Development of the GEM-MACH-FireWork System: An Air Quality Model with On-line Wildfire Emissions within the Canadian Operational Air Quality Forecast System

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A wildfire emissions processing system has been developed to incorporate near-real-time emissions from wildfires and large prescribed burns into Environment Canada's real-time GEM-MACH air quality (AQ) forecast system. Since the GEM-MACH forecast domain covers Canada and most of the U.S.A., including Alaska, fire location information is needed for both of these large countries. During AQ model runs, emissions from individual fire sources are injected into elevated model layers based on plume-rise calculations and then transport and chemistry calculations are performed. This "on the fly" approach to the insertion of the fire emissions provides flexibility and efficiency since on-line meteorology is used and computational overhead in emissions pre-processing is reduced.

GEM-MACH-FireWork, an experimental wildfire version of GEM-MACH, was run in real-time mode for the summers of 2012 and 2013 in parallel with the normal operational version. 48-hour forecasts were generated every 12 hours (at 00 and 12 UTC). Noticeable improvements in the AQ forecasts for PM2.5 were seen in numerous regions where fire activity was high. Case studies evaluating model performance for specific regions and computed objective scores will be included in this presentation. Using the lessons learned from the last two summers, Environment Canada will continue to work towards the goal of incorporating near-real-time intermittent wildfire emissions into the operational air quality forecast system.