

EGU22-4361

<https://doi.org/10.5194/egusphere-egu22-4361>

EGU General Assembly 2022

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Low cost source apportionment of urban air pollution

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Over the last 10 years, there has been a revolution in the use of low cost sensors to measure air pollution concentrations. These sensors are not without problems, but it is now possible to get high quality measurements of air pollutants. In particular, the use of low cost optical particle counters (OPCs) for the measurement of particulate matter (PM) in regulatory size ranges has been successfully achieved in many urban areas worldwide, with an associated cost that is far less than regulatory instruments.

Successful air quality management and control not only requires measurement of air pollution levels, but it also requires information on the sources and their relative importance. Without this critical, targeted information on pollution sources, it is difficult to plan and enact control measures with which to reduce air pollution.

This talk will present new work on using low cost PM sensors to achieve low cost source identification and apportionment. The measured PM size distribution obtained from OPCs is used to identify sources. Typically, source apportionment that uses particle size distributions as input relies on particle size information in the sub 300 nm size range to obtain information about sources. However, OPCs typically only provide size information above approximately 300 nm. Initial work used k-means clustering to obtain source information (Bousiotis et al. 2021). Subsequent work has used other algorithms including positive matrix factorization (PMF). Comparison between source information obtained between low cost and regulatory grade instruments is remarkably promising.

This presentation will highlight the methodological approaches undertaken. It will then use a series of urban case studies showing how low cost source apportionment can be used to identify different sources of PM pollution in urban areas, both in the ambient air and indoor air. Finally, the presentation will discuss the prospects for low cost urban source apportionment and hyperlocal air pollution management.

Bousiotis, D., Singh, A., Haugen, M., Beddows, D., Diez, S., Murphy, K.L., Edwards, P.M., Boies, A., Harrison, R.M. and Pope, F.D., 2021. Assessing the sources of particles at an urban background site using both regulatory instruments and low-cost sensors—a comparative study. *Atmospheric Measurement Techniques*, 14(6), pp.4139-4155. <https://doi.org/10.5194/amt-14-4139-2021>