

# Characterization of the Ambient Air Quality in Syracuse, NY and Identification of its Origins

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## INTRODUCTION

The overarching motivation for this research is developing and implementing *i*-EQS for buildings in urban settings that will reduce potential health impacts and improve productivity of building occupants. Envisioned *i*-EQS will include capabilities for monitoring the local airshed and the transport of outdoor contaminants through the building envelope; dynamically regulating the building control system in response to, or in anticipation of, changing outdoor conditions; and optimizing the delivery of conditioned outdoor and/or treated recirculated indoor air to individual occupants.

In support of this vision, the new headquarters facility for the Syracuse CoE is being designed to serve as a testbed for prototype *i*-EQS technologies, including sensors and systems that monitor environmental conditions across a cascade of scales, from individuals' desktops to rooms, floors, and the surrounding urban airshed. In addition, the Syracuse CoE headquarters will include a variety of specialized laboratories designed for studies of the impact on human performance of multiple environmental factors, including air quality, thermal conditions, lighting, and sound. Construction of the Syracuse CoE headquarters facility is scheduled to be completed in Spring 2008.

## OVERALL OBJECTIVE

Characterize the nature of the ambient air quality in the vicinity of the CoE headquarters site and the sources that contribute gaseous and particulate pollutants.

## SPECIFIC OBJECTIVES

- Characterize the nature of air quality in the vicinity of the CoE headquarters building in an urban location and at a upwind urban background residential site.
- Determine the fluxes of heat, water, and CO<sub>2</sub> in both the urban environment (CoE headquarters building site in downtown Syracuse) and the upwind urban background residential site (Upper Onondaga Park).
- Compare meteorological data and air pollutant concentrations at both the residential background and downtown urban sites.
- Ascertain the influence of local sources primarily traffic on air quality at the CoE headquarters building including the evolution of the traffic emissions as they are transported to the area of the building air-handling system.
- Develop relationships between traffic density as determined by automated video surveillance systems and air quality to provide direct input into ventilation decisions by the CoE building air handling system.
- Ascertain the value of upwind background site measurements of transported ozone and particulate matter as input into ventilation decisions by the CoE building air-handling system, and
- Compare and contrast the measurements of outdoor air pollutants versus indoor air pollutants in the CoE site.

## MONITORING PROGRAM

### Continuous Monitors

Meteorological conditions

The gaseous species will be ozone (O<sub>3</sub>), carbon monoxide (CO), oxides of nitrogen (NO and NO<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>).

Particle number counts will be made using a water-based condensation particle counter (CPC) and a Grimm nephelometer

At the CoE site tower, a second set of monitors will be employed to measure the same variables at the top of the enclosure (~3 m above ground level).

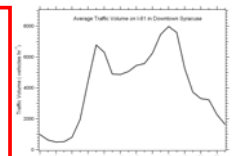
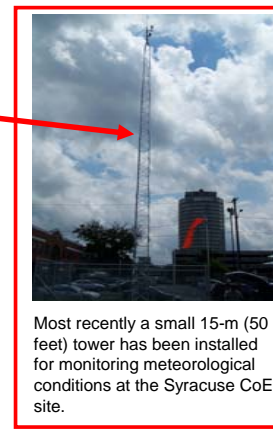
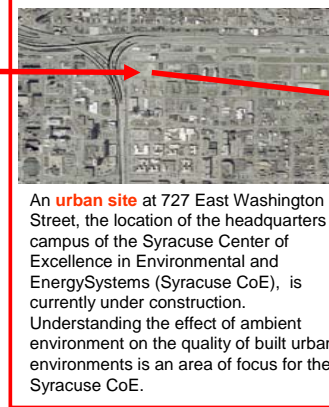
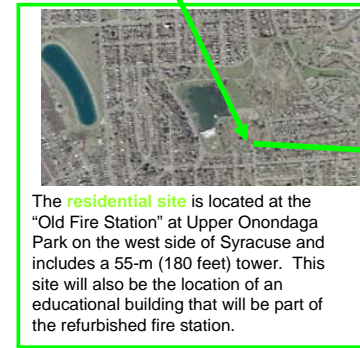
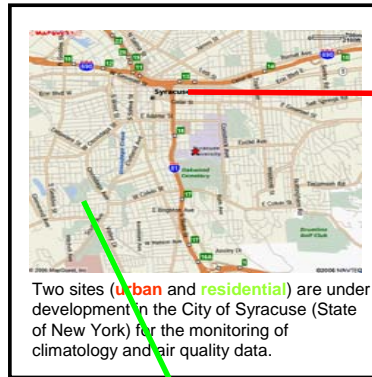
Mercury measurements will also be made at ground level at both sites. At the downtown site, TGM, RGM, and particulate mercury will be measured while only TGM will be measured at Upper Onondaga Park.

### Traffic Monitors

A pair of Autoscope Solo Terra systems will be mounted on the CoE site tower focused on the two interstate highways (I-81 and I-690). The system measures traffic volume, speed, density, occupancy and headway with vehicles dividing into 5 classes.

### Integrated Sampling and Analysis

A speciation network sampler (Andersen RAAS2.5-400) will be placed at each site and operated on a every sixth day schedule. These samples will be analyzed for mass, organic and elemental carbon (OC/EC), sulfate, nitrate, low molecular weight, water soluble organic acids, elements and a suite of molecular marker compounds.



NYSDOT surveys indicated a large volume of traffic going through downtown Syracuse each day.



We will be able to provide real-time traffic data for the I-EQS



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