

# Overview of ClearfLo: Study of Aerosol Sources and Processing at a Rural Site Southeast of London

L. R. Williams<sup>1</sup>, S. Herndon<sup>1</sup>, J. Jayne<sup>1</sup>, A. Freedman<sup>1</sup>,  
B. Brooks<sup>1</sup>, J. Franklin<sup>1</sup>, P. Massoli<sup>1</sup>, E. Fortner<sup>1</sup>, P. Chhabra<sup>1</sup>,  
M. Zahniser<sup>1</sup>, H. Stark<sup>1</sup>, T. Onasch<sup>1</sup>, D. R. Worsnop<sup>1</sup>,  
F. Lopez-Hilfiker<sup>2</sup>, C. Mohr<sup>2</sup>, J. Thornton<sup>2</sup>, N. L. Ng<sup>3</sup>, L. Xu<sup>3</sup>,  
M. Kollman<sup>3</sup>, B. Knighton<sup>4</sup>, M. Dubey<sup>5</sup>, A. Aiken<sup>5</sup>,  
K. Gorkowski<sup>5</sup>, T. Martin<sup>6</sup> and R. Coulter<sup>6</sup>

<sup>1</sup>Aerodyne Research, Inc., <sup>2</sup>University of Washington, Seattle, <sup>3</sup>Georgia Institute of Technology, <sup>4</sup>Montana State University, <sup>5</sup>Los Alamos National Laboratory, <sup>6</sup>Argonne National Laboratory

## Acknowledgements:

US Department of Energy Atmospheric System Research Program

UK Natural Environment Research Council

Ashley Williamson (DOE), Wanda Ferrell (DOE), Amon Haruta (LANL)

# Why Detling?

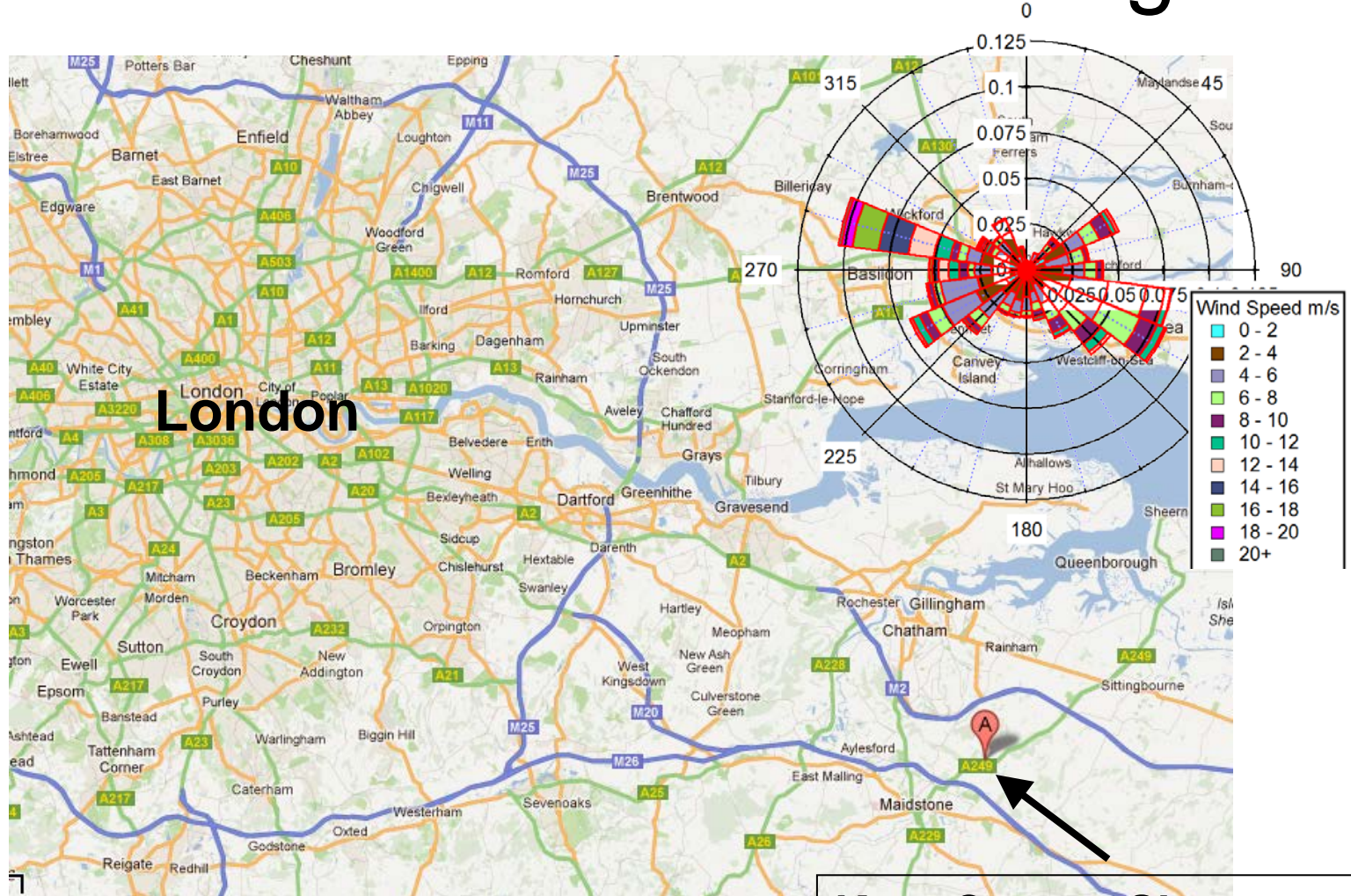
## Clean Air for London (ClearfLo)

- 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. Year long measurements plus winter and summer intensives.

## Detling Site

- 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?
- Thermal denuder to study volatility, effects of coatings.

# Clean Air for London (ClearfLo) Winter 2012 Intensive Detling Site



**Kent County Showground  
Detling, UK**

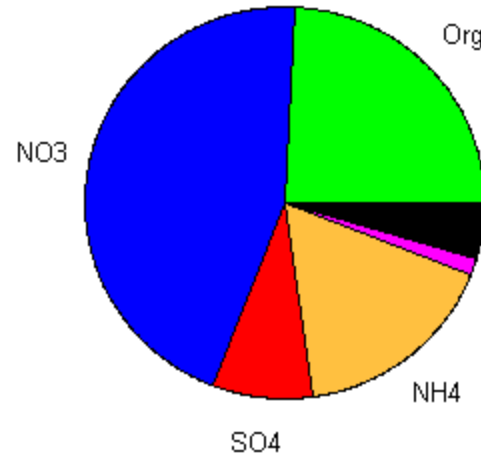
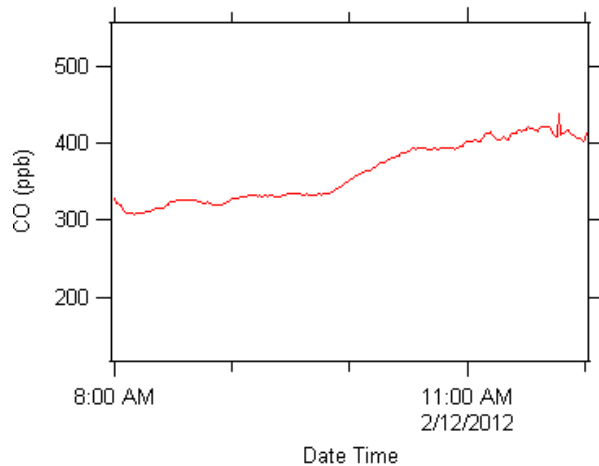
# Instruments at Detling

- **Gas-Phase Measurements: Scott Herndon (ARI)**
  - NO, NO<sub>2</sub>, NO<sub>x</sub>, O<sub>3</sub>, N<sub>2</sub>O, CO<sub>2</sub>, CO, SO<sub>2</sub>, NH<sub>3</sub>, HCHO
  - PTR-MS and GC/FID: VOC's
  - MOVI-CI-ToF: oxygenated HC's
- **Particle Measurements: Sally Ng (Ga Tech), Joel Thornton (UW)**
  - HR-ToF-AMS
  - MOVI-CI-ToF: organic acids
  - SMPS, OPC, LAS
  - Thermal Denuder
- **Particle Black Carbon/Optical Measurements: Ed Fortner (ARI), Allison Aiken (LANL)**
  - SP-AMS, MAAP, SP2, aethalometer
  - CAPS PMex (red and blue), PASS-3, PASS-UV
- **Bulk Particle Measurements:**
  - Real-time ECOC
  - High volume filter sampler, medium volume filter sampler, rotating drum impactor, SEM filter collector
- **Remote Sensing: Rich Coulter (ANL)**
  - Micro Pulse LIDAR
  - Radiometer
  - SODAR Wind Profiler
  - Surface met

# Movie

- Scott Herndon

# London Outflow

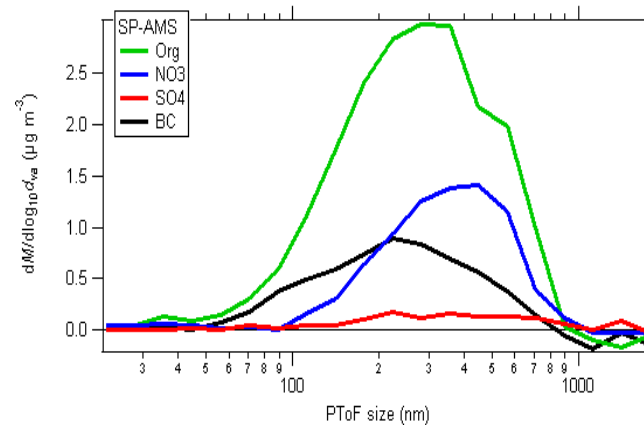
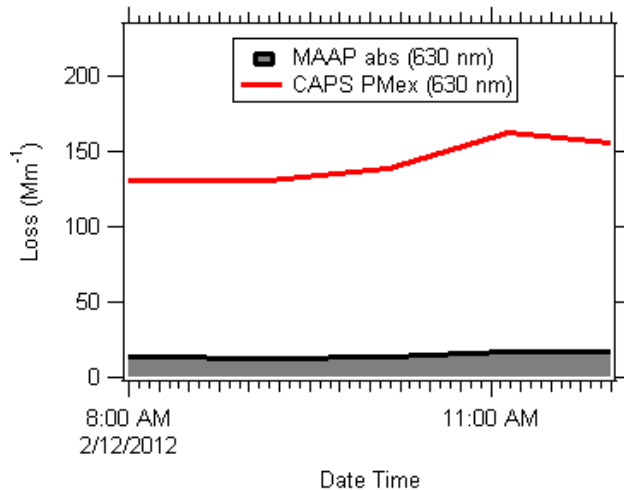


$$O/C = 0.42$$

$$H/C = 1.54$$

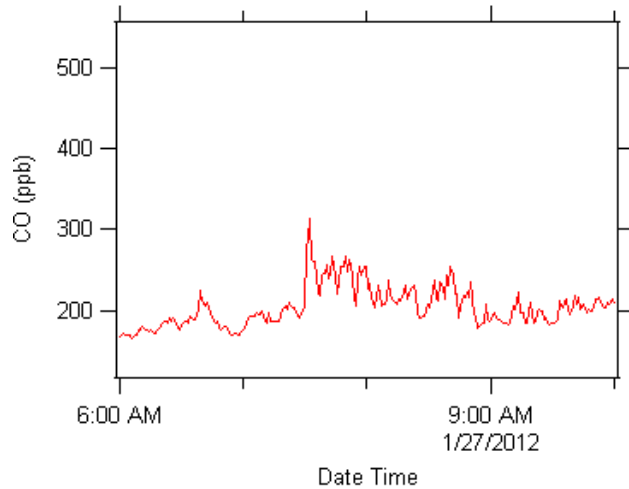
Smooth CO indicates well-mixed air mass

More inorganic and higher O/C for aged air mass.

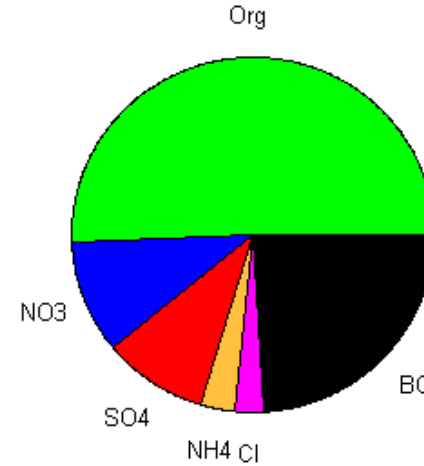


Higher extinction consistent with larger particles and higher non-refractory mass relative to black carbon.

# Local Pollution



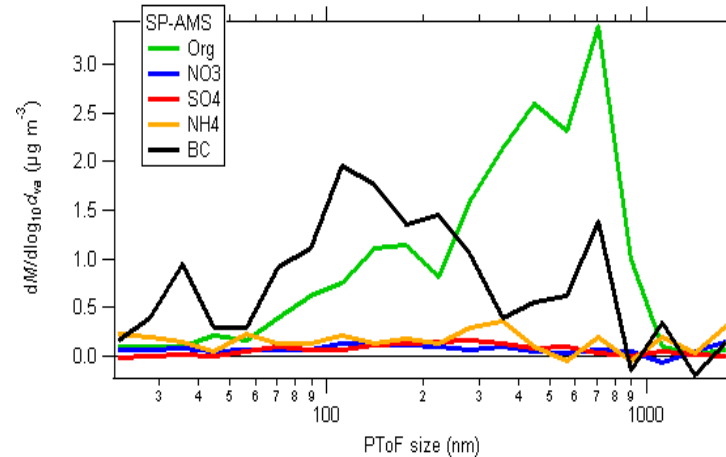
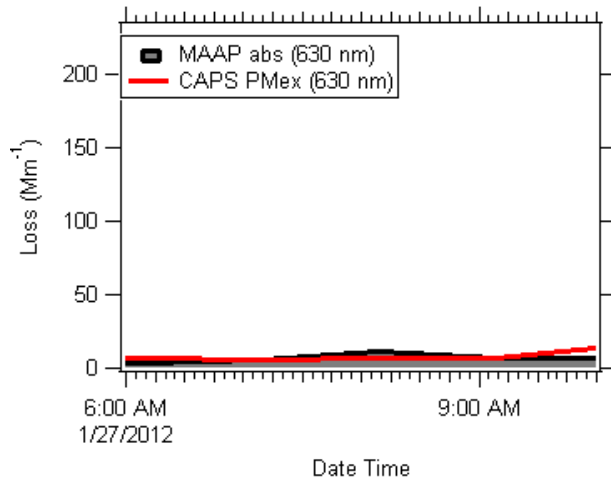
Varying CO indicates not well-mixed air mass.



$$O/C = 0.27$$

$$H/C = 1.58$$

More BC and lower O/C for fresh emissions.



Lower extinction consistent with smaller black carbon particles.