

AQAST Assists Ambitious WINTER Air Quality Study

*By Ben Kaldunski
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It is well known that heat and intense sunlight contribute to poor air quality during the summer months, but much less is known about the factors that contribute to poor air quality during winter. Several members of NASA's Air Quality Applied Sciences Team (AQAST) are supporting an intensive study aimed at improving scientific understanding of winter air quality along the east coast.

The Wintertime Investigation of Transport, Emissions, and Reactivity (WINTER) is an atmospheric chemistry project that seeks to track emissions and the movement of polluted air masses across the eastern U.S. The study, which began on February 1, is based on data collected from pollution monitoring equipment onboard a C-130 aircraft provided by the National Science Foundation (NSF). Joel Thornton, a professor of atmospheric science at Washington University, obtained funding from the NSF and is the lead investigator of the campaign. The same C-130 "flying laboratory" was used last summer during the Front Range Air Pollution and Photochemistry Experiment (FRAPPE), an ambitious air quality study in Colorado that also involved several AQAST members.

Russell Dickerson, an AQAST member and professor of atmospheric science at the University of Maryland, has been actively involved in flight planning and post-flight data analysis. His research team is collecting data from a Cessna 402, a smaller aircraft capable of performing tighter flight patterns than the much larger C-130. Xinrong Ren, a research scientist in Dickerson's group, is leading the aircraft campaign focused on observing air quality in the Baltimore-Washington, D.C. metro area. Anne Thompson, an AQAST member and scientist at NASA's Goddard Space Flight Center, is tracking emissions from oil and gas operations collected by satellite instruments. The combination of aircraft and satellite measurements will produce a comprehensive picture of pollution sources and the movements of polluted air masses across the eastern U.S.

The C-130 flying laboratory will be collecting air quality and meteorological data along the Northeast Urban Corridor, the Ohio River Valley, and the Southeast Mid-Atlantic regions through March 15. Researchers involved with the campaign hope the aircraft and satellite data will improve their understanding of the interaction between emissions and weather conditions that affect air quality. For example, natural emissions from plants and wildfires are much lower during the winter months compared to summer, while emissions related to heating homes and businesses are much higher. WINTER will help air quality scientists develop more accurate computer models and support informed policy decisions.

One of the most important questions that WINTER seeks to answer is, how far do different pollutants travel during colder winter months compared to warmer summer months? Chemical reactions that transform primary pollutants like SO₂ and NO_x into fine particulates and ozone, respectively, tend to slow down in cold weather. This means that pollutants could remain in the atmosphere longer during winter, which would allow them to travel farther distances across state and international boundaries. Thus, pollution plumes from urban centers and power plants can have a much broader impact in winter compared to summer. Also, some pollutants condense into liquid droplets as temperatures fall, which can accelerate the formation of fine particulates.

"WINTER offers a great opportunity for improving our understanding of emissions, chemistry, and transport of greenhouse gases, aerosols and other pollutants over the eastern U.S.," Dickerson said. "This field project will provide a rich dataset and policy relevant science for the state and federal agencies responsible for controlling emissions that affect air quality and climate."

The project received funding from the NSF and the National Oceanic and Atmospheric Administration (NOAA), and is supported by the National Center for Atmospheric Research (NCAR). The project is led by Principal Investigators from the University of Washington, NOAA, the University of Colorado, the University of California, and the Georgia Institute of Technology. The small aircraft flights are supported by the National Institute of Standards and Technology (NIST).

Read more about WINTER on NCAR's [website](#)

Watch a video tour of the C-130 flying laboratory [here](#)

Read a story about the WINTER campaign by the Washington Post [here](#)

Read more about WINTER from Washington University [here](#)

Read more about the University of Maryland's FLAGG-MD program [here](#)

Sources and media coverage

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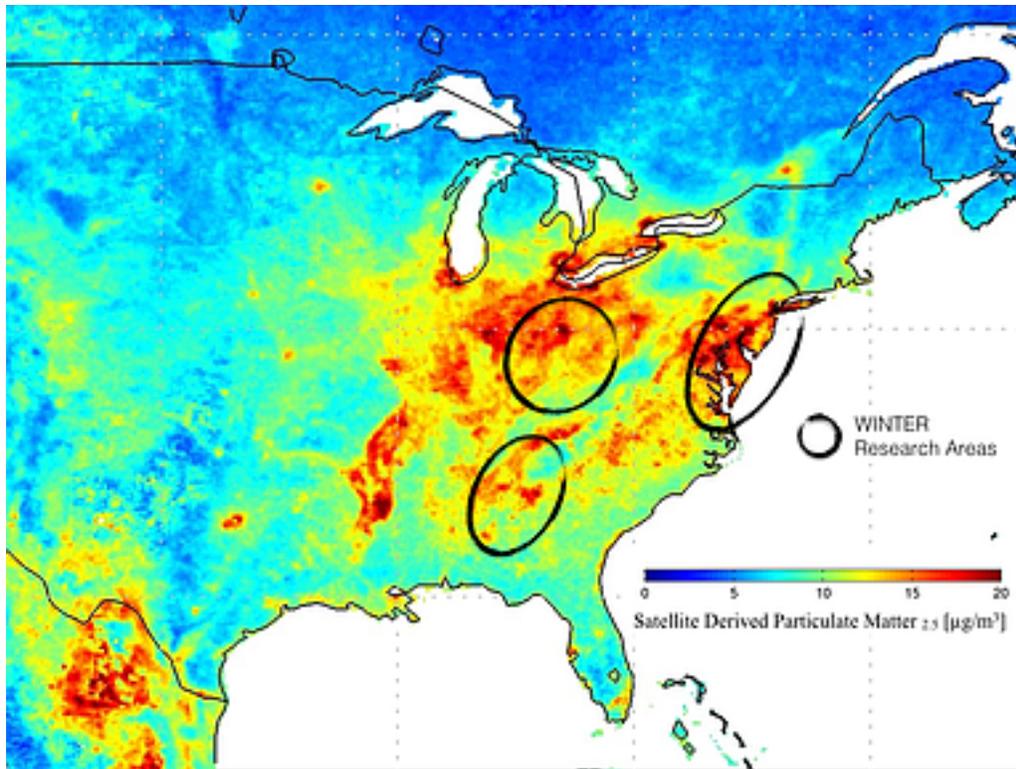
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This photograph was taken from the cockpit of the C-130 "flying laboratory" during a night flight over Long Island. The aircraft is collecting data during the WINTER campaign to help scientists understand what factors impact air quality both at night and during the day in colder, winter months along the U.S. east coast (Image courtesy of J. Thornton, University of Washington).



This map shows the major study areas targeted by the WINTER air quality study. The ambitious field study will gather air quality and meteorological data from aircraft flying over the Northeast Urban Corridor, the Ohio River Valley, and the Southeast Mid-Atlantic region (Image courtesy of the National Center for Atmospheric Research).