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Biomass Burning Really Heats Things Up:

New Study Shows Significance of Fire's Brown Carbon for Global Warming

Washington, DC, 5 July 2012 – Emissions from forest fires and other biomass burning has a greater impact on global warming than previously understood, according to a new study.

"We used to think the lighter particles in the smoke from forest fires and crop burning had a cooling effect that might offset the warming effect of the darker black carbon particles in the smoke," said Dr. Ramanathan of Scripps Institution of Oceanography and one of the authors of the study. "But because we've found brown carbon particles mixed in with the lighter organic matter, we now know that the net effect of the lighter particles is about zero, meaning there is no significant cooling to offset the warming from black carbon particles from fires."

Carbonaceous aerosol emissions from forest fires and other biomass burning have long been known to include both dark particles that absorb heat, known as black carbon, as well as lighter colored particles known as organic matter or organic carbon that reflect heat back into space and cancelled the warming.

The new study now shows that even some of the lighter organic particles, those known as brown carbon, absorb heat that is more than the total cooling effect of the lighter particles. The absorption of these brown carbon particles essentially negates the overall cooling effect of the lighter organic material. As a result the overall warming impact of carbonanceous aerosols is approximately equivalent to the black carbon components. The study is based on empirical data from a ground-based aerosol network integrated with field data and satellite observations.

"The record-breaking wildfires in the western United States are part of a vicious cycle amplified by global warming," said Durwood Zaelke, President of the Institute for Governance and Sustainable Development. "Climate change dries the forests and fuels the fires, and the fires fuel climate change."

The new study, lead by Dr. Chul E. Chung from the Gwangju Institute of Science and Technology, also reported that warming from global black carbon could be as much as 85% larger than the Intergovernmental Panel on Climate Change calculated in 2007. A recent study by U.S. EPA ranked black carbon as the number two climate pollutant behind carbon dioxide but ahead of methane.

Cutting black carbon in addition to other short-lived climate pollutants (SLCPs) such as methane, tropospheric ozone, and hydrofluorocarbons (HFCs) can reduce the current rate of global warming by almost half and the rate of warming in the Arctic by two-thirds for the next 30 or more years while avoiding up to 4.7 million premature deaths each year from outdoor air pollution and up to 1.6 million a year from indoor pollution.

Black carbon has an even more powerful warming impact on vulnerable regions such as the Arctic and the Himalayan-Tibetan Plateau in Asia. The Arctic is currently warming at twice the rate of the global average, and melting there is predicted to contribute to sea levels to rise of as much as five feet by the end of the century. Another recent report on black carbon in the Brahmaputra River Valley, southeast of the Tibetan Plateau, found that the exceptionally high concentrations of black carbon in the area contributed to the extreme regional climate change, including increased surface temperature and

changing precipitation patterns.

Black carbon is targeted by the new Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants, along with HFC, and methane. There are currently 19 members of the Coalition including the G8 countries, the European Commission, World Bank, and the United Nations Environment Programme, which will host the Secretariat.

"The Climate and Clean Air Coalition may be the only way to reduce climate impacts in the near term, and is a critical complement to the primary battle to reduce emissions of CO_2," said Zaelke.

Chul E. Chung, V. Ramanathan, and Damien Decremer. *Observationally constrained estimates of carbonaceous aerosol radiative forcing.* (See report here.)

Rajan K. Chakrabarty, Mark A. Garro, Eric M. Wilcox, and Hans Moosmüller, *Strong radiative heating due to wintertime black carbon aerosols in the Brahmaputra River Valley*. (See report here.)