Study Quantifies Global Mortality Risk from PM2.5

By Ben Kaldunski
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How does energy use affect global health? A new study led by Dalhousie University quantifies the response of global premature mortality rates to reduced emissions of SO2, NOx, ammonia, and carbonaceous aerosols worldwide. It is estimated that PM2.5 causes millions of premature deaths each year, but the sources contributing to atmospheric particulates are complex. Whereas some particles are directly emitted – like smoke, and wind-blown dust – many others “cook up” in the atmosphere from gas-phase ingredients. Untangling the linkages between the emitted pollutants and the downwind health impacts requires advanced modeling and analysis tools.

The team found that the largest reductions in mortality associated with a 1 kg/km2-year decrease in emissions were for ammonia and carbonaceous aerosols in Eastern Europe. The greatest reductions in mortality for a 10% decrease in emissions were found for secondary inorganic sources, especially sulfate aerosols, in East Asia. PM2.5 , as well as precursors SO2 and NO2, are regulated as criteria pollutants under the U.S. Clean Air Act, and part of most health-based air quality standards around the world.

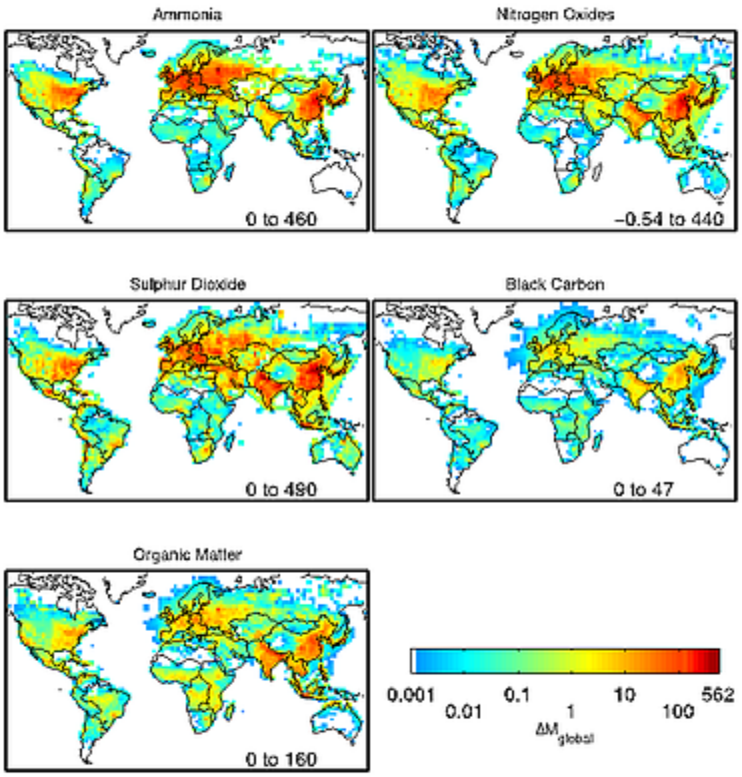
The study “Response of Global Particulate Matter Related Mortality to Changes in Local Precursor Emissions” was published on March 2 in the journal Environmental Science & Technology. On March 24, the article was made publicly available, without subscription access, through the American Chemical Society (ACS) Editors’ Choice initiative, recognizing outstanding articles that exemplify the mission of the ACS.

Colin Lee, a graduate student at Dalhousie University in Halifax, Nova Scotia, used the GEOS-Chem model, along with satellite data from NASA’s MODIS and MISR satellite instruments to better align pollution exposure with population density. That exposure was then related to premature mortality using methods developed recently for the Global Burden of Disease project.

One of the co-authors to the study, Daven Henze, is a member of NASA’s Air Quality Applied Sciences Team (AQAST). Henze, a professor of mechanical engineering at the University of Colorado-Boulder, said the project uses “NASA research capabilities … to improve our understanding of how different sources of pollution impact human health.” In line with AQAST mission to connect advanced research with air quality management needs, the team developed new methods for linking models, satellite data, and health outcomes. “Satellite observations allowed us to refine the model’s estimated pollution field at a much finer scale, and helped … make the results much more credible,” Henze said.

AQAST is a nationwide collaborative research team dedicated to serving the needs of air quality managers in the United States by analyzing a variety of NASA satellite data, models and suborbital platforms on the ground. Created in 2011 by NASA's Applied Sciences Program, AQAST is made up of 19 of the top minds in all fields of air quality science and strives to inform air quality managers and provide high-quality resources for the press and public (**www.aqast.org** or **www.aqast-media.org**).

Read the full article in *Environmental Science & Technology* **here**



These maps show the global change in premature mortality caused by local reductions or increases in emissions that lead to the formation of PM2,5 such as SO2 and NOx. The study published in Environmental Science & Technology found that reducing SO2 emissions generally led to the greatest reduction in premature mortality (Image courtesy of C. Lee, Dalhousie University).

Sources and media coverage

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