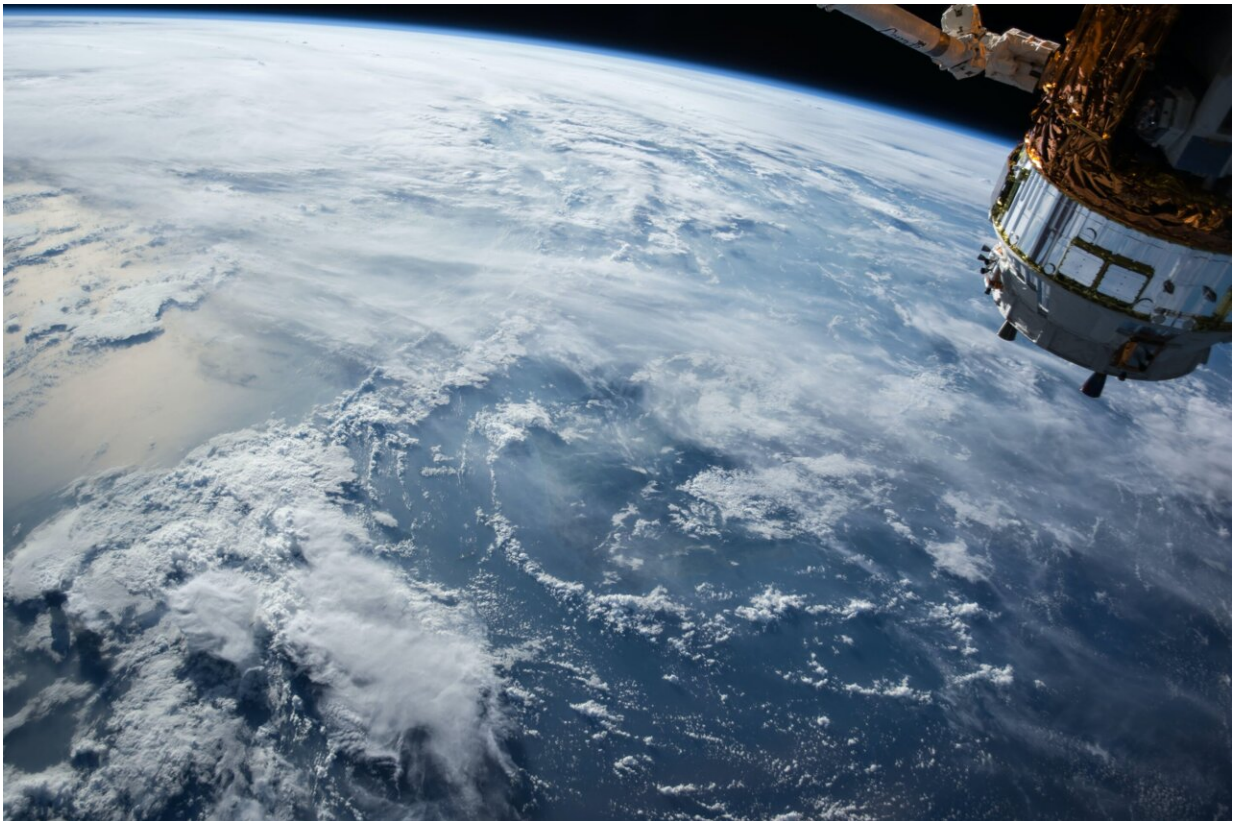


# Tracking air pollution disparities—daily—from space

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Studies have shown that pollution, whether from factories or traffic-snarled roads, disproportionately affects communities where economically disadvantaged people and Hispanic, Black and Asian

people live. As technology has improved, scientists have begun documenting these disparities in detail, but information on daily variations has been lacking. Today, scientists report preliminary work calculating how inequities in exposure fluctuate from day to day across 11 major U.S. cities. In addition, they show that in some places, climate change could exacerbate these differences.

The researchers will present their results at the fall meeting of the American Chemical Society (ACS).

Air pollution levels can vary significantly across relatively short distances, dropping off a few hundred yards from a freeway, for example. Researchers, including Sally Pusede, Ph.D., have used satellite and other observations to determine how air quality varies on a small geographic scale, at the level of neighborhoods.

But this approach overlooks another crucial variable. "When we regulate [air pollution](#), we don't think of it as remaining constant over time, we think of it as dynamic," says Pusede, the project's principal investigator. "Our new work takes a step forward by looking at how these levels vary from day to day," she says.

Information about these fluctuations can help pinpoint sources of pollution. For instance, in research reported last year, Pusede and colleagues at the University of Virginia found that disparities in air quality across major U.S. cities decreased on weekends. Their analysis tied this drop to the reduction of deliveries by diesel-fueled trucks. On weekends, more than half of such trucks are parked.

Pusede's research focuses on the gas  $\text{NO}_2$ , which is a component of the complex brew of potentially harmful compounds produced by combustion. To get a sense of air pollution levels, scientists often look to  $\text{NO}_2$ . But it's not just a proxy—exposure to high concentrations of this

gas can irritate the airways and aggravate pulmonary conditions. Inhaling elevated levels of NO<sub>2</sub> over the long term can also contribute to the development of asthma.

The team has been using data on NO<sub>2</sub> collected almost daily by a space-based instrument known as [TROPOMI](#), which they confirmed with higher resolution measurements made from a similar sensor on board an airplane flown as part of NASA's [LISTOS](#) project. They analyzed these data across small geographic regions, called census tracts, that are defined by the U.S. Census Bureau. In a proof-of-concept project, they used this approach to analyze initial disparities in Houston, and later applied these data-gathering methods to study daily disparities over New York City and Newark, New Jersey.

Now, they have analyzed satellite-based data for 11 additional cities, aside from New York City and Newark, for daily variations. The cities are: Atlanta, Baltimore, Chicago, Denver, Houston, Kansas City, Los Angeles, Phoenix, Seattle, St. Louis and Washington, D.C. A preliminary analysis found the highest average disparity in Los Angeles for Black, Hispanic and Asian communities in the lowest socioeconomic status (SES) tracts. They experienced an average of 38% higher levels of pollution than their non-Hispanic white, higher SES counterparts in the same [city](#) — although disparities on some days were much higher. Washington, D.C., had the lowest disparity, with an average of 10% higher levels in Black, Hispanic and Asian communities in low-income tracts.

In these cities, as in New York City and Newark, the researchers also analyzed the data to see whether they could identify any links with wind and heat—both factors that are expected to change as the world warms. Although the analysis is not yet complete, the team has so far found a [direct connection](#) between stagnant air and uneven pollution distribution, which was not surprising to the team because winds disperse pollution.

Because air stagnation is expected to increase in the northeastern and southwestern U.S. in the coming years, this result suggests uneven air [pollution](#) distribution could worsen in these regions, too, if actions to reduce emissions are not taken. The team found a less robust connection with heat, though a correlation existed. Hot days are expected to increase across the country with climate change. Thus, the researchers say that if greenhouse gas emissions aren't reduced soon, people in these communities could face more days in which conditions are hazardous to their health from the combination of NO<sub>2</sub> and heat impacts.

Pusede hopes to see this type of analysis used to support communities fighting to improve [air quality](#). "Because we can get daily data on pollutant levels, it's possible to evaluate the success of interventions, such as rerouting diesel trucks or adding emissions controls on industrial facilities, to reduce them," she says.

**More information:** Observing air pollution inequality from space, ACS Fall 2022, [www.acs.org/content/acs/en/meetings/fall-2022.html](http://www.acs.org/content/acs/en/meetings/fall-2022.html)

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