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Enhanced surface ozone concentrations in Seville urban area (southwestern Europe)

J.A. Adame (1,4), A. Lozano (3), J. Contreras (2), J.P. Bolívar (4), F. Godoy (2) and B. De la Morena (1)

(1) Atmospheric Sounding Station, El Arenosillo – National Institute of Aerospace Technology (INTA). Crta. Huelva Matalascañas, km 34, 21130. Huelva. Spain. adamecj@inta.es (2) Consejería de Medio Ambiente de la Junta de Andalusia. Seville. (3) Empresa de Gestión Medioambiental (EGMASA). (4) Departamento de Física Aplicada. Universidad de Huelva. Campus de El Carmen, s/n. 21007. Huelva.

The ozone episodes are very frequent in the European Mediterranean basin. In the case of the Iberian Peninsula, region located in the southwest Spain, are measured very high surface ozone levels during warm season. In order to know the characteristics and causes of these ozone events, the ozone concentrations recorded in Seville (the biggest urban metropolitan area in the southwest of Europe) have been analysed..

A four-year hourly data period of eight ozone stations from Seville metropolitan area has been studied. The episodic days have been identified if the daily hourly maximums exceed 160 μg m^{-3} and the daily maximum 8 h average is higher than 120 μg m^{-3}. According to this criterion, 373 episodic days presenting inter-annual differences with a major number of episodes in 2003 and 2004 have been registered. Moreover, ozone events were recorded between May and September with maximum in July.

With the purpose of identifying the difference between episodic and no-episodic days, NO and NO_2 cycles were analysed as well as the daily evolution of surface meteorological parameters. In episodic days the daily ozone average was 90 to 100 μg m^{-3} (average of maximums of 177 μg m^{-3}), NO daily mean ranging from 4 to 18 μg m^{-3}, and NO_2daily mean oscillate between 21 to 38 μg m^{-3}. The temperature daily mean ranging from 25 to 28 ºC and the maximum up 33 ºC with an average daily relative humidity of 50%.

The comparative analysis between the two types of days showed that the increase of ozone in episodic days respect no-episodic may reach 60 μg m^{-3} with an increase of 12-15 μg m^{-3} in the NO_2 concentrations while the NO values are not affected with similar concentrations in episodic and no-episodic days. Additionally, during ozone events the temperature increase 4 ºC, the relative humidity and the wind speed decrease respect to no-episodic days.

The ozone evolution during situations with elevated concentrations indicates that the average temporal duration of an event is three or four days. The longer episodes were recorded in 2003 and 2004. The ozone events are related to mesoescale processes with diurnal regime blowing from S-SW, attributed to an effective ozone coastal transport meanwhile ozone produced from Seville emissions could affect the NE area.