

Comparison of Equivalent Black Carbon at Background and Roadside Sites in Dublin

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In Ireland, domestic home heating relies heavily on coal and peat burning, as well as wood. In order for policy makers to develop effective abatement strategies for reducing air pollution, information about current levels of pollution, and the contribution that each fuel source makes to particulate pollution in this complex environment, is required. Multi-wavelength aethalometer measurements were made over a 12 month period at two sites in Dublin, Ireland; a background site at University College Dublin (UCD) campus, a predominantly residential area, and at Pearse Street, a high traffic density roadside site in inner city Dublin.

The aethalometer (Model AE33, Aerosol d.o.o.) was employed for measuring optical attenuation as a basis for apportioning solid fuel burning and traffic related equivalent black carbon (eBC) at two distinct sites in Dublin, Ireland. The aethalometer was deployed at the UCD campus from August 2016 for a two year period. From August 2018, a monitoring site was established on Pearse Street. Data analysis and source apportionment based on the aethalometer model (Sandra Dewi *et al.*, 2008) employed source specific Ångström exponent (α) values of 1.68 and 0.9 for solid fuel burning and traffic, respectively (Zotter *et al.*, 2017).

Initial results indicate a strong diurnal trend at both sites. A traffic-related peak in eBC levels is observed during morning rush hour, while the evening peaks are dominated by solid fuel burning emissions, especially at the UCD campus site. Although measurements at both sites follow a similar trend, eBC concentrations are significantly higher at Pearse Street, as illustrated in Figure 1. Such considerable instances of solid fuel combustion for residential heating was unexpected as homes in the city have access to mains gas heating. The results of this campaign will also aid in the determination of the best possible Ångström absorption exponent (AAE) pairs for source apportionment in Ireland. Given the unique nature of combustion emissions in Ireland, with significant contributions from fuel types other than wood and traffic (e.g. coal and peat), the determination of site specific AAE pairs will provide the most accurate data to all relevant stakeholders. Table 1 demonstrates the variation in eBC levels

between the two sites during the winter months. Pollution levels increase dramatically at the roadside site. Following aethalometer data analysis, using the α values stated above, it is evident that source contributions vary between sites. The dominant source of pollution at Pearse Street is traffic, while significant contributions from solid fuel burning were recorded at the UCD campus.

Table 1. Average monthly eBC values at background and polluted sites in Dublin, Ireland.

Month	UCD Campus - eBC ($\mu\text{g}/\text{m}^3$)	Pearse Street - eBC ($\mu\text{g}/\text{m}^3$)
November	1.062	5.838
December	1.478	5.690
January	1.217	4.454
February	0.750	4.096

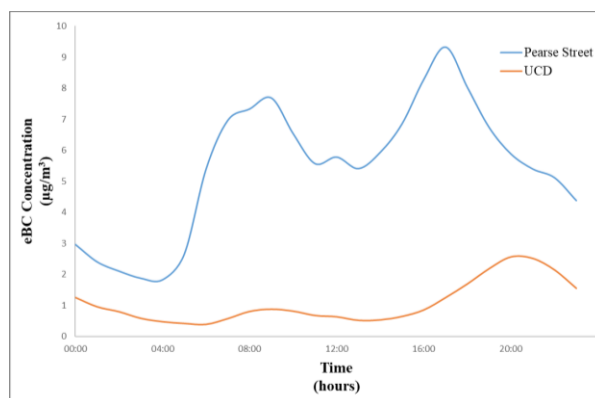


Figure 1. Diurnal trends observed during the winter months.

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Sandra Dewi, J., *et al.*, *Environmental Science & Technology* **2008**, 42 (9), 3316-3323

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