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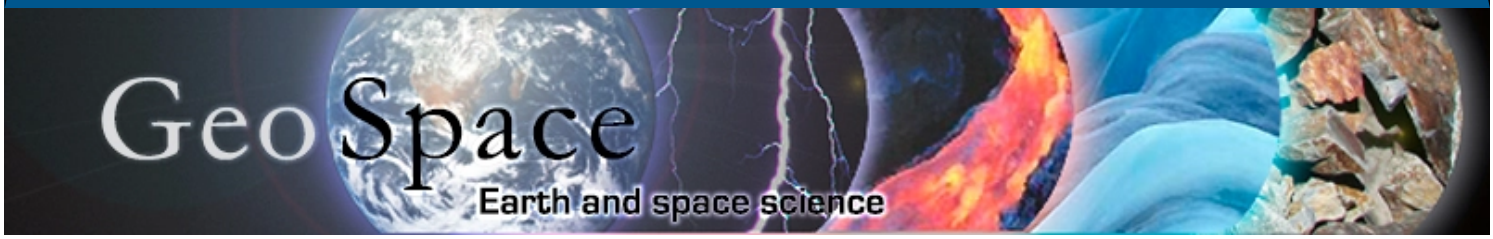

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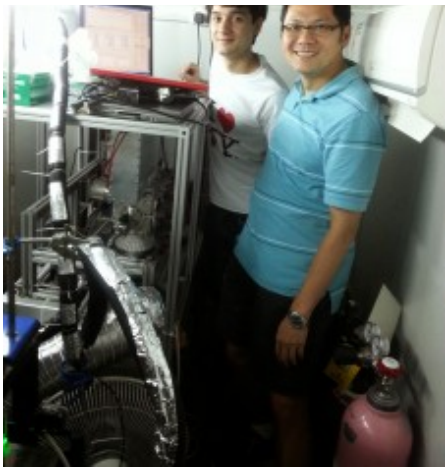
13 AUGUST 2015

Scientists track air pollution by meal times (https://blogs.agu.org/geospace/2015/08/13/scientists-track-air-pollution-by-meal-times/)

Posted by lcooper (https://blogs.agu.org/geospace/author/lcooper/)



(https://blogs.agu.org/geospace/files/2015/08/20130523_145220_Lai-Chi-Kok-Rd.jpg)

Berto Lee (left) and Chak Chan (right) stand in a shelter in Hong Kong's Mong Kok next to the Aerodyne High Resolution Aerosol Mass Spectrometer, used to sample airborne particulate matter.
Credit: Chak Chan

By Leigh Cooper

Cars and trucks shouldn't take all of the blame for air pollution in Hong Kong. Smoke from cooking adds more of a specific type of pollution – organic aerosols – to the city's air than traffic emissions, a new study finds.

Fossil fuel burning, vehicle emissions, cooking smoke, and chemical reactions of particles in the sun add organic aerosols to the atmosphere. These tiny particles are a major component of airborne particle pollution and can cause heart and lung problems in humans and reduce visibility, according to the U.S. Environmental Protection Agency.

Hong Kong, a city of more than 7 million people, has struggled with air pollution. At times, much of the city's famous skyline along the coast is masked by a thick layer of smog, according to the study's authors.

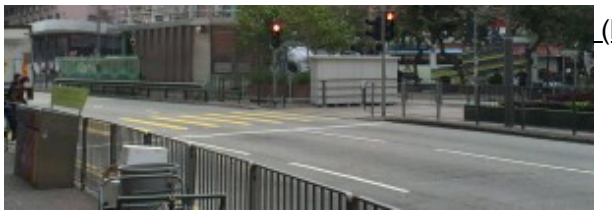
The new study sought to identify the sources of organic aerosols in Hong Kong by continuously monitoring fine particles on an urban street in the Mong Kok area of downtown Hong Kong.

The study found that from March to July 2013, cooking aerosols accounted for 35 percent of organic aerosols in the air, while 25 percent of the organic aerosols came from traffic. The remaining 40 percent of aerosols were particles formed in the atmosphere, according to the study published in *Journal of Geophysical Research-Atmospheres* (http://onlinelibrary.wiley.com/doi/10.1002/2015JD023311/full?campaign=wlytk-41855.6211458333), a journal of the American Geophysical Union.

Identifying the sources of organic aerosols – a major component of airborne particle pollution – could help inform air quality policies in Hong Kong, according to the study's authors.

"[The study] shows that continuing to focus on traffic alone may not really lead to much more [air quality] improvement," said Berto Lee, a graduate student in the Division of Environment at the Hong Kong University of Science and Technology in China, and first author of the new study. "I think it is important to expand the focus to other sources as well."

The researchers were able to pick out where an organic aerosol originated by its chemical makeup. Organic aerosols from cooking have different chemical structures than those that come from gasoline or diesel fuel, according to the study. Cooking techniques such as barbecuing, charbroiling, roasting, stir-frying and deep-fat frying meat send small droplets of fat and oil into the air, creating organic aerosols, according to the study's authors.

 (https://blogs.agu.org/geospace/files/2015/08/IMAG0421.jpg)

Mong Kok is a crowded urban district in Hong Kong filled with markets and restaurants. Researchers found that restaurant cooking in Mong Kok produced more organic aerosols than traffic.
Credit: Berto Lee

Even without a watch, the scientists could tell when it was meal time. Cooking aerosols peaked from noon to 2 p.m. and again from 7 p.m. to 9 p.m., coinciding with lunch and dinner. The scientists didn't observe an increase in aerosols around breakfast time, because local breakfast foods like porridge, soup and toast, require less cooking than lunch and dinner foods.

Most of the cooking pollution comes from local restaurants, the study suggests. The amount of cooking aerosols measured by the researchers increased when winds blew from the direction of a local restaurant district in Mong Kok. Restaurants cook food at hotter temperatures and produce much larger volumes of food than households do, producing more aerosols than home cooking, according to Chak Chan, a chemical engineer at the Hong Kong University of Science and Technology in China and corresponding co-author of the new study.

"Hong Kong not only has large-scale restaurants but also many tiny ones," said Chan. "Large-scale restaurants have [the ability] to remove emissions, but the small ones will just have a simple ventilation fan. Maybe tighter controls of emissions from these small-scale restaurants will be needed."

Organic aerosols from cooking are likely higher than traffic-related organic aerosols in Hong Kong, because the city has already worked to reduce traffic emissions, Chan said. However, the study's authors noted that particulate pollution from traffic did rise above cooking when the scientists included elemental carbon, commonly known as soot, along with organic aerosols.

Chan hopes the study stimulates similar experiments in other large, more heavily-polluted cities throughout Asia. However, he noted that in these other cities, where pollution levels are much higher than they are in Hong Kong, cooking emissions may account for fewer organic aerosols percentage-wise than they do in Hong Kong.

— Leigh Cooper is a science writing intern at AGU.

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