

## EXECUTIVE SUMMARY

This report summarizes quantitative chemical composition data of ambient particulate matter of less than 2.5  $\mu\text{m}$  (PM<sub>2.5</sub>) aerosol collected during a month-long study in Fairbanks, Alaska in February and March, 2011. The data collected include hourly measures of ions commonly found in aerosol, as well as hourly measurements of organic and elemental carbon. Daily filter samples were also collected for alternative chemical analyses. Data were collected in a small, insulated trailer that was located near the Fairbanks Borough North Star Administrative Office near 809 Pioneer Road.

Approximately 283 sets of ion samples were collected during this study, and just over 500 measurements of organic and elemental carbon were collected. 37 pairs of filters were collected as well, with one set consumed by analytical techniques and a second set collected for long-term storage and post-hoc analyses. Aerosol chemical composition appears to be dominated by organic carbon (mean = 6.5  $\mu\text{gC m}^{-3}$ ) and estimated organic matter, as well as elemental carbon (mean = 0.9  $\mu\text{gC m}^{-3}$ ) and sulfate (mean = 2.02  $\mu\text{g m}^{-3}$ ). Lesser measurements included ammonium, nitrate, potassium, and several light organic acids.

The data show a clear diurnal profile that is likely attributed to anthropogenic activities. Wood burning appears to be a significant contributor to the high particle loading observed during the winter in Fairbanks as indicated by the enhanced levels of organic carbon and in the relative absence of other compounds that would indicate other emission sources of PM<sub>2.5</sub>. Ion information provides some confirmation of this, and a preliminary look at high time resolution XRF data provides additional confirmatory evidence in support of this hypothesis.

A particular focus of this work involved improving the understanding of sulfur in the Fairbanks airshed. Particulate sulfur (as sulfate) was detected throughout the study indicating that mechanisms that promote sulfur conversion (from gas phase to particle phase) are, in fact, present. We also examined chemical composition by complementary analytical methods – first by X-Ray Fluorescence (XRF) followed by ion chromatography for two measures of sulfur from the same filter. Results show that sulfur is measured at the same levels no matter the analytical method, which is in contrast to results reported by the United States Environmental Protection Agency (EPA) for chemical speciation measurements in Fairbanks. It is likely that a methodological difference explains the disagreement between the two methods of sulfur measurement used by the EPA speciation network.