FIGAERO
(Filter Inlet for Gases and Aerosols)

Felipe Lopez-Hilfiker, **Claudia Mohr**,
Joel Thornton

Department of Atmospheric Sciences, University of Washington, Seattle

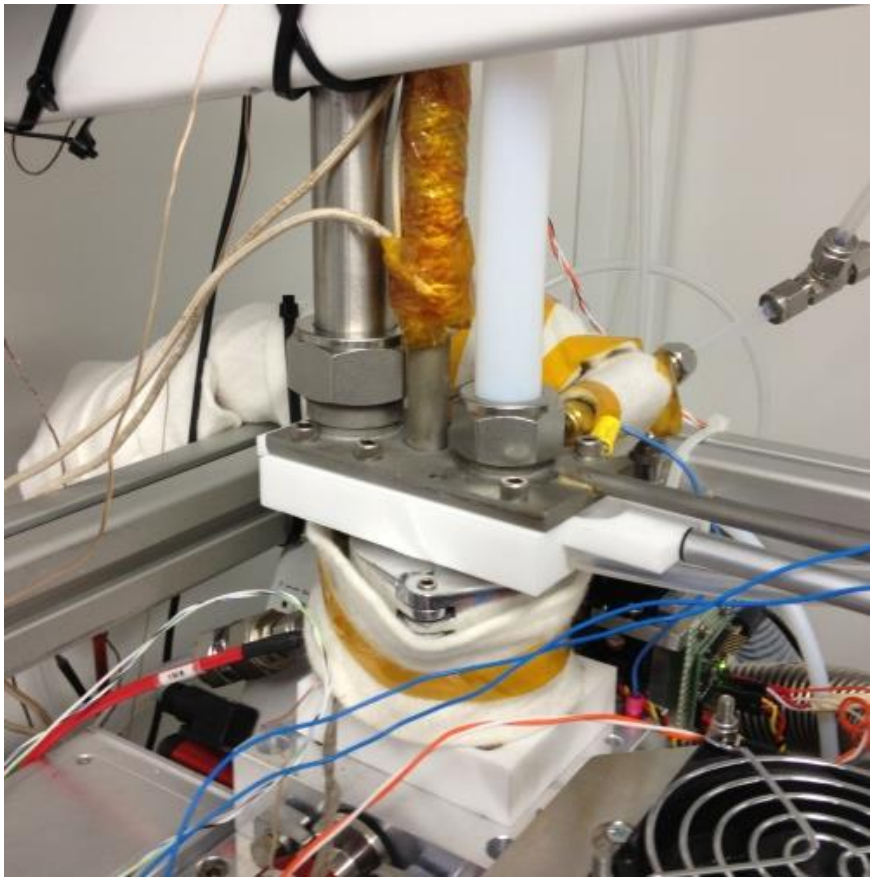
Aerodyne Users Meeting, Prague, September 2013

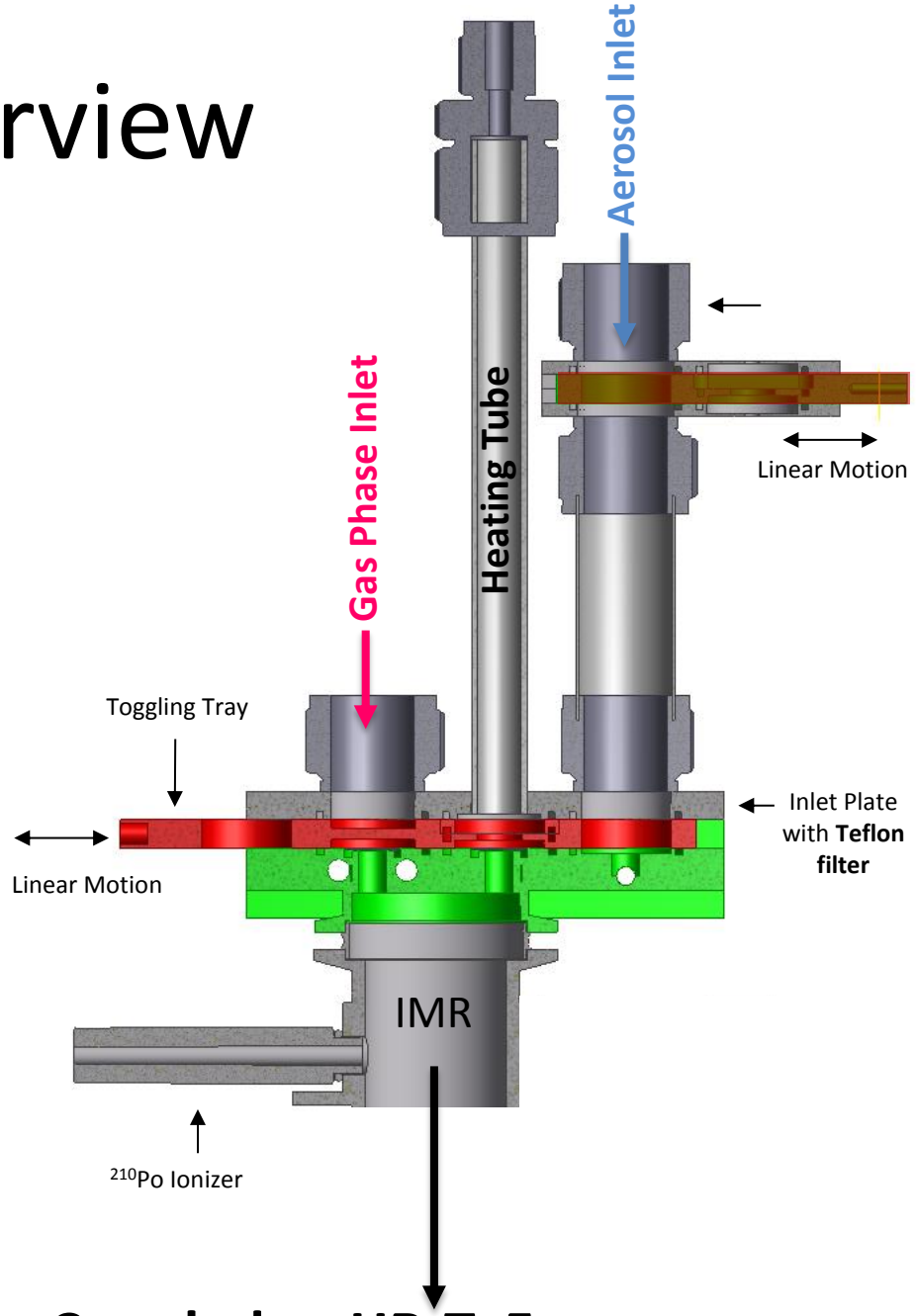
Motivation

- Measuring organic compounds in both gas and particle phase (→ partitioning)
- Difficult due to different properties (→ inlet transmission, interferences)
- Impaction (→ size cut, bounce)

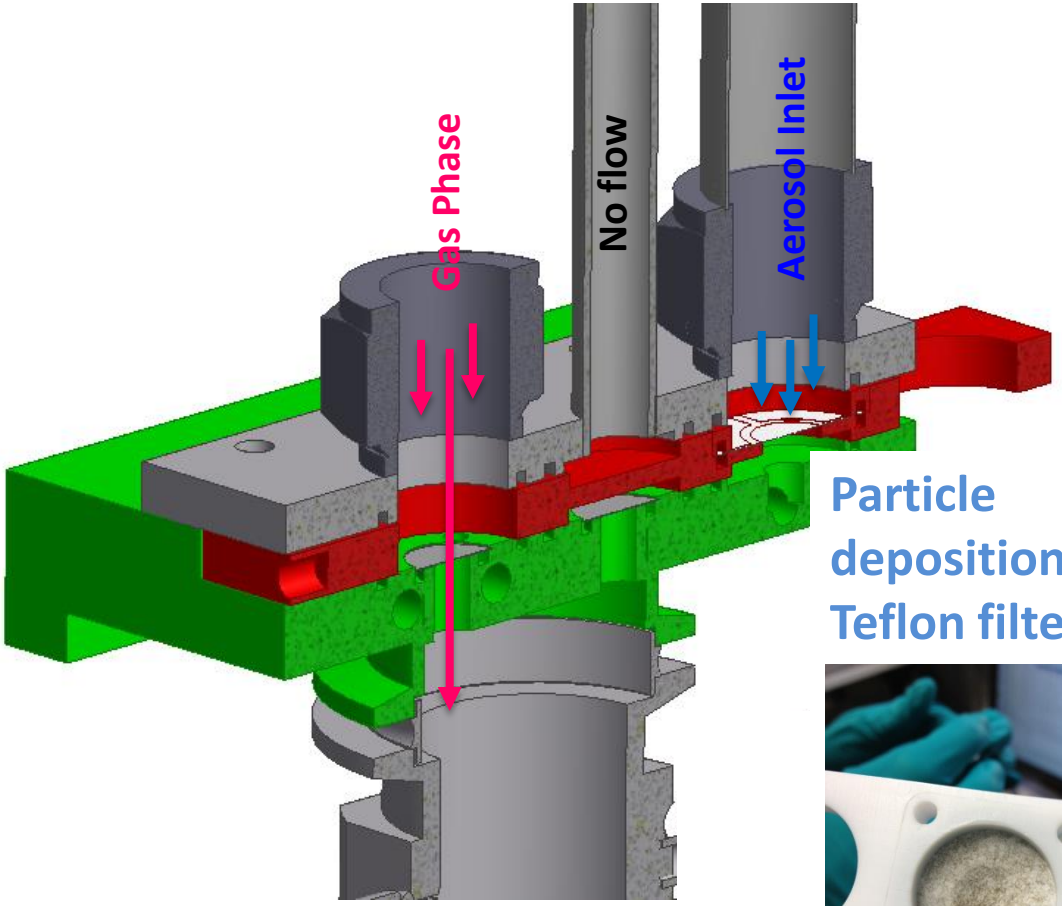
Filter Inlet for Gases and Aerosol (FIGAERO)

Overview

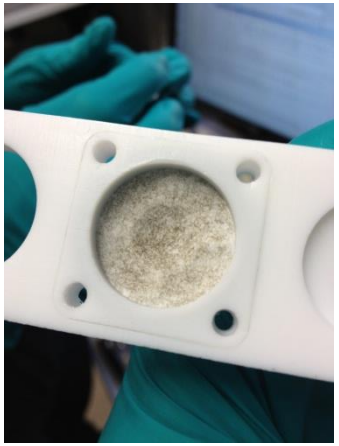



Aerosol Inlet
Gas Phase Inlet
Heating Tube
Linear Motion
Toggling Tray
Linear Motion
Inlet Plate with Teflon filter
IMR
210Po Ionizer
Coupled to HR-ToF-CIMS

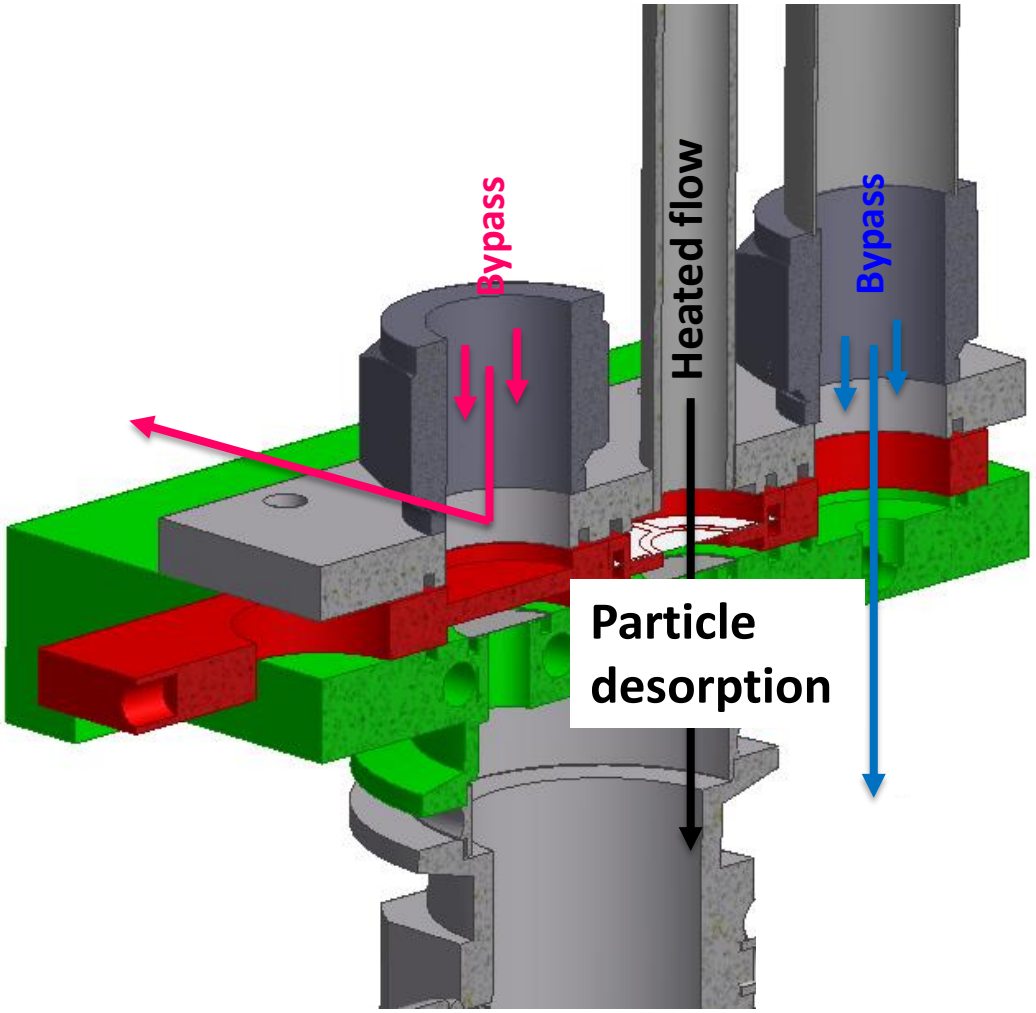
Gas phase/aerosol collection mode



Particle deposition on Teflon filter

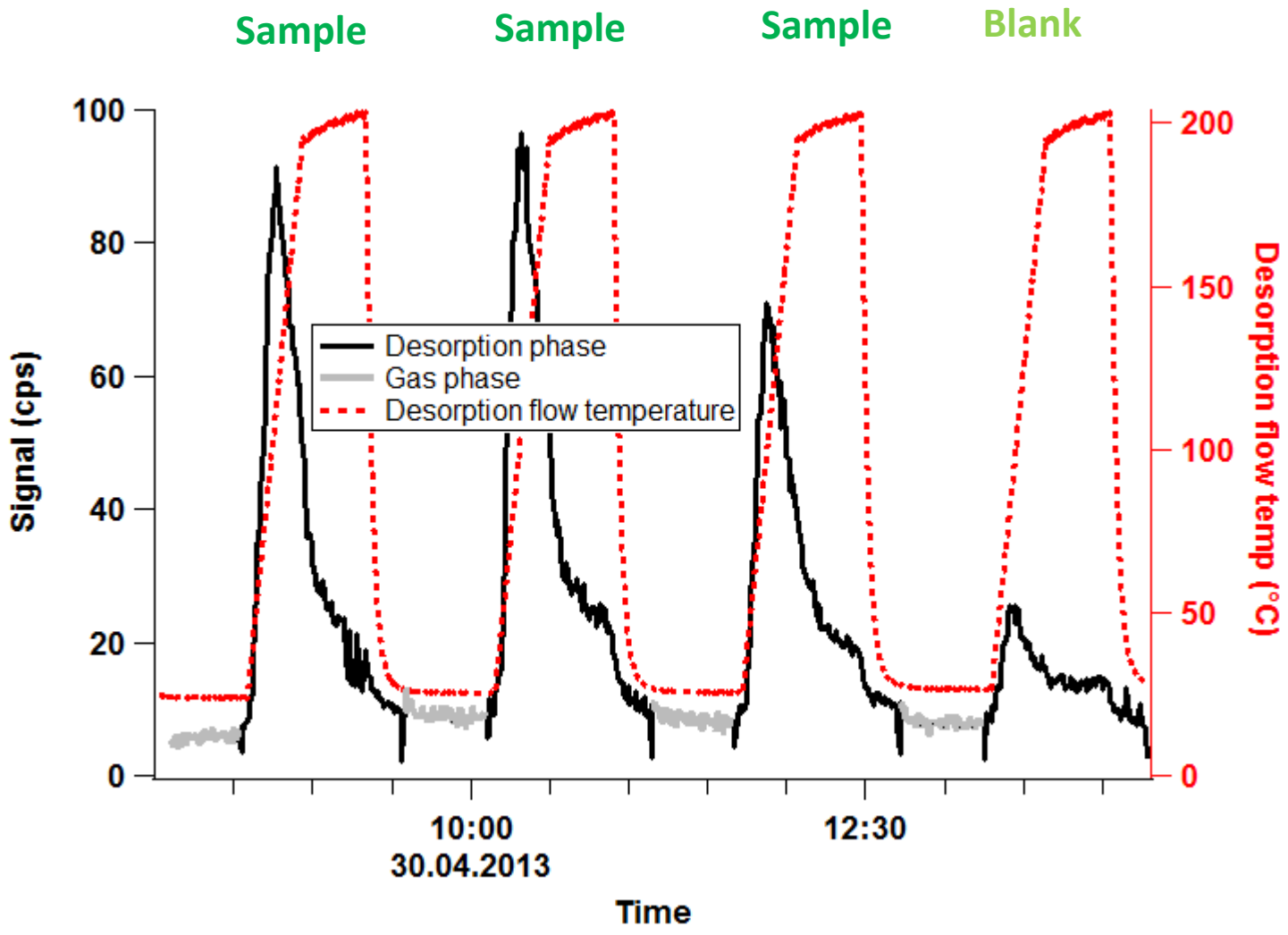


Heating/bypass mode



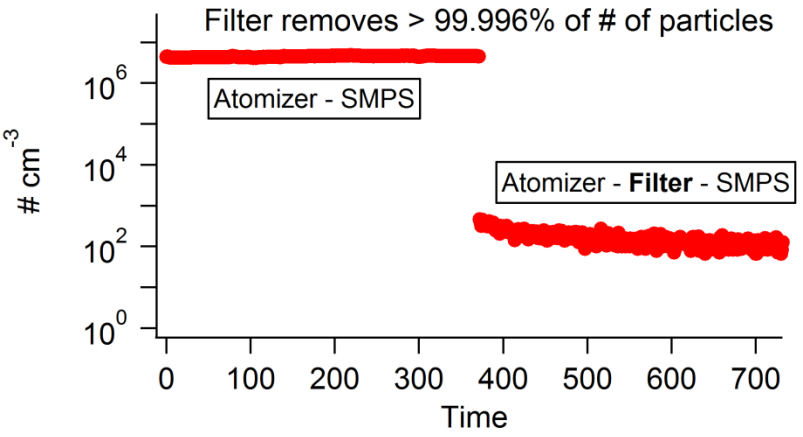
Fully automated switching

Operation

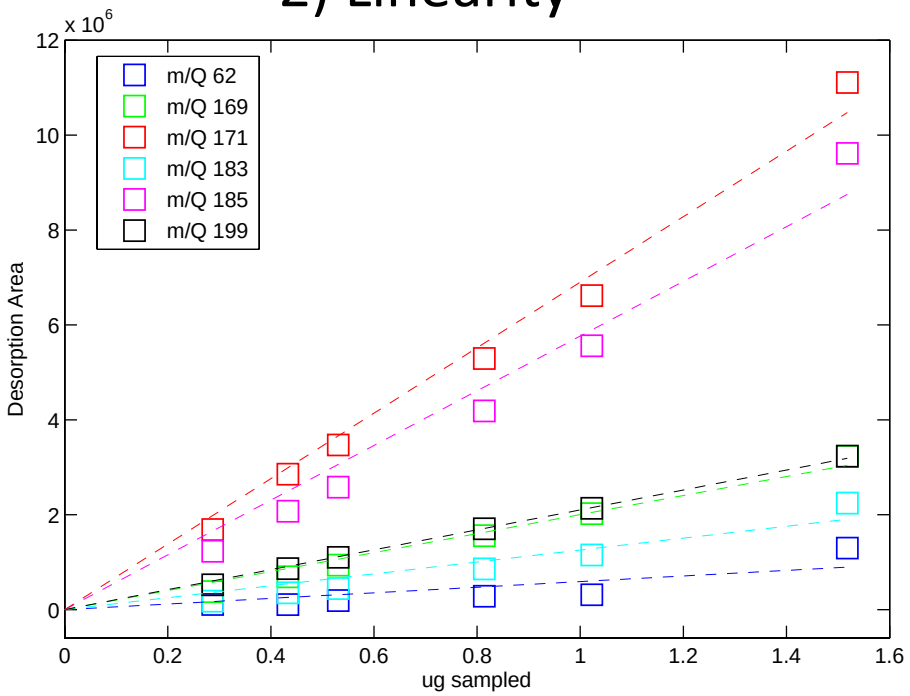

Sample
Sample
Sample
Blank
Signal (cps)
Desorption flow temp (°C)
Desorption phase
Gas phase
Desorption flow temperature
100
80
60
40
20
0
200
150
100
50
0
10:00
30.04.2013
12:30
Time

Performance

1) Collection efficiency



2) Linearity



3) Detection limits

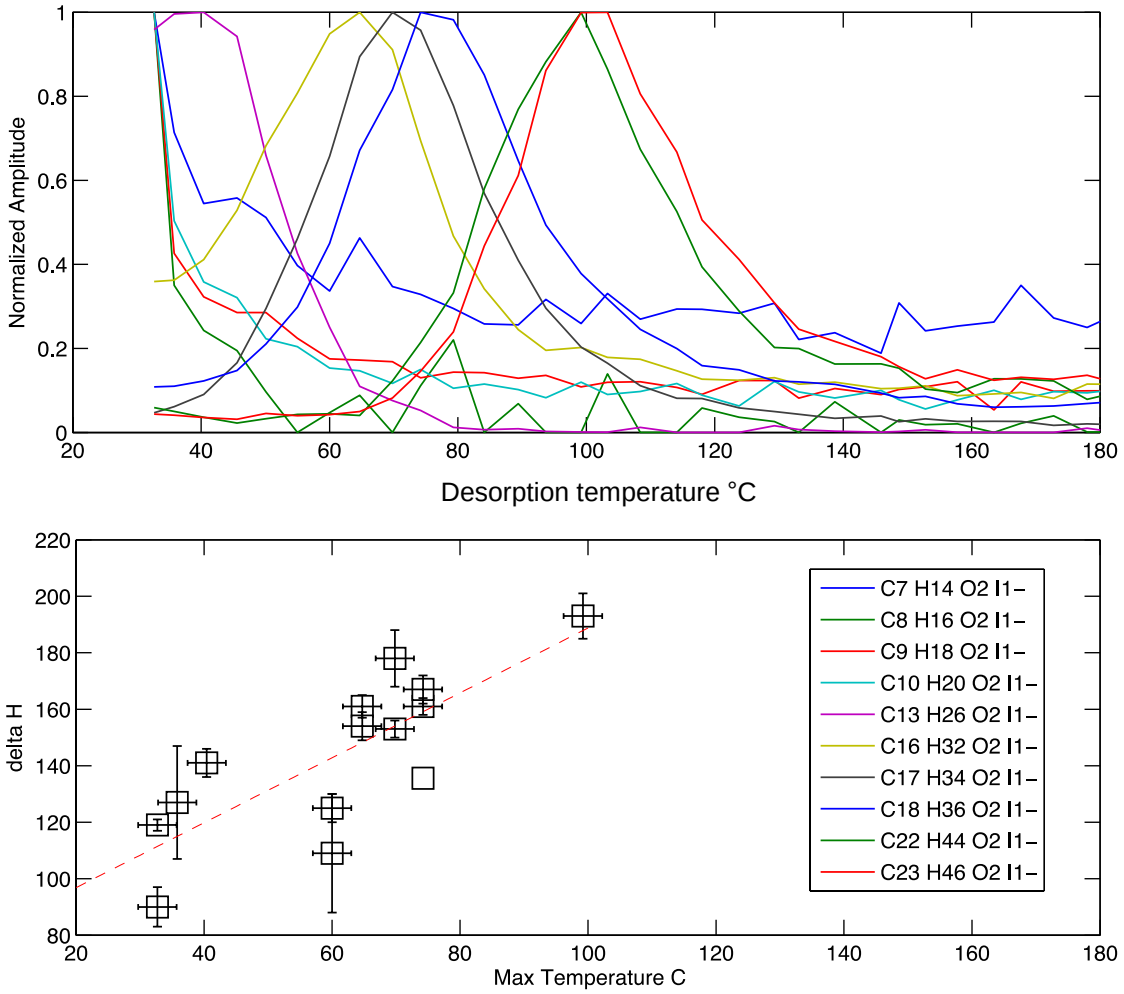
Gas phase:

- Depends on compound, surface area of inlet, concentrations
- < 1 - few ppt

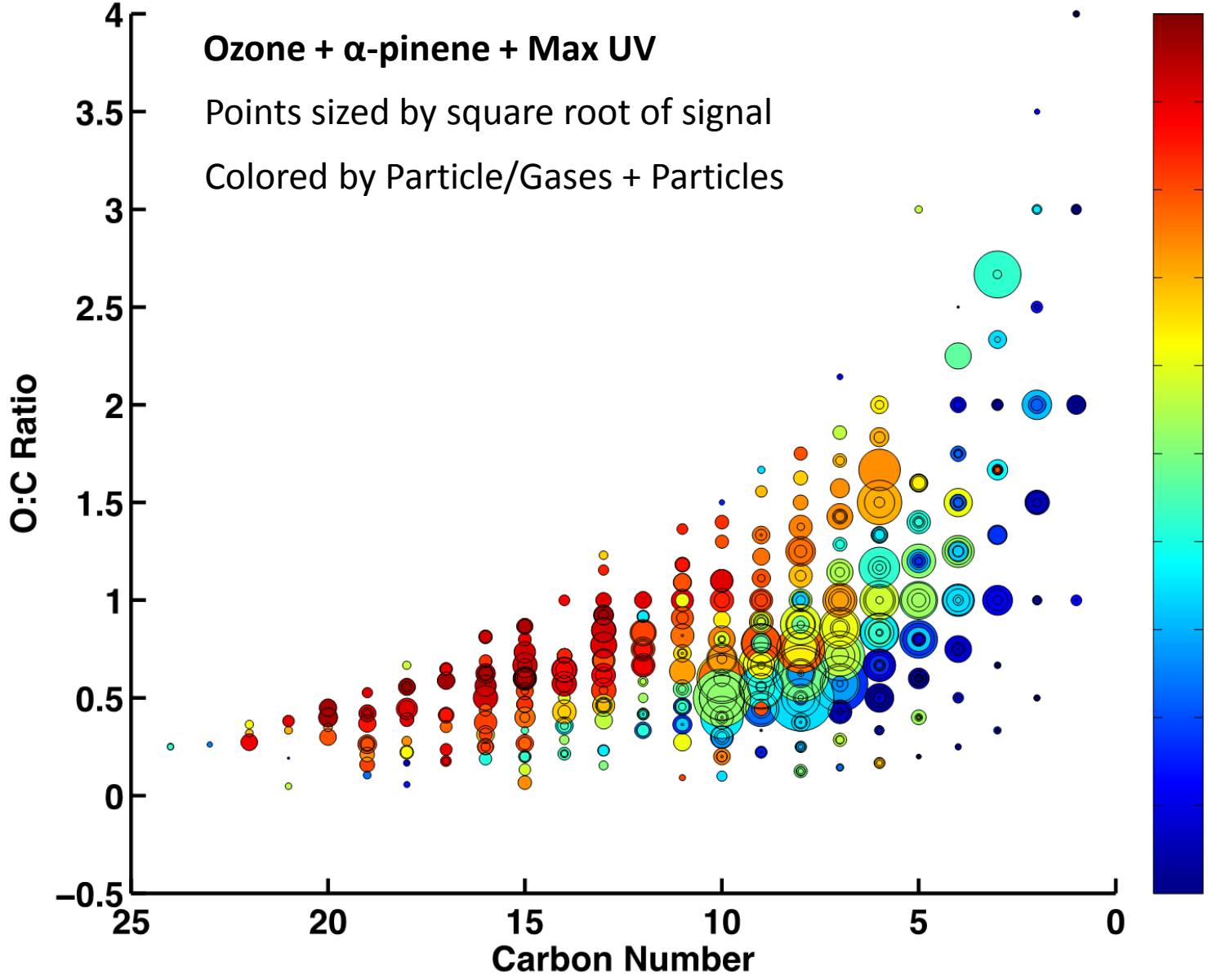
Aerosol phase:

- Set by point-to-point variability in blanks
- Varies with gas phase concentrations (ambient vs chamber), < 1 ng m^{-3}
- Determines time resolution

Thermal desorption - volatility separation

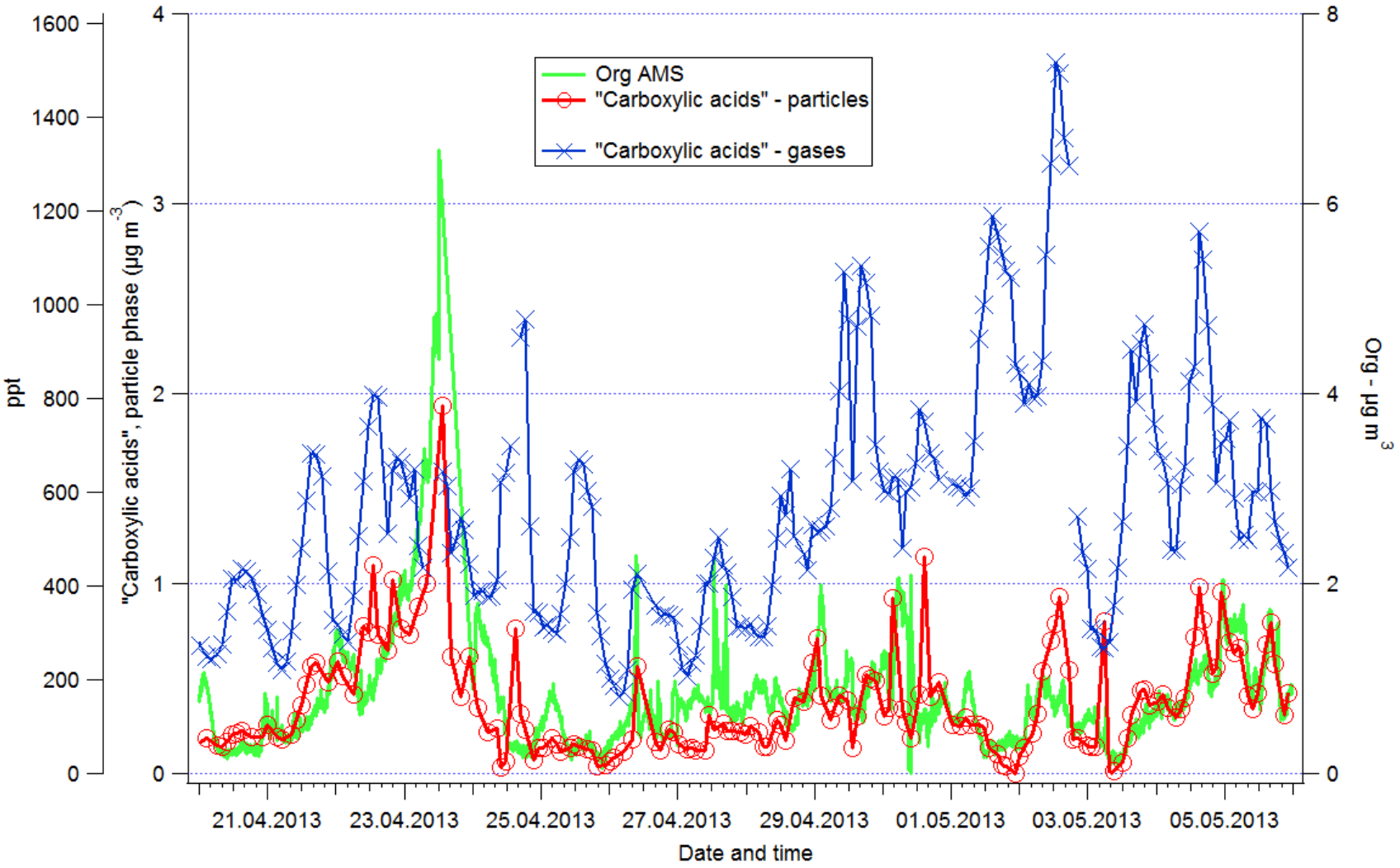


Jülich chamber data: Partitioning

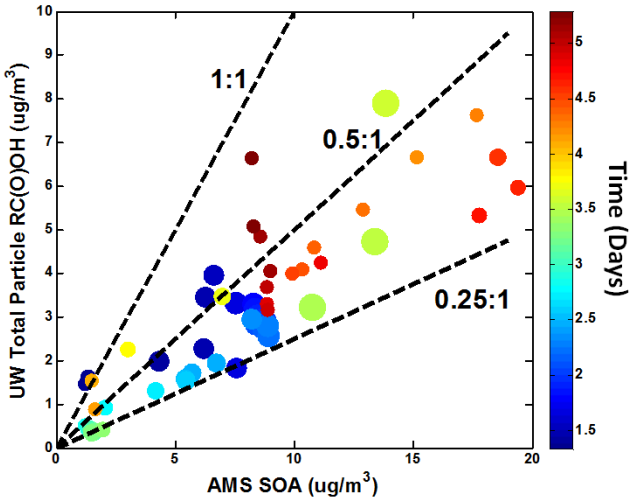


Iodide

Ambient time series – Hyytiälä, Finland



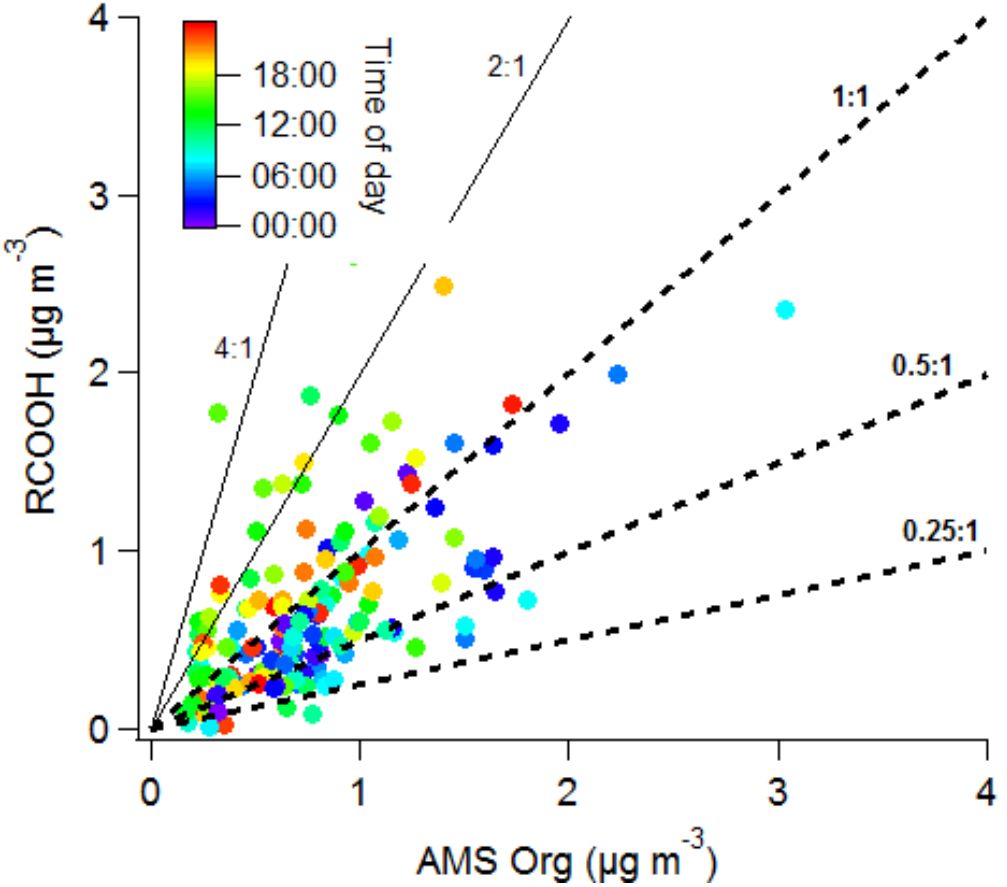
Carboxylic acids vs AMS Org



Jülich Plant Chamber

α-pinene oxidation

Steady state conditions:
80 ppb O_3
20 ppb α-pinene
Sulfate seed aerosol



Summary

- FIGAERO coupled to HR-ToF-CIMS measures both chemical composition of both gases and particles with minimal artefacts
  - **Separate inlets** - less interferences
  - **Teflon filter** – less bounce, no cutpoint
  - Low detection limits
  - Enables partitioning analysis
  - Thermogram analysis
  - Chamber and ambient data