

Enhanced Monitoring at Shenandoah National Park

Overview

PROGRAM OBJECTIVES

The enhanced monitoring program at Shenandoah National Park, Big Meadows, is a multiple-year cooperative program designed to measure and understand air pollutants that impact the park. The general objectives of the program are to:

- characterize ozone trends and precursors,
- identify source regions and source types,
- determine proportions of local vs. transported ozone,
- to understand ozone production limiting factors (NO_x- or VOC-limited, seasonal changes), and
- observe S and N species trends (related to acidic deposition).

FUNDING

The site enhancements and instrumentation were provided by donor funds. The operation of the station and involvement by University of Maryland and University of Miami researchers also can from donor accounts. ARD has funded the basic operations and site operator for the ozone and meteorological parameters as part of the gaseous pollutant monitoring network. ERPI funded University of Maryland researchers to further enhance measurements at the site during the NARSTO-Northeast study intensive periods. Cooperating researchers from the University of Virginia provided their own funds to do ozone back trajectory analysis.

STATUS

The enhanced monitoring has been operational for three years. The site has attracted several other programs: NARSTO-Northeast used the data and the site during their intensive program, the DISPro program has installed a Brewer UV-B instruments, data from Shenandoah is used to predict and follow ozone concentrations for the Washington DC-Baltimore urban area. A related VOC study is being funded by EPA. At least two other research proposals have included the Big Meadows site and data in their planning. It is likely that PM_{2.5} research and monitoring will be enhanced at the site with funding from EPA or the State. Three publications are being organized and prepared for submittal to scientific journals.

LIST OF PARAMETERS MEASURED

O₃, SO₂, NO_y, NO, NO₂, NO_x, CO, VOC (60+ species), UV radiation, solar radiation, wind direction, wind speed, RH, ambient temperature, delta-temperature, barometric pressure, wetness, precipitation, UV-B irradiance, total column ozone - (weekly) NO₃, SO₄, NH₄, SO₂, HNO₃ - (Twice weekly, 24-hrs) elements, mass, NO₃, SO₄, PM₁₀, PM_{2.5}, organics - transmissometer, nephelometer

SCIENTIFIC BACKGROUND

The NRC published an examination of the issue and a series of recommendations in "Rethinking the Ozone Problem in Urban and Regional Air Pollution" that are relevant to this program. The report recommended systematic measurements of NO_x and VOCs in addition to ozone to determine the extent to which precursors can be controlled and to verify the effectiveness of control measures. The measurement of ozone precursor trends is recommended as a means to better understand the effect of meteorology on the ozone trends. The report also states that there is an insufficient amount of monitoring in rural and upwind areas of many urban centers. Thus, the measurement of ozone precursors at a rural National Park, that has extended periods of elevated ozone concentrations, is necessary if an understanding of the situation is desired.

EXPECTED RESULTS

- A better understanding of the factors that affect ozone concentrations at the park, thus supporting positions and policies that NPS might take to reduce pollutant levels.
- An indication of the most likely source regions and source types for ozone, SO₂, and acidic species, thus supporting activities to limit or reduce emissions from existing and new sources.
- Provide input data to regional air pollution models and regional programs that will determine the control strategies to be used.
- Peer-reviewed scientific publications (3-5 anticipated) that will advance the science and understanding of ozone formation and transport in rural areas (regional transport)
- The research site will attract additional programs and researchers that will improve the scientific understanding of air resources in the park and the interaction with AQRVs.

LIST OF COLABORATING RESEARCHERS

University of Maryland, Dept. Meteorology

Dr. Bruce Doddridge, Kristen Hollock, Dr. Russ Dickerson, Dr. Robert Ryan, Dr. Shobha Kondragunta

University of Miami

Dr. Rod Zika, Charles Farmer

University of Virginia

Dr. Jenny Moody, Owen Cooper

North Carolina State University

Dr. Viney Aneja

National Park Service, Air Resources Division

Dr. John D. Ray

NPS PROGRAM CONTACTS

Dr. John D. Ray, Air Resources Division

(303) 969-2820

jdr@aqd.nps.gov

Christi Gordon, Shenandoah National Park

(540) 999-3499

Christi_Gordon@nps.gov

Shane Spitzer, Shenandoah National Park

(540) 999-3434

Shane_Spitzer@aqd.nps.gov

Shen ehc mon overview.doc
JDR 6-5-98