AQAST Spotlight: Director, Daniel Jacob & U.S. EPA

The AQAST Legacy: Science to Support Decision-Making
By Ben Kaldunski & Tracey Holloway

Since 2011 the NASA Air Quality Applied Sciences Team (AQAST) has been working to serve air quality managers at the national, state, and local levels through advanced research and technology. As AQAST enters its final year of funding, Team Leader Daniel Jacob, professor at Harvard University, reflects on the impact and legacy of this groundbreaking initiative.

"Our most important accomplishment has been showing air quality managers the value of satellite data, and showing them how to utilize it in their work," Jacob said. "Satellites have now become a relatively standard tool, both for measuring certain types of air pollution, and for testing the accuracy of air quality models."

Under Jacob's leadership, AQAST has been active in engaging air quality managers at biannual meetings, as well as through one-on-one research projects, and "Tiger Teams" that address stakeholder-driven research questions.

Jacob himself has exemplified the AQAST mandate to align research with the most pressing needs in the air quality management community. An expert in global modeling of atmospheric chemistry and air quality, Jacob's team has a long track record of tackling policy-relevant problems and working with the U.S. Environmental Protection Agency (EPA) to ensure that science is serving the public. This philosophy – that exciting science and user-relevance go hand in hand – have shaped all research activities in AQAST.

For example, Jacob's group has been active in working with EPA to quantify how much air pollution in the U.S. is coming in from other countries (i.e. "background" ozone). This issue is especially relevant for California, a state downwind from rapidly developing Asia, that is already struggling to meet clean air standards. "We [AQAST] are hosting a meeting in late March at California's Yosemite National Park in collaboration with the San Joaquin Air Quality Management District that will be very important in addressing that issue," Jacob said.

EPA scientist Joseph Pinto notes how important research on background ozone has been for policy-making. "When I first got involved with this issue, I saw that EPA was relying on measurements in areas subject to local and regional pollution to characterize background ozone levels," Pinto said. "I realized that a global model was needed to address the issue, and that's when I went to Daniel."

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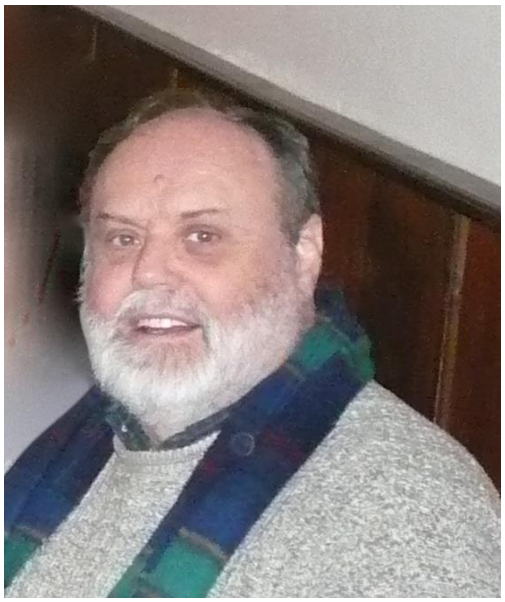
Dr. Daniel Jacob's research has helped EPA improve modeling capabilities to produce more accurate estimates of background ozone (Image from Harvard University).



Dr. Joseph Pinto is a research scientist at EPA's Research Triangle Park in North Carolina. Dr. Pinto has collaborated with AQAST on several studies of background ozone (Image from EPA).

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"Daniel thought that this was an interesting and important problem," Pinto said. "He worked on the problem with Arlene Fiore, a bright graduate student at the time, who wrote her thesis on the topic." Fiore began working on the background ozone problem in the late 1990s and has gone on to become a scientist at the NOAA Geophysical Fluid Dynamics Laboratory, a tenured professor of atmospheric science at Columbia University, and an AQAST member.

Although the roots of AQAST success date back nearly 20 years, NASA investment has been pivotal in defining user-support as a fundamental part of the science process, not just an add-on. "Support from AQAST helped put the results of this research into EPA's scientific review process for updating the federal ozone standards," Jacob said. New estimates of background ozone have changed the way EPA views this problem, a legacy that could affect policy development and implementation for years to come.

"It's really exciting to see that AQAST's science and research has implications for policy development," Jacob said. Jacob's ongoing and future research efforts are aimed at determining whether air quality models can predict and mimic high ozone events caused by natural, or background sources. "I want to hit hard on this because there is an expectation that models can provide an answer, but I think there is only so much that models can do." The next generation of satellite instruments may fundamentally change the role of NASA science in air quality management programs.

Jacob is looking ahead to 2018, for a planned launch of a new instrument in geostationary orbit called TEMPO (Tropospheric Emissions Monitoring of Pollution). Whereas polar-orbiting satellites "see" the earth once a day, geostationary satellites rotate with the earth, so they can monitor the U.S. continuously. This new instrument will measure the evolution of air quality precursors every hour. "This will totally change the game in terms of using satellites to observe ozone events from background, or anthropogenic sources," Jacob said. "The work AQAST is doing now will ensure that we hit the ground running when [TEMPO] launches."

Over the course of a few short years, AQAST has established a lasting legacy of successful collaboration between leading scientific experts and air quality managers. "This has been a great success and we want this to continue beyond AQAST," Jacob said. Like the first astronauts to set foot on the moon, AQAST represents a giant leap for connecting NASA science with air quality management and public health.

Dr. Jacob has guided AQAST since 2011, spearheading multiple research initiatives and biannual meetings (above) that allow the team to align research initiatives with the most pressing needs in the air quality management community. The meetings now feature nearly a full day of presentations from local, state and federal air quality managers (Image from Harvard University).