http://www.adn.com/news/alaska/story/381302.html

Anchorage Daily News

AL GRILLO / The Associated Press

Mike Cubison, a University of Colorado postdoctoral student, shows how he analyzes air samples collected over Alaska's skies with a mass spectrometer on NASA's DC-8 flying laboratory in Fairbanks.

Jet lab cruises Alaska skies as scientists study bits of pollution

ARCTIC HAZE: Clues to global warming fix may be in air samples.

By DAN JOLING
The Associated Press

Published: April 20th, 2008 12:32 AM
Last Modified: April 20th, 2008 12:29 PM

FAIRBANKS -- Mike Cubison has been flying around in a haze for three weeks, by choice.

The University of Colorado postdoctoral student grabs air samples from Alaska skies, and using a mass spectrometer, measures floating particles of pollution before obliterating them into their constituent parts to determine what they're made of.

Farther back in the DC-8 commercial airliner that's been converted by NASA into a flying laboratory, atmospheric chemist Nicola Blake of the University of California, Irvine captures air samples that will be analyzed for more than 50 chemicals to identify what part of the globe has contributed to the Arctic haze.

Cubison, Blake and about 275 scientists and support staff are trying to solve a mystery: What's making the Arctic warmer than climate models say it should be.

Greenhouse gases such as carbon dioxide have been the focus of climate change. Scientists at Fairbanks and Barrow are focusing on another suspect: tiny floating particles known as aerosols.

Their air samples turn up dust from Asian deserts, salts that swell with moisture, particles from incomplete burning of organic material from forest and cooking fires and all manner of nasties emitted by automobile exhaust pipes, factory smokestacks and power plants.

POTPOURRI OF POLLUTION

Collectively, they're a United Nations of pollution. Through chemical analysis, the particles can be traced to sources throughout Asia, Europe and North America.

"The Arctic is a melting pot for mid-latitude pollution," said Harvard's Daniel Jacob, co-project scientist for NASA, which will spend $24 million on the mission over three years. "We have signatures of just about everything you can imagine flying around in the Arctic."

The particles change as they move, sometimes reacting with chemicals in the atmosphere as they age, sometimes growing or changing color.

HAZY SKIES A SURPRISE

The scientists are building on the work of a University of Alaska Fairbanks atmospheric scientist who arrived 35 years ago after finishing his dissertation at the University of Arizona. Glenn Shaw took a photometer to Barrow, America's northernmost community, figuring he could measure the clearest skies on the globe and perhaps get a mention in a scientific journal.

"I was expecting to set a record," he said, "because at the northern tip of Alaska, there's no industry, and the idea was, that this must be the cleanest place, essentially, almost, on planet Earth."

He was wrong. Shaw detected a phenomenon later dubbed Arctic Haze that indicated the skies above Barrow and all the way to the North Pole turned into a giant lint trap in late winter and early spring.

"The important thing was, and is, this is aerosol material that is traveling over three or four thousand miles, which was unprecedented at the time," he said.

The focus on greenhouse gases has made it difficult to bring other agents of climate change into the discussion, Jacob said. But the shortcomings in climate models, which did not foresee last summer's startling record sea ice melt-off, and the International Polar Year effort, a scientific program focused on the Arctic and Antarctic every 50 years or so, made the case for the research blitz now under way by NASA, the National Oceanic Atmospheric Administration and the Department of Energy.

Aerosols may have an effect far beyond their diminutive mass.

The Department of Energy is focused on what aerosols do to clouds, said Greg McFarquhar of the University of Illinois, one of the principal investigators. The size and density of particles alter the type and longevity of clouds and whether they reflect heat back into space or absorb it.

Jacob said there has been quite a bit of work on how soot on snow may act as a strong warming agent but less effort on the radiative properties of the haze. It's a focus for both NASA and NOAA.

In most of the world, particles lead to cooling by reflecting light before it reaches the Earth's darker surface, partially offsetting the warming effect of greenhouse gases, said A.R. Ravishankara of NOAA's Earth System Research Laboratory. That's not the case in the Arctic, where ice and snow already reflect much light. Some particles absorb the sun's energy and give off their own radiant heat, like blacktop on a summer day.

"How much of this aerosol is there?" Ravishankara said. "Do they absorb light? Do they scatter light? Do they make clouds brighter or dimmer? Are they getting to the ice surface? Because if you add these absorbing particles to the ice surface, it could actually enhance the melting. What are these particles made of? Where do they come from, but particularly focusing on aerosols that absorb light."

VERIFYING POLLUTANT INFORMATION

NASA also is using the information from the flights to enhance the veracity of the information it collects from its satellites, which includes tracking pollution sources.

"We don't have to take China's word for how much a certain pollutant is emitted in the atmosphere," Jacob said.

NASA will be back to the Arctic in July for more flights to study the effects of forest fire smoke and the associated chemistry, said Jim Crawford, the agency's tropospheric chemistry program manager.

"We're really trying to understand the difference between the relative importance of these two very large and dramatic influxes of pollution to the Arctic," Crawford said.

If aerosol particles prove to be a major factor in warming, Ravishankara said, there could be a relatively fast benefit to removing them.

"It lasts only for a few days, and then it's removed from the atmosphere, unlike carbon dioxide, which stays with us for hundreds of years," he said. "Aerosols can be a way to do something very quickly."

Moreover, he says, the team has been gathering details on the haze's color, which can vary from nearly white to dark gray. The relative abundance of these different tones can play a significant role in tilting aerosols' net effect toward or away from warming.

By understanding how pieces of the Arctic air-pollution puzzle fit together, researchers say they hope to give modelers the information they need to better simulate the changes there.

"The researcher we're doing is not simply about whether warming is under way," says James Crawford, who heads the tropospheric chemistry program at NASA headquarters in Washington. "It has to do with predictability of consequences" from shifts in the delivery of pollution to the Arctic as climate changes and as countries strive to clean up their emissions.

This Associated Press story also appeared in the following media:

Anchorage Daily News-Miner
http://newsminer.com/news/2008/apr/19/agencies-go-sky-high-study-arctic-haze/

Juneau Empire:
http://www.juneauempire.com/stories/042108/sta_270603113.shtml