



Fine Particle Air Pollution in North Carolina: Sources and Effects of the Clean Smokestacks Act

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Wednesday, October 9, 2013

0001 Michael Hooker Research Center

12:00 - 12:50 p.m.

Abstract

Motivated by concerns about both declining air quality and public health, in 2002 the North Carolina (NC) General Assembly enacted the Clean Smokestacks Act. The Act required progressive reductions in pollutant emissions from the state's coal-fired power plants. Past studies have provided compelling evidence that coal-fired power plants are a key source of airborne particulate matter (PM), as sulfur dioxide from power plant emissions is a main precursor for secondary fine PM ($PM_{2.5}$). Observational data collected by the NC Division of Air Quality suggest that ambient $PM_{2.5}$ levels have declined by 30% on average since the Clean Smokestacks Act took effect. However, as yet, no study has sought to determine whether these observed reductions are attributable to the decreased emissions from coal-fired power plants, or whether they result from changes in some other pollution source, such as industries or automobiles. This seminar describes the process used to identify the major pollution sources contributing to $PM_{2.5}$ in NC during 2000-2012 and to assess changes in the contribution to observed $PM_{2.5}$ from coal-fired power plants during that time period. Results revealed that the major contributors to $PM_{2.5}$ air pollution in NC are secondary sulfate produced in part from power plant emissions (46-59%), fires (15-45%), and mobile emissions (33-38%); other minor but important sources include dust, industry, secondary nitrate, and sea salt. Although secondary sulfate from power plants remains the leading source of $PM_{2.5}$, importantly, our analysis shows substantial declines in contributions from this source since passage of the Clean Smokestacks Act. Between 2000 and 2012, secondary sulfate contributions to observed $PM_{2.5}$ levels decreased by about 67%, 70%, and 30% in the state's mountain, piedmont, and coast regions, respectively, suggesting that the Clean Smokestacks Act has yielded important and measurable differences in air quality.