A PHOENIX Rises

A Caltech-led team installs new air-quality sensors throughout Altadena to monitor airborne dust after the fires.

By Kimm Fesenmaier

Above: **Nikos Kanakaris, Coleen Roehl,** and **Paul Wennberg** install a sensor on a fence.

In the wake of the Eaton fire, Caltech researchers quickly deployed a network of particulate air-quality sensors on rooftops in and around the burned areas of Altadena. The network of 29 sensors is dubbed PHOENIX (Post-fire airborne Hazard Observation Environmental Network for Integrated Xposure-monitoring) and aims to monitor airborne dust as debris removal and rebuilding continue.

"We wanted to give the community a source of independent air-quality measurements," says Haroula Baliaka (MS '23), a graduate student in environmental science and engineering at Caltech who helped install the PHOENIX sensors. The data, which is updated every five minutes, can be used by agencies such as FEMA, the EPA, and the Army Corps of Engineers to gauge how well dust-mitigation efforts are working, she adds.

Baliaka, along with Coleen Roehl, an associate research scientist at Caltech; and Nikos Kanakaris, a machine learning researcher at USC; reached out to the community to identify possible installation sites and then quickly went out to set up the sensors, which run on solar power and use cellular networks, whereas many other sensors require access to Wi-Fi.

Each of the air-quality devices measures particulate matter in three size categories: particulates measuring less than 1 micrometer in diameter (PM1.0), particulates less than 2.5 micrometers in diameter (PM2.5), and particulates up to 10 micrometers in diameter (PM10).

Paul Wennberg, Caltech's R. Stanton Avery Professor of Atmospheric Chemistry and Environmental Science and Engineering, who initiated the PHOENIX project, says the PM10 particles settle to the ground relatively fast compared to the smaller PM2.5 particles, which tend to stay aloft for days. "These larger particles are much more indicative of local dust events," Wennberg says. "Since one of our goals was to be able to isolate from the general aerosol pollution of Los Angeles things that were more related to the fire debris, we needed sensors capable of good PM10 measurements."

Although the PM10 particles settle quickly, Wennberg says the air mixes them around and can carry them roughly a kilometer away. "If you have a dust source during the day, and if it's made out of the ash and the dust from these houses, it will get transported some distance. We're trying to place our sensors roughly a kilometer apart in every direction to be able to isolate and figure out where the dust is coming from."

While the PHOENIX website currently shows only raw sensor data, the team plans to continue incorporating additional features to the site that will illustrate general air quality across Altadena and identify dust events.

The researchers also plan to make the data as accessible as possible and use machine learning and predictive models to gain additional insights. [C]

View the PHOENIX data

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