The Role of Background Ozone Levels in Contributing to High Pollution Events in Texas in 2011-2012

[1]C. Zucker, [2]A. Fiore

[1]Barnard College of Columbia University, [2]Lamont Doherty Earth Observatory Of Columbia University

The National Ambient Air Quality Standard (NAAQS) for ground-level ozone currently is 70 parts per billion (ppb) averaged over an 8-hour period; this is the 4th highest value averaged over 3 years that triggers non-compliance. Totaling all the TCEQ ozone detection monitors across the state of Texas we find the limit for ozone was exceeded 106 times between August 2011 and June 2012. It is necessary to determine how much ozone is produced from U.S anthropogenic emissions as compared to background levels, which are produced or transported from natural emissions, in order to manage these high ozone levels and control ozone pollution. We are using Maximum Daily 8-h Average (MDA8) ozone concentrations as observed by the TCEQ ozone monitors, and a suite of 2004-2012 global 2°x2.5° GEOS-Chem simulations [Murray, 2016] to provide estimates of various factors affecting U.S. background ozone, including the contributions of Canadian and Mexican anthropogenic sources, biomass burning, soil NO_x, lightning NO_x, and biogenic NMVOC. Comparing the model with the observed MDA8 data, we can evaluate the ability of the model to reproduce the observed ozone levels and use the model to interpret from where the observed ozone is originating. U.S. background and anthropogenic emissions are both a major source of these high ozone events, depending on the event. These events were averaged using all monitors within a city. Within a particular month, there were high events that exceeded the EPA standard, dominated by background sources; these events typically lasted four to five days with 10 ppb ozone concentration output. These high events were then followed by shorter events, which lasted only two to three days with 15 ppb ozone concentration output, owing to anthropogenic emissions. By separating concentrations of observed ozone levels in the 10 Texan cities into categories of above 70, between 50-70 and below 50, and analyzing the model simulations, we find that as the observed ozone concentration increased, the percentage of background decreased but the percentage produced from U.S. anthropogenic emissions increased. This study will allow for better knowledge of the sources of air pollution in Texas and therefore allow for guidance and development of air quality standards and guidelines for the region. Since the model indicates that U.S. anthropogenic emissions appear to drive the highest ozone events, it is clear that steps must be taken to reduce such emissions in order to reduce ozone pollution and improve air quality.