Séminaire Vendredi le 11 juillet 2014 11:00h / Seminar Friday July 11th 2014 11:00h

Subject/ Sujet : How Air Pollution Affects The Weather – Results from Phase 2 of the Air Quality Model Evaluation International Initiative.

Langue/language : Anglais / English

Conférencier/Lecturer: Paul Makkar (Toronto, Air Quality Modelling and Integration Section Air Quality Research)

Resumé / Abstract:

The default configurations of the Global Environmental Multiscale (GEM) and the Global Environmental Multiscale – Modelling Air-quality and CHemistry (GEM-MACH) models make use of simplified parameterizations to describe the radiative effects of particles on the atmosphere (aerosol direct effect), and the radiative impact of aerosol-generated cloud droplet formation (aerosol indirect effect) . These parameterizations assume uniform distributions of aerosols (and their optical properties) over space and time. However, in the real atmosphere, the spatial distribution of aerosols, and their composition, varies dramatically in space and time. In this work, the aerosols created by the chemistry portion of the GEM-MACH air quality model were allowed to feedback into the radiative transfer and cloud formation routines of GEM, to show how air pollution modifies the weather. The work was carried out as part of an international collaboration with colleagues from NOAA, NCAR, ECMWF, TNO, UK met office and twelve other research groups, under Phase 2 of the Air-Quality Model Evaluation International Initiative. The focus of the work led by Environment Canada centered on the impact of the feedback mechanisms themselves on both weather and air-quality forecasts, with simulations with and without feedbacks being compared to observations for the years 2006 (North American domain only) and 2010 (North America and European domains). These simulations showed that feedback models have the potential to improve *both* forecasts of weather and air-quality. Comparisons with surface observations for temperature, surface pressure, total precipitation and summertime ozone and other gases showed significant improvements with the incorporation of feedbacks. Cross-model comparisons showed that the aerosol indirect effect and $PM_{2.5}$ concentrations were highly dependent on the details of the implementation of the feedback effects – further improvements to the forecasts are possible, beyond what was accomplished in this first intercomparison of "fully coupled" air-quality/weather models. Very large pollution events (e.g. mega-city emissions, large

forest fire plumes) were shown to have significant local to regional-scale impacts on weather. Future directions for this work and possible applications will also be discussed.