



The annual evolution of the daily cycle of surface ozone concentration in long time series of the Portuguese air quality network

A. C. Parracho (1), M. Silva (2), T. Fonte (2), A.C. Carvalho (3), N. Barros (2), and J. M. Castanheira (1)

(1) CESAM, Department of Physics, University of Aveiro, Campus (claudiabernardes@ua.pt), (2) CIAGEB, Faculty of Science and technology, University Fernando Pessoa, Praça 9 de Abril, 349 | 4249-004 Porto, Portugal (nelson@ufp.edu.pt), (3) CENSE, DCEA FCT-UNL, Campus de Caparica 2829-516 Caparica, Portugal (accsgc@gmail.com)

Surface ozone concentration time series show large variability in the time scales of hours to years. Many factors may contribute for that variability being the daily and annual cycles of meteorological variables two important ones. Therefore two important components of the ozone concentration variability are the evolving diurnal cycle superposed on the annual cycle. The characterization of these two components of surface ozone variability is useful for the definition of police measures to deal with ozone extremes.

In this communication we present a methodology to characterize the annual evolution of the diurnal cycle of ozone concentration in long time series of observations in the Portuguese air quality network. The typical daily cycle for a given Julian day, n , is obtained calculating the inter-annual mean of the ozone concentration at each hour, t , of the day, n . A smoothing of the inter-annual means is applied by a 61-day running average for each hour, t . A similar procedure was used to determine the daily cycle in the standard deviation of concentrations.

Results show that the type of observation station has a signature in the daily profiles of ozone concentrations. Urban stations show two daily peaks which may result from the interplay of the variation in meteorological variables, from the availability of ozone precursors produced mainly by the road traffic and, in particular for the first peak, from vertical mixing of the ozone of the precedent day present on the residual layer. Background rural stations present only a peak in the daily cycle mainly resulting from photochemical activity. With respect to the standard deviation of ozone concentrations, the results suggest that during part of the year the variability is dominated by meteorological factors and in other part the variability is determined by the emissions of ozone precursors from human activities.