

**ATS/CIRA Colloquium**

**Dr. Armistead (Ted) G. Russell**

**Visiting ATS from the Georgia Institute of Technology**

**Air Pollution Accountability: Assessing Regulatory Impacts on Emissions and Air Quality**

**Hosted by Sonia Kreidenweis**

**Friday, Sept. 22, 2017**

**ATS room 101**

**Discussion will begin at 11:15 a.m.**

**Refreshments will be served at 10:45 a.m. in the weather lab**

The United States has seen large improvements in air quality over the last half century with the implementation of regulations designed to reduce air pollutant emissions. Regulatory costs, estimated by the Environmental Protection Agency at tens of billions of dollars per year, motivate air pollution accountability research, which evaluates impacts of air quality regulations on emissions, air quality, exposure/dose, and public health—components of the so-called *Accountability Chain*. This work conducts a detailed analysis of a range of regulatory actions on electricity generating units and on-road mobile sources promulgated since the 1990s from the action at the federal level, implementation at the state level, the resulting emissions changes and the impacts on air quality and health. Results show that the United States has seen major emissions reductions over this period attributable to regulatory policies, although influences such as fuel costs, demographic shifts, and technological improvements have influenced emissions reductions as well. The resulting emissions reductions have led to air quality and health benefits.

A range of empirical and first-principle approaches are used to investigate central questions for atmospheric and health effects researchers. First, *what factors influence ambient air quality?* Analyses focus on ambient ozone and particulate matter with diameter less than 2.5  $\mu\text{m}$  (PM<sub>2.5</sub>), two pollutants linked with negative health impacts. This is investigated using both observation-based statistical models and a deterministic air quality model (the Community Multiscale Air Quality—CMAQ—model), both showing that emissions reduction programs have reduced the highest ozone concentrations while simultaneously increasing the lowest concentrations. For PM<sub>2.5</sub>, controls have reduced both the annual mean values and the variability. Surprisingly, little change is found in aerosol pH. Meteorology had large impacts on daily pollutant concentrations, but long-term trends were driven by emissions reductions. An evaluation shows that CMAQ captures ozone and PM<sub>2.5</sub> concentrations and changes over the decade, but the two approaches do not agree in detail. A second question is, *what health benefits can be tied to specific regulations and what are the levels of uncertainty?*

This research provides a framework and methods to link regulations to emissions reductions, air quality responses and health impacts while accounting for numerous concurrent changes. Lessons learned in accountability research can be applied to future air quality management strategies.

## **Biography**

Prof. Armistead (Ted) Russell is the Howard T. Tellepsen Chair and Regents' Professor of Civil and Environmental Engineering at Georgia Tech, where his research is aimed at better understanding the dynamics of air pollutants at urban and regional scales and assessing their impacts on health and the environment. He earned his M.S. and Ph.D. degrees in Mechanical Engineering at the California Institute of Technology, conducting his research at Caltech's Environmental Quality Laboratory. His B.S. is from Washington State University. Dr. Russell was a member of EPA's Clean Air Science Advisory Committee (CASAC), the National Research Council's Board on Environmental Studies and Toxicology and the Health Effects Institute Review Committee, and continues to serve on associated committees. He chaired the CASAC NO<sub>x</sub>-SO<sub>x</sub>, Secondary NAAQS review panel, the Ambient Air Monitoring Methods Subcommittee and the Council on Clean Air Compliance Analysis' Air Quality Modeling Subcommittee, and was an expert on the recent IARC air pollution committee. He is a fellow of AAAS and ASME. He currently co-directs the NSF-funded Integrated Urban Infrastructure Solutions for Environmentally Sustainable, Healthy, and Livable Cities network.

Link to colloquia page: <https://www.atmos.colostate.edu/colloquia/>