Scientists study Arctic haze for clues to northern melting

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The Associated Press

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.

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 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.

"Aerosols can be a way to do something very quickly."

Army of scientists study Arctic haze, warming

Five aircraft also part of study on impact of aerosol pollutants on climate

NASA's DC-8 flying lab is seen during a mission over Alaska on April 12. Sensors on the aircraft are tracking particles in the Arctic's lower atmosphere in part to determine if they contribute to warming.

Eric James / NASA via AP

Associated Press

updated 1:54 p.m. PT, Tues., April. 22, 2008

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'Melting pot ... for pollution'

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How are clouds impacted?

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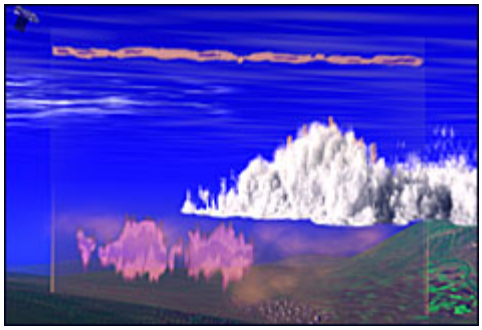
The Online Newshour (PBS.ORG):

http://www.pbs.org/newshour/updates/science/jan-june08/arcticair_04-01.html

Scientists Plot Pollutants' Path at the Arctic

The Arctic is a receptacle of the planet's air pollutants -- from forest fires to human-produced carbon dioxide emissions -- and a coordinated international effort is geared toward learning more about pollutants' effects at the top of the globe.



"The pole is this isolated place that receives pollution from all locations," explained Jim Crawford, tropospheric chemistry program manager at NASA headquarters. So scientists are working to get a clearer picture of the types of pollutants, their pathways and whether they are human or natural in origin, he said.

A broad international effort called POLARCAT -- Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate, Chemistry, Aerosols and Transport -- incorporates ground stations, airplanes, balloons, ships and satellites to closely study pollutants at the Arctic. Coordinated by Norway, numerous countries are involved including Canada, France, Germany, Russia and the United States.

The spotlight, so to speak, is on Arctic haze -- the layers of pollution that tend to linger over the Arctic in the winter and spring months. The POLARCAT campaigns aim to learn more about the makeup of these polluted air masses, seasonal changes, effects on snow and ice covers, and how they impact cloud formations.

Researchers also hope to learn where the pollutants originate. For example, the projects will measure chlorofluorocarbons. That class of chemical compounds has been blamed for reducing the Earth's protective ozone layer and has been banned in some countries but is still in use in others.

The data collected will be added to Earth science models that help forecast air quality and gauge how the Arctic may respond to future environmental changes.

Crawford and NASA radiation scientist Hal Maring are leading one of the sub-projects, called Arctic Research of the Composition of the Troposphere from Aircraft and Satellites, or ARCTAS.

Under ARCTAS, the United States, France and Germany intend to fly sensor-laden aircraft from Alaska and Canada during three-week periods in April and July. The spring missions will focus on pollution drifting up from northern continents, creating Arctic haze, and the summer flights will take readings when temperatures are warmer and forest fires in northern latitude countries are most active, Crawford said.

The measurements taken during the short-term flights will help validate data from longer-term observations from polar-orbiting satellites.

"It's the first study that looks at the Arctic atmosphere in understanding climate change and the long-term transport of pollutants," said Daniel J. Jacob, professor of atmospheric chemistry at Harvard University and an ARCTAS project scientist.

Also in the spring, the National Oceanic and Atmospheric Administration is conducting a research cruise with an eye on pollutants from local sources and ship emissions in an ice-free area of the eastern Arctic -- in the Greenland, Norwegian and Barents Seas -- in a project with the acronym ICEALOT.

The measurements will serve as a baseline, so scientists will later be able to determine whether there is an increase in pollutants from a potential increase in ship traffic due to the loss of ice cover along the Northern Sea Route and Northwest Passage, according to the agency.

Jacob said the findings from these scientific missions will likely be incorporated into future reports by the Intergovernmental Panel on Climate Change. But the policy implications for the environment are less clear and further down the road.

First, he said, the data will be published in scientific journals, where it will be peer-reviewed, and then it will be distilled into documents for the general public and possible use by policy-makers.

-- By Larisa Epatko, Online NewsHour

Discovery EarthLive Blog:

http://blogs.discovery.com/earth_live_arctas/

April 30, 2008

Mike Obland: A Plane With a View

The mountain peaks of Southern Alaska

Juneau, Alaska, April 20, 2008 -- Today may have been the most scenic flight I have had on the King Air since taking this job last June. We started our transit back to Virginia and flew from Barrow to Fairbanks and on to Juneau in two flights.

Almost all of the crew met at 7:30 a.m. in the lobby of the King Eider for one last breakfast in Barrow together. A number of people were in the habit of having breakfast at Sam and Lee's every morning. Chris had become so much of a regular that he didn't even require a waitress; he would just go up to the kitchen and tell the cook what he was having that day. We were wondering if the owners were going to give him a key so that he could open the place up for them in the morning! Anyway, with Sam and Lee's the only restaurant in Barrow that I had not yet visited, I decided to go along. It was a very good meal, as most of our meals in Barrow have been.

Most of my gear was packed last night, so when we got back to the hotel, I just had to put a few last-minute items in my bag, upload some data and check my email. I checked out of the hotel, and we drove our gear down to the hangar. Ray and I did the preflight for the instrument and made sure all the gear that we needed was onboard. After tightly packing luggage and gear for the four crew members who would be transiting back with the plane (Rick, Mike, Dale and myself), Rick, Mike and I went to church.

After church, we were expecting to basically just say our goodbyes, load onto the plane and take off. Unfortunately, getting jet fuel in Barrow on a Sunday morning can sometimes be problematic, and we were forced to wait for a few hours as Dale and P.J.

called everyone they could to try and find fuel. In the meantime, we played many rounds of really bad pool at the hangar. With all the thawing and freezing in the Arctic, building foundations tend to be very warped. A consequence of this is that the pool table is not exactly level, creating some interesting shots.

We finally lifted off at 1:15 p.m. and put Barrow behind us. We landed in Fairbanks to refuel and grabbed some quick snacks for lunch, and then we were on our way.

Up until that point, the scenery was about the same as it had been: hazy with little visibility of the Alaskan country. South of Fairbanks, though, the air started getting much clearer, and we finally had amazing views of southern Alaska: mountain peaks as far as you could see, being carved out by gigantic glaciers. All four of us had our cameras out and were taking pictures. Mike was calling out the names of peaks and glaciers that we were flying over. Rick even flew almost exactly over the peak of the second-highest mountain in North America, at over 19,500 feet, Canada's Mount Logan. Very impressive!

Our approach into Juneau was amazing, too. Juneau is situated between towering mountain peaks and right on an inlet from the ocean, and the airport is right in the middle of all that. We were lucky to fly in here on a clear-weather day. Dale had contacts with the local Army National Guard unit, and they graciously allowed us to park our airplane in their hangar overnight and use one of their vans to drive around town. We checked into a local hotel and went to the downtown area. We watched the sun go down behind the mountains, and then had some phenomenal food at a local eatery on the water. After a relaxing time at the restaurant, we went back to the hotel, where I uploaded today's data and crashed into bed.

If you love to travel and see new places and things, this is a great job.

Photo: Mike Wusk

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Posted at 10:57 AM | Permalink | Comments (0) | TrackBack (0)

Mike Obland: Packing Up


Canadian Convair used as part of the DOE mission

Barrow, Alaska, April 19, 2008 -- Ray is flying on our last ARCTAS science mission today. Mike referred to today's flight as the "money maker," because we will be doing so much coordination with the other airplanes. I walked down to the hangar with a bit of difficulty, as I was fighting 40-plus mile-per-hour wind gusts that were pushing me around. Fortunately, the temperature was above zero for once, so it was not that cold out.

We had some time before the flight would leave in the morning, so Ray and I started packing up our crates of equipment for shipping back to Virginia on Monday. We went through the hangar building and gathered up the rest of our equipment that was lying out, packed it all and cataloged it so that we know where to find it in a few weeks when it arrives at Langley Research Center.

Rick, Mike and Ray took off for their afternoon flight. They accomplished quite a bit, coordinating with the DOE Convair and NOAA P-3, and doing a CALIPSO run northwest of Barrow and passes over the ARM NSA site. In the meantime, Internet access was down at the hangar, so I went back to my hotel room to monitor the flight from there and work on some writing and packing, as we will probably start heading for home tomorrow.

The flight went well; the crew handled all the real-time flight changes and coordination smoothly. After the plane was back in the hangar and everyone was finished with their post-flight tasks, we all met in the hangar offices to go over the final logistics for the trip back home. We will be leaving tomorrow with our mission successfully completed. Rick, Mike, Dale and I will be leaving Barrow on the King Air for about a three-day transit home. Dale, being the crew chief, rides with the plane on long rides like this in case something mechanical should go wrong. I am flying home on the King Air because Ray flew up to Barrow on it, so that we can try to keep our flight times even. Ed, Scottie and Ray will be flying home commercially in the next few days.

We had our last dinner in Barrow at Osaka's, where the sushi was again excellent. I'm getting excited to be heading back to warmer climates tomorrow!

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Posted at 10:39 AM in Planet Earth | Permalink | Comments (0) | TrackBack (0)

Mike Obland: Hanging Out in Barrow

A life-sized model of a bowhead greets visitors at Barrow's cultural heritage center.

Barrow, Alaska, April 18, 2008 -- Today was our first day off since last Friday. It has been a long week, especially with the busy trip we had down to Fairbanks. I think everyone really needed today to rest up and get some energy back.

I wanted to use today to do last-minute tourist tasks before leaving Barrow. After sleeping in a bit, Ray and I drove around the town taking pictures to remember the place by. We stopped in at the Laundromat and picked up a few Christmas gifts and souvenirs for friends and family. We also stopped by the AC grocery store, because for some reason they were having a crazy clearance sale on cologne, and the prices were too good to pass up. Of course, when I got back to the hotel, I opened up the container and found out that the bottle was loosely sealed and had leaked about a quarter of the cologne. So, you get what you pay for, but it was still a good deal.

Ray and I next went to visit the cultural heritage center. They had nice exhibits about the history of the North Slope Borough, and about the history of the native people. The exhibit about how they used to survive in such an inhospitable environment was interesting as well. They even had a life-sized model of a bowhead whale in the lobby.

We had a nice conversation with a woman who works there, sharing what we are doing and listening to her stories about life in Barrow. The people here seem very concerned about the changes to their environment, and several people have specifically mentioned all the haze and pollution that is coming their way. They have been appreciative of the work we are doing.

What to do on a day off in Barrow? Mike Wusk goes Hawaiian in the snow.

After Ray and I returned to the hotel, we met up with the other members of the team. One thing we all wanted to do before leaving the frigid confines of Barrow was to take a few fun pictures of us decked out in our shorts and Hawaiian shirts. After a little coaxing, we all agreed and changed clothes. We drove around to a few "tourist" places in Barrow, such as the "top of the world" sign. I'm sure we'll be laughing about those pictures for years to come.

We were all pretty cold after taking those pictures, and were generously greeted back at the hangar with a home-cooked Philippine meal by one of the hangar employees, P.J., and his wife, Melva. P.J. has been very helpful with moving, servicing, and fueling our plane the entire time we have been in Barrow. The meal was delicious; we appreciated P.J, and Melva's hospitality.

Stuffed from dinner, we all spent the evening doing separate things. I went back to the hotel to start packing my suitcases for the trip home and to get some sleep. We have one more research flight tomorrow.

Photo: Mike Obland

WVEC

http://www.wvec.com/

Researchers in Hampton studying pollution's effects on our planet

06:08 PM EDT on Wednesday, May 14, 2008

Reported by: Craig Moeller

HAMPTON -- Every day, direct sunlight heats the earth and that heat is released at night. How much radiation reaches the planet and the amount that gets trapped in the atmosphere varies by location, depending on the gases and aerosols or tiny particles in the air.

Rich Ferrare, a senior researcher with NASA Langley, is studying how that's affecting the arctic.

"What NASA was trying to do was look at the effects of anthropogenic, or man-made pollution, as well as forest fire smoke on the atmosphere in the arctic -- looking at the balance of radiation. How does the solar radiation change as a result of all these pollutants being put into the atmosphere?," he explains.

Ferrare has seen the impact of artic haze.

"We've seen this accelerating change with the ice melt and so on that is going on in the artic," he notes.

With changes elsewhere on Earth, researchers are working to improve their climate forecasts to help determine whether similar changes are happening in Virginia.

The crew from NASA Langley flew 18 missions out of Barrow, Alaska.

A NASA research plane along with four others measured haze in the Artic atmosphere. A laser radar identified where the haze was while other researchers were able to determine it came from wildfires in Siberia and pollution along the U.S. East Coast.

The work helps validate data from the CALIPSO Satellite, which has been scanning the skies for aerosols and thin clouds since its launch in 2006.

The findings are essential to improving climate predicting models, as research scientist Chris Hostetler explains.

"The idea is to improve our models that we use to understand climate change because only models are going to allow us to predict future climate change."

ARCTAS Media Briefing

April 14 2008

Major Media Coverage
Compiled through April 24, 2008

http://www.csmonitor.com/2008/0416/p25s01-wogi.html

THE CHRISTIAN SCIENCE MONITOR csmonitor.com

U.S. scientists to study Arctic smog

Key question: Is air pollution from lower latitudes causing the region's recent warming?

By Peter N. Spotts | *Staff writer of The Christian Science Monitor*
posted April 16, 2008 at 4:12 p.m. EST

Reporter Peter N. Spotts discusses the challenges of studying the impact of air pollution on the Arctic climate.

Despite its pristine image, the Arctic has a serious smog and soot problem.

Scientists from three federal agencies are now engaged in the most ambitious effort yet to measure airborne pollutants in the Arctic and gauge their effect on the region's climate.

For three weeks this month, and another three weeks this summer, they are marshaling satellites, instrument-laden aircraft, oceanographic ships, and ground stations to study the gases, aerosols, and black-carbon soot that accumulate in the region from human activities and wildfires.

By some accounts, these pollutants – especially soot from inefficiently burned fossil fuels and from burning biomass – could be responsible for a significant portion of the region's recent warming.

That warming has outpaced projections from climate models. And it's led to a dramatic loss of summer sea ice in the Arctic Ocean. If current trends continue, some researchers say, the Arctic Ocean could be ice-free in the summer within the next 10 years – with ripple effects that would touch climate and weather patterns at lower latitudes.

Scientists have long observed that atmospheric circulations have carried pollutants into the skies above the Arctic, turning them into something of a dumpster for the Northern Hemisphere's air pollution. More recently, the vast northern forests in Russia, Canada, and Alaska have seen rising numbers of wildfires, adding their emissions to the mix.

"There is an urgent need to better understand changes going on in Arctic pollution" and its effects on the region's climate, says Harvard University's Daniel Jacob, who specializes in atmospheric chemistry and is chief scientist for ARCTAS, the National Aeronautics and Space Administration's contribution to the effort.

The two-phase study is part of a broader international effort – associated with the International Polar Year – to understand the sources and effects of airborne pollutants reaching the region.

The ambitious project follows on the heels of major field efforts in the late 1990s and last year looking at similar issues in the Indian Ocean and across the northern Pacific Ocean. Taken together they should provide a more detailed global picture of the impact air pollution can have on weather and climate and how those effects change with latitude, according to Veerabhadran Ramanathan, director of the Center for Clouds, Chemistry, and Climate at the Scripps Institution of Oceanography in La Jolla, Calif. He played a leading role in these earlier research projects.

"What they are trying to do is very important," he says. "The chemistry of how you go from emissions to pollution is very different" in different regions of the world. Even when the chemistry is the same, the pollutants' behavior can vary with temperature, humidity, and a region's broader climate patterns. "To put the global puzzle together, we need to understand the different contexts" in which gaseous emissions, aerosols, and black-carbon soot find themselves.

The Arctic illustrates the point. Taken globally, soot and tiny particles called aerosols have a mixed effect on temperatures at the Earth's surface. Soot has a warming effect, because its dark surface absorbs and reemits heat. Aerosols present a more mixed picture. On their own, they can lead to cooling. But they also provide the seeds around which cloud droplets can grow. The size and number of particles affect the thickness of the clouds. That thickness can help determine whether the clouds will cool the surface by blocking sunlight and reflecting it back into space or keep things relatively toasty by letting some light through and trapping heat coming up from the surface.

Globally, the net impact of aerosols is to cool climate, partly offsetting the warming from a build up of human-generated greenhouse-gases, explains Ravi Ravishankara, who heads the chemical sciences division of the National Oceanic and Atmospheric Administration's Earth System Research Laboratory in Boulder, Colo.

"But," he adds, "the Arctic is a strange place." Aerosols that form Arctic haze appear to warm the region, he says.

Although the project is roughly halfway through its first three weeks in the field, researchers are already noting the region's role as a caldron for emissions flowing up from lower latitudes.

"We've seen European pollution, North American pollution, Russian pollution. We've seen Siberian forest-fire plumes already, in April. We've seen plumes coming all the way up from Indochina," where locals use fire to clear farmland, Dr. Jacob says. This stew is aging in the Arctic, combining to form Arctic haze.

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

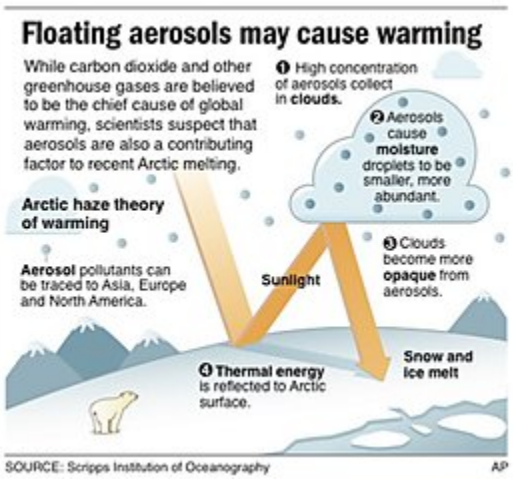
http://abcnews.go.com/US/wireStory?id=4703377

ABC News

Scientists study Arctic haze for clues to rapid melting

Scientists are studying Arctic haze for clues to rapid melting of sea ice in northern Alaska

By DAN JOLING Associated Press Writer
FAIRBANKS, Alaska Apr 22, 2008 (AP)
The Associated Press



Graphic shows how aerosols and pollutants in the Arctic atmosphere act as a warming agent; 2c x 3 1/2 inches; 96.3 mm x 88.9 mm
(AP)

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.

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."

This photo provided by NASA shows NASA's DC8 flying laboratory during a mission over Alaska on...
(AP)

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 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 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.

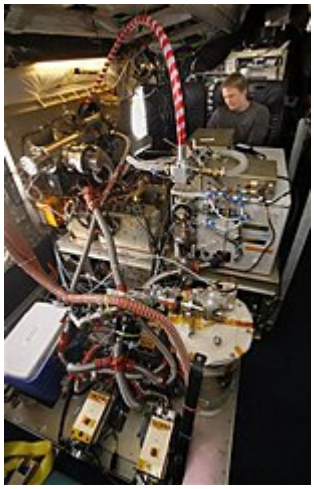
Among other things, they want to know how the size and density of the particles alter the type and longevity of clouds, said Greg McFarquhar of the University of Illinois. Also, they want to find out whether the airborne particles reflect heat back into space or absorb it.

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.



John Crounse, a graduate chemistry student from Cal-Tech, works with one of the instruments aboard...
(AP)

"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."

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On the Net:

NASA Arctic Research of the Composition of the Troposphere from Aircraft and Satellites: http://www.espo.nasa.gov/arctas/logos.php Top of Form

NOAA Aerosol, Radiation, and Cloud Processes affecting Arctic Climate: http://www.esrl.noaa.gov/csd/arcpac/

DOE Indirect and Semi-Direct Aerosol Campaign: http://acrf-campaign.arm.gov/isdac/

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This Associated Press story also appeared in the following media:

Daily Herald:
http://www.juneauempire.com/stories/042108/sta_270603113.shtml

Arizona Daily Star:
http://www.azstarnet.com/sn/news/235582.php

Live Science:
http://www.livescience.com/environment/080423-ap-arctic-haze.html

KCBY-TV, Coos Bay:
http://www.kcby.com/news/national/18041709.html

WashingtonPost.com (with slideshow):
http://www.washingtonpost.com/wp-dyn/content/article/2008/04/22/AR2008042201543.html

Arizona Republic:

THE GREEN ZONE News of the environment from wire reports

Arctic haze studied for clues to melting

ASSOCIATED PRESS

FAIRBANKS, Alaska – 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.

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Through chemical analysis, the particles can be traced to their sources throughout Asia, Europe and North America.

CBSNews.ca: http://www.cbc.ca/technology/story/2008/04/22/arctic-haze.html

http://newsminer.com/news/2008/apr/15/scientists-using-fairbanks-base-arctic-research/

Fairbanks Daily News-Miner

Scientists using Fairbanks as base for Arctic research

By Christi Hang

Published Tuesday, April 15, 2008


Daily News-Miner

SNOW DAY

AIRLINE MERGER

STEPPING DOWN

Judge rejects retrial for Kohring

Arctic research heats up

Feds reopen comments on Yukon Flats

Ex-Canada official: Big hurdles for Alaska gas line

Inside

CMT Awards

Americans spend more than a day, $200 to pay their taxes

Photo by John Wagner

Photo by John Wagner

Photo by John Wagner

Researchers are flocking to Fairbanks as scientific interest in the Arctic intensifies in the face of global warming.

About 250 researchers from three federal agencies are using the city as a base for field research. NASA, the National Oceanic and Atmospheric Administration and the Department of Energy are using a small fleet of airplanes to collect data about pollution in the Arctic atmosphere.

At a media day Monday, representatives from the three organizations discussed their research. All three are studying atmospheric contributions to climate warming, but each organization is focusing on different components, such as arctic haze. Arctic haze is caused by pollution found in the Arctic atmosphere at high altitudes.

“There are signs of everything you could imagine in the Arctic,” NASA researcher Daniel Jacob said.

Jacob said particles originating from China, North America and Europe have been found in the arctic haze. In the current study, researchers have found a large amount of pollution from Siberian agricultural fires in the Arctic atmosphere, an unusual finding this early in the season.

Groups are also focusing on how aerosols cool or warm the Earth.

Aerosols are fine particles suspended in the air. On a global level, they cool the Earth’s temperature, but in the Arctic, particles have the opposite effect and are warming the area, said A.R. Ravishankara, director of the Chemical Sciences Division of the NOAA Earth System Research Laboratory.

Other scientists are working to refine climate models.

Some current climate models are not predicting the rate of warming accurately and are behind the actual rate of warming.

Using airplanes, a mode of fossil-fueled transportation that leaves its own trail of pollutants, may seem an odd choice, but Jacob says long-term results more than offset the short-term effects.

“The legacy is predictability,” he said.

NASA is using three airplanes: a DC-8, P-3B and B-200, to collect data. The other agencies have one plane apiece.

The largest of NASA’s airplanes, the DC-8, is a commercial jet airliner that has been modified for scientific research. It takes four weeks to transform a bare cabin into an airborne research center.

Research stations are spread out throughout the DC-8’s cabin to record a wide range of atmospheric data, such as how different particles form different clouds, different types of pollution, dust and soot; and determining the composition of different pollution types found in the Arctic atmosphere.

The P-3B has two radiometers to detect aerosols above and below the airplane. The P-3B has a central data logging system, which records flight data.

The smallest airplane, the B-200, is based out of Barrow and has a single Light Detection and Ranging System, also known as LIDAR. The B-200 specializes in satellite validation and tracks the Cloud-Aerosol LIDAR and Infrared Pathfinder Satellite Observation satellite, also known as CALIPSO. The satellite monitors clouds and aerosols from space, and the B-200’s missions ensure the satellite is working properly.

NOAA also uses a P-3 to conduct its aerial research. The particular aircraft the organization is using is also a hurricane hunter, and has been used in 73 hurricanes, signified by the 73 red stickers stuck on its side with the names of each of the storms it has weathered.

“It’s incredibly rugged; it was built for aggressive weather,” said Hal Maring, a NASA program manager.

Carstens Warneke, a NOAA researcher, said his organization and NASA are both researching the climate effects of air pollution, but NOAA is focused on particle composition and origin.

The only airplane flying Monday was DOE’s Convair 580, which is used to collect data above, below and inside clouds. The 580 has multiple sensors on its exterior to record cloud and atmospheric data. The program has a permanent base in the North Slope to provide data about clouds and radioactive processes at high latitudes.

NASA research missions similar to the Fairbanks mission usually last for seven weeks, but NASA will only spend three weeks in Fairbanks because there is a second phase, Jim

Crawford, the NASA program manager, said. The second phase is a three-week residency without NOAA or DOE at Cold Lake in Alberta, Canada, to measure emissions from forest fires.

Contact staff writer Christi Hang at 459-7590.

http://www.dailycamera.com/news/2008/apr/15/noaa-plane-flying-in-an-arctic-haze/

Your Daily Camera Online
dailycamera

NOAA plane flying through an 'Arctic haze'

Pollution over region may add to its warming

By Steve Graff, For the Camera
Tuesday, April 15, 2008

Courtesy photo

David Thomson, left, and Chuck Brock, both of the National Oceanic and Atmospheric Administration's Earth System Research Laboratory in Boulder, adjusting one of nearly 30 instruments attached to a research aircraft.

Those extra greenhouse gases warming the planet may have a partner in crime.

Scientists from Boulder's National Oceanic and Atmospheric Administration, as well as NASA and the Department of Energy, are in Fairbanks, Alaska, flying through Arctic clouds to study how pollution that's congregating over the region, commonly known as "Arctic haze," may be contributing to its warmer climate.

Scientists leading the airborne missions, in which specially equipped planes collect air data, say the seasonal pollution -- made up of aerosols trapped in the clouds -- comes from all over the world.

“The Arctic is the melting pot for mid-latitude pollution,” said Daniel Jacob, NASA project scientist, in a teleconference Monday in Fairbanks. “We’ve seen North American pollution, European pollution and (pollution from) Asia.”

According to a report issued by NOAA for the haze study, the aerosols are comprised of sulfate, nitrate and soot from biomass burning.

“Globally, aerosols lead to cooling, but over the Arctic, they lead to surface warming,” said A.R. Ravishankara, research scientist for NOAA’s Earth System Research Laboratory.

That’s because aerosols gravitating to the Arctic are dark in color, and up against the reflective, white surface they absorb light more easily, said Dan Murphy, a NOAA research scientist also working in Fairbanks.

“Arctic haze,” which peaks in late winter and spring, has been observed since the Industrial Revolution began in the late 1700s and has been studied for the past three decades.

Determining the climate-relevant properties and how much it contributes to the warming and ice shrinkage is part of the comprehensive study, as well as pinpointing the emission sources of the pollutants.

For the rest of April, NOAA’s cargo plane will continue collecting data — which includes aerosol composition and radiation measurements — with instruments attached to its wings and belly. NASA’s planes will work through the summer.

The project is NOAA’s contribution to the International Polar Year of 2008, a large, scientific research effort focused on the Arctic and Antarctica.

http://newsminer.com/news/2008/apr/24/scientists-ready-dig-polar-air-research/

Fairbanks Daily News-Miner

Scientists ready to dig into polar air research

By Christi Hang

Published Thursday, April 24, 2008

The aircraft and scientists have left Fairbanks but the polar atmosphere research continues.

For the majority of April, more than 250 scientists from the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration and the Department of Energy joined in Fairbanks to gather research on air pollution in the Arctic.

Even with the influx of scientists coming from across the nation and Europe, researchers at the University of Alaska Fairbanks' Geophysical Institute and International Arctic Research Center were able to interact with the scientists and work on the Arctic pollution problem as well. One of UAF's researchers was Ken Sassen, a professor of atmospheric sciences, who looked at different aerosol sources such as Russian or Chinese agricultural fires and their effects on cloud formation.

Sassen said although the NASA researchers are finished gathering in Fairbanks, they still need to analyze the data, which can take from six months to a year. NASA is also planning to go to Cold Lake, Alberta, in the summer to collect more data, which will be complied with the Fairbanks data.

Glen Shaw, professor emeritus of atmospheric sciences, won a grant from NASA to study Arctic haze and became a project manager during the agency's residency in Fairbanks. Although he worked closest with NASA, Shaw said all of the researchers used the GI and International Arctic Research Center facilities as headquarters and had large daily meetings.

"There was a feeling of good spirits and camaraderie," Shaw said.

Shaw said he was able to conduct research related to the work being done by NASA on its research aircraft. Shaw is still collecting data from two experiments at the Poker Flats Research Range. One experiment is looking at cloud condensations and the different clouds they formed. The second project uses an aerosol mass spectrometer to look at

individual chemical particles in Arctic haze. His work will continue until the Arctic haze dissipates closer to summer.

Shaw discovered Arctic haze in Barrow in 1972 and originally thought it was caused by dust from the Gobi Desert. Over the years as more research was being done, the theory evolved. It is now believed Arctic haze is mainly composed of pollution from Russia and Eastern European countries that burn dirty coal. The pollution then gets swept into a meteorological pattern that brings it to the Arctic.

Shaw said because of trends in science, the topic of Arctic haze faded into the background until the International Polar Year shifted the science community's attention to the environment. By bringing a section of the science community to Fairbanks, he said the university definitely benefited.

"We made a lot of contacts," he said. "It was a wonderfully fruitful experience."

http://www.washingtonpost.com/wp-dyn/content/photo/2008/04/22/PH2008042201546.html

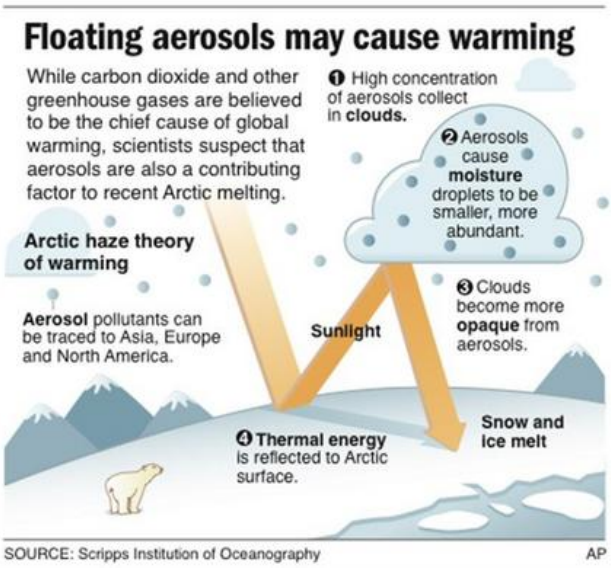
Washington Post

Click for more of the best photojournalism: This photo provided by NASA shows NASA's DC8 flying laboratory during a mission over Alaska on Saturday, April 12, 2008. Scientists from three federal agencies are researching particles in the Arctic's lower atmosphere in part to determine if they contribute to climate change and warming. (AP Photo/NASA,Eric James)

http://ksjtracker.mit.edu/?p=6141

AP: A closer look at Int'l Polar Year and its scrutiny of Arctic haze

About a week ago NOAA, NASA, and other US agencies had a media day in Fairbanks to trumpet a major campaign to characterize and explain the gunk in the air over the Arctic. A few outlets ran stories immediately. **AP**'s **Dan Joling** gets his in today, and it's the better for the wait. The first day, media-day stories had the atmosphere of an airplane hangar. This one gives readers a clearer feel for the science involved as airplanes and other instrument platforms sample the air, the snowfields and tundra on which aerosol particles fall, and as researchers try to weave it all together.



He pins much of the attention on one puzzle: does the pollution-laden Arctic haze tend to cool things, or warm them, and how are its effects distributed by altitude and over the landscape? Last week, one reports called the airborne stew a "melting pot for mid-latitude pollution." Joling uses that one, too, and adds that they are a "United Nations of pollution."

Earlier post, Apr 16, **here**;

-CP

http://ksjtracker.mit.edu/?p=6069

Fairbanks News-Miner, Boulder D. Camera: How hazy is the Arctic, and why.

With the International Polar Year well-along, three federal agencies - NASA, NOAA, and the Dept. of Energy - ran a media day in Fairbanks, Alaska Monday to tell reporters about an airborne campaign to measure and analyze the industrial and natural gunk that cuts visibility in the high atmosphere over the Arctic. Two print outlets that The Tracker could find filed stories right away - the local **Daily Miner**, and the **Boulder Daily Camera** in Colorado for which some of the research teams also are local stories.

The **Daily Miner's** **Christi Hang**, in a story well illustrated by a staff photographer, tells readers researchers are "flocking to Fairbanks" for such studies, including 250 for the airborne haze campaign. One researcher tells her that while industrial hazes, on a global basis, tend to counter global warming by a bit, in the Arctic they magnify it. Perhaps it's due to a difference in soot levels but she doesn't get into that. She does list the three planes NASA has, while the other agencies have but one apiece, and does a nice job indicating the instrumentation some of them carry.

The Tracker also noted, looking at the Miner's copy, a promotion for a free public lecture by Denmark's climate change not-so-much-worried **Bjorn Lomborg** in Fairbanks as part of a "Int'l Polar Year visiting author series." (Info on that **here**).

Writing the haze story from afar, the **Camera**'s **Steve Graff** focusses on the home town-based NOAA team. One researcher tells him the Arctic is a "melting pot for mid-latitude pollution."

Grist for the Mill: NASA **Press Release**