Recent improvements to an operational North American air quality forecast system with near-real-time biomass burning emissions: FireWork

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Biomass burning, and in particular wildfires, can be a major contributor to air quality episodes in North America. Environment and Climate Change Canada has been running FireWork, a comprehensive operational AQ forecast system that includes near-real-time (NRT), satellite-based estimates of biomass-burning emissions, since spring 2016. This system is the result of years of development in collaboration with the Canadian Forest Service, whose Canadian Wildland Fire Information System (CWFIS) provides NRT information on wildfire locations and characteristics. The CWFIS uses remote sensing data from the AVHRR, MODIS, and VIIRS satellite instruments combined with vegetation and weather data to estimate biomass-burning fuel consumption and other fire activity information. Until now, however, emission estimates have been calculated for FireWork using the Fire Emission Production Simulator (FEPS), a component of the U.S. Forest Service's BlueSky Modeling Framework, and the treatment of wildfire plume rise has followed an approach better suited to anthropogenic major point sources.

More recently, the Canadian Forest Service has developed the Canadian Forest Fire Emissions Prediction System (CFFEPS) to predict wildfire emissions and smoke plume development through integration with the Canadian Forest Fire Behavior Prediction System (FBP). CFFEPS can employ different treatments of fire growth and different pollutant emission factors specific to different fire stages, and it uses input forecast meteorology to estimate wildfire plume rise. CFFEPS has now been incorporated into FireWork as a more flexible and updateable alternative to the FEPS module. Tests for the 2016, 2017, and 2018 Canadian wildfire seasons have shown that FireWork predictions of $PM_{2.5}$ and other pollutants such as ozone using CFFEPS out-perform the current operational FireWork.