MULTISCALE AIR QUALITY MODELLING: HIGH RESOLUTION REGIONAL DOMAIN NESTED IN A GLOBAL MODEL

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Air Quality is no longer regarded as simply regional or urban in scale. Export and import of natural and anthropogenic pollutants affects global air quality. Three dimensional modelling addresses emission of species, their transport, transformation, and removal from the atmosphere. This takes place on many scales from local to regional to global because of the different time scales involved for transport and removal of species and aerosols. Large aerosols are removed rapidly from the atmosphere, while aerosols from combustion or secondary reactions may last much longer in the atmosphere before being removed. Ozone is sufficiently long lived that once it exits the planetary boundary layer (PBL) it may circle the Earth. Carbon monoxide has a life time of several months. Because of the many different scales involved it is necessary to parameterize certain processes that cannot be resolved at model scales. An important reason (but not the only one) for considering multiscale models is the problem with setting arbitrary influx conditions on boundaries of modelling domains, which can produce artificial results. This is even more critical at urban scales.

Models can be used for diagnosis of air quality situations. Thus, they can be used to provide historical air quality information throughout the domain that is not accessible to measurements. This can be useful for historical epidemiological studies. And, once carefully evaluated with field measurements they can be used in a forecast mode to predict air quality.

We will present the philosophy behind the development of Canadian multiscale three-dimensional tropospheric air quality modelling and chemical data assimilation. The Canadian operational weather prediction model, the Global Environmental Multiscale (GEM) model, developed by the Meteorological Service of Canada (MSC) is used as a host meteorological model for inclusion of tropospheric air quality processes. We will present results from initial global and regional high resolution integrations in preparation for air quality data assimilation over North America.