

## Chinese fireworks spark pollution controversy

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Researchers have studied fireworks' contribution to air pollution in a few cities in the USA, Europe, and India, but only rarely in the fireworks capital of the world, China. Now, Guoshun Zhuang (Fudan University, Shanghai, China) and colleagues have monitored air quality over a 4-day period in Beijing during the lantern festival (*Atmos Environ* in press). In 2006, in response to public pressure, the Chinese Government eased up on an official 13-year ban and allowed fireworks to be set off at certain times and places. In addition to many known pollutants associated with firework detonation, colored fireworks generate ozone, a harmful oxidizing agent.

Says Zhuang, "Fireworks are an essential part of Chinese festivities and were traditionally thought to scare off evil spirits. However, they



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*Fireworks, a beautiful source of pollution.*

can increase air and noise pollution and contribute to respiratory diseases, so there's a conflict between health issues and tradition." The researchers found that various fine metals were emitted in very high quantities on festival night, while coarse particle formation of chemicals such as nitrate, sulfate, oxalate, and others, occurred secondarily, after the festival.

There are two problems to overcome in assessing the effects of fireworks on ambient air quality. The researchers solved the first, identifying the pollution products, by using

correlation analysis. "Our results suggested that metals in fireworks were mainly in the form of chloride salts", explains Zhuang, "while potassium chlorates or perchlorates were the main oxidizers". Secondly, some of these compounds are present in everyday air pollution, so the contribution of fireworks must be separated out. "We addressed that problem by using potassium as a tracer, and found that about 97.8% of lead in the air, 43.1% of total carbon, and 27.5% of zinc, as well as many other pollutants, were derived from fireworks."

These results show that firework combustion, particularly the resulting fine particulates, truly is dangerous to the environment and human health. Zhuang believes that, especially in the context of China's existing air pollution problems, "a combination of political will and public support to limit health and environmental hazards while maintaining China's traditions", is necessary. ■