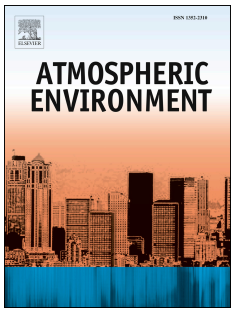
Accepted Manuscript



$PM_{2.5}$ and gaseous pollutants in New York State during 2005–2016: Spatial variability, temporal trends, and economic influences

Stefania Squizzato, Mauro Masiol, David Q. Rich, Philip K. Hopke

PII: S1352-2310(18)30199-7

DOI: 10.1016/j.atmosenv.2018.03.045

Reference: AEA 15915

To appear in: *Atmospheric Environment*

Received Date: 30 December 2017

Revised Date: 11 March 2018

Accepted Date: 20 March 2018

Please cite this article as: Squizzato, S., Masiol, M., Rich, D.Q., Hopke, P.K., $PM_{2.5}$ and gaseous pollutants in New York State during 2005–2016: Spatial variability, temporal trends, and economic influences, *Atmospheric Environment* (2018), doi: 10.1016/j.atmosenv.2018.03.045.

$PM_{2.5}$ and gaseous pollutants in New York State during 2005-2016: spatial variability, temporal trends, and economic influences

Stefania Squizzato,[1] Mauro Masiol,[1] David Q. Rich,[1, 2] Philip K. Hopke[1, 31]

1. Department of Public Health Sciences, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642
2. Department of Environmental Medicine, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642
3. Center for Air Resources Engineering and Science, Clarkson University, Potsdam, NY 13699

Abstract

Over the past decades, mitigation strategies have been adopted both by federal and state agencies in the United States (US) to improve air quality. Between 2007 and 2009, the US faced a financial/economic crisis that lowered activity and reduced emissions. At the same time, changes in the prices of coal and natural gas drove a shift in fuels used for electricity generation. Seasonal patterns, diel cycles, spatial gradients, and trends in $PM_{2.5}$ and gaseous pollutants concentrations (NO_x, SO_2, CO and O_3) monitored in New York State (NYS) from 2005 to 2016 were examined. Relationships between ambient concentrations, changes in NYS emissions retrieved from the US EPA trends inventory, and economic indicators were studied. $PM_{2.5}$ and primary gaseous pollutants concentrations decreased across NYS. By 2016, $PM_{2.5}$ and SO_2 attained relatively homogeneous concentrations across the state. $PM_{2.5}$ concentrations decreased significantly at all sites. Similarly, SO_2 concentrations declined at all sites within this period, with the highest slopes observed at the urban sites. Reductions in NO_x emissions likely contributed to summertime average ozone reductions. NO_x and VOCs controls reduced O_3 peak concentrations at rural and suburban sites as seen in significant relationships between the annual O_3 4th-highest daily maximum 8-hour concentrations and estimated NO_x emissions at rural and suburban sites ($r^2 \sim 0.7$). Spring maxima were not reduced with most sites showing insignificant slopes or significant positive slopes (e.g., +2.6 % y^{-1} and +2% y^{-1}, at CCNY and PFI, respectively). Increases in autumn and winter ozone concentrations were found (e,g., 6.6 ± 0.4% y^{-1} on average in New York City). Significant relationships were observed between $PM_{2.5}$, primary pollutants, and economic indicators. Overall, a decrease in electricity generation with coal, and the simultaneous increase in natural gas consumption for power generation, led to a decrease in $PM_{2.5}$ and gaseous pollutants concentrations.

Keywords: Trends, air pollution, spatial variability, policy, economics

[1] Author to whom correspondences should be addressed. Email: phopke@clarkson.edu