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Evolution of the urban heat island at a large coastal urban area of Mediterranean

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Urban heat islands (UHI) are in the focus of research interest during past decades, as they concern densely populated areas, thus having a great impact on health of citizens, but also on environment and economy of cities. The linkage between urban heat islands and climatic change is of particular importance, especially in areas where - according to future projections - significant warming is expected, as the urban effect amplifies regional warming.

The study focuses on the city of Athens and concerns the temporal evolution on the mesoscale of UHI over the period 1975-2010. Although the study of the spatial distribution of the urban heat island in Athens has revealed large differences of the air temperature between the central zone of the city and surrounding rural stations (reaching up to 10 oC in certain cases), it is quite important to study the rates of UHI changes on the mesoscale and extract information on whether UHI is amplified, stabilized or has declined over time. It is mentioned that Athens has undergone dramatic changes during recent decades as regards land use/land cover map and population distribution. The knowledge of the rates of UHI changes will also reveal the 'true' rates of background warming which is observed in the area during the study period.

Annual and seasonal values were calculated from daily average, maximum and minimum temperature at seven stations of different characteristics of the area of interest (urban/ suburban/ coastal/rural). From the comparison of the average air temperature between the rural and urban stations, it was found that the intensity of UHI increases by approximately +0.2 oC/decade on an annual basis over the study period, but the results are strongly dependent on the season. In summer and spring, the rate of UHI changes is more pronounced, amounting to +0.4 oC/decade (statistically significant at 0.05 CL). Moreover, it was found that the rate of change is higher in the maximum than in the minimum air temperature.

It was also estimated that urban effect accounts almost for the half of the observed warming trends in the area, on an annual base.