

AQAST Spotlight: Pius Lee & Connecticut DEEP

AQAST Brings Satellite Data into Local Orbit

By Ben Kaldunski & Tracey Holloway

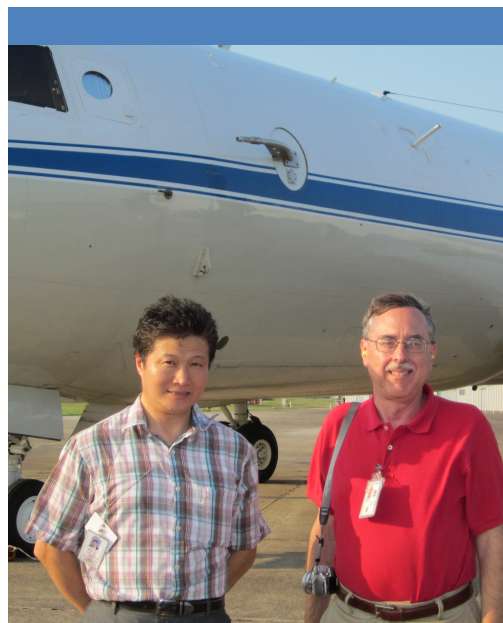
Satellites orbit the globe several hundred miles above Earth's surface, but NASA's Air Quality Applied Sciences Team (AQAST) is working with air quality managers in Connecticut to bring satellite data down to ground-level.

Pius Lee, an AQAST member and scientist at the National Oceanic and Atmospheric Administration's (NOAA) Air Research Laboratory, has been working with Michael Geigert of Connecticut's Department of Energy and Environmental Protection (DEEP) since 2004. The partnership has provided benefits to both NOAA and DEEP, and has resulted in substantial improvements to the accuracy of NOAA's air quality forecasts.

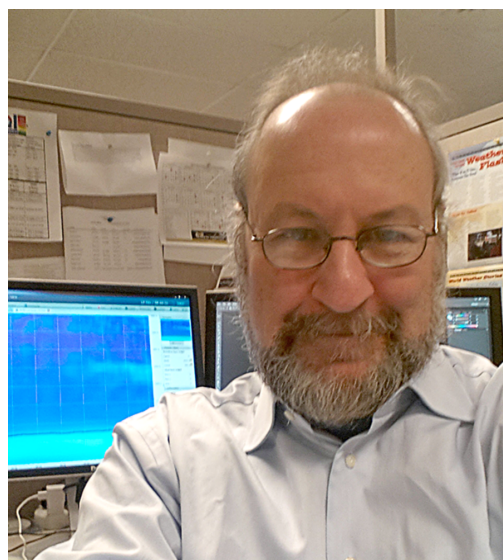
"Michael's insight as a superb air quality forecaster has been extremely valuable," Lee said. "He has provided valuable feedback that helped us improve NOAA's national air quality forecasting service." Lee explained that Geigert's input has helped NOAA refine the National Air Quality Forecasting System (NAQFS) to account for localized weather and emissions characteristics. "A decade of good collaboration between NOAA and Connecticut has improved air quality forecasting capabilities for the entire nation, and New England in particular," Lee said.

In April 2008, elevated ozone concentrations were caused by trees and other vegetation that began sprouting leaves earlier than usual. This "early leafing" produced natural (or biogenic) emissions of chemicals that lead to the formation of ozone. "Our model missed high ozone episodes from April 19-22," Lee said. "The fix was to use more recent monthly data retrieved from the MODIS instrument on NASA's Terra satellite."

Data retrieved from MODIS and other NASA satellite instruments has helped NOAA test and tweak the NAQFS, and provide unprecedented monitoring capabilities for state agencies like DEEP. "We are very interested in identifying emissions from specific sources," Geigert said. "Satellites allow us to perform almost real-time observations of fine particulates and NO₂ from power plants, which will be very important moving forward."



Dr. Pius Lee (left) has works for NOAA's Air Resources Laboratory where he has collaborated with air quality managers in Connecticut to improve national air quality forecasting capabilities (Image courtesy of NOAA).



Michael Geigert of Connecticut's DEEP has helped NOAA refine national air quality models so they can account for localized phenomenon and emissions sources unique to the northeast (Image courtesy of the Connecticut DEEP).

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With the help of Lee and other AQAST members, Geigert and his colleagues at DEEP are evaluating the usefulness of satellite products for developing state implementation plans (SIPs) to comply with federal air quality standards. “We are trying to set up our own air quality modeling center,” Geigert said. “Initially, it will be used for SIP modeling, but eventually we hope to use it for daily forecasting.” Connecticut has struggled to achieve attainment with federal standards for many years because pollution from New York City and other regions is carried into the state where it affects local air quality. Geigert also identified wood burning stoves as a source of local pollution, particularly during the harsh winter months of 2013-2014.

Lee and Geigert see a very promising future for the use of aircraft data and satellite products in coming years. “One of our future goals is to determine how much pollution comes from different types of sources,” Geigert said. Satellites could help DEEP and other air quality managers determine how much pollution is caused by emissions from vehicles, or even specific power plants on a real-time basis. “That could be extremely useful for our modeling and forecasting activities,” Geigert said. Lee said that new multi-channel instruments can provide an entirely new perspective on our current understanding of the atmosphere. “These are very promising products,” he said.

AQAST’s work with Connecticut provides strong evidence that satellite data can be brought down to Earth, and applied to solve local air quality problems. Bringing high altitude science into the same orbit as accomplished air quality managers is a model for success that AQAST will continue to pursue for years to come. “I really appreciate Michael’s insight into local meteorological considerations that have greatly improved the NOAA’s modeling capabilities,” Lee said. “Having a dialogue between air quality managers and NOAA has been vital.”



The collaboration between AQAST and the Connecticut DEEP has provided substantial benefits for both parties. Dr. Lee’s work at NOAA has provided DEEP’s air quality managers with expert knowledge and support for forecasting and modeling. DEEP has helped NOAA refine its models to account for local phenomenon like bay breezes that affect Connecticut’s coastal areas (Image courtesy of the Connecticut Public Library).