# Peroxy Radical Formation and Ozone Chemistry in New York City Air

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## Abstract

Decades of air quality regulation have aimed to address urban ozone pollution, yet a significant American population still resides in areas failing EPA ozone standards. Historically, nitrogen oxides ($NO_x$) and volatile organic compounds (VOCs) from combustion, especially vehicles, have driven ozone formation in urban areas. While these anthropogenic factors persist, various sources like biogenic VOCs and power plant NOx emissions further complicate ozone chemistry. Recent emission reduction programs have decreased the relative importance of motor vehicle emissions and led to the emergence of Volatile Chemical Products (VCPs) as significant contributors to ozone formation, particularly in densely populated regions. These VOCs, which include emissions from personal care products (PCPs), have introduced a new dimension to air quality challenges, necessitating a comprehensive understanding of their impact. Additionally, the rising frequency of wildfires, exacerbated by climate change, releases a plethora of pollutants, including VOCs and $NO_x$, impacting both urban and rural areas. To comprehensively investigate these phenomena's influence on ozone concentrations, we deployed the Drexel University Ethane Chemical AMPlifier (ECHAMP) instrument to measure total peroxy radicals at a site in upper Manhattan (the CUNY Advanced Science Research Center) as part of the NOAA AEROMMA/NYC-METS project. The instrument, utilizing an innovative approach, quantifies hydroperoxy radicals ($HO_2$) and organic peroxy radicals ($RO_2$) by inducing radical propagation reactions through interactions with NO and ethane. By differentiating measurements in amplification and background modes, precise determination of radical concentrations is achieved. We use these peroxy radical measurements to calculate instantaneous ozone formation rates, which combined with measurements of VOCs (including PCPs and smoke-related compounds) aim to elucidate the contribution of VCPs, wildfire smoke, and PCPs to ozone formation in the New York City area.

## Early Career Scientist

YES, I am an early career scientist.