Stable Boundary Layers Representation in Meteorological Models in Extremely Cold Wintertime Conditions, Gaudet et. al., Pennsylvania State University, January 2010.

The purpose of this study was to develop and adapt a 3-dimensional numerical model to represent the winter time meteorology in Fairbanks, Alaska. One 14 day representative episode was modeled using the WRF (Weather Research and Forecast) model for the meteorological input in the photochemical grid model used for the Fairbanks PM 2.5 attainment demonstration.

Fairbanks, North Star Borough AK PM2.5 Non-Attainment Area WRF-ARW, Gaudet et al., Pennsylvania State University, January 2012.

The purpose of this study was to continue to develop a second WRF metrological model for input into the photochemical grid model used for the Fairbanks PM2.5 modeled attainment demonstration for representative episode 2 (Nov 2-17th, 2008). The performance for low levels wind improved and under the same study, episode 1 was updated to reflect the new methodology of representing the Fairbanks winter time conditions.

Fairbanks North Star Borough PM2.5 Non-Attainment Area CMAQ Modeling, Final Report Phase I, Molders and Leelasakultum, October, 2011.

The purpose of this study was to configure the CMAQ (Community Multi-scale Air Quality) model to Fairbanks specific conditions. Changes were made to the initial and boundary conditions, advections schemes, diffusion and dry deposition module, snow albedo and land use categories. The combined changes improved the overall performance of CMAQ to represent the Fairbanks PM 2.5 conditions.

Fairbanks North Star Borough PM2.5 Non-Attainment Area CMAQ Modeling, Final Report Phase II, Molders and Leelasakultum, December, 2012.

The purpose of this study was to run additional science and sensitivity tests on the model configuration for CMAQ in order to better represent the speciation of PM 2.5. Process analysis was performed on ammonium, nitrate and sulfate to understand what the dominant mechanism was in the model. The result for a majority of the PM 2.5 was from emissions and very little from secondary chemistry. Additional tests were run to test the model sensitivity to secondary sulfate: increased SO2, pH, turning the ice into water for increased reactivity, and increased concentration of iron and manganese to allow for sulfate formation from catalysis.

Characterization of PM 2.5 from Fairbanks, AK: Organics Analysis for Residential Oil Burner Emissions study by Chris Palmer, August 2012.

A study to characterize the organic components of PM2.5, specifically hopanes, steranes and PAHs, was performed. These organics were analyzed from high PM2.5 day filter samples. High levels of sulfur containing compounds (dibenzothiophene) were found and are related to emissions of diesel vehicles, residential oil burners and picene for coal combustion. The study concluded that these emissions contribute to PM2.5.

Exploratory Research of Wintertime Aerosol Chemical Composition at a Ground Location in Fairbanks, Alaska, Richard Peltier, February, 2012.

Improving the understanding of sulfur in the Fairbanks area was the purpose this study. Hourly samples collected for one month measured PM 2.5 components common to the aerosol including organic, inorganic and elemental carbon. A combination of measurement techniques revealed a diurnal pattern including high organic carbon during certain hours of the day. In addition, the fractions of all the major components of PM2.5 were measured hourly.

The Fairbanks, Alaska PM2.5 Source Apportionment Research Study for the winters 2005-2012 at the State Office Building, North Pole, NCORE, RAMS and North Pole Fire sites, Tony Ward, March 2013.

The purpose of this study was to use a Chemical Mass Balance (CMB) model to source apportion the PM 2.5 filter measurements during the winter months in Fairbanks. The average contribution to PM 2.5 from the 5 sites indentified wood burning contribution between 58-85%, sulfate 8-21%, ammonium nitrate 3-10%, automobiles 2-6%. Additional methods of measuring 14C confirmed the results of CMB modeling with 50% contributing to wood smoke burning.

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