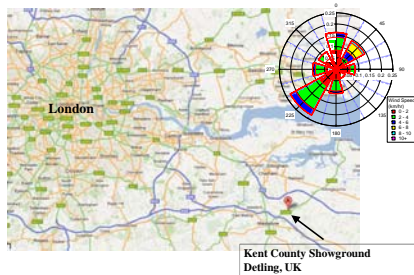


Poster 124. Overview of ClearfLo: Study of Aerosol Sources and Processing at a Rural Site Southeast of London

L. R. Williams¹, S. Herndon¹, J. Jayne¹, A. Freedman¹, B. Brooks¹, J. Franklin¹, P. Massoli¹, E. Fortner¹, P. Chhabra¹, M. Zahniser¹, H. Stark¹, T. Onasch¹, D. R. Worsnop¹, F. Lopez-Hilfiker², C. Mohr², J. Thornton², N. L. Ng³, L. Xu³, B. Knighton⁴, M. Dubey⁵, A. Aiken⁵, K. Gorkowski⁵, S. Liu⁵, T. Martin⁶, R. Coulter⁶, S. Visser⁷, M. Furger⁷, P. Zotter⁷, and A. S. H. Prévôt⁷

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Clean Air for London (ClearfLo) Winter Intensive Detling Site (Jan-Feb 2012)



- Study of London air pollution at an urban street site, an urban background site and rural sites in order to understand transport and aging of the urban plume.
- We provided an extensive suite of instruments at the rural site at SE of London in Detling, UK.
- During the one month deployment, we sampled London outflow, continental outflow and local pollution sources.
- Understand air mass sources and aging, and correlations with London urban measurements.

- Closure between optical properties and chemical composition including black carbon.
- Absorption enhancement by coatings on black carbon.
- Instruments at Detling:

Gas-Phase Measurements:

- NO, NO₂, NO_x, O₃, N₂O, CO₂, CO, NH₃, HCHO
- PTR-MS and GC/FID: VOC's
- MOVI-CI-ToF (oxygenated HC's)

Particle Measurements:

- HR-ToF-AMS, SP-AMS
- MOVI-CI-ToF (organic acids)
- SMPS, LAS
- Thermal Denuder

Particle Black Carbon:

- SP-AMS, MAAP, SP2, aethalometer

Particle Optical Measurements:

- CAPS PMex (red and blue), PASS-3, PASS-UV

Bulk Particle Measurements:

- High volume filter sampler, rotating drum impactor, SEM filter collector

Remote Sensing:

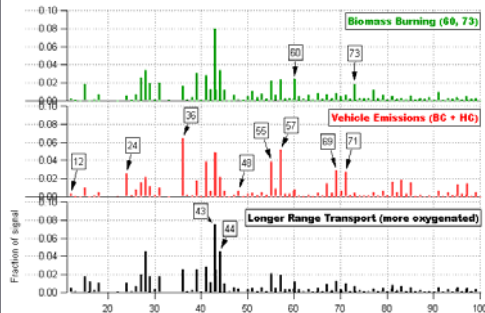
- Micro Pulse LIDAR
- Radiometer
- SODAR Wind Profiler
- Surface met

Learn more at Aerosol Life Cycle (ALC) Working Group Session, Wed. 13:30 – 15:15.

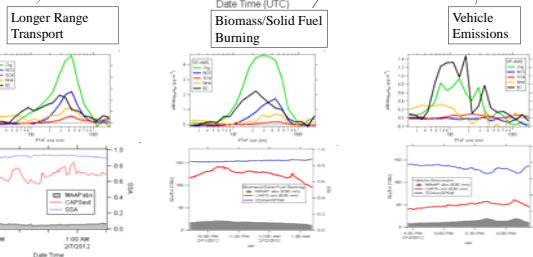
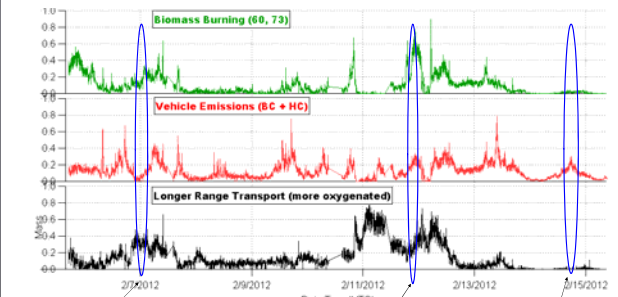
Soot Particle Aerosol Mass Spectrometer (SP-AMS)

Learn more at Onasch et al., Poster 7, Room 21, Tuesday 15:30 – 18:00.

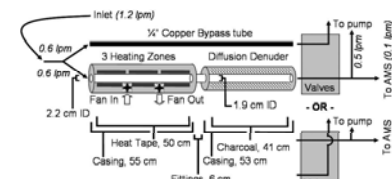
- Laser-induced incandescence of black carbon containing particles.
- High resolution mass spectrometry of black carbon cores and associated coatings.
- Size distributions of black carbon containing particles.
- Positive Matrix Factorization (PMF) - covariance of mass spectral features in organic MS
- Identify sources with:
 - PMF factor
 - air mass source (back trajectories)
 - local wind direction (local sources)



Contribution of each factor to total 2/5/2/15/2012.

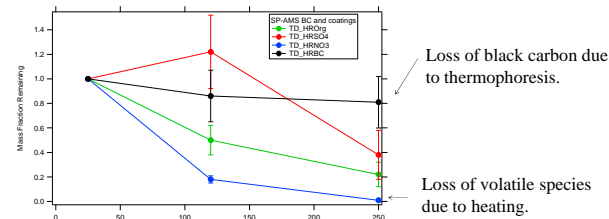


Thermal Denuder: Volatility of PM1



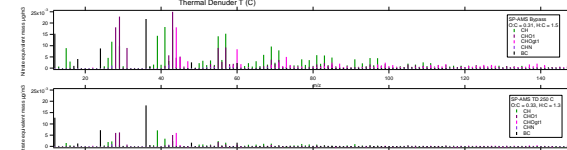
Huffman et al., *Aerosol Science and Technology*, 42:395–407, 2008

- Alternate sampling through thermal denuder and bypass.
- Downstream instruments included:
 - SP-AMS (BC cores and coating chemistry)
 - SP2 (BC cores and coating thickness)
 - PASS (absorption enhancement due to coatings)
- Absorption enhancement observed in lab and field measurements of biomass burning plumes, not in field measurements of ambient aerosol in CalNex and CARES.

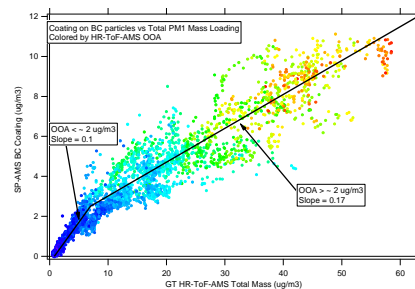


Loss of black carbon due to thermophoresis.

Loss of volatile species due to heating.



SP-AMS vs HR-AMS



10 to 20% of ambient PM1 has black carbon core.

Acknowledgements:

- US Department of Energy Atmospheric System Research Program
- UK Natural Environment Research Council