

Data from outer space used to map air pollution and its impact on health

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How can data from outer space be used to impact human health?
NASA's [Multi-Angle Imager for Aerosols \(MAIA\)](#) mission will study how different types of airborne particles affect human health over the short term, long term and during pregnancy.

"This is the first time NASA has 'baked' societal benefits and public

health applications into a mission's DNA," says Yang Liu, associate professor in Emory's Department of Environmental Health.

An expert on air pollution, Liu helms an Emory team that is part of an international consortium of scientists and health organizations designing and implementing the scientific objectives of the \$100 million MAIA mission, which is scheduled to launch in 2022.

Under Liu's leadership, Emory's team secured \$2.1 million of the research budget to create algorithms that will convert MAIA's satellite imagery from low-Earth orbit into maps of air pollution composition and concentrations over a dozen global megacities, including the Atlanta-Birmingham-Huntsville complex. The maps will distinguish between such pollutants as sulfate particles from power plant emissions, nitrates from traffic emissions and organic carbon from a few different sources including fossil fuel combustion and wildfires.

"More than 90 percent of the [world population](#) breathes polluted air, which is associated with numerous adverse health outcomes," Liu says.

The pollution maps will be combined with population health records to assess potential connections between site-specific particulate mixes and health problems such as cardiovascular and respiratory diseases. "We selected the Atlanta region because the southeast has a unique combination of particles, a robust base of health datasets and a strong cohort of epidemiologists to analyze the data," Liu says.

Liu has previously used [satellite data](#) to study the impact of climate change on air quality and [human health](#) related to extreme heat, wildfires and ambient [air pollution](#). But, at the same time, he has also kept one foot solidly on the ground.

His team has tested novel designs for ground pollution sensors to be used

in tandem with MAIA's space-based data. He's dynamically downscaling [climate models](#) so that air quality measures can be analyzed on a much smaller geographic basis that's far more relevant for local health policy decisions. And his lab is also developing algorithms for integrating satellite-based models with data from the rapidly growing number of low-cost ground [pollution](#) sensors coming online.

"Communities put up their own monitoring networks, but they lack the expertise to analyze the data," he says. "We're developing tools for them to clean and benefit from their data. This has pretty significant implications in the citizen-science movement."

Provided by Emory University

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