Interpretation of Urban Particle-bound Polycyclic Aromatic Hydrocarbons Source Profiles of PMF with Known Site Specific Emission Characteristics

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Keywords: Positive Matrix Factorisation, particulate polycyclic aromatic hydrocarbons, site specific emission characteristics.
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Measured concentrations of polycyclic aromatic hydrocarbons in urban air are the outputs of mixed emissions from various sources. Because of the carcinogenic and mutagenic properties of the inhalable size particulate PAHs, various methods for source apportionment have been reviewed to extract source specific profiles.

Positive Matrix Factorization has been widely used to apportion the source of pollutants recently, as one of the advanced receptor modelling tools. There are some difficulties to extract site representative profiles because of the uncertainties caused by transport and removal mechanisms between sources and receptors. However, the fact that there are similar extracted source profiles from different continental locations support the existence of source specific profiles (Christie et al., 2012).

Application of PCA to the UK PAH Network sites by Mari *et al* (2010) and Brown and Brown (2012) identified that urban PAH including benzo(a)pyrene was associated with metallurgical industry emissions, domestic solid fossil fuel combustion for heating, and traffic influence. However, common fuel usages between the domestic and industry sector sometimes make it difficult to separate the two specific source profiles and quantify each contribution.

An example of the results shown in Figure 1 is a decomposition of a known industry influenced urban particle-bound PAH dataset into an industry factor with sporadic emission, and a domestic combustion origin with notable seasonality. The latter profile strongly explained by cyclopenta(c,d)pyrene and anthanthrene, was consistent with a factor profile extracted from another dataset which domestic combustion is known to be prevalent.

Known local emission characteristics of combined PAH with seasonal variation made it possible to distinguish between domestic fuel combustion origin and industry influence. The largest contribution to the particle associated PAH and BaP was from traffic exhaust and solid fossil fuel combustion, respectively across UK urban areas.
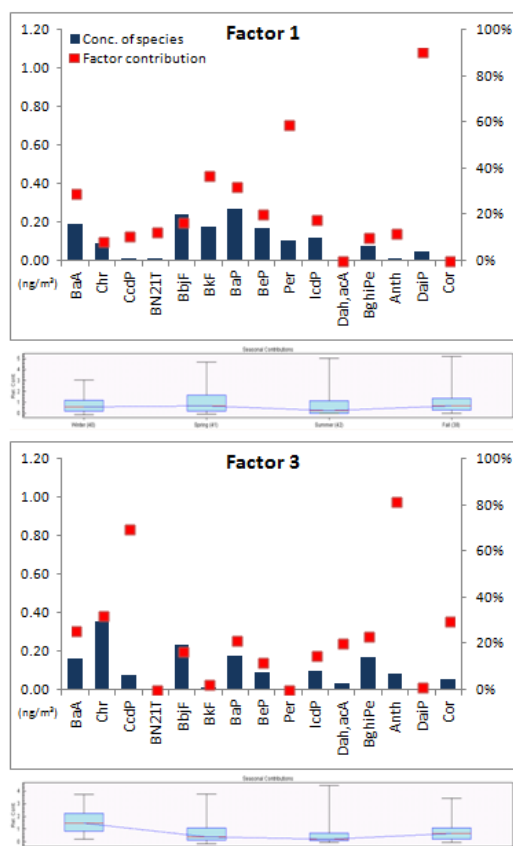

Figure 1. Extracted two factor profiles from known industry sites.

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