# Airborne Sugar Compounds: Correlation with Chemical and Biological Tracers

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Atmospheric aerosols comprise a variety of non-biological and biological particles. Sugar compounds (saccharides, anhydrosaccharides and alcohol-saccharides), represent an important part of the water soluble organic fraction in the atmospheric aerosol and can have their origin in different anthropogenic and natural sources (Barbaro et al., 2019). This study aims to evaluate the daily and seasonal evolution of 17 sugar compounds in the $PM_{10}$ fraction (arabinose, fructose, galactose, glucose, ribose, sucrose, xylose, adonitol, arabitol, 2-methyleryritol, myo-inositol, mannitol, sorbitol, xylitol, galactosan, levoglucosan and mannosan) and identify the emission sources of these sugar compounds thought their correlation with meteorological parameters, some biological markers (pollen and the fungal spore *Alternaria*) and chemical species.

Sampling was carried out at a suburban area of León (Spain), between 9 March 2016 and 14 March 2017 by using a low volume sampler (TECORA, ECHOPM), equipped with 47 mm diameter teflon filters and a high volume sampler (CAV-Mb), equipped with 150 mm diameter quartz filters. Quartz filters were used for the determination of $PM_{10}$ by the gravimetric method, organic (OC) and elemental (EC) carbon by a thermal-optical method and sugar compounds by ion chromatography with amperometric detection. Teflon filters were analysed for trace elements by particle induced x-ray emission (PIXE) and for inorganic ions by ion chromatography. Additionally, a Hirst volumetric trap was used for sampling atmospheric bioaerosol. Weather variables (temperature, relative humidity, wind speed and direction) were recorded in the sampling location with an automatic weather station.

A principal component analysis (PCA), applied to the seventeen sugar compounds, along with the chemical species analysed, *Alternaria* and total pollen concentration, allowed identifying three main sources, explaining more than 55% of the accumulated variance: pollen (31%), fungal spores (15%) and biomass burning + fossil fuel (6%). The pollen source was related to myo-inositol, 2-methylerythritol, arabinose, galactose, glucose, fructose, ribose, sucrose, mannitol, arabitol and xylose, showing maximum levels between May and June (Fig. 1). The fungal spores source was defined by arabitol and mannitol, reaching maximum values between summer and winter. These alcohol-saccharides were positively correlated with *Alternaria*, temperature and relative humidity. Levoglucosan, galactosan and mannosan were grouped in the biomass burning + fossil fuel factor, showing a positive correlation with $NO_3^-$, K, Se, OC, EC, $NH_4^+$ and Pb, and a negative correlation with temperature. The highest concentrations of anhydrosugars were observed in autumn and winter, due to the use of heating devices and the increase in traffic emissions.

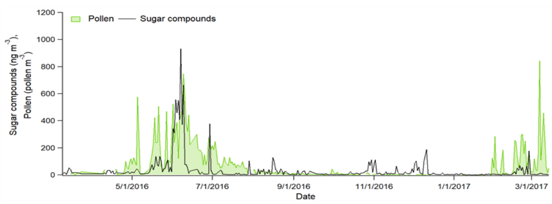


Figure 1. Daily evolution of the sum of sugar compounds related to the first factor and total pollen concentration.

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