UNH Scientists Aloft As Part Of Major NASA Airborne Arctic Study

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DURHAM, N.H. - Today marks the start of NASA's most extensive field campaign ever to probe the chemistry of the Arctic's lower atmosphere. The investigation is poised to help scientists identify how Earth's atmosphere contributes to the recent, dramatic changes in the vast, climate-sensitive region.

The first phase of the two-part, international campaign known as the Arctic Research of the Composition of the Troposphere from Aircraft and Satellites (ARCTAS) was launched to coincide with the Sun's annual return north where, after months of darkness, it begins "cooking" the snow and ice, oceans and atmosphere, and driving important physical and chemical processes.

Among the 30 teams of investigators aboard three research aircraft that will fly during the field campaign are atmospheric scientists from the University of New Hampshire, who are on board the space agency's instrument-laden DC-8 "flying laboratory" that today began making a spate of atmospheric measurements. The airborne sampling, and subsequent data analysis, will reveal how gases and small particles in large air masses transported around the globe are affecting changes on the ground in the Arctic.

"We're going to fly into these plumes of air to see where they're coming from, where they're going, and what they're composed of," says UNH scientist Jack Dibb of the Institute for the Study of Earth, Oceans, and Space (EOS). From the DC-8, Dibb and UNH colleague Eric Scheuer will be sampling gaseous nitric acid - a byproduct of pollutants emitted by car and truck engines, particles in the atmospheric known as aerosols, and mercury - a ubiquitous toxin that is very tricky to measure.

The airplane-based sampling will aid in the interpretation of complex satellite measurements taken over the Arctic and improve global chemistry and climate models. This will ultimately provide scientists with a better idea of how pollutants are transported to and around the Arctic, and what their impact on the environment and on the climate might be.

The Arctic is a beacon of global climate change. It is where warming has been strongest over the past century and has accelerated over the past decades. It is an atmospheric receptor of pollution from the northern mid-latitude continents, as manifested in particular by thick aerosol layers known as "arctic haze" and by accumulation of persistent pollutants such as mercury, which can be from both natural (the ocean, for example) and man-made sources like coal-fired power plants.

The Arctic region is increasingly beset by emissions from massive forest fires in boreal Eurasia...
and North America, which will be a focus during phase two of the campaign. Changes to the arctic environment trigger unique regional responses, including melting of ice sheets and permafrost, decrease in snow reflectivity due to deposition of black carbon, and chemical changes from airborne sea salts deposited to the ice. These responses make the Arctic a particularly vulnerable place, subject to dramatic amplification of environmental change with possibly global consequences.

"There's great interest in figuring out if these atmospheric components are accelerating the melting that goes on," Dibb says. From the DC-8, in addition to the nitric acid and aerosol measurements, Dibb and Scheuer will be operating a mercury analyzer for EOS colleagues Bob Talbot and Huiting Mao. Says Talbot, "By sampling the plumes of air coming off continents and moving towards the Arctic, we should get a clearer picture of the sources of mercury and of the complex cycling processes that deposit it into the Arctic environment."

The airborne campaign is NASA's contribution to an even larger effort called the Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate, Chemistry, Aerosols, and Transport or POLARCAT for short - an international series of field experiments in the Arctic this spring as part of the International Polar Year (http://www.ipy.org). Joining NASA flights this month from Fairbanks, Alaska, are complementary research flights headed by the National Oceanic and Atmospheric Administration and the Department of Energy.

"It's important that we go to the Arctic to understand the atmospheric contribution to warming in a place that's rapidly changing," says Jim Crawford, manager of the Tropospheric Chemistry Program at NASA Headquarters in Washington. "We are in a position to provide the most complete characterization to date for a region that is seldom observed but critical to understanding climate change."

For more information about the ARCTAS field campaign on the Web, visit: http://www.espo.nasa.gov/arctas.

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Photo available to download: http://www.eos.unh.edu/newsimage/scheuer_lg.jpg
Caption: Eric Scheuer of the UNH Climate Change Research Center installs the Soluble Acidic Gases and Aerosol instrument on NASA's DC-8 for the ARCTAS mission.