

# Abstract

## **The challenges of characterizing wildfire plumes in ozone CMAQ models and their interactions with urban NO<sub>x</sub> plumes and the land/water interface.**

Western wildfires emit ozone precursors that can travel thousands of kilometers on westerly winds, potentially elevating ozone levels across the eastern U.S. and Canada. These events are not well-captured in ozone air quality forecast models. The Fort McMurray, Alberta wildfires of May 2016 were a prime example of how the NOAA CMAQ operational ozone model does not capture the full chemistry of the plume and forecast the full extent of the ozone exceedances, as was seen in the urban New York City region. Since then, it has become evident that ozone enhancement, not just from massive wildfires, but from large scale agricultural burning during the spring and early summer months, is occurring and is not well-characterized in the operational models. Ozone forecasting for Connecticut and the area downwind of the urban Northeast Corridor is especially problematic because of the density and variability of urban NO<sub>x</sub> emissions interacting with wildfire plumes, and the complex chemistry that occurs with residual pollutants from long distance smoke transport.

In addition to the challenges of properly modeling ozone production in the presence of smoke, the operational models are generally using a grid resolution of 12km, which cannot resolve the movement of ozone plumes over Long Island Sound (LIS) into coastal cities via the sea breeze. I will show, using wind vectors generated from the NOAA Real Time Mesoscale Analysis (RTMA), how a high resolution grid of 2.5 km better characterizes the sea breeze during ozone events and the transport of elevated ozone to coastal and inland Connecticut.

Also of interest will be the initial NO<sub>2</sub> images from the recently launched [TROPOspheric Monitoring Instrument \(TROPOMI\)](#). These high resolution daily satellite images are showing a persistent swath of NO<sub>2</sub> over the NYC urban area that is responsible for much of the elevated ozone being produced over LIS. To the extent quality-assured data are available, I will also display preliminary information from the 2018 activities of the [Long Island Sound Tropospheric Ozone Study \(LISTOS\)](#). Some of the LISTOS activity days included ozone LIDAR images when smoke was present, which can help modelers better parameterize the smoke chemistry in the ozone models. This has promise for improving air quality forecasts in New York City metropolitan area (CT-NJ-NY), a highly populated urban region affected by persistent ground-level ozone pollution.