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UNH Institute for the Study of Earth, Oceans and Space

The Air Up There: UNH Scientists Part of Multi-Million Dollar Investigation of Springtime Ozone Formation

By Sharon Keeler
UNH News Bureau

The wind is blowing around 50 miles per hour in blizzard conditions that make the temperature feel like 100 degrees below zero.

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UNH research scientist Robert Talbot checks the instruments in his C-130 aircraft "flying laboratory" for measurements of nitric oxide, ozone and sulfur dioxide to build a picture of the overall chemistry of the Arctic.

Robert Talbot, University of New Hampshire research professor, is among the scientists boarding a C-130 aircraft bound for Churchill, Manitoba, from Jefferson County Airport in Broomfield, Colo. It's the beginning of a four-month mission that will provide scientists with new information on ozone formation in the Northern Hemisphere.

Ozone, formed when volatile organic compounds and oxides of nitrogen interact in the presence of sunlight, plays a central role in the chemistry of the troposphere, the portion of the atmosphere located from Earth's surface to 50,000 feet. It has an important impact on the

chemical balance of the atmosphere, and is known to have detrimental effects on human health and agricultural crop production. While ozone usually peaks in the summer months throughout the world, due to increased sunlight and temperature, it peaks in the spring in the Northern Hemisphere mid-latitudes. Scientists are trying to find out why.

Talbot and his colleagues, which include fellow UNH scientists Jack Dibb, Eric Scheuer and Garry Seid, are part of a multi-million dollar National Science Foundation research project called TOPSE (Tropospheric Ozone Production about the Spring Equinox). The aircraft that will be their "flying laboratory" through the end of May is crammed with equipment that allows scientists to take precise measurements of such compounds as nitric oxide, ozone and sulfur dioxide to build a picture of the overall chemistry of the Arctic.

"No previous comprehensive airborne research program has focused on this region of the troposphere during the period most relevant to photochemical processing, ozone formation and seasonal chemical change," says Talbot. "Where is the ozone coming from? Pollution? From higher up in the stratosphere? We want to better understand what photochemical processes are occurring, and what mechanisms are taking place."

Collecting such data is important, says Talbot, because the Arctic region is a primary pathway for transferring harmful ozone into remote areas. The troposphere is also the area where the mixing of atmospheric currents is most active.

Mission instruments and methods were developed at the Complex Systems Research Center at UNH's Institute for the Study of Earth Oceans and Space, where he, Dibb, Scheuer and Seid work. The scientists are rotating in pairs on flight missions, which leave Colorado every two weeks for Manitoba and Thule, Greenland.

About 30 other researchers from such institutions as the University of California, Irvine, the University of Rhode Island, and the NASA Langely Research Center are working on the mission, which is coordinated through the Atmospheric Chemistry Division of the

National Center for Atmospheric Research in Boulder, Colo.

"We're taking measurements before the sun rises, while it's coming up, and after it has risen to better understand the photochemical processes taking place," says Talbot. "We're also measuring vertical cross sections to look for variability, long-range transport, and potential stratospheric inputs. Our goal is to find out what the distribution of ozone is over the mid- to high-latitudes, and how this distribution evolves during the winter-spring transition."

The TOPSE project is scheduled to coincide with several other related ground-based and airborne studies investigating tropospheric ozone. These include data collection from the satellite project GOME (Global Ozone Monitoring Experiment), run by the Institute of Remote Sensing at the University of Bremen, Germany, and from MOPITT (Measurements Of Pollutants in the Troposphere), an instrument launched last year aboard the Terra satellite, the flagship of NASA's Earth Observing System program.

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