Justin G. Coughlin

Air Quality Data Scientist

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Mr. Coughlin joined Sonoma Technology in 2022 and has nearly a decade of experience in air quality monitoring and laboratory analyses, geospatial data analyses, and conducting risk assessments for human health and the environment. He has used and audited air quality monitors that measure criteria pollutants, volatile organic compounds (VOCs), metals in particulate matter (PM), and other hazardous air pollutants. In addition, he has experience using various spectrometry techniques, including gamma ray, continuous flow isotope ratio mass, inductively coupled plasma mass, ultraviolet doppler optical absorption, and proton transfer reaction time-of-flight mass. At Sonoma Technology, Mr. Coughlin is actively involved in geospatial data science, ecosystem impact modeling, air quality monitoring, and litigation services. He has a strong interest in the nexus of air pollution, climate change, and ecosystems, as well as science communication to the public.

Education

- MS, Environmental Science, University of Pittsburgh
- BS, Environmental Geology, University of Pittsburgh

Membership

- American Geophysical Union

Prior to joining Sonoma Technology, Mr. Coughlin was a Senior Environmental Scientist at the U.S. Environmental Protection Agency (U.S. EPA). He designed, conducted, and oversaw air quality monitoring campaigns to collect measurements—notably in environmental justice (EJ) communities—of metals in PM, mercury, and VOCs using stationary and mobile monitoring techniques. Mr. Coughlin was responsible for developing quality assurance project plans; overseeing quality control and assurance procedures; performing data validation, analysis, and visualization processes; and communicating results to public, industrial, and political stakeholders. As part of these monitoring campaigns, he used source apportionment techniques, such as positive matrix factorization and non-parametric wind regression, to determine emissions sources and contribute to human health risk exposure assessments. Many of the monitoring campaigns resulted in substantial emissions reductions of hazardous air pollutants in EJ communities through enforcement and compliance assistance activities.

In addition to air quality monitoring, he also conducted research activities at the U.S. EPA to assess ecosystem impacts from air pollution and climate change. This research was used to further develop the Secondary National Ambient Air Quality Standards for nitrogen oxides, sulfur oxides, and PM, and to enhance the National Atmospheric Deposition Program's understanding of critical loads. As part of these efforts, Mr. Coughlin served as a Co-Chair on the Executive Committee of the Critical Loads in Atmospheric Deposition Subcommittee.

Mr. Coughlin's graduate work at the University of Pittsburgh included laboratory and field studies focused on reactive nitrogen measurements, deposition, and ecosystem impacts near unconventional natural gas (UNG) extraction activities in the Marcellus Shale Basin in Pennsylvania and West Virginia. As part of an Oak Ridge Institute for Science and Education (ORISE) Fellowship with the U.S. Department of Energy's National Energy Technology Laboratory, he oversaw field campaigns surrounding UNG well pads, using passive air quality samplers to evaluate ambient air concentrations and isotopic signatures so source apportionment techniques could be applied.

In addition to laboratory and field activities, Mr. Coughlin served as a Geoscientist Educator, as part of a National Science Foundation Fellowship, to educate historically under-represented students in STEM (science, technology, engineering, and mathematics) about local air quality and EJ issues. This joint fellowship with the Carnegie Museum of Natural History culminated in a student-created museum exhibit that was viewed by over 75,000 museum visitors. He continues to participate in science communication activities with students by serving as a Science Communicator in local museums and judging local science fairs.

Mr. Coughlin is proficient in R, Python, and GIS. He also has experience running AERMOD and working with CMAQ outputs. He is a co-author of many peer-reviewed publications and has presented numerous works at scientific conferences.

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