

Rapid evolution of air pollution sensor technology

Gayle Hagler, Ronald Williams, Eben Thoma, Bill Mitchell, Rachele Duvall,
Russell Long, Brian Gullett, Amara Holder, Tim Barzyk, Sue Kimbrough, Stephen
Feinberg, Amanda Kaufman, Halley Brantley
EPA Office of Research and Development

Abstract.

Outdoor air pollution measurement approaches have historically been conducted using stationary shelters that require significant space, power, and expertise to operate. The cost and logistical requirements to conduct monitoring have limited the number of locations with continuous measurement of air pollution. In recent years, significant development has occurred in low cost sensors and peripheral technology, enabling air pollution research in unprecedented ways. The United States Environmental Protection Agency (EPA) researchers are currently using sensor technologies in various application areas including 1) detection of emissions plumes near industrial facilities through fence-line monitoring, 2) quantification of lofted emissions from wildfires through deploying sensors on aerial systems, 3) creation of sensor networks in urban and suburban environment, and 4) development of turn-key-sensor systems to support community engagement via monitoring their environment. In addition to research applications of sensors, commercial air sensors are available for personal monitoring via wearable technology or in-home stationary devices. EPA is testing the real-world performance of emerging commercial air sensor products through co-locating sensors with reference monitors in different environments in the United States. The emergence of low cost sensor technology is poised to exponentially increase the observational data on air pollution patterns. Drawing meaningful information from this data, however, requires the development of strategies to overcome challenges of inherent noise, measurement drift, and varying performance under different environmental conditions.