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NESL's Atmospheric Chemistry Division Seminar

Long-range transport of natural and man-made ozone precursor emissions to the Arctic: perspectives from a multi-model comparison exercise

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3:00 p.m. – Refreshments & Socializing

Foothills Lab 2, Room 1022

Abstract

Observations suggest that the Arctic has warmed rapidly in the past few decades compared with observed global-mean temperature increases. Model calculations suggest that changes in short-lived pollutants such as ozone and aerosol may have contributed significantly to this warming. Arctic tropospheric budgets of short-lived pollutants are impacted significantly by long-range transport of gases and aerosols from Europe, Asia and N. America, and in summer by boreal wildfires. Previous assessments based on limited surface observations, have demonstrated that chemistry-transport models have highly variable and generally poor skill in reproducing short-lived pollutant concentrations in the Arctic. This suggests a significant limitation in the ability of models to predict Arctic and hemispheric climate response to changes in mid-latitude emissions.

This talk will focus on remote man-made and natural influences on summertime Arctic tropospheric ozone, and how they are represented in models. I will present results from the POLARCAT Model Intercomparison Project (POLMIP), which aims to exploit the large number of observations collected in the Arctic troposphere as part of International Polar Year in 2008, to evaluate a series of state-of-the-art global atmospheric chemical transport models. I will show important differences in key processes for transport and chemistry of ozone and precursors in the Arctic between models and compared with observations, and what they may imply about our confidence in model projections of future Arctic composition. A novel Lagrangian method for evaluating these differences in coordinates defined by air mass origins will be demonstrated, which allows improved understanding of key transport patterns and source regions associated with model biases. Finally, I will show some recent work aimed at understanding drivers of variability in boreal wildfire influence on Arctic atmospheric composition.