AQAST Spotlight: Russell Dickerson & MDE

Recipe for Ozone Reductions Cooks Up in Maryland
By: Ben Kaldunski & Tracey Holloway

Ever since the US Environmental Protection Agency (EPA) established limits on ground-level ozone to protect public health in 1970, the state of Maryland has struggled to comply. Unlike the smoke from a backyard barbeque, ozone is not directly emitted from tailpipes, smokestacks, or open burning. Rather, it is "cooked up" when ingredients from human and natural sources combine with heat and sunlight in the air.

Across the US and other countries, a common recipe creates ozone: nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight.

Maryland faces unique challenges in controlling ozone because the state is located near several urban areas, and prevailing winds carry polluted air in from upwind states. Russell Dickerson, a member of NASA's Air Quality Applied Sciences Team (AQAST) and a professor at the University of Maryland, is working with air quality managers at the Maryland Department of the Environment (MDE) to create the ultimate ozone reduction cookbook.

"AQAST has been a catalyst and liaison for communication between states and NASA scientists," Dickerson said. Although he has supported MDE for over 15 years, Dickerson said that the launch of AQAST in 2011 has led to a substantial uptick in connecting NASA science with state air quality agencies like MDE. The collaboration between AQAST and MDE kicked into high gear during the summer of 2011 when Dickerson helped coordinate the first DISCOVER-AQ campaign, a month-long study of air quality in the Baltimore-Washington metro area.

"DISCOVER-AQ was a wonderful opportunity for Maryland because a NASA aircraft laden with state-of-the-art instruments spent an entire month observing our local air quality," Dickerson said. Data collected from the aircraft and satellites proved that ozone in the eastern U.S. is a regional problem, not just local. The hard evidence supports what computer modelers had been arguing for years, that ozone pollution in Maryland is dependent on emissions from surrounding states.

Story continues on page 5

Russell Dickerson, an AQAST member and professor at the University of Maryland, has worked with the Maryland Department of the Environment (MDE) for over 15 years (Image provided by University of Maryland).

Tad Aburn, Director of MDE's Air & Radiation Division, said his agency has received great benefits from their partnership with AQAST (Image provided by MDE).

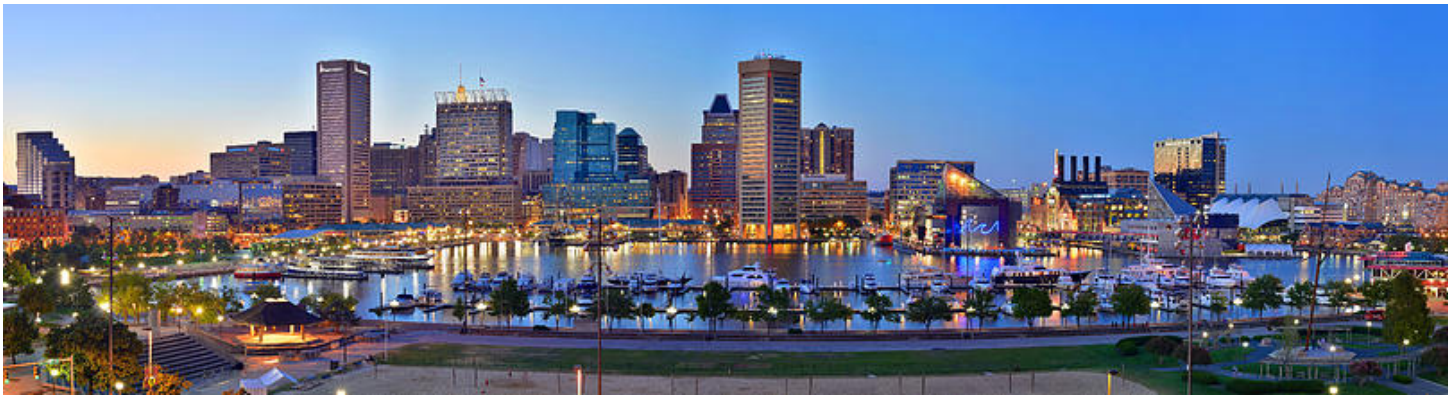
AQAST Spotlight: Russell Dickerson & MDE

Tad Aburn, director of MDE's Air & Radiation Division, said Dickerson's work had provided critical insights that have guided the agency's efforts to develop the most effective ozone reduction strategies. "Understanding how emissions behave aloft, and how they are transported into Maryland, is the single most important piece of our partnership with AQAST," Aburn said. "The concentrated efforts by Russ Dickerson and AQAST over the past several years has been a really positive thing," he said. "I truly believe that this collaborative structure is the right way to go about solving local and regional air quality problems."

Power plants that only generate electricity during extremely hot days to meet air conditioning demand, known as "peaking" plants, are one of the major sources of ozone-forming emissions. These peaking units often run without the same NOx emission controls used on standard power plants. Unfortunately, the hottest days are often the most polluted, because of active chemistry in the atmosphere. "It is perfectly legal for power plants to operate without controls under current emissions trading programs," Dickerson said, "but doing this on extremely hot days is very bad for air quality."

The partnership between AQAST and MDE has been successful in several ways. It has provided MDE with access to expert scientists, like Dickerson, who connect their staff with NASA satellite data products, complex modeling simulations, and intensive field campaigns like DISCOVER-AQ. Aburn highlighted AQAST's role in developing tools to simplify the use of satellite data products and best practices for using those datasets to examine pollution source trends and exception events. "Satellite data analysis is a relatively new piece of our process, but I expect it to grow rapidly and produce valuable benefits in the next several years," Aburn said.

The combination of these tools, resources, and shared knowledge has resulted in significant improvements in MDE's modeling capabilities, which are critical for developing effective pollution reduction strategies. "Much of the success of this partnership lies in the two-way conversations between MDE and AQAST members," Aburn said. "They listen very closely to the problems we have and help us solve those problems by applying high quality scientific research."



The collaborative effort between AQAST researchers and Maryland's air quality managers has produced significant improvement in air quality over the past decade. The joint effort has led to many more clear skies over Baltimore (above) and other urban areas in Maryland that have struggled to meet federal air quality standards since the 1970's (Image provided by the City of Baltimore).