What Effect Do Local Factors (Lake Breeze, Industry, Topography, Harbor, and Weather) versus Regional Factors (Statewide Transport) Have on Ozone Levels in Duluth, Minnesota?

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Ground level ozone is one of the most abundant forms of air pollution worldwide. Ozone is regulated by the EPA because of its negative health effects, such as premature aging of lungs and difficulty breathing. The current ozone standard is 0.070 parts per million (EPA, 2018). The question is: What effect do local factors (lake breeze, industry, topography, harbor, and weather) versus regional factors (statewide transport) have on ozone levels in Duluth, Minnesota? The hypothesis is: If local factors (lake breeze, industry, topography, harbor, and weather) and regional factors (statewide transport) are compared to ozone levels in Duluth, Minnesota, regional factors will affect ozone levels. Ozone data was collected from 16 ozone analyzers across the state of Minnesota for 2007 and 2012. Weather data (temperature, wind direction, and wind speed) was collected through Surface Weather Maps from University of Utah. NOAA's archived Forecast Charts were also considered. Line graphs were constructed to display ozone levels during each year. Ozone levels were then sorted into events: days where ozone levels were abnormally high. The top eight ozone events were examined and wind direction and temperatures were examined to look for lake breeze. Our hypothesis was partially supported. Overall, the low ozone levels in Duluth resulted from the interaction between local, regional, and transported pollution, and the regional climate and weather. Duluth's ozone levels appeared highest during statewide transport events and without a lake breeze. Ozone levels were lowest in the spring and early summer, when lake breezes are most common.

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