Time-resolved organic speciation at the Theodore Roosevelt National Park, North Dakota, USA

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National Parks and Wilderness Areas in United State possess many stunning vistas and scenery. Unfortunately, these scenes are diminished as result of increased air pollution. To maintain visual air quality, congress included legislation in the 1977 Clean Air Act to prevent future and remedy existing visibility problems. In 1985, the IMPROVE program (Interagency Monitoring of Protected Visual Environments) was initiated. This program implemented an extensive long term monitoring program to establish the current visibility conditions, track changes in visibility and determine causal mechanism for the visibility impairment in the National Parks and Wilderness Areas. (http://vista.cira.colostate.edu/improve/)

Since 2000 the total number of sites in the IMPROVE network is 110. These sites are under the supervision of the IMPROVE committee and represent 155 of the 156 areas of concern (figure 1).

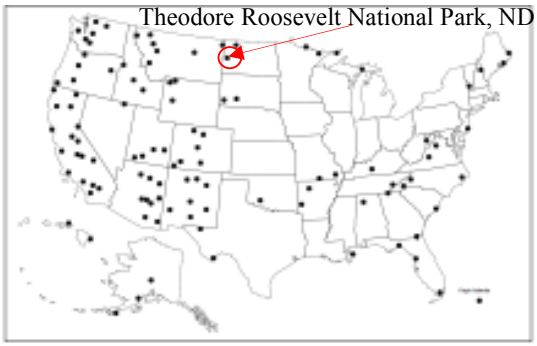

Figure 1. IMPROVE Monitoring Network (IMPROVE aerosol QMP, 2002) and location of this study's site.

The current study was focused on the Theodore Roosevelt National Park (North Dakota). This park is surrounded by oil and gas production wells (figure 2).

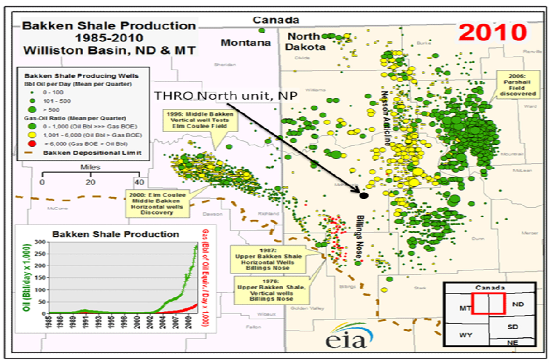

Figure 2. Distribution of Bakken Shale Producing Wells as 2010, and Monitoring Station location

Emissions from well development and production phases, including hydraulic fracturing "fracking" processes and open flame combustion of the extracted methane gas (figure 3), are not well characterized and their impact on visibility is unknown.

Figure 3. Oil wells and open flame near Watford City, ND

Three spot samplers have been deployed at the park's north site monitoring station, for the collection of time-resolved dry, concentrated $PM_{2.5}$ samples. Collection will be conducted from mid February to beginning of April. Samples for inorganic anion analysis (IC-ECD) are collected for 6 hr, and samples for polycyclic aromatic hydrocarbon characterization (HPLC-FL) and organic speciation by Thermo-desorption HR-GCxGC-MS are collected for 24hr.

Results obtained in this pilot study will help better understanding and characterizing emissions from oil production wells and fracking processes and their impact on the visibility and air quality of the park as well as surrounding communities.

Acknowledgements:
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References:
QUALITY MANAGEMENT PLAN for the Aerosol Monitoring Network Component of the IMPROVE Visibility Monitoring Program, 2002
(http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVEAerosolQMP_May2002.PDF)