

Urban Heat Islands Analysis of Matera, Italy Based on the Change of Land Cover Using Satellite Landsat Images from 2000 to 2017

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Abstract : Climate change is a major public health threat due to the effects of extreme weather events on human health and on quality of life in general. In this context, mean temperatures are increasing, in particular, extreme temperatures, with heat waves becoming more frequent, more intense, and longer lasting. In many cities, extreme heat waves have drastically increased, giving rise to so-called Urban Heat Island (UHI) phenomenon. In an urban centre, maximum temperatures may be up to 10° C warmer, due to different local atmospheric conditions. UHI occurs in the metropolitan areas as function of the population size and density of a city. It consists of a significant difference in temperature compared to the rural/suburban areas. Increasing industrialization and urbanization have increased this phenomenon and it has recently also been detected in small cities. Weather conditions and land use are one of the key parameters in the formation of UHI. In particular surface urban heat island is directly related to temperatures, to land surface types and surface modifications. The present study concern a UHI analysis of Matera city (Italy) based on the analysis of temperature, change in land use and land cover, using Corine Land Cover maps and satellite Landsat images. Matera, located in Southern Italy, has a typical Mediterranean climate with mild winters and hot and humid summers. Moreover, Matera has been awarded the international title of the 2019 European Capital of Culture. Matera represents a significant example of vernacular architecture. The structure of the city is articulated by a vertical succession of dug layers sometimes excavated or partly excavated and partly built, according to the original shape and height of the calcarenitic slope. In this study, two meteorological stations were selected: MTA (MaTera Alsia, in industrial zone) and MTCP (MaTera Civil Protection, suburban area located in a green zone). In order to evaluate the increase in temperatures (in terms of UHI occurrences) over time, and evaluating the effect of land use on weather conditions, the climate variability of temperatures for both stations was explored. Results show that UHI phenomena is growing in Matera city, with an increase of maximum temperature values at a local scale. Subsequently, spatial analysis was conducted by Landsat satellite images. Four years was selected in the summer period (27/08/2000, 27/07/2006, 11/07/2012, 02/08/2017). In Particular, Landsat 7 ETM+ for 2000, 2006 and 2012 years; Landsat 8 OLI/TIRS for 2017. In order to estimate the LST, Mono Window Algorithm was applied. Therefore, the increase of LST values spatial scale trend has been verified, in according to results obtained at local scale. Finally, the analysis of land use maps over the years by the LST and/or the maximum temperatures measured, show that the development of industrialized area produces a corresponding increase in temperatures and consequently a growth in UHI.

Keywords : climate variability, land surface temperature, LANDSAT images, urban heat island

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