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Study Finds Stronger Link Between Human Activity And Particulate Pollution

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Air pollutants mainly from cars, trucks and industrial activity are contributing significantly more to the formation of urban haze than previously thought, according to a new study.

Jose-Luis Jimenez, an assistant professor of chemistry and biochemistry at the University of Colorado at Boulder and a fellow of the Cooperative Institute for Research in Environmental Sciences, and Rainer Volkamer, a Feodor Lynen Fellow at the University of California-San Diego, were the lead authors of the study published last month in *Geophysical Research Letters*.

Their study, conducted in the Mexico City metropolitan area in 2003, reveals that human activities may play a greater role in helping form particulate pollutants than previously thought. The tiny pollutants that make up haze, called particulate matter, are believed to exacerbate cardiovascular and pulmonary problems and to increase the risk of premature death.

Jimenez and Volkamer have been studying organic, or carbon-based, particulate matter that is formed chemically when smog-forming gases known as volatile organic compounds, or VOCs, react in the air. They refer to these pollutants as secondary organic aerosols because they are formed from other pollutants, rather than emitted directly from a smokestack or other source.

Until recently, it was widely believed that secondary organic aerosol pollution made only a small contribution to haze. But Jimenez and Volkamer have measured secondary organic aerosol concentrations that are eight times greater than those predicted by traditional air quality models.

"In urban areas, we believe secondary organic aerosols may be responsible for roughly half to two-thirds of all organic particle pollution," said Jimenez.

"Before, scientists thought VOCs emitted naturally from vegetation were responsible for 95 percent of secondary organic aerosol production on a global scale," Volkamer said. "Our work shows that anthropogenic pollution factors greatly enhance secondary organic aerosol formation, and that these processes are much faster than we currently understand."

The researchers believe human-caused VOCs could be responsible for more than one-third of total secondary organic aerosol production on a global scale, and have an even larger role in producing organic particulate matter in urban areas.

The study also may have implications for future climate change research. Aerosols, or particulate matter, are believed to play a role in cooling the earth by scattering the sun's radiation and modifying clouds.

The larger-than-expected amounts of organic aerosols discovered by Volkamer and Jimenez may enhance these global cooling effects.

Other co-authors of the study include Katja Dzepina and Qi Zhang of CIRES and researchers from MIT, the Universidad Autonoma del Estado de Morelos in Cuernavaca, Mexico, and Aerodyne Research Inc. in Billerica, Mass.

CIRES is a research institute sponsored jointly by CU-Boulder and the National Oceanic and Atmospheric Administration.

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