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CU-Boulder Study Suggests Air Quality Regulations Miss Key Pollutants

CU-Boulder Study Suggests Air Quality Regulations Miss Key Pollutants

September 24, 2008

A new study led by the University of Colorado at Boulder reveals that air quality regulations may not effectively target a large source of fine, organic particle pollutants that contribute to hazy skies and poor air quality over the Los Angeles region.

According to the study, a much smaller percentage of organic haze than was previously thought is directly emitted by vehicles and industrial processes. Instead, 75 percent of fine, organic particle pollutants form when reactive gases called VOCs, or volatile organic compounds, are oxidized and condense onto existing particles in the air.

"Air quality regulations today effectively target most sources of 'primary,' or directly emitted particles," said lead author Ken Docherty, a researcher with the university's Cooperative Institute for Research in Environmental Sciences. "Yet our study indicates that the 'secondary,' or chemically formed particles contribute more significantly to poor air quality, even in very polluted urban regions.

"Our study suggests that regulations need to focus much more attention on the gases -- such as gasoline vapors -- that form secondary organic particles and create visible haze," he said. Other examples of VOCs include vapors from paints, varnishes, cleaning supplies, automotive products and dry-cleaned clothing.

The study will be published in the journal Environmental Science and Technology and was posted online Sept. 23.

According to California state regulatory agencies, motor vehicles and household products are both significant sources of VOCs in the Los Angeles region.

"Although current regulations do target many sources of VOCs, these regulations will need to further reduce VOC emissions and perhaps target still unknown sources to effectively reduce fine particle concentrations," said Docherty. He and his colleagues cautioned that it is not clear which VOCs are most responsible for haze formation.

Docherty also pointed out that while all types of fine particle pollutants are considered harmful, little is known about how a particle's chemical composition might exacerbate its impact on human health. Fine particles have diameters of less than 2.5 microns, or less than one-tenth the diameter of a human hair.

The CU-Boulder-led study employed several continuous and filter-based sampling techniques, as well as five different methods to estimate the amount of chemically formed, organic particles in haze. All five methods showed that 68 to 90 percent of total organic pollution hanging over the Los Angeles region during the afternoon is secondary in nature. During the morning commute, when direct emissions from vehicles are at their peak, secondary particles still make up about half of the organic haze.

"We have used almost all the methods that can be used to attack this problem,

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Faculty/Staff Newsletter

Calendars
Events, Academic Calendar

and the fact that they give consistent results at one location and time is very telling," said project director and CU-Boulder Professor Jose-Luis Jimenez. Jimenez conducted similar research in Pittsburgh in 2002 and Mexico City in 2006, where secondary organic particles also were found to contribute significantly to the region's poor air quality.

The Los Angeles region study was conducted from July 18 to August 14 during the summer of 2005 in Riverside, Calif., about 50 miles east of Los Angeles. Additional sampling in Pasadena, Calif., approximately 10 miles northeast of Los Angeles, also suggested a similar contribution of secondary organic particles to haze.

Other groups involved in the research included the University of Wisconsin-Madison, Georgia Institute of Technology, California Institute of Technology and Brigham Young University. The study was funded in part by the Environmental Protection Agency, the National Science Foundation and NASA.

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