Spatial-temporal variation of air quality in León (Spain)

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Currently, according to WHO data, most of world population breathe air whose levels exceed the limits recommended, harming human health. PM_{10} concentrations exceeding 20 µg/m^3 increase between 23 % - 46 % the number of respiratory diseases (Aldunate et al., 2006). Epidemiological studies conducted by Krewski et al. (2000) and Woodruff et al. (1997), have shown the impact of PM_{10} concentrations on human health.

Traffic is one of the main sources of air pollution, specifically diesel vehicles. They emit high levels of particles (Alves et al., 2015).

It is also important to highlight the influence of natural dust emissions from the nearby African continent. These emissions have a significant impact on air quality in the Iberian Peninsula.

The limit values for suspended particles (Directive 2008/50/EC10) are exceeded mainly in urban areas. In Spain, 40-70% of air quality monitoring stations, located in areas with high road traffic, exceed the annual and daily limit values for suspended particles since 2005 (Querol, 2008).

The present study has been conducted in the city of León (Spain), located in the northwest of the Iberian Peninsula. This area has a continental Mediterranean climate, with dry summers and cold winters, prevailing winds from north and west, with a mean annual rainfall of 515 mm (Aemet, 2022).

This study comprises data from 3 air quality stations (traffic, background and suburban). Two of them (traffic and background), belong to the Air quality control network from "Junta de Castilla y León". The traffic station is placed at the west part of León (1.5 km far from the city centre), and the background station is situated 2.5 km far from the city centre, in the south of León. The suburban station is located in the north-east, in the Faculty of Veterinary of the University of León (2 km far from the city centre).

The aim of this work is to compare data from the different stations in order to analyse the impact of the spatial and temporal distribution of the atmospheric pollutants, mainly PM_{10}, during 1 year (from March 2016 to March 2017).

Different PM_{10} concentrations were observed throughout the studied year (Fig. 1) with the highest concentration corresponding to the traffic station, followed by the suburban and the background stations. The annual pattern shows a maximum in winter for the traffic and suburban stations, probably due to the use of domestic heating devices and the reduction of the mixing layer height.

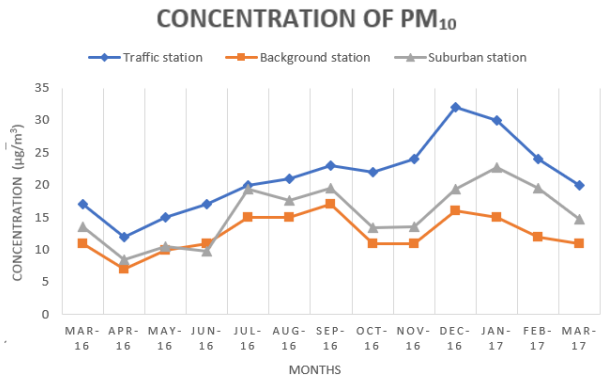

Figure 1. Monthly PM_{10} concentrations registered in the three air quality stations from March 2016 to March 2017.

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Aemet, Meteorology Statal Agency, consulted in *http://www.aemet.es/es/serviciosclimaticos/datosclimatologicos/valoresclimatologicos*.

Aldunate, P., et al. (2006). *The effects of air pollution by PM_{10} on health city of La Paz.* Rev Acta Nova: 422-442.

Alves, C., et al. (2015). Emissions from light-duty diesel and gasoline in-use vehicles measured on chassis dynamometer test cycles. *Aerosol Air Qual. Res*. 15, 99-116.

Krewski, D., et al. (2000). *Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Health Effects Institute*. Boston MA; Special Report.

Querol, X. (2008) *Air quality, particles and metals*, Rev. Esp. Public health, vol.82.

Woodruff, TJ., et al. (1997). *The relationship between selected causes of postneonatal infant mortality and particulate air pollution in the United States*. Environmental health perspectives; 105(6): 608-612.