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Climatological classification of five sectors in the Iberian Peninsula using columnar (AOD, α) and surface (PM10, PM2.5) aerosol data supported by air mass apportioning

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The study of atmospheric aerosol over the Iberian Peninsula (IP) under a climatologic perspective is an interesting and meaningful aim due to the wide variety of conditions (geographical position, air masses, topography, among others) which cause a complex role of the distribution of aerosol properties. In the deeply investigation on the annual cycle and time evolution of the particulate matter lower than 10 μm (PM10, surface) and aerosol optical depth (AOD, columnar) in a large number of sites covering the period 2000-2013, five sectors can be distinguished in the IP. Both set of data belong to EMEP and AERONET networks respectively, as representative of aerosol air quality and climate studies, are complementary elements for a global aerosol research. The prevalence of fine-coarse particles is also analyzed over each sector. Seasonal bimodality of the PM10 annual cycle with a strong North-South gradient is observed in most sites, but this is only reported in the AOD climatology for the southern IP. The northern coast is clearly governed by the Atlantic Ocean influence, while the northeastern area is modulated by the Mediterranean Sea. The southern area, very close to the African continent, presents a large influence of desert dust intrusions. However, the southern Atlantic and Mediterranean coast present discrepancies and two sectors have been defined in this area. Finally, the center of the Peninsula is a mix of conditions, with north-south and east-west gradients of different magnitude. Overall, there is a relationship between PM10 and AOD with a proportional factor varying from 20 to 90, depending on the sector. The particular characteristic of PM10-AOD annual cycle of each geographical sector can be understood by the different climatology of the air mass origins observed at 500 and 1500 m (a.s.l.) and its apportioning to PM10 and AOD, respectively.