

An astonishing Saharan dust outbreak in March 2022: Impact on air quality in Castilla y León (Spain)

P. Rodríguez-Rodríguez, A.I. Calvo and R. Fraile

¹Department of Physics, Universidad de León, 24071 León, Spain

Keywords: aerosol, air masses, HYSPLIT, PM10

Associated conference topics: 2.6, 2.9

Presenting author email: rfral@unileon.es

Due to its proximity to the Saharan dust system, considered the largest in the world (Garrison *et al.*, 2014), Spain is often affected by Saharan dust intrusions, mainly in spring and summer. These outbreaks produce notable impacts on the environment and human health (Oduber *et al.*, 2019).

From 14 to 16 March 2022, an increase in PM10 concentration was reported throughout the Iberian Peninsula as a result of the combination of two atmospheric phenomena: a high-impact storm in the Gulf of Cádiz region and a cut-off low south of the peninsula (García-Valero, 2022). This resulted in an unprecedented extreme outbreak of Saharan dust that affected the Iberian Peninsula.

The aim of this study is to analyse the impact of this intrusion on air quality in the autonomous region of Castilla y León (Spain). To this end, the hourly PM10 concentration registered in March in the background stations located in the nine provincial capitals was analysed. Data were provided by the Air Quality Control Network of the Junta de Castilla y León (<http://servicios.jcyl.es/esco/index.action>).

With this information it has been possible to verify that in 14, 15 and 16 March, the PM10 limit value of 50 µg/m³ was considerably exceeded in the autonomous community. For example, on March 15 the average daily value for the Castilla y León provinces as a whole was ten times higher than the limit and practically one hundred times higher than the usual average values.

The analysis of the daily PM10 averages for each of the nine provinces in eight-hour intervals (from 0001 to 0800, 0801 to 1600 and 1601 to 0000 UTC) for the three days under consideration (Fig. 1), showed that the highest values were reached on March 15 in the interval from 0801 to 1600 UTC. The most affected provinces were Segovia, Valladolid, Salamanca and Ávila with PM10 concentrations higher than 965 µg/m³ for that time interval. It is important to keep in mind that the sampling equipment only provide PM10 values up to 999 µg/m³.

Different tools were used in order to analyse the synoptic situation and the air mass trajectories: Hysplit model, synoptic maps at 300, 500 and 850 hPa from the European Center for Medium-Range Weather Forecasts, satellite images of total aerosol dispersion from the Giovanni interface and satellite images from the Worldview (from NASA).

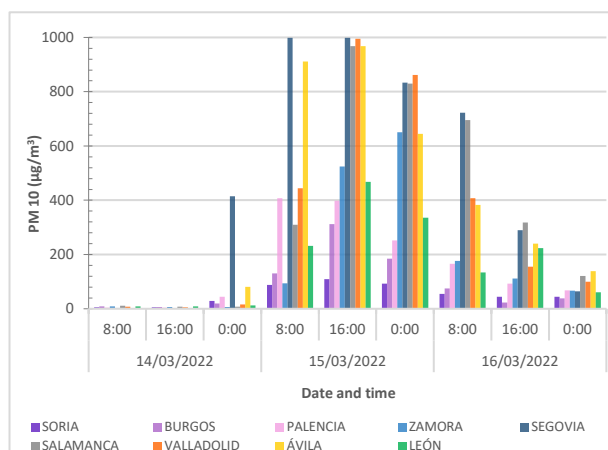


Figure 1. Hourly average PM10 concentration from 14 to 16 March 2022.

This work was partially supported by the Junta de Castilla y León co-financed with European FEDER funds (Grant LE025P20). It was also in part supported by the AEROHEALTH project (Ministry of Science and Innovation, co-financed with European FEDER funds. Grant PID2019-106164RB-I00). Furthermore, it is part of the project TED2021-132292B-I00, funded by MCIN/AEI/10.13039/501100011033 and by the European Union "NextGenerationEU"/PRTR.

García-Valero, J. A. (2022) "*Informe acerca de la intrusión de polvo de origen sahariano sobre el territorio Peninsular Español*", Agencia Estatal de Meteorología (AEMET), 1–11.

Garrison, V. H., Majewski, M. S., Foreman, W. T., Genualdi, S. A., Mohammed, A. and Massey Simonich, S. L. (2014) *Sci. Total Environ.*, **468-469**, 530–543.

Oduber, F., Calvo, A. I., Blanco-Alegre, C., Castro, A., Nunes, T., Alves, C., Sorribas, M., Fernández-González, D., Vega-Maray, A. M., Valencia-Barrera, R. M., Lucarelli, F., Nava, S., Calzolari, G., Alonso-Blanco, E., Fraile, B., Fialho, P., Coz, E., Prevot, A. S. H., Pont, V. and Fraile, R. (2019) *Sci. Total Environ.*, **669**, 213–228.