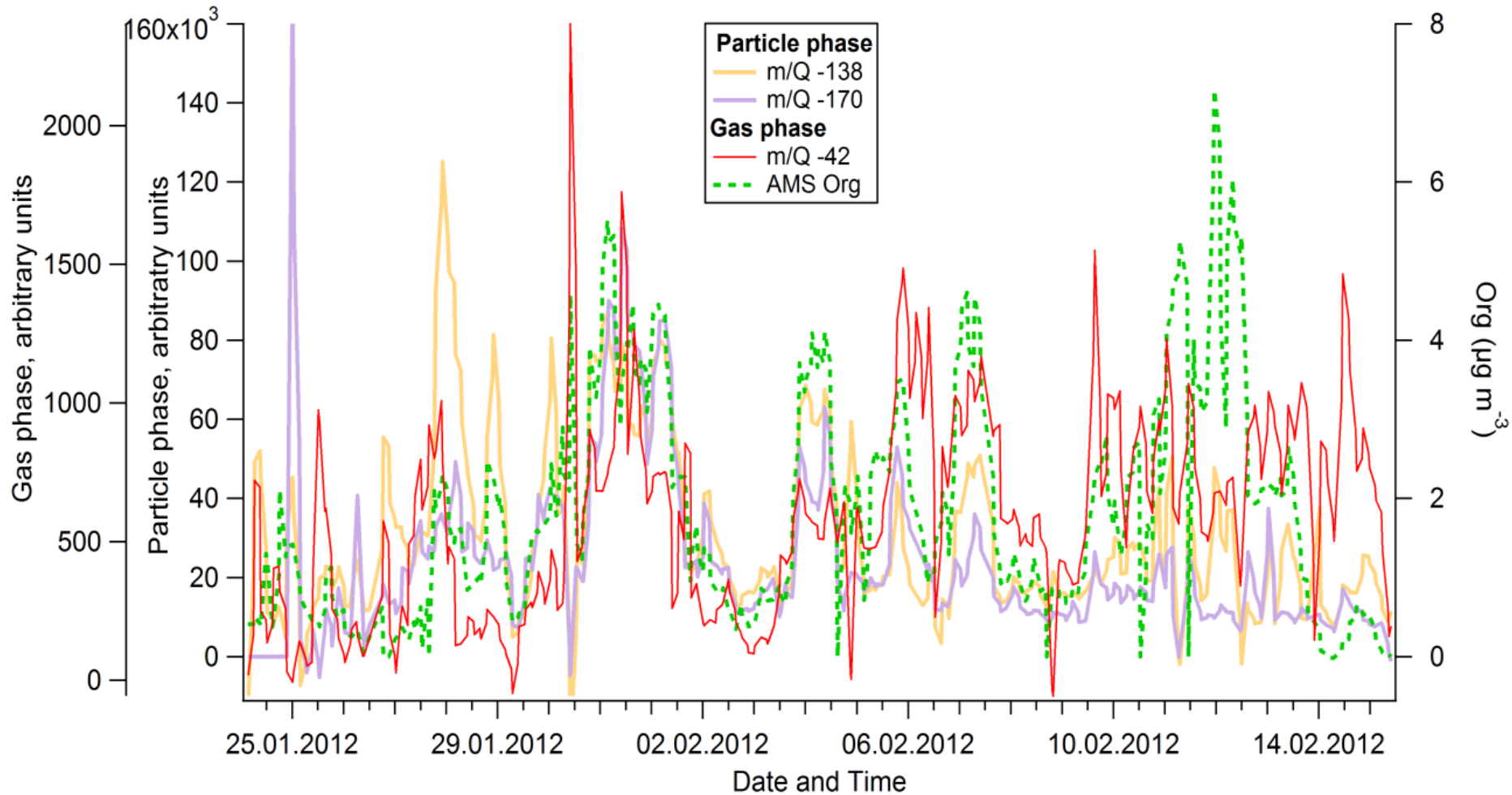


- Multifunctional carbonyls, amines, alcohols and peroxides

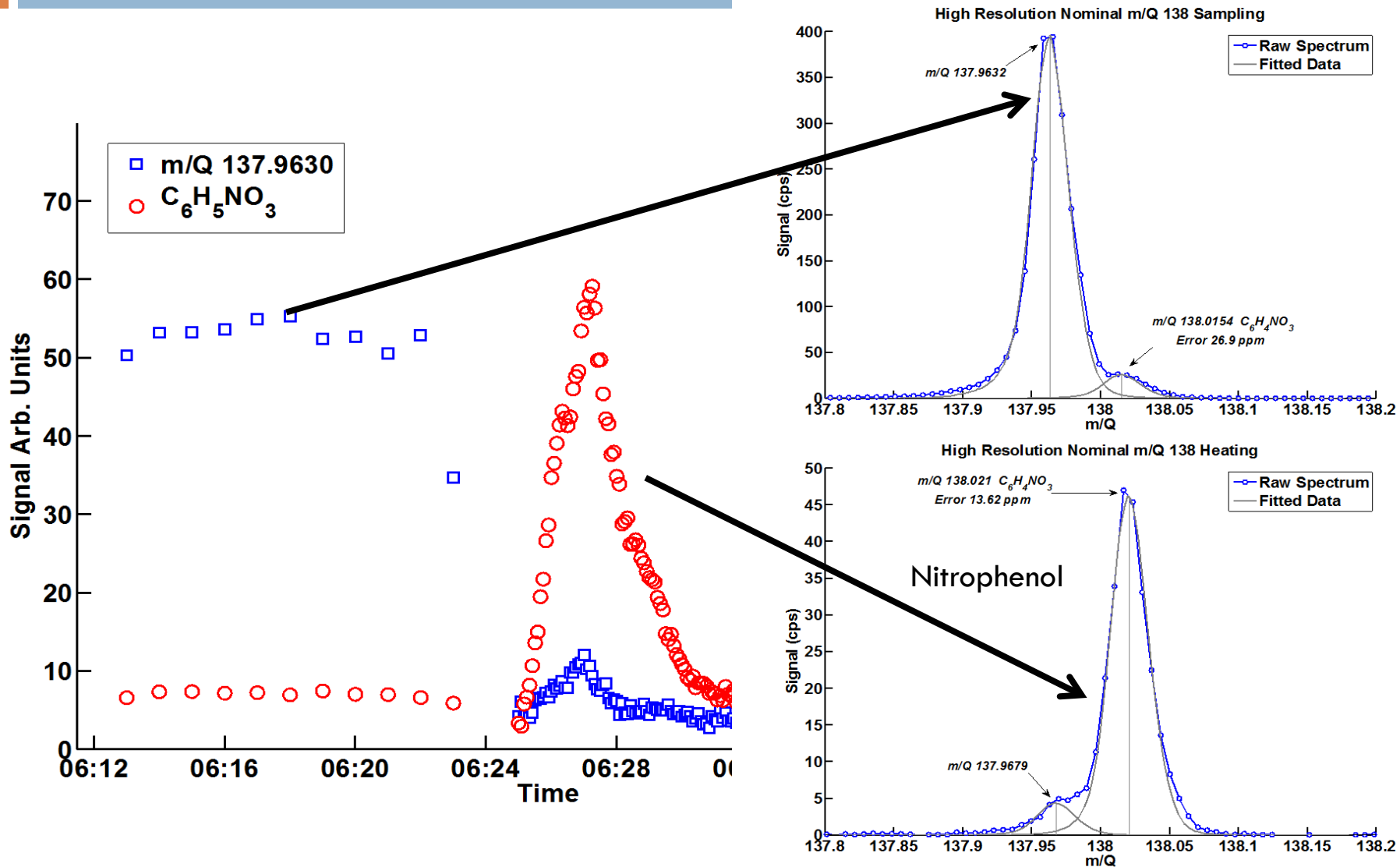
ClearfLo MOVI Protocol



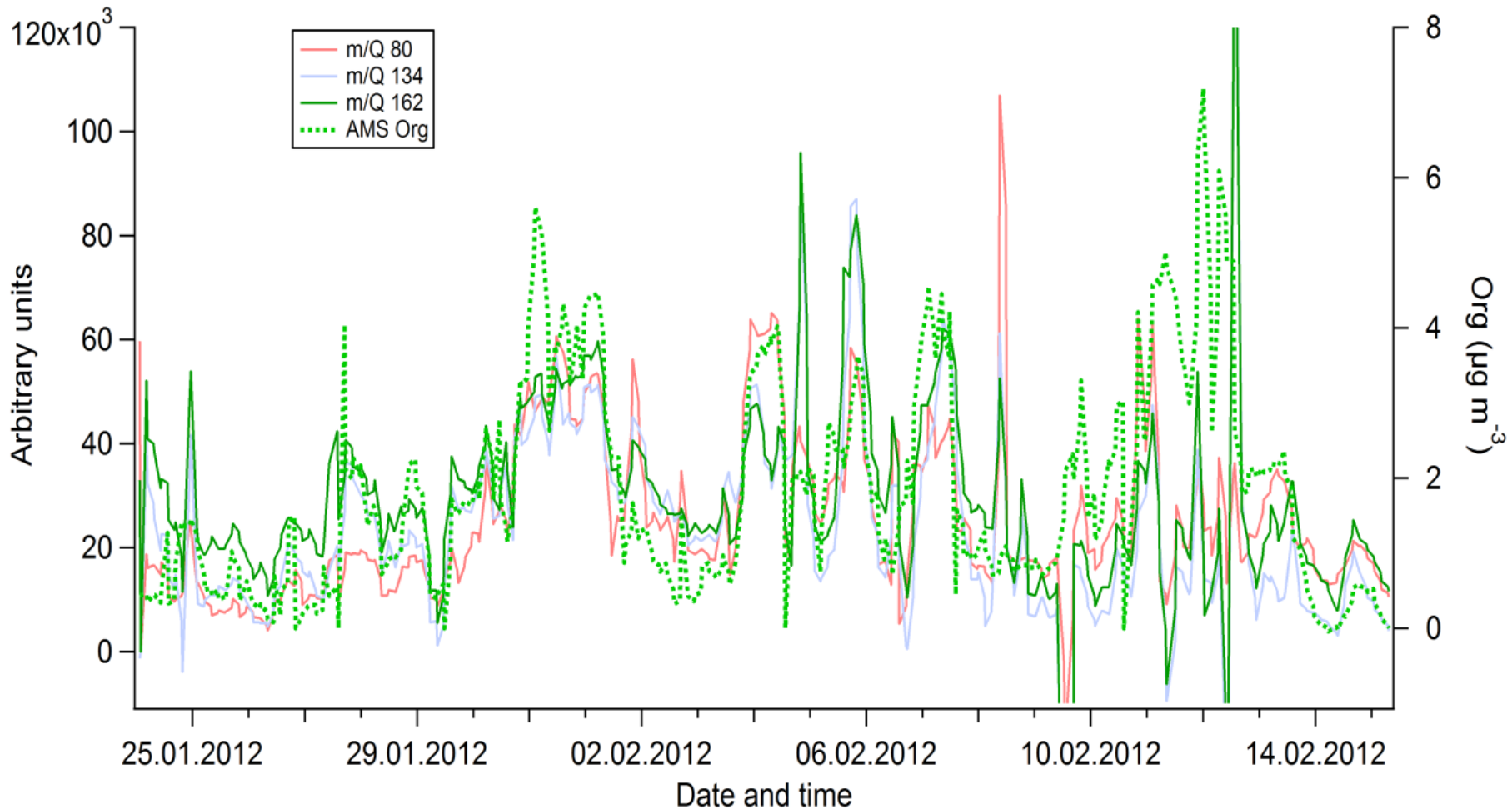
Preliminary Data: (Biofuel Combustion)



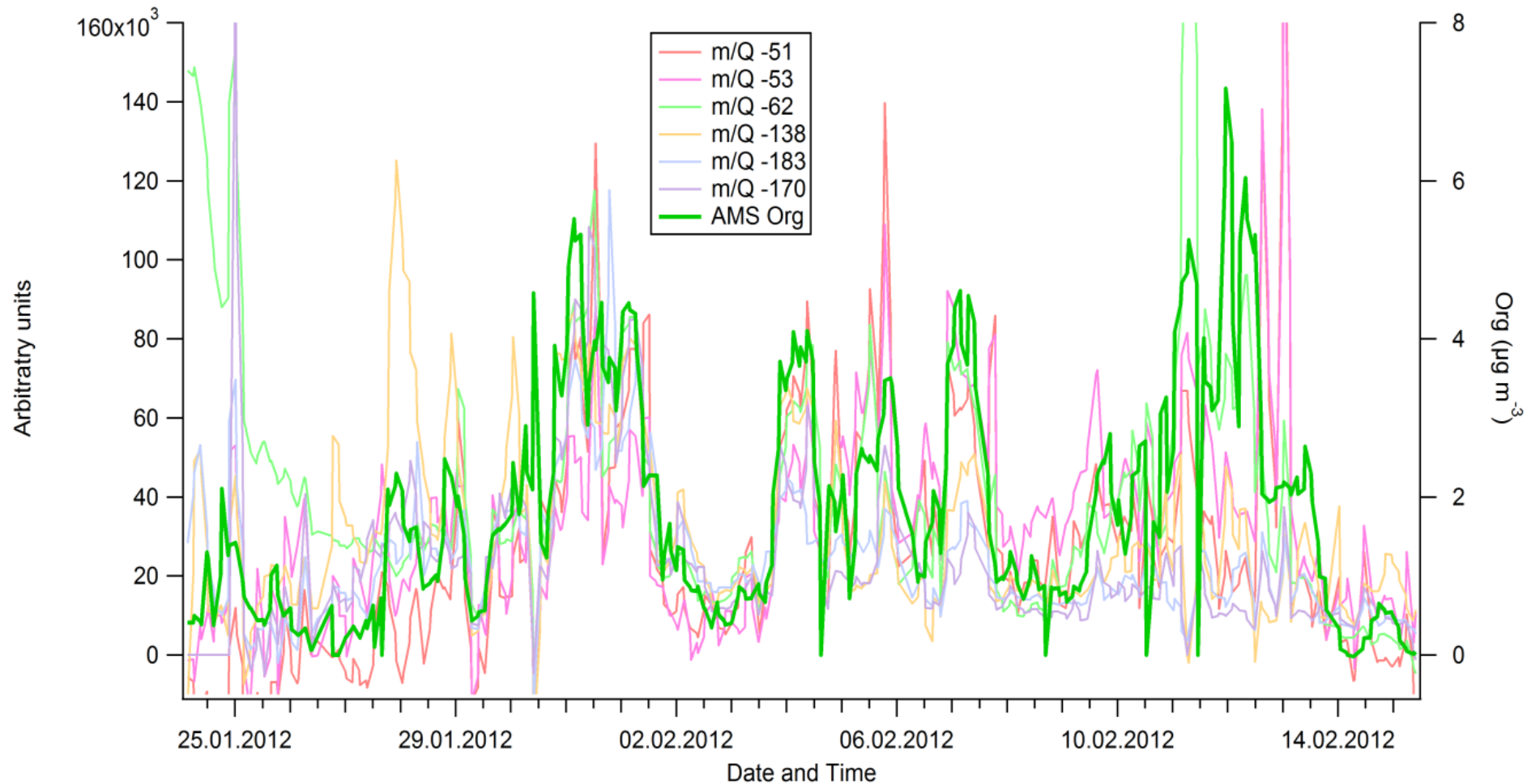
m/Q 138: Nitrophenol (in particles)



Preliminary Data: Positive Ion Mode



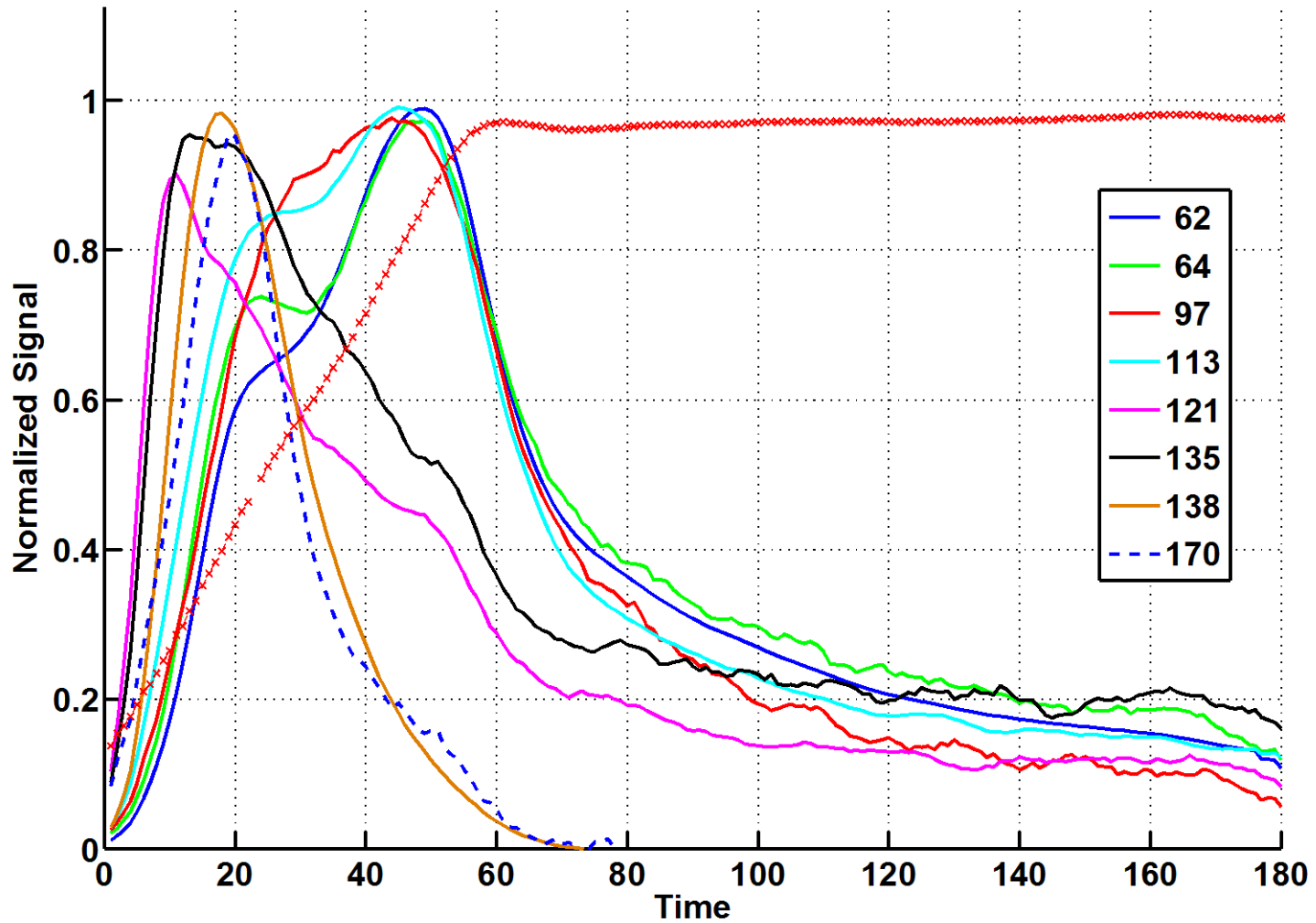
Preliminary Data: Many more



Future Work: Statistical Patterns

- Use multi-dimensional nature of data set to develop a highly constrained apportionment of gas and particle time series to sources, aging processes, etc.
- Describe evolution of mass spectra during temperature-programmed thermal desorption to group into relative volatility bins or perhaps other particle characteristics

Thermal Desorption Example



Summary

- We (Clearflo-Detling) have a rich data set!
- Insights into dominant aerosol sources, gas-particle interactions, and connections between particle composition and climate-relevant properties (e.g. optical properties) yet to be explored

Instrument Calibration

