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# Scientists study Arctic haze for clues to northern melting

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Visitors to Alaska often marvel at the crisp, clear air. But the truth is, the skies above the Arctic Circle work like a giant lint trap during late winter and early spring, catching all sorts of pollutants swirling around the globe.

In recent weeks, scientists have been going up in government research planes and taking samples of the Arctic haze in hopes of solving a mystery: Are the floating particles accelerating the unprecedented warming going on in the far north?

While carbon dioxide and other greenhouse gases that trap the Earth's heat are believed to be the chief cause of global warming, scientists suspect that airborne particles known as aerosols are also contributing to the Arctic meltdown.

To prove their suspicions, they are analyzing the haze, using mass spectroscopy and other technology to identify what is in it, where it came from and how it interacts with the clouds, the sunlight and the snow cover.

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## Arctic a 'melting pot' of pollution, Harvard scientist says

Their air samples have been found to contain dust from Asian deserts, salts that swell up moisture, particles from incomplete burning of organic material from forest and cooking fires, and all manner of nasties emitted by automobile tailpipes, factory smokestacks and power plants.

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

"The Arctic is a melting pot for mid-latitude pollution," said Daniel Jacob, a Harvard scientist taking part in the research. "We have signatures of just about everything you can imagine flying around in the Arctic."

The research is being conducted separately by NASA, the Department of Energy and the National Oceanic Atmospheric Administration, and involves about 275 scientists and support staff and five aircraft.

The researchers are building on the work of a University of Alaska Fairbanks atmospheric scientist who arrived 35 years ago.

Glenn Shaw took a light meter to Barrow, America's northernmost community, figuring he could document 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 collect pollutants.

"The important thing was, and is, this is aerosol material that is travelling over three or four

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thousand miles, which was unprecedented at the time," he said.

## Melting Arctic sea ice prompts research blitz

The focus on greenhouse gases has made it difficult to bring other possible agents of climate change into the discussion, Jacob said. But last summer's startling melt-off of Arctic sea ice has lent new urgency to the research blitz now under way.

It is well-established that soot that has fallen on snow can absorb heat from the sun and cause melting. But the researchers are also interested in what the soot does while it is still airborne.

Among other things, they want to know how the size and density of the particles alter the type and longevity of clouds, said Greg McFarquhar of the University of Illinois. Also, they want to find out whether the airborne particles reflect heat back into space or absorb it.

In most of the world, particles lead to cooling by reflecting light before it reaches the Earth's surface, partially offsetting the warming effect of greenhouse gases.

But A.R. Ravishankara of NOAA's Earth System Research Laboratory said he suspects that's not the case in the Arctic, where ice and snow already reflect much of the light. Some particles may absorb the sun's energy and give off their own radiant heat, like blacktop on a summer day, he said.

"How much of this aerosol is there?" Ravishankara asked, summarizing some of things scientists hope to find out. "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."

If aerosols prove to be a major factor in warming, Ravishankara said, removing them could yield relatively fast benefits for the environment.

"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.

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