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A Modelling Study of the Photochemical and Particulate Pollution Characteristics above a Typical Southeast Mediterranean Urban Area

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Abstract : The Greater Athens Area (GAA) faces photochemical and particulate pollution episodes as a result of the combined effects of local pollutant emissions, regional pollution transport, synoptic circulation and topographic characteristics. The area has undergone significant changes since the Athens 2004 Olympic Games because of large scale infrastructure works that lead to the shift of population to areas previously characterized as rural, the increase of the traffic fleet and the operation of highways. However, no recent modelling studies have been performed due to the lack of an accurate, updated emission inventory. The photochemical modelling system MM5/CAMx was applied in order to study the photochemical and particulate pollution characteristics above the GAA for two distinct ten-day periods in the summer of 2006 and 2010, where air pollution episodes occurred. A new updated emission inventory was used based on official data. Comparison of modeled results with measurements revealed the importance and accuracy of the new Athens emission inventory as compared to previous modeling studies. The model managed to reproduce the local meteorological conditions, the daily ozone and particulates fluctuations at different locations across the GAA. Higher ozone levels were found at suburban and rural areas as well as over the sea at the south of the basin. Concerning PM10, high concentrations were computed at the city centre and the southeastern suburbs in agreement with measured data. Source apportionment analysis showed that different sources contribute to the ozone levels, the local sources (traffic, port activities) affecting its formation.

Keywords : photochemical modelling, urban pollution, greater Athens area, MM5/CAMx
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