

Aerosol load at the surface in the Iberian Peninsula during the last 25 years

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The effects caused by tropospheric aerosols on Earth's climate and radiative budget, human health, and material degradation have motivated the analysis of the particulate matter (PM) worldwide. In particular, the Iberian Peninsula presents a great interest in this field due to the high PM levels compared to Northern European regions. These high levels are explained by emissions (either anthropogenic and natural) as well as the topography and climate. As a result, the Mediterranean basin is a vulnerable region in terms of the climate destabilization, which produces a more complex role of aerosols in the climate system. The EMEP (European Monitoring and Evaluation Programme) network database includes total suspended matter (TSP) and PM of aerodynamic diameters less than 10 μm (PM10) and 2.5 μm (PM2.5) data. The former variable was recorded in the Iberian Peninsula between 1985 and 2000, while the two latter ones are recorded since 2000. Hence, 15 EMEP Spanish sites are selected to analyze the main climatological features of the PM levels in this area and their temporal evolution. The three variables exhibit similar annual patterns: low values during winter increase in the spring up to a summer maximum, and after that a progressive decline. A bimodality is observed in this cycle with an early March-maximum/April-minimum which has been attributed to the impact of desert dust intrusions into the Iberian Peninsula climatology. With respect to temporal evolution, the PM concentrations have notably decreased in the last 25 years: the TSP sites exhibit negative trends since the late 1980s which also are obtained for PM10 and PM2.5 levels since the early 2000s. This more recent PM reduction is in line with the temporal trends of columnar aerosol evolution recorded in the same area. Furthermore, this aerosol decline has the impact of increasing radiation levels at the Earth's surface contributing to the brightening period observed in this region.