

Scientists measure Arctic soot in bid to slow global warming, oceans' rise

May 11 2011, By Renee Schoof

American scientists working on an island far above the Arctic Circle have been launching unmanned aircraft and digging snow samples to measure how soot helps melt Arctic snow and ice.

[Satellite observations](#) in recent decades show longer warm seasons and more melting throughout the region. One reason for this is black carbon, the basic component of soot. The black pollution absorbs light energy, increasing temperatures that speed melting.

The measurements over the past month on a Norwegian island of the Svalbard group, east of northern Greenland, could help show the most useful places to reduce soot - one part of broader efforts to slow Arctic warming and the rise in sea level that it will bring to coastal communities worldwide.

Different sources of black carbon have different chemical tracers, said Patricia Quinn, a chemist and co-leader of the team. The tracers, along with models of airflows, allow scientists to figure out where the soot came from.

"So we can say this is coming from forest fire burning in this region, or oil burning in this region, indicating that those are the sources that really need to be targeted and reduced," Quinn said.

Black carbon stays in the atmosphere for days or weeks. Carbon dioxide, on the other hand, the main heat-trapping gas, accumulates in the

atmosphere for hundreds of years. Scientific studies say there's no way around the need to reduce carbon dioxide from energy use, but black carbon reductions in the meantime would bring immediate benefits.

Quinn, a research chemist at the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory in Seattle, said this is the first year that scientists have put black carbon sensors on the two suitcase-sized, unmanned Manta aircraft they used to study the Arctic atmosphere. The aircraft regularly find a layer of [air pollution](#), sometimes with black carbon, at about 4,000 feet.

Quinn and her team dig into a snow pit to measure the black carbon deposited since last summer. What they find is mainly from diesel emissions and wood or agricultural burning in Russia and Eastern Europe, she said.

NOAA's soot study is part of an international effort to understand the role of black carbon on the Arctic that involves cooperation with Norwegian, Russian, Chinese, German and Italian scientists working together in Svalbard at the northernmost permanent human settlement on Earth.

It's a beautiful land of glaciers and a fjord, where the ice has now broken up and drifted out to sea. Temperatures were around freezing last month, Quinn said after returning from a three-week stint.

Michael McCracken, an atmospheric physicist whose career included work as a climate scientist in Washington, D.C., from 1993 to 2002, said that scientists have a good conceptual understanding of black carbon's role in warming, but many questions remain, including how much black carbon enters the atmosphere and what happens when it mixes with other pollutants.

"We have some estimates on all of this, but not nearly as good an understanding as for the greenhouse gases. So, the effects are important, but the range of our estimates is still pretty large," he said.

One major study this year said that black carbon reductions would slow warming for a few decades, but that the main driver of warming - heat-trapping gases - still must be sharply reduced as well. It also found that soot reductions would save lives around the world, because the fine particles cause heart and lung diseases.

That United Nations Environment Program and World Meteorological Organization report said that soot reductions could be achieved by replacing traditional, smoky cook stoves with more efficient ones; banning agricultural burning; and adding filters to old diesel vehicle engines.

Ships traveling through the Arctic also leave soot from their exhaust. The International Maritime Organization is considering requirements for diesel filters on ship engines. As summer sea ice declines and disappears, Arctic shipping is expected to take off, both for cargo transport and to serve oil and gas production.

Secretary of State Hillary Clinton and the foreign ministers of seven other Arctic nations meet in Greenland on May 12 to discuss how to reduce [black carbon](#) and methane, another relatively short-lived climate-damaging pollutant.

In the U.S., diesel exhaust is a primary source of soot and, according to the Environmental Protection Agency, a major health threat. New diesel engines and those with filters added cut the pollution by 90 percent, but there are still 11 million heavy-duty diesel engines in operation.

There's been strong bipartisan support for a program that provides

federal funds to encourage communities to put filters on or replace old diesel school buses and other vehicles. Lawmakers from both parties objected recently when the Obama administration's proposed budget eliminated these funds for 2012.

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