HOME AIR PROJECT

Determinants of indoor and outdoor exposure to ozone and extreme heat in a warming climate and the health risks for an aging population

Funded by US EPA

Investigators: David J. Sailor¹ (lead PI), Olga Wilhelm², Doug Nichka², Christine Wiedinmyer², Mary Hayden², Deborah Banerjee³, Vishnu Nepal³

Institutions: 1. Arizona State University, 2. National Center for Atmospheric Research, and 3. Houston Department of Health and Human Services

Project Period: January 2015 – January 2018

Objective(s) of the Research: The overall goals of this proposed project are to 1) develop an integrated modeling framework to characterize current and future health risks of an older population to urban ozone and extreme heat, indoors and outdoors; 2) improve understanding of how emerging trends in building design and management practices affect indoor air quality; and 3) build local capacity in reducing negative health outcomes during episodes of high ozone and extreme heat.

Progress Summary/Accomplishments:
The project tasks revolve around three key elements: (1) develop scenarios for future climate, air pollution, building management/operations, and system failures; (2) conduct measurements in the laboratory and in occupied residences (initially Assisted Living Facilities) to characterize air quality/exposure-related interactions among building materials, management practices, occupant behavior, and ambient conditions; and (3) use results from (2) in conjunction with data gathered from phone and in-person surveys to develop exposure and health outcomes models for scenarios developed in (1).

In this first year of the project our focus has been on the second element described above. Specifically, we have initiated an extensive suite of laboratory measurements to explore the air quality interactions associated with different materials found in residences. This has included experiments with different carpet fiber materials, paints (during first weeks after application), indoor vegetation, and other materials. Data from these measurements will supplement data available in the literature to characterize emissions of volatile organic compounds and secondary reactions with indoor ozone that may produce various harmful compounds in indoor air. We have also purchased all equipment for measurements to be made in Assisted Living Facilities in the summer 2016 and developed our field measurement protocols. These protocols include measurements to determine building leakage and outdoor air pollutant penetration characteristics. We conducted our initial Stakeholder Workshop (Feb 10, 2016) in which we sought input on research questions and methods from a variety of academic, government, and private sector stakeholders, and also initiated the process of recruiting Assisted Living Facilities for our measurement campaign. As a result of this workshop and with subsequent follow-up meetings with stakeholder groups we have recruited 8
facilities for our initial summer 2016 measurement campaign (locations shown in map below along with locations of a subset of TCEQ weather/ozone monitoring locations to be used in our analysis):

**Publications/Presentations:** We have submitted one article based on some initial laboratory measurements for publication in *Atmospheric Environment*. Several presentations have been delivered to stakeholder audiences to gather input/feedback and recruit facilities for our summer field measurement campaign: These are the Stakeholder workshop in Houston, Texas (Feb 10, 2016); the H-TORCH monthly meeting of Assisted Living Facility owners (upcoming Apr 13, 2016); and the Department of Aging and Disability meeting with Assisted Living Facility managers (upcoming Apr 14, 2016). Additionally, co-PI Wilhelmi presented a project summary at NCAR and PI Sailor gave a presentation at the International Conference on Urban Climate in Toulouse France, August, 2015.

**Future Activities:** In this next project year, we will continue air quality measurements and modeling for Assisted Living Facilities and in private residences in Houston. These measurements will be combined with results from a scenario development effort to provide input data for computer models that we will develop to explore variations in building materials, occupant behavior, management practices, and ambient climate and air quality conditions. We will also initiate the development and deployment of a household survey instrument to gather data on housing conditions and exposure characteristics for the elderly population across the city.