

## Influence of meteorological parameters on air pollution in the city of A Coruña (Spain)

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Currently, air pollution is a worldwide problem, increasing greatly due to the development of industrial and economic activities, especially in the last century (Calvo, 2009). As a consequence, some air quality policies have been developed with the aim of reducing the emissions to the atmosphere. Despite reductions in the emissions of some air pollutants produced by the actions contemplated in the new legislation on air quality, high concentrations continue to be registered in some urban areas (EEA, 2017), road traffic being the main cause of these high concentrations, exceeding in some cases the limits established by current regulations (RD 2008/50 / CE).

The present study was carried out in A Coruña, a port city located on a promontory in the region of Galicia (northwest of Spain). The municipality of A Coruña has a population of 243 978 inhabitants (INE, 2016). It has a Mediterranean oceanic climate. Due to its coastal characteristics, its climate prevents a large difference in temperature between the seasons of the year. Winters and summers are mild, and rainfall is combined with sunny seasons. It has an average annual humidity close to 70%. The proximity to the Atlantic Ocean causes strong winds (since 1973 the average is  $12.9 \pm 1.2 \text{ km h}^{-1}$ ). Furthermore, the strongest winds of the year reach speeds of  $80 \pm 20 \text{ km h}^{-1}$ .

The aim of this study is to determine the significant correlations between the concentration of some air pollutants and several meteorological parameters in A Coruña (Spain) during 2016. Daily air pollutant concentrations (SO<sub>2</sub>, CO, NO, PM, NO<sub>2</sub>, O<sub>3</sub>, benzene and toluene) were obtained from four stations of the Air Quality Network of A Coruña (<http://coruna.es/infoambiental/es/calidad-del-aire/red-de-vigilancia.html>): i) Sta. Margarita (urban); ii) Castrillón (urban); iii) San Diego (urban) and iv) San Pedro (urban background). 53 meteorological parameters (CCL, LCL, temperatures, pressures, height of thermal inversions...) were extracted from the processing of daily radiosounding (downloaded from the OGIMET page <http://www.ogimet.com/sond.phtml>), using the RAOB computer program. Furthermore, the daily weather type was identified with a Circulation Weather Types classification (CWTs) (Lamb, 1972) (Table 1) and the pollution concentration associated to each weather type was calculated. In addition, the number of PM<sub>10</sub> daily exceedances (Directive 2008/50/CE, 50  $\mu\text{g m}^{-3}$ ) was determined, analysing possible causes.

Table 1.- Weather types according to Lamb classification (Lamb, 1972).

Anticyclonic types		Pure directional		Cyclonic types	
A	Anticyclonic			C	Cyclonic
ANE	Anticyclonic- northeast	NE	Northeast	CNE	Cyclonic- northeast
AE	Anticyclonic- east	E	East	CE	Cyclonic- east
ASE	Anticyclonic - southeast	SE	Southeast	CSE	Cyclonic - southeast
AS	Anticyclonic - south	S	South	CS	Cyclonic - south
ASW	Anticyclonic - southwest	SW	Southwest	CSW	Cyclonic - southwest
AW	Anticyclonic - west	W	West	CW	Cyclonic - west
ANW	Anticyclonic - northwest	NW	Northwest	CNW	Cyclonic - northwest
AN	Anticyclonic - north	N	North	CN	Cyclonic - north

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- Calvo I. (2009). *Caracterización y transporte del aerosol atmosférico: medio urbano, rural y quema de biomasa. Tesis doctoral. Universidad de León* (España) (in Spanish).
- EEA (2017). *Contaminación atmosférica*. Agencia Europea de Medio Ambiente. [www.eea.europa.eu](http://www.eea.europa.eu) (Last visit: 09-02-2018)
- INE (2016) Search of inhabitants in A Coruña <http://www.ine.es/jaxiT3/Datos.htm?t=2868> (Last visit: 02/04/2018)
- Lamb, H. (1972). British Isles Weather types and a register of daily sequence of circulation patterns. *Geophysical Memoir*, 116, 85.