

Black Carbon and Organic Carbon Aerosol Mass and Optical Properties



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Approach & Goals

- Generate realistic black carbon, secondary organic & inorganic aerosols as internal and external mixtures.
- Characterize physically/chemically and optically.
- Derive refractive indecies (B. Barkey talk)
- Quantify the relationship between standard measurements of EC, OC and BC and optical properties.

Current Instrumentation

Optical Instruments

- Integrating Nephelometer
- Polar Nephelometer
- Transmissometer

Filter-based EC & OC

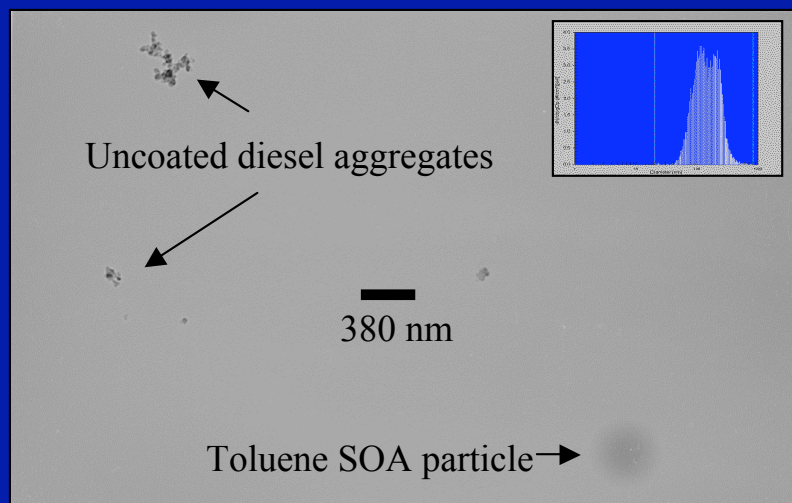
- EC/OC Thermo-Optical-Transmission (TOT) NIOSH protocol
- EC/OC TOT Conny et. al. protocol
- Aethalometer

Physical Characterization & Gas Phase

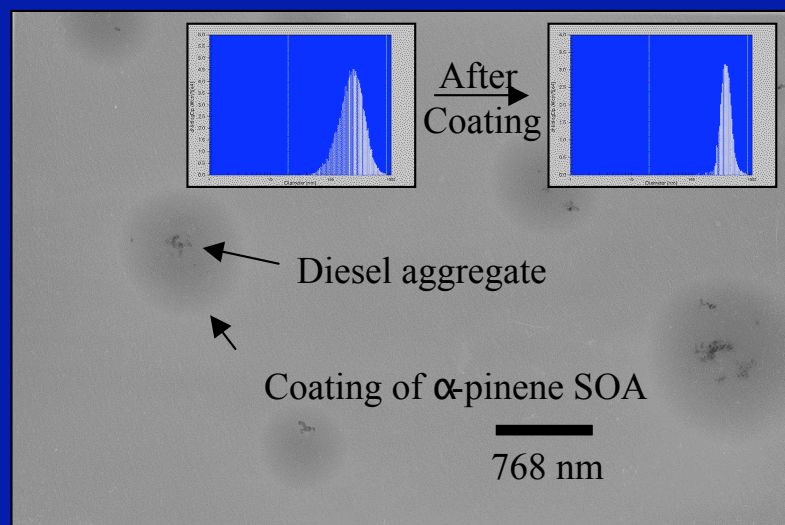
- SMPS
- TEM
- O₃, NO_x, Organics, Temp



Generate Controlled Internally and Externally Mixed Biogenic and Anthropogenic Aerosols



External mixture of diesel particles and toluene



Internal mixture of diesel particles and α -pinene

	α Pinene	Toluene + Propene	Propene only
Diesel: External Mixture	✓✓	✓✓	
Diesel: Internal Mixture	✓✓✓✓	✓✓	✓✓✓
Biodiesel: Internal Mixture	✓		✓

First Results

- Biodiesel produces less particulate mass and much less BC than low-sulfur diesel.
- For these mixtures, EC/OC TOT using NIOSH and Conny et al. temperature programs report similar, and ~reasonable average EC and OC mass loadings, but the NIOSH results are much more scattered.
- Polar Nephelometer → refractive index of α -pinene aerosol

Future Work

- Modeling of aerosol dynamics inside the chamber
- Chemical-optical closure calculations of aerosol scattering and absorption
- Compare EC/OC, mass, and aethalometer data
- Compare EC/OC analysis protocols
- Future experiments are planned for the coming year, including (but not limited to)
 - Different organic mixtures, ammonium sulfate & other inorganic aerosols.
 - TOR evolved gas analysis

Collaborations

Collaborations are very welcome.
We'll be doing more aerosol types
in the coming year.

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