



Spotlight

They're Baaaaack! In-Person Conferences Resume

We're happy to have an opportunity to see you again at conferences, after the long hiatus. Please visit us if you're attending either of these upcoming conferences. We'd love to talk with you about your air quality monitoring projects.

- **May 2-5: National Tribal Forum on Air Quality 2022, Tulsa, OK**
- **May 11-13: Air Sensors International Conference, Pasadena, CA**

We'll have several of the heavy hitters from our versatile lineup on display. We offer a range of options:

- [FEM measurements of ozone](#) and [NO₂](#)
- [Calibration instruments](#) for use in the field or in the lab
- the [Personal Air Monitor](#) mobile sensor package, and enclosure options for deploying it either outside or mounted on the vehicle of your choosing
- the [AQSync](#) and [AQLite](#) packages that combine the best of both worlds, sensors and instruments

The powerful [AQSync](#) and [AQLite](#) packages are the newest members of our lineup and can be used as stand-alone air quality monitoring stations, or the AQSync can serve as a calibration checkpoint for your sensor-based monitoring program. Cloud-based data transmission puts the AQLite and AQSync measurements at your fingertips.



Our new [**AQSync Air Quality Monitoring Station**](#), shown on the left side of the table in the photo above, offers a measurement suite comparable to brick-and-mortar air quality monitoring facilities. It combines the "Best of the Best" instruments for measuring air pollution gases and particulate matter:

- FEM-quality absorbance measurements for O₃, NO₂, and NO
- NDIR absorbance for CO₂
- Optical particle counter with sheath flow and heated inlet for PM₁, PM_{2.5}, and PM₁₀
- Amperometry for CO
- Sonic anemometry and weather data
- Data access and instrument control via the Cloud

Let us show you our options to take your air quality monitoring to the next level!

[Request a Quote](#)

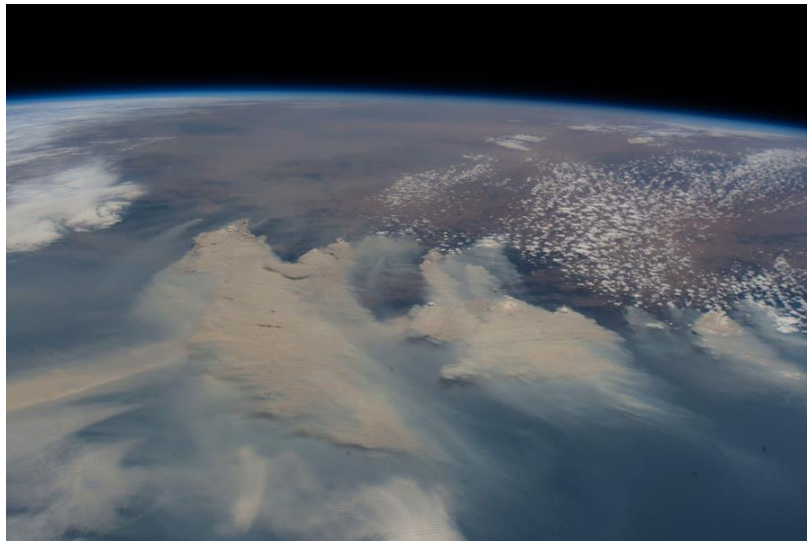
[Visit the AQSync Website](#)

[Check Out our Full Product Lineup](#)

Air Pollution News

The Long Reach of Wildfires

Australian Wildfires Depleted the Stratospheric Ozone Layer



Fires burning during the Australian "Black Summer" of 2019-2020. Image Credit: NASA.

Even the ozone layer is not safe from wildfires.

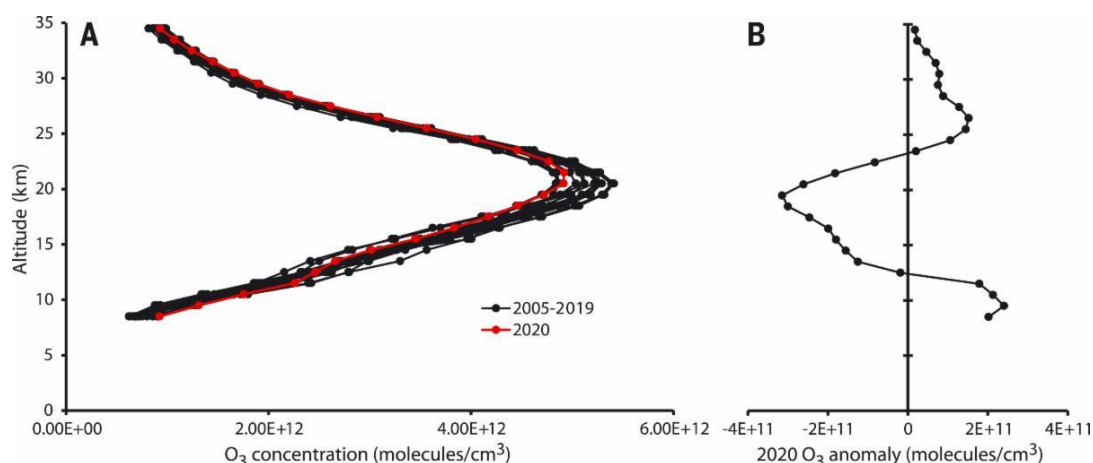
As we know all too well, wildfires have devastating effects -- destruction of forests, landscapes, & buildings; loss of human and animal lives; implications for air quality and climate. New studies now show that the the extent of the damage can reach miles above us, into the stratosphere. With this long reach, wildfires can also affect the ozone layer that protects Earth's surface from excessive amounts of the Sun's UV radiation.

The studies have focused on the Australian wildfires of 2019-2020, which were particularly intense, widespread, and lengthy. Susan Solomon (MIT) and colleagues were the first to show that the wildfires had a chemical link to the ozone layer. Their [paper in the Proceedings of the National Academy of Sciences](#) used satellite data to demonstrate that stratospheric NO₂ concentrations fell as the particle concentrations rose from the lofted wildfire smoke. This is a marker for the kind of surface chemistry that has been shown to occur during ozone depletion. The NO_x levels (NO + NO₂) were in fact the lowest seen throughout the 20-year record of the satellite's measurements.

Why does the NO_x go down? The smoke particles get wet as they travel in the atmosphere, and reactions occur on their surfaces--notably, the hydrolysis of atmospheric N₂O₅ to form nitric acid (HNO₃). HNO₃ does not photolyze as readily as N₂O₅ and it "holds on" to the nitrogen, hence the decline in NO_x in the atmosphere.

This has effects that ripple through to ozone, because ozone-destroying cycles involving reactive nitrogen, chlorine, and hydrogen species are all interrelated and are affected. Exactly "how" is a topic that is not so settled. Some suggest that the chemistry might be similar to what happens after large volcanic eruptions that are known to deplete ozone, but others think that the chemistry is different, and that perhaps the organics found in the wildfire smoke may be the reason.

Ozone decreases were indeed observed in the months after the fires (figure below), broadly consistent with expectations based on models of the stratospheric chemistry but with enough differences in location and timing to suggest that the processes are not yet fully understood.



Ozone profiles during 2020 (red) and 2005-2019 (black) over southern midlatitudes in July. Differences of the 2020 values from the prior 15 years are shown in the "anomaly" plot, panel B, revealing the altitudes where depletion occurred. Figure Credit: Figure 1 from Bernath et al., *Science*, 375 (2021).

The ozone decreases that occurred were transitory and limited in scope. However, the interaction of wildfire smoke with the chemistry in the stratosphere is a climate/atmospheric chemistry coupling that has not previously been considered. And it suggests that progress in healing the ozone layer, achieved under the 1985 U.N. Montreal Protocol agreement, could be slowed by the increase in intense wildfires likely to occur in the warming climate.

[On the Stratospheric Chemistry of Midlatitude Wildfire Smoke](#), S. Solomon et al., *Proceedings of the National Academy of Sciences* (2022), **119**, e2117325119.
[Wildfire Smoke Destroys Stratospheric Ozone](#), P. Bernath, C. Boone, and J. Crouse, *Science* (2022), **375** (6586), 1292.

Case Study: 2B Tech's NO_x Monitor

What's the Lifetime of a NO₂ Sensor?

Long-Term Study Used Model 405nm as a Reference Instrument

Sensors offer an economical approach to air quality monitoring, and much work has been done to characterize their performance. One question has not often been examined rigorously: How do they do over the long haul?

A [new study by J. Li et al.](#) tackles this question for the case of the most widely used NO₂ sensors, made by Alphasense. The authors tracked the performance of 29 sensors, some for as long as 3.5 years. They carried out periodic checks versus reference instruments (including a 2B Tech Model 405nm NO₂/NO/NO_x monitor). Previous studies had looked at performance over at most 18 months, so this new study makes a quantum leap in assessing longevity.

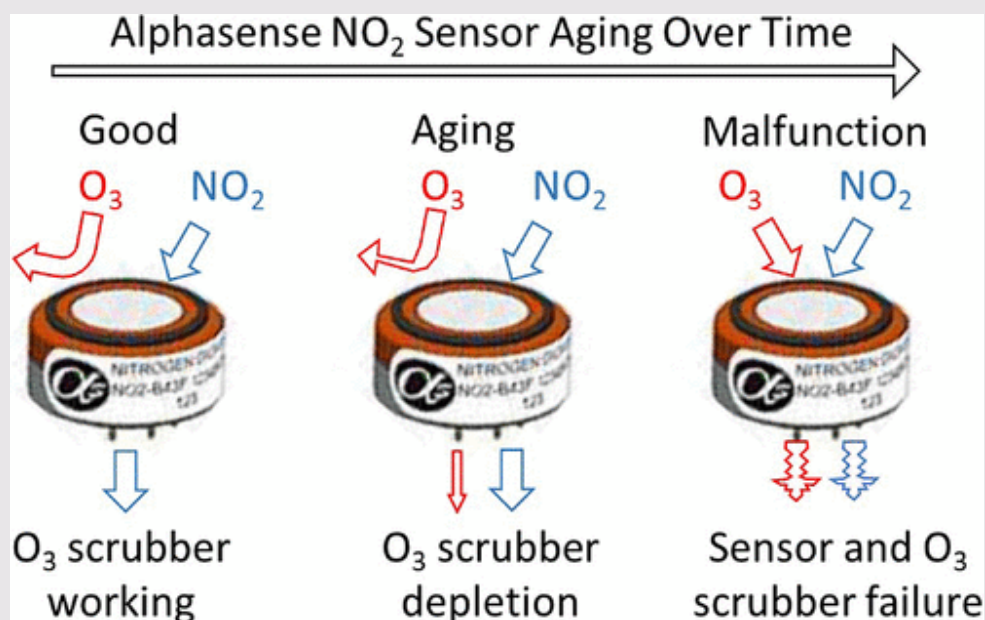
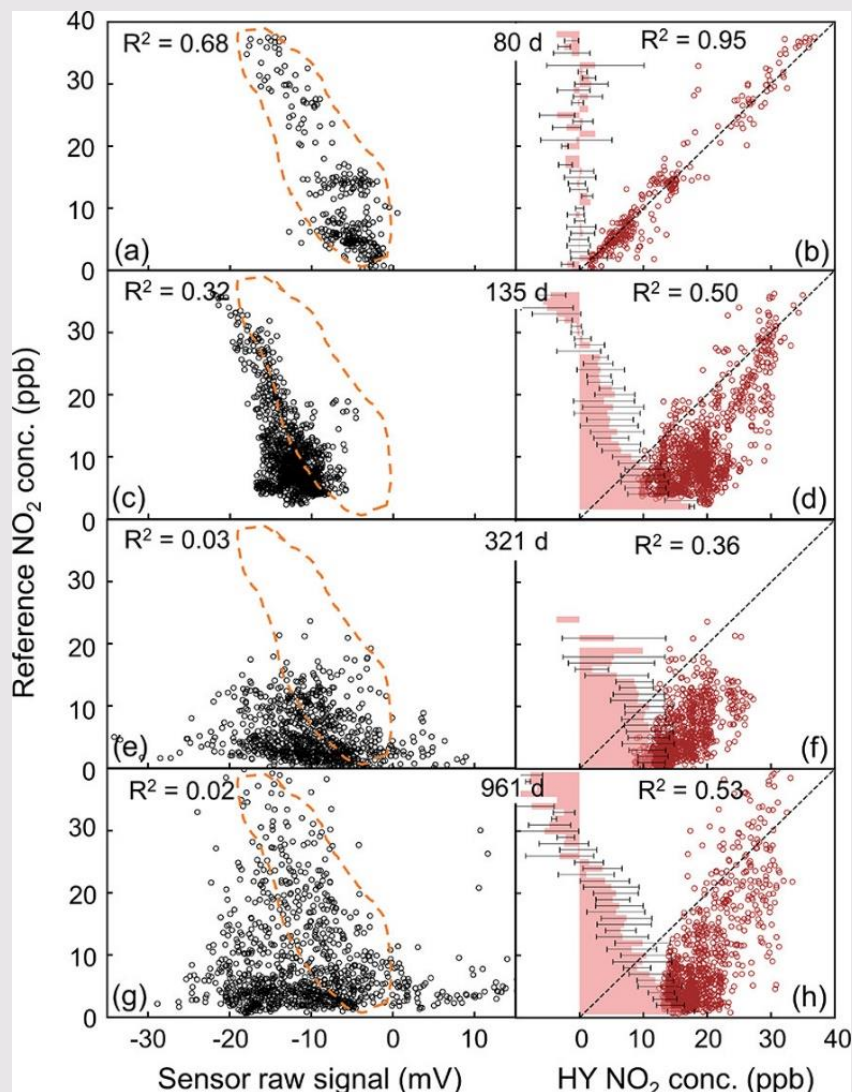


Figure Credit: American Chemical Society, Lit et al., 2021.

The bottom line: Most of the sensors were nonfunctional after 200 to 400 days. None of the sensors lasted beyond 400 days. Various environmental factors affected the time course of the degradation, including temperature, relative humidity, and ozone concentration. In long-term deployments, the authors recommend checking sensors with a reference instrument regularly after 200-400 days of deployment, so that nonfunctional sensors can be identified and replaced.

The NO₂ sensor is an electrochemical sensor that measures the current between working (or sensing) and reference electrodes immersed in a electrolyte solution. The NO₂ in sampled air is reduced at the working electrode, resulting in a current that varies with the rate of NO₂ diffusion into the sensor. Other strong oxidants in the air can also be reduced at the working electrode, notably ozone, resulting in an interference. An ozone scrubber built into the sensor prevents this interference, but over time the scrubber is depleted and hence the sensor responds to ozone as well as NO₂. As the sensor ages, its measurements of NO₂ tend to be overestimates of the atmospheric concentration (see figure below).



Performance of one NO₂ sensor at 80, 135, 321, and 961 days. Sensor raw signals (left panels) and modeled NO₂ concentrations (right panels) are shown versus the reference instrument. Figure Credit: Figure 1 from Li et al., *ACS Sensors*, **6**, 2952-2959 (2021).

It's generally recognized that regular checking of sensor performance is important to achieving data quality in sensor-based air monitoring. 2B Technologies has launched the [AQSync Air Quality Monitoring Station](#) with exactly this in mind. Contact us to discuss how the AQSync, or our other instruments for measuring NO_x and ozone, could provide the reference measurements for your monitoring.

[Characterizing the Aging of Alphasense NO₂ Sensors in Long-Term Field Deployments](#), J. Li, A. Hauryliuk, C. Malings, S. Rose Eilenberg, R. Subramanian and A.A. Presto, *ACS Sensors* (2021), **6**, 2952-2959.

[Link to ACS Paper](#)

[The 2B Tech Model 405nm NO₂/NO/NO_x Monitor](#)

Employee Spotlight

Cisco Manzo: Building the Model 405nm and Model 714

Meet One of Our Manufacturing Specialists

A lot of hands-on work goes into making each and every one of 2B Tech's instruments. And if you've purchased a Model 405nm NOx Monitor or a Model 714 NO2/NO/O3 Calibrator, the hands were most likely those of Cisco Manzo.

Cisco has been a manufacturing specialist at 2B Tech since December 2017. Over time, he's become the go-to person for making some of our most complex instruments. The Model 405nm uses our patented (and elegant) folded tubular photometer, and incorporates a heated scrubber and an ozone photolysis source. The Model 714 combines a few of our instrument concepts to enable calibration of 3 gases with one instrument. Cisco's latest building challenge has been to build the version of the NOx monitor that has been engineered for incorporation into our new AQSync Air Quality Monitoring Station.



Cisco likes having his "niche" at 2B Tech, and he enjoys the attention to detail that the job requires. His strong mechanical background makes him well suited for his work here at 2B Tech. He was in the Air Force for 4 years, where he was a mechanics crew chief on helicopters and the F-111A supersonic combat aircraft.

When not building at 2B Tech, Cisco is most likely to be found riding his bicycle on nearby trails in the mountains, playing one of the ~12 guitars he owns, creating art, or enjoying spending time with his girlfriend/adventure companion. He has played lead guitar in local bands for many years, including a Tom Petty tribute band. Check out one of his YouTube videos for a treat! [[Goodbye Stranger, Supertramp](#)]
