Impacts of Forest Shading/Turbulence and Aerosol Direct/Indirect Effect Feedbacks on Urban Air Quality Forecasts

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The outcome of urban air quality simulations depend in part on how the surrounding environment influences the pollutants and precursors entering and leaving the urban environment itself. The pollutants themselves are also capable of altering meteorology through well-known impacts on radiative transfer. Here, we examine these effects using GEM-MACHv2 at 2.5 km resolution for a domain covering the Great Lakes (PanAm setup), with four scenarios (each using the 12-bin aerosol version of GEM-MACHv2): (1) a "Base Case" scenario (the original model); (2) a "Feedback" scenario (aerosol direct and indirect effects are allowed to modify model meteorology); (3) a "Forest" scenario (canopy shading and turbulence are included into the model); (4) a "Combined" scenario (Feedbacks and Forest processes combined). The simulations will be compared to available observations, in order to determine their relative impact on model performance.