

Events of biomass burning affecting mainland Spain from 2005 to 2020

A. Martínez, E.D. Vicente, A.I. Calvo, C. Blanco-Alegre and R. Fraile

Department of Physics, IMARENAB University of León, León, 24071, Spain

Keywords: Air quality, Particulate Matter, Weather types

Presenting author email: aicalg@unileon.es

According to The Global Burden of Disease study, in 2019, air pollution caused 6.7 million deaths globally, being the 4th leading risk factor for mortality worldwide. Its total impact is exceeded only by high blood pressure, dietary risks, and tobacco use (Health Effects Institute, 2020). In urban areas, there are several main pollution sources such as traffic, industries and biomass combustion. Biomass burning is regarded as an important source of pollutants, particularly particulate matter (PM), which has been classified by the International Agency for Research on Cancer as carcinogenic for humans (Loomis *et al.*, 2013). Biomass burning can result from natural events, such as wildfires (Linares *et al.*, 2018), as well as from anthropogenic sources such as biomass combustion for residential heating (Vicente *et al.*, 2018) and open burning of pruning residues for waste disposal (Alves *et al.*, 2018). It has been reported that in rural areas, wildfires might increase PM levels up to four times compared to periods without this source of pollution, largely exceeding the air quality guidelines (Alonso- Blanco *et al.*, 2014).

This work focuses on the study of the number of biomass burning events that affected mainland Spain from 2005 to 2020. Different sectors have been analysed: SW, SE, East, W, Centre, NW, N and NE. Data for each sector were retrieved from the site of Ministry for Ecological Transition and Demographic Challenge.

The yearly and seasonally trends have been analysed. Moreover, the evolution of weather types has been studied using the weather type classification proposed by Lamb (1972), in order to check its potential relation with the biomass burning events. The impact of biomass burning events on the air quality in the city of León has been studied and the number of PM₁₀ exceedances of the 50 µg/m³ threshold related to these episodes has been analysed. For this, data from the Castilla y León air quality network (www.jcyl.es) have been studied.

A significant positive trend in the occurrence (number of days) of biomass burning events from 2005 to 2020 has been observed (Fig. 1). A peak was reached in 2017, with more than 600 days-sector affected by biomass burning events and the lower value was registered in 2008, with 11 events.

A total of 338 PM₁₀ exceedances were registered in the city of León during the studied period, with around 20% likely to be influenced by biomass burning events.

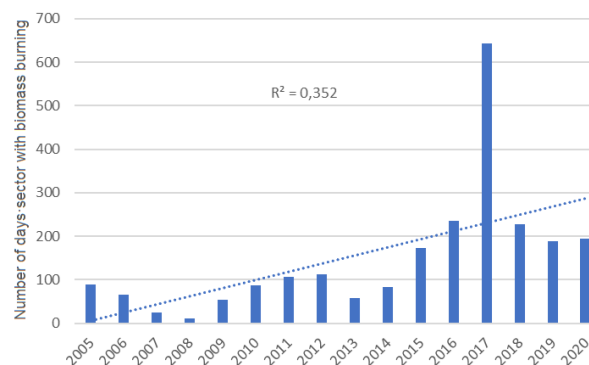


Figure 1: Days-sector with biomass burning events in mainland Spain (sum of data for all sectors) from 2005 to 2020.

Data owned by the Ministry for Ecological Transition and Demographic Challenge, provided under the "Commission of the Ministry for ecological transition to the State Agency Higher Council for Scientific Research for the detection of natural episodes of cross-border particle inputs and other sources of contamination of particulate matter, and tropospheric ozone formation". This study was partially supported by the Junta de Castilla y León co-financed with European FEDER funds (Grant LE025P20) and by AEROHEALTH project (Ministry of Science and Innovation, Grant PID2019-106164RBI00, co-financed with European FEDER funds).

Alonso-Blanco *et al.* (2014). Impact of biomass burning on aerosol size distribution, aerosol optical properties and associated radiative forcing. *Aerosol and Air Qual. Res.*, **14**, 708–724.

Alves, C.A. *et al.* (2019). Gaseous and speciated particulate emissions from the open burning of wastes from tree pruning, *Atmos. Res.* **226**, 110–121.

Health Effects Institute, State of Global Air 2020. Special Report, Boston, MA, 2020.

Lamb H. (1972). British Isles Weather types and a register of daily sequence of circulation patterns: 1861–1971. *Geophys. Mem.* 116 HMSO, London.

Linares, C. *et al.* (2018). Impact on mortality of biomass combustion from wildfires in Spain: A regional analysis, *Sci. Total Environ.* **622–623**, 547–555.

Loomis, D. *et al.* (2013) The carcinogenicity of outdoor air pollution, *Lancet Oncol.* **14**, 1262–1263.

Vicente, E.D. and Alves, C.A. (2018). An overview of particulate emissions from residential biomass combustion, *Atmos. Res.* **199**, 159–185.