

Researchers constrain the sources of climate- and health-afflicting air pollution from China

August 9 2013



The international Atmospheric Brown Cloud (ABC) Program Superobservatory ideally located to intercept the outflow from China at Gosan, Jeju Island in SE Yellow Sea. Credit: Elena Kirillova

Particulate air pollution from incomplete combustion is affecting climate

over East Asia more than carbon dioxide and cause premature deaths of over half a million annually in China alone, yet its sources have been poorly understood. In this week's issue of *Environmental Science and Technology* (journal of the American Chemical Society) a research team from China, Sweden, USA and South Korea use a powerful carbon-14 method to show that four-fifths of the soot particle air pollution are from fossil fuel combustion such as household cooking with coal briquettes and city traffic, drastically changing the view on sources and guiding efforts to mitigate emissions.

The finding improves our understanding of the sources of black carbon (BC; soot) aerosols – a key constituent of air pollution in China – and the most important short-lived climate pollutant. The relative contribution from fossil fuel versus biomass combustion is important to constrain as fossil soot is a stronger climate forcer, penetrates deeper into the respiratory tract and accurate source apportionment is the underpinning of society's mitigation actions.

Severe air pollution, covering large parts of South and East Asia as Atmospheric Brown Clouds (ABC), originate from incomplete combustion such as household burning of coal and wood fuel, agricultural residue burning, industrial processes and massive traffic. Previous studies, based on uncertain emission factors, spans a wide range but have all suggested a larger role for biomass combustion than what is shown by the now published source-diagnostic characterization of soot in the actual atmosphere over East Asia.

The international team of scientists, lead jointly by the Chinese Academy of Sciences and Stockholm university, Sweden managed to pinpoint sources of the air pollution by the first-ever measurements of natural C-14 (half-life of 5700 years) of atmospheric [soot particles](#) in East Asia, intercepted both in [megacities](#) Beijing and Shanghai as well as in regional receptor sites in coastal SE China and on the International

ABC Program Super-Observatory on the Korean Jeju Island in South East Yellow Sea. Their results, presented in the *Environmental Science and Technology* article, demonstrated that the brown cloud soot was persistently about four-fifths from fossil fuel combustion (C-14 "dead") and only one-fifth from burning of contemporary biomass (C-14 "alive").

The rewards of decreasing soot emissions from [fossil fuel combustion](#) in China, the World's largest emitter, may be rapid and sizeable. Globally, soot accounts for roughly half the warming potential of carbon dioxide. Ke Du, a professor at the Chinese Academy of Science Institute of Urban Environment in Xiamen and co-leader of the study, says that while carbon dioxide is the key target for fighting climate change, its levels in the atmosphere respond on a sluggish 100-1000 yr timescale to reductions in emissions. "In contrast, Brown Cloud soot particles only reside in the atmosphere for days-weeks raising the hope for a rapid response of the climate system" explains Du.

Örjan Gustafsson, a professor at Stockholm University and co-leader of the study, says that understanding the sources of the soot [air pollution](#) is central to current international efforts to fight such short-lived climate pollutants. "Efficiently addressing the key sources of Chinese soot emissions will lead to rapid and multiple co-benefits to the quality of the air people breathe, the regional climate and its secondary effects such as on freshwater availability" says Gustafsson.

Provided by Stockholm University

Citation: Researchers constrain the sources of climate- and health-afflicting air pollution from China (2013, August 9) retrieved 9 April 2024 from <https://phys.org/news/2013-08-constrain-sources-climate-health-afflicting-air.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.