

Not My Fault: Sifting through the smoke, my journey through air quality data

Lori Dengler/For the Times-Standard
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How do you get reliable information on something you don't know much about? I've got a handle on earthquakes and tsunamis. But when it comes to air quality, I'm sitting in the same spot that most of you are in. I'm no expert and I'm not sure where to start.

A week ago Tuesday was lovely. I almost gloated at satellite photos showing the pristine North Coast as an island in a state being overrun by fire and smoky conditions. I awoke to a different world the next morning, one cast in amber and dark orange. My eyes were watering and my throat raw and itchy. The wind had shifted and we were suddenly plunged into what other Californians had been experiencing for days. I couldn't avoid paying attention.

First thought, this isn't good for my health so close the windows. Second, is how to quantify what I am experiencing. I've heard of the Air Quality Index (AQI) and know of the famously dirty cities in the world – Mexico City, Mumbai, Beijing. But that couldn't be happening here, right? Over the next week, Portland, Seattle and San Francisco claimed the top slots as the most polluted cities in the world.

I searched online for air quality maps and got pages of results but little consistency. Most used the AQI scale ranging from zero to over 500 (low is good, bad is high), but one used a flipped index with zero bad and 100 ideal. Values for McKinleyville varied by over 150, one site calling the air very hazardous and another saying it was fine. Confusing to say the least. How to sort all this out?

An HSU emergency notification announcing campus closures provided the next step. The email included information on how air quality is measured and what the categories meant. Best of all, it included a link to the campus Purple Air station. A quick click and up popped a graphic with the current value and the trend over the past ten days.

Purple Air was new to me. Scrolling out, I could see colored dots throughout the area. The color scale ranged

from green (good) to maroon (bad). Expanding further brought out the state, the country and finally the world. Purple Air is an example of citizen science or crowdsourcing. The company began producing low cost (\$200 - \$270) air quality monitors in 2015. Anyone can buy and install one. The sensor has two laser beams that estimate particle size and density. An algorithm converts the output into a number that is intended to roughly agree with official AQI. Once the instrument ships out the door, that's it. There is no further calibration or quality control. The instruments can be set up anywhere and send data via WIFI to <https://www.purpleair.com/> where your site is added to the map. There are now Purple Air sensors on all continents, even Antarctica.

I became absorbed in the Purple Air Map, but then wondered was the data any good and how well it agreed with official measurements. I needed an expert. I wasn't sure whom to ask, but the NWS Office in Eureka is always a good place to start. If you have a weather or tsunami-related question, do what I did and call the NWS Office or email ryan.aylward@noaa.gov. They put me in contact with Brian Wilson of the North Coast Unified Air Quality Management District who really is an expert and was kind enough to answer my questions.

Brian cautioned me to be careful on the Purple Air web site. First, toggle off the indoor sensor data – it isn't indicative of outdoor conditions. Second consider toggling on a conversion factor to more closely align the data with official values. Instantaneous values are of little use. It's better to look at values averaged over an hour and look at the trends shown in the graph for a particular site. If you look closely, you should see two lines on the graph for each sensor. If both are working well, they will neatly overlay each other and the confidence number in the information box will be 100%.

The official AQI numbers are at <https://fire.airnow.gov/>. The EPA and other government air quality organizations maintain both permanent and temporary monitors (circles and triangles on the map). Ignore the small squares – I'll get to them later. Don't worry about the difference between the circles and triangles; they both produce government-sanctioned output. Unlike Purple Air, the official instruments detect more than just particles and are frequently tested to make sure they adhere to strict standards. They are used for regulatory purposes and to issue air quality alerts.

If the official instruments are superior to the low cost sensors, why bother with Purple Air? High quality instruments are expensive and require regular

maintenance and testing. They are few and far apart in rural areas like the North Coast. Air quality can vary greatly over short distances depending on terrain, microclimates and pollution sources. Recognizing the value of the low cost sensors in filling in the gaps, Airnow added a select number of the low cost sensors sites like Purple Air in July. They are the small colored squares on the map. They aren't used for regulatory purposes, but do help fill in the gaps. And you don't need to worry about conversion factors or toggling off indoor sensors, it's already been done for you.

I asked Brian Wilson what he thought of the Purple Air instruments, and he expressed caution in reading too much into the numbers, but admitted that he has one himself and finds it quite helpful. Now that I've been hooked on air quality, I've ordered one too. But the company is backed up on orders and I will have to wait a few months for it to arrive.

My take on how to navigate unfamiliar territory? Enjoy an online exploration, but be suspicious of contradictory information and definitely ask an expert.

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake hazards. All Not My Fault columns are archived at <https://www2.humboldt.edu/kamome/resources> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email Kamome@humboldt.edu for questions/comments about this column, or to request a free copy of the North Coast preparedness magazine "Living on Shaky Ground."
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