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EPA Scientists Participate in Southern Oxidant and Aerosol Study (SOAS)

What is SOAS?

EPA scientists are participating in the collaborative Southern Oxidant and Aerosol Study (SOAS) in partnership with the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and researchers at colleges, universities and institutions.

SOAS is a major field research campaign that took place in the Southeastern United States during summer 2013.

John Offenberg, EPA scientist, looks at air sampling equipment

Scientists from more than 60 organizations are working together on SOAS to conduct atmospheric chemistry research to learn more about how man-made sources of air pollution interact with volatile organic compounds from plants to affect air quality and climate.

Southern Company, and Electric Power Research Institute are providing additional support for SOAS, which is part of a larger study — the Southeast Atmosphere Study (SAS) — one of the largest studies of the North American atmosphere in decades.

In June 2013, EPA announced that it awarded more than $4.3 million in grants to 13 academic and research institutions, who are taking part in the SOAS, to study atmospheric chemistry and how the interactions of chemicals — both man-made and natural — can impact air quality and climate change.

Why is SOAS important?

Results from the study will enable the development of more accurate models of air pollution and climate, which in turn will make more effective plans to improve air quality across the country possible. Such scientific discoveries may enable us to better understand the atmosphere across the country and ultimately determine ways to enable more people to breathe cleaner air. They will also allow scientists to understand, anticipate, and prepare for potential future climate changes.

What field research is EPA conducting for SOAS?

EPA scientists are developing advanced computational models and conducting novel field measurements in Alabama, North Carolina and Tennessee to better understand the processes that control the formation of regulated pollutants such as ozone and particulate matter.

An important contributor to particulate matter is secondary organic aerosol (known as SOA). SOAs are produced through a complex interaction of sunlight, volatile organic compounds from trees, plants, cars or industrial emissions, and other airborne chemicals. SOAs are important because they make up a large fraction of the total fine particle concentration in the atmosphere, and it is these particles that have been found to be most potent in their threat to public health and the environment. EPA scientists are investigating how SOA formation

is enhanced in the presence of man-made pollution and its impact on regional climate.

As part of this collaborative effort, EPA scientists collected ambient air quality measurements in four locations between June 1 and July 15, 2013:

- outside EPA's Research Triangle Park laboratory facility;
- in the Blackwood Division of Duke Forest, owned by Duke University;
- at the Great Smoky Mountains National Park Service site in Look Rock, Tenn., and
- at the Southeastern Aerosol Research and Characterization (SEARCH) site in Centreville, Ala.

Pollutants measured by EPA scientists during SOAS include ozone, nitrogen oxides, volatile organic compounds (VOCs), semi-volatile organic compounds, sulfur dioxide, and airborne particles (particulate matter).

An important and novel contribution of EPA scientists is the use of a SOA tracer method that allows them to determine the sources of SOA, by measuring for specific chemical "marker" compounds. This allows them to differentiate man-made SOA sources from natural sources. Scientists want to gain a better understanding of SOA sources since previous research has found that emissions from vehicles, industry, and power plants interact with natural volatile organic compound emissions from trees to impact air quality.

What laboratory and modeling research is EPA conducting for SOAS?

EPA scientists are conducting a variety of laboratory and modeling research efforts in support of SOAS including:

- Using aerosol mass spectrometry and other techniques to measure the chemical components of airborne particles and determine the degree to which they absorb or scatter light. From this, the scientists involved in SOAS hope to gain a better understanding of their climate forcing influences which can create haze, reduce visibility, and ultimately influence the amount of sunlight that reaches the earth's surface.
- Using EPA's Community Multi-scale Air Quality Modeling System (CMAQ) to simulate the fate and transport of pollutants in the United States during the SOAS data-collection timeframe (June 1-July 15, 2013). The scientists will also use CMAQ to simulate the concentrations of the chemical compounds that form SOA. EPA scientists will later compare modeled results with those measured in the field.

SOAS Science Objectives

Data gathered from multiple locations across the southeastern United States will help EPA scientists study:

- The extent to which airborne particles play a role in regional temperature trends;
- How man-made and natural pollution sources interact and affect air quality and climate;
- How air chemistry changes as an air mass ages and is transported across a region;
- How much SOA comes from various sources (trees, motor vehicles, industry, wildfires, etc.), and
- Whether carbon found in airborne particles comes from natural sources (trees and other vegetation), or from man-made sources (oil, coal, or natural gas that has been burned in combustion processes by cars, trucks, trains, industry, or coal-fired power plants).

How will SOAS study results be used?

Study results will be used to further understanding of SOA chemistry and sources, and will also provide important information about SOA formation for EPA's Community Multi-scale Air Quality Modeling System (CMAQ). The model is used by states to meet National Ambient Air Quality Standards., and by the National Weather Service to produce daily U.S. air quality forecasts for ozone. The model allows scientists and air quality managers to simulate different air quality scenarios and quantify the environmental, human health, and climate-related benefits of reducing emissions from different sources.

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