



Influence of industrial plume emission on urban and regional air-quality: high resolution air quality model evaluation with PrAIRie2005 observation data

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Industrial power plants have been found to be a major source of pollution, affecting public-health due to large emission quantities of pollutants. The main objectives of this study include 1) examination of the effects of power-plants on urban and a regional air-quality, 2) evaluation of the application of a regional air-quality model for plume emission and 3) improvement of the treatment of aerosol plume emissions in a regional air-quality model. In this study, power-plant plume measurements made during and after an urban/regional air-quality study are compared to model simulations using two different models; A Unified Regional Air-quality Modeling System (AURAMS, Environment Canada) and a Plume Aerosol Microphysical (PAM) model.

Environment Canada's PrAIRie2005 field study took place between August 12th and September 7th, 2005, and included over and downwind measurement flights near the five power plants in the vicinity of Edmonton, Alberta, Canada. The data collection included speciated size-distributed aerosol mass (AMS), fine size distributions (PCASP), meteorological data, and other chemical species.

In order to investigate and improve our understanding of the formation mechanisms and physical properties of power-plant-generated aerosols and their impacts on ur-

ban/regional air quality, two models were employed.

AURAMS is regional, size-resolved, chemically-speciated PM modeling system, that includes SMOKE (emissions processing), GEM/GEM-LAM (weather forecasting) and the AURAMS Chemical Transport Model. Particles are size distributed using a bin approach (bin size range from 0.01 to 40.96 μm). This model was set up for coarse (21km) and high (3km) horizontal resolutions for this study. The high resolution model was nested from 21km using internal-interpolation grid nesting, and emissions for both low and high resolution were updated to account for measured 2005 major point emissions at the power-plants. The effects of the power-plants were studied through a scenario in which the power-plants were switched off in the model, and the results compared to the base case in which the powerplants were included. The microphysics of the power-plant plumes were studied with the PAM model (which that includes detailed aerosol microphysical processes, Gaussian dispersion module and a gas-phase chemistry module (SMVGEAR II)).

In this presentation, we will present results such as 1) the relative importance of power-plant-generated aerosols on local and regional air-quality, 2) the extent to which the available measurement data can be used to isolate the power-plant plumes from other sources and their effects on urban and regional air quality, and 3) a description of the fine particle formation and evolution in these plumes.