

## Better models needed to track atmospheric pollution's impact on health, climate

February 19 2012

The past decade has witnessed a significant growth in Asian air pollution, causing a great concern for air quality and climate. If government policy makers hope to contain the problem, they will need increased research and better computer models of black carbon and other aerosol pollutants, also known as atmospheric brown cloud (ABC), according to University of Iowa engineering professor Gregory Carmichael.

Carmichael made the case for more research and better-informed policy makers when he spoke Sunday, Feb. 19, at the 2012 Annual Meeting of the <u>American Association for the Advancement of Science</u> (AAAS) in Vancouver, British Columbia, Canada. He said that while ABC pollution is responsible for many problems -- including hundreds of thousands of deaths annually in India and China alone -- the scientific data required to attack the problem needs improvement.

He stressed that the problem of Asian pollutants has steadily grown worse.

"Collectively, ABCs have given rise to major areas of concern, some of the most critical being the observed decrease in the Indian summer monsoon rainfall, the north-south shift in eastern China <u>rainfall patterns</u>, and the accelerated retreat of the HKHT (Hindu Kush-Himalayan-Tibetan) glaciers and decrease in snow packs," he said. "All these have led to negative effects on water resources and crop yields in Asia."



He noted that the many variables involved in weather and <u>air pollution</u> forecasting have made it almost impossible to predict the pathways and effects of such pollution.

"Models play a critical role in linking emissions to climate and environmental impacts. This information is needed to help inform policies that target reductions in health and <u>climate impacts</u>. But the emissions inventories themselves are recognized to have 50 percent uncertainty in global totals, and have estimated errors of a factor of two to five in specific regions," he said.

"We need to reduce the uncertainties in the analysis chain. Uncertainties are reduced through laboratory and field experiments that improve our understanding of key processes and provide data to help constrain model predictions," he said.

In fact, the interactions of pollution, weather and climate are so complex that computer models may be the only useful tools for policy makers who must manage future emissions to improve the air quality and reduce the impacts of climate change, said Carmichael, who serves as Karl Kammermeyer Professor of Chemical and Biochemical Engineering in the UI College of Engineering and co-director of the UI's Center for Global and Regional Environmental Research.

He noted that information he and his colleagues gathered as a part of the NASA-funded project Atmospheric Brown Cloud already is enabling researchers to build more reliable computer models that can be used to more accurately forecast increases not just in carbon dioxide levels, but in Asian pollution in general.

During the past 10 years, field studies sponsored by National Science Foundation (NSF) and NASA in Asia have enabled Carmichael and colleagues to monitor air pollution transport in East Asia. Such studies



have involved multiple aircraft, ship, satellite, and ground-based measurements to help develop a forecast using new computer models of the chemical weather situation. This work has helped to establish the fact that air pollution can be transported from one continent to another.

Carmichael said that new results from a detailed study of ABCs conducted during the October 2010 Commonwealth Games held in Delhi, India, showed that emissions from vehicles and houses, along with primary and secondary aerosols, greatly diminished sunlight and increased temperatures.

The Commonwealth Games study and other studies are demonstrating that the large impact of air pollution in cities is also having a large impact on local and regional climate. "Improvements in our capacity to forecast weather, air pollution, and climate will require that these systems be more closely integrated. And this close interaction of weather and environmental services is already beginning to happen around the world," he said.

**More information:** The AAAS talk was titled, "What's Our Understanding of Asian Aerosols and Its Climate and Air Pollution Impacts?"

## Provided by University of Iowa Health Care

Citation: Better models needed to track atmospheric pollution's impact on health, climate (2012, February 19) retrieved 27 April 2024 from <u>https://phys.org/news/2012-02-track-atmospheric-pollution-impact-health.html</u>

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