PurpleAir PM2.5 performance across the U.S.#2

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Citation:

Johnson, K., A. Holder, S. Frederick, G. Hagler, AND A. Clements. PurpleAir PM2.5 performance across the U.S.#2. Meeting between ORD, OAR/AirNow, and USFS, Research Triangle Park, NC, February 03, 2020.

Impact/Purpose:

Interest and concern about air quality has grown in recent years. Simultaneously, growth in the popularity and use of air sensors across the US has also occurred especially during wildfires. However, adoption of this technology is limited due to uncertainty and variation in the quality of the data provided. This work evaluates the performance of a popular low-cost PM2.5 sensor (PurpleAir) across the U.S.. It seeks to inform sensor users of potential data accuracy issues and potential correction methods applicable to both this sensor and other similar low-cost sensors during typical ambient and smoke impacted events. This presentation will be given to the U.S EPA AirNow team and the U.S. Forest Service on February 3rd to allow them to better understand how to use PurpleAir sensors to understand wildfire smoke impacts.

Description:

PurpleAir particulate matter (PM) sensors are increasingly used in the United States and other countries by a variety of individuals and organizations for continuous monitoring of ambient air pollutant conditions, with additional sensors

often deployed for monitoring during wildfire smoke episodes. The performance of these sensors must be evaluated during smoke impacted times, and nominally corrected for bias if necessary, to ensure accurate data are reported to inform appropriate health protective actions. Here, we use data from PurpleAir sensors collocated with regulatory-grade monitors across the United States to develop quality assurance checks and a multilinear correction equation (including temperature and relative humidity) for PurpleAir PM2.5 data. A secondary data set was included to test the data correction scheme for wildland fire smoke conditions (including wildfires and prescribed burns) – a series of research field deployments of PurpleAir sensors collocated with temporary smoke monitors that are of near-regulatory grade quality (EBAMs and E-Samplers). Results suggest that the PurpleAir raw PM2.5 data overestimate PM2.5 by ~60% in most states under various conditions. Hourly NowCast Air Quality Index (AQI) categories are calculated using the raw and corrected PurpleAir PM2.5 concentrations, as well as for the collocated reference monitor. For the national data set of sensors collocated with regulatory-grade monitors, results show that PurpleAir sensors, when corrected, accurately report NowCast AQI categories 90% of the time as opposed to uncorrected PurpleAir data, which are accurate only 75% of the time. Testing the correction scheme for the research data set of wildland fire smoke events revealed that the corrected data compared closely with the reference monitors and produced similar NowCast AQI categories.

URLs/Downloads:

PURPLE AIR PM 2 5 PERFORMANCE ACROSS THE U S.PDF
(PDF,NA pp, 1525.79 KB, about PDF)

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