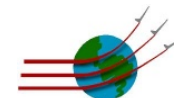




University
of Colorado
Boulder

HR-ToF-AMS: Non-Refractory Total Speciated Submicron Aerosol Composition and Chemistry



Principle: The CU aircraft version of the Aerodyne High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS) detects non-refractory submicron aerosol composition by impaction on a vaporizer at 600°C, followed by electron ionization and time-of-flight mass spectral analysis. Size-resolved composition can be quantified by measuring the arrival times of the aerosol at the vaporizer.

Aircraft Operation: (1 min cycles, can be adjusted to meet mission goals):
46 s total concentration measurements (1 s resolution)
5 s size distribution measurements
9 s Background + Overhead

Data Products:

Aerosol Mass Concentrations:

Organic aerosol (OA), SO_4 , NO_3 , NH_4 ,
Chloride

OA Chemical Markers: f_{44} (Secondary OA),
 f_{57} (hydrocarbon-like OA), f_{60} (biomass
burning OA), f_{82} (isoprene epoxide-SOA)

All products are available in real-time

More advanced products:

- O/C, H/C, OA/OC
- Particle organic nitrates (RONO₂)
- Ammonium Balance, estimated pH
- OA components by positive matrix factorization

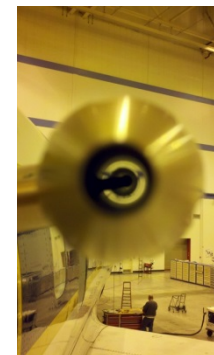
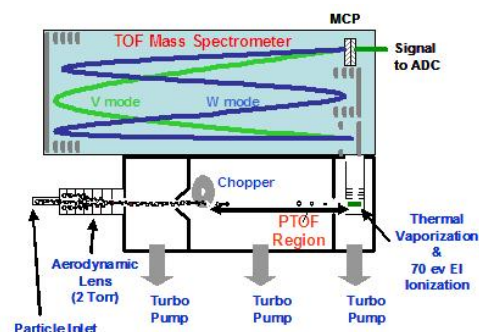
Detection Limits (1s, ng sm⁻³):

Sulfate:	30
Nitrate:	60
Ammonium:	2.0
Chloride:	70
OA:	700

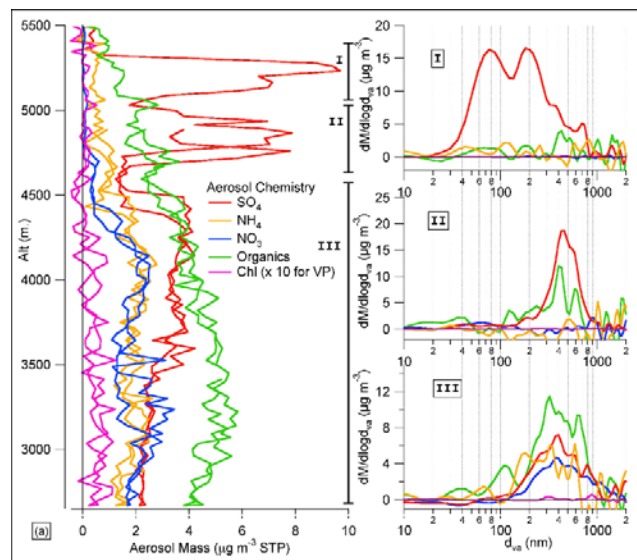
For detailed OA analysis, longer averaging (3-30 s, depending on OA concentration) is needed. A 1 min product is hence available as well.

Personnel

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AMS Schematic (left) and aircraft inlet used (right)



Example of speciated altitude profiles and aerosol size distributions at different altitudes. MILAGRO