Colorado Front Range Ozone Analysis

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The Colorado Northern Front Range Metro Area (NFRMA) is a geographical location that is subject to air quality concerns and frequent exceedances of the National Ambient Air Quality Standards for ozone. Increases in gas and oil extraction and production, population expansion, biomass burning, transported pollution, high levels of UV radiation, and mountain-valley meteorological conditions create an environment which is conducive to the photochemical creation and accumulation of ground based ozone. As one of the main compounds in photochemical smog over the NFRMA, surface ozone levels have a dramatic effect on the oxidation characteristics of the lower atmosphere, public health conditions, and ecosystem functioning of this region. In order to investigate the influence of pollutant sources on ozone trends and high ozone episodes, NOAA/GMD maintains measurements and long-term records of surface ozone and precursor pollutants in the NFRMA from three locations (Erie, Niwot Ridge, and Tundra lab). These locations provide an elevation gradient of ozone measurements, precursor pollutant samples, and meteorological data, which allow for exploration of sources and conditions that allow for build-up of ozone at the surface. These data in combination with NOAA HYSPLIT back-trajectory, NOAA RAQMS model, and NCAR WRF model analysis are used to understand the origins, seasonality, and photochemical processes of air masses moving into the NFRMA. The long-term surface ozone record from NOAA/GMD measurement sites are analyzed in regard to dominant wind direction and precursor emissions to provide a quantitative, detailed understanding of high ozone episodes in the Colorado Front Range.

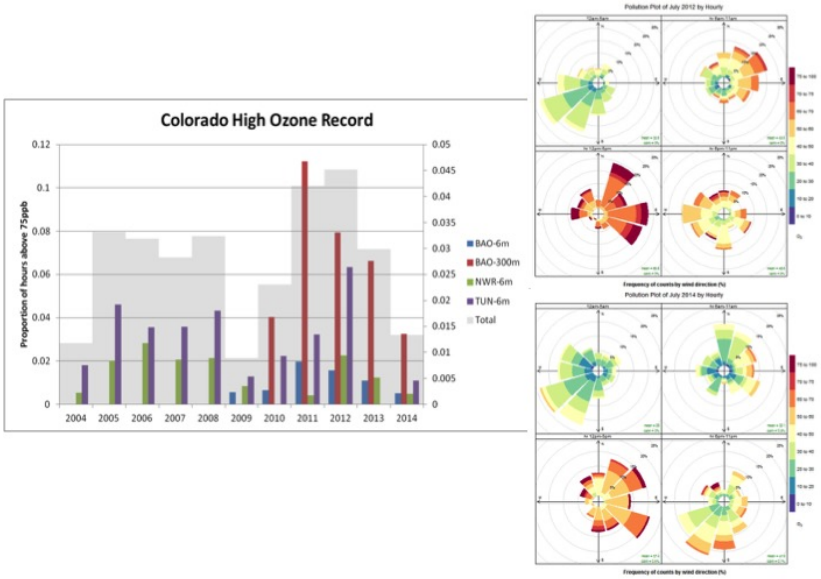

Figure 1. NOAA/GMD Colorado Surface ozone sites proportion of hours above the National Ambient Air Quality Standard are plotted for each station. Yearly exceedance proportion is analyzed with regard to wind direction. 2012 demonstrates a year of increased frequency of high ozone events, with a high proportion of pollution being brought in from the East and North East. In contrast, 2014 demonstrates a relatively "clean" year with variable wind conditions.