

UNH Media Relations

UNH Scientists Continue To Fly High As NASA Unlocks The Puzzle Of Global Air Quality

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DURHAM, N.H. -- The National Aeronautic and Space Administration's (NASA) DC-8 research aircraft is arguably the world's most sophisticated flying laboratory and scientists from the University of New Hampshire have been onboard the jet conducting one-of-a-kind science for the past two decades.

UNH research associate professor and atmospheric chemist Jack Dibb and research project engineer Eric Scheuer are currently on the jetliner among a select group of scientists taking part in NASA's Intercontinental Chemical Transport Experiment, or INTEX-B. This two-phase experiment is aimed at understanding the transport and transformation of gases and aerosols on transcontinental and intercontinental scales and assessing their impact on global air quality and climate.

The first phase of INTEX-B kicked off in March when NASA, in collaboration with several other agencies and universities, quantified the outflow and evolution of gases and aerosols from Mexico City, one of the most heavily polluted "megacities" in the world. The current phase of INTEX-B is probing large, polluted air masses flowing off the Asian continent towards North America.

The DC-8, in conjunction with a National Science Foundation-National Atmospheric Research Center C-130 research aircraft, is now plying the air above the Pacific Ocean measuring a wide range of pollutants. Because of meteorological conditions, this time of year is the peak outflow of Asian pollution toward the North American continent. Dibb says that already, with just three flights completed, they are seeing "pervasive" pollution throughout the North Pacific.

While most of the instruments onboard the plane were selected because they have very low detection limits, Dibb notes that the point of a series of these intercontinental transport and chemical transformation campaigns is that the level of pollutants traveling between continents is significant – something that was poorly understood before such field campaigns were launched.

"When we get into the 'pervasive' Asian plumes north of Hawaii we are seeing air that the U.S. EPA would be worried about if it was in Durham," Dibb says. For example, they have detected ozone at 140 parts per billion (ppb), a level rarely found in New England.

Among other compounds, Dibb and Scheuer are measuring levels of nitric acid – a by-product of the nitrogen oxides emitted by car and truck engines. Nitric acid is one of the primary ways nitrogen compounds, which can lead to ozone (smog) and acid rain, get transported long distances. It's a tricky measurement to make even on the ground, let alone from a jet hurtling along at 600 miles per hour. To make the measurement, Dibb and Scheuer are using a mist chamber-ion chromatograph technique developed by Robert Talbot, director of the UNH Climate Change Research Center within the Institute for the Study of Earth, Oceans, and Space (EOS).

"NASA's tropospheric chemistry program is world-class, and we've been involved with the DC-8 since it began flying back in the early 80s," Talbot says. "We're producing high-quality measurements for some of the key aerosol and trace gas species that are needed in these campaigns. Our instrument for measuring nitric acid has been developed specifically to meet the needs of NASA's program." The UNH instrument is so precise and reliable is that it has become the benchmark for nitric acid measurement.

Talbot notes that because these sophisticated scientific campaigns are so competitive, over the years he and his colleagues "have strategically put together a package of measurements that nobody else has." That package, in addition to nitric acid, includes measuring bulk aerosols or tiny particles (ranging from dust to compounds of sulfate derived from, for example, burning coal) and two "tracer" compounds that can help identify just where the air mass being sampled is from. Dibb is sampling for beryllium-7, a tracer of stratospheric air, and lead-210, which comes from the emission of radon gas off the continent.

UNH is also making experimental mercury measurements in an effort to obtain detailed information about this ubiquitous atmospheric toxin. On a global basis, Asia is the largest emitter of mercury on Earth (largely a result of burning poor-quality coal) so the UNH instrument should be picking up a hefty load of the heavy metal.

Says Scheuer, "We've tried to address some of the problems that have been outlined by previous experimenters measuring mercury. It's not a novel measurement but it's certainly novel on a DC-8 and novel in terms of the range we can cover in a 10-hour flight. We're collecting a lot of numbers, doing a lot of calibrations in an effort to validate the measurements, and we'll know a lot more when we sit down and look at the data in a qualitative way."

The INTEX-B field campaign continues through mid-May.

For more information on INTEX-B visit <http://www-air.larc.nasa.gov/missions/intex-b/intexb.html>.