Interdisciplinary Renewable & Environmental Collaborative REU

Characteristics of Carbonaceous Fractions in Atmospheric Particulate Matter for Grand Forks, North Dakota

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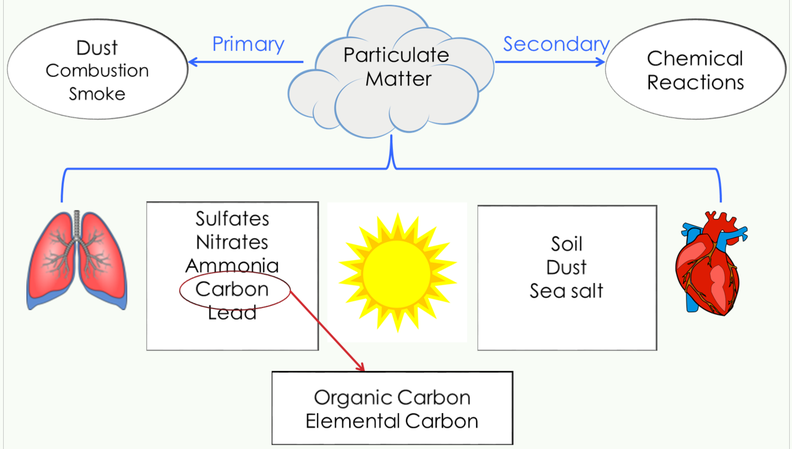
Objectives

- Investigate carbonaceous atmospheric particulate matter of 2.5 µm ($PM_{2.5}$) in Grand Forks, ND in the months of July through November in 2018
- Measure organic carbon (OC) and elemental carbon (EC) concentrations within PM using a thermal optical OC/EC analyzer

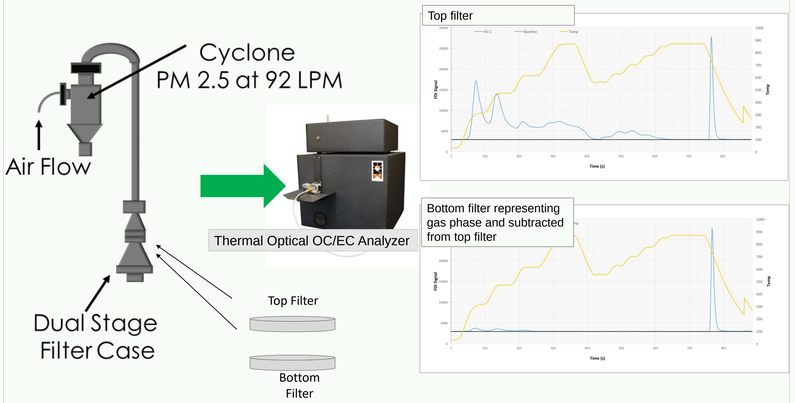
Background

- Atmospheric PM is any particle suspended in the atmosphere in either a solid or liquid state
- Both OC and EC have been associated with impacting the Earth's energy budget and the public's health, making knowledge on the composition and transport of OC/EC in atmospheric models vital

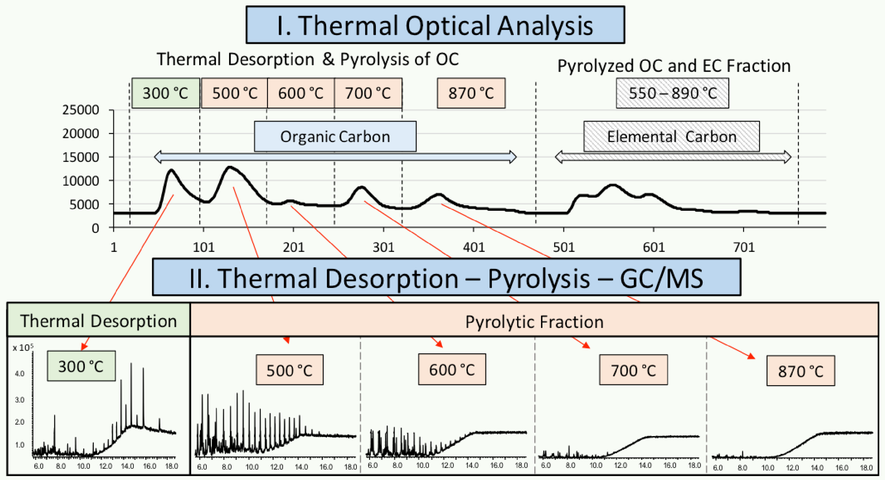


Sample Collection and Analysis

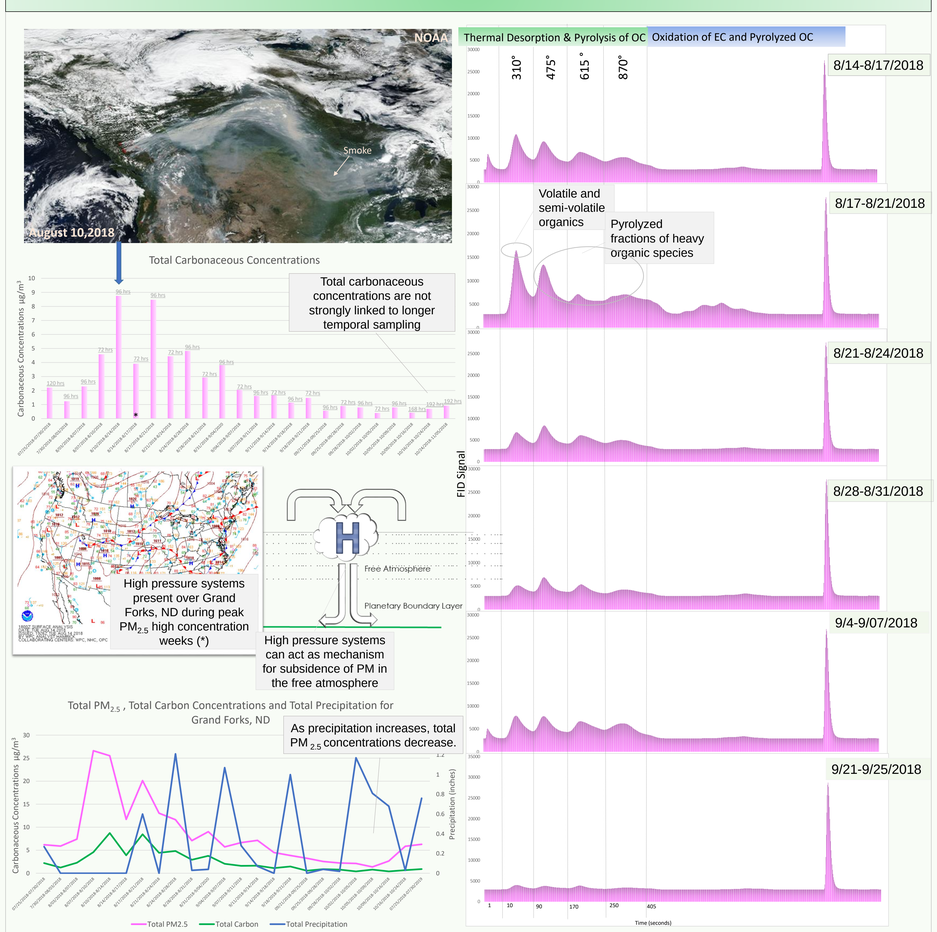
- Prebaked quartz filters were used in a high volume semi-volatile organic aerosol sampler to collect $PM_{2.5}$ from the roof of Clifford Hall in Grand Forks
- Samples were collected for 72, 96,120,168 and 192 hours then processed in a thermal optical OC/EC analyzer



Thermal Carbon OC/EC Analyzer: Carbon Speciation



Results: Carbonaceous Concentrations



Conclusions

- Carbonaceous fractions of atmospheric PM made up 10-36% of total $PM_{2.5}$ in Grand Forks, ND during the months of July through November
- Elemental carbon made up 1.5-12% of total carbonaceous $PM_{2.5}$ using TOT method and 2-12% using TOR method
- Agriculture, Canadian forest fires and meteorological perturbations can impact the total PM2.5 and characteristics of carbonaceous fractions

Results: Carbonaceous Fractions

Future Work

- Continue to collect longer temporal range of samples
- Characterize non-volatile organic carbon species using Thermal Desorption-Pyrolysis-Gas Chromatography-Mass Spectrometry (TD-Pyr-GC-MS)
- Collect detailed meteorological data in Grand Forks, ND to correlate atmospheric sinks with carbonaceous fractions

Acknowledgements

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