Assessing the relationship between urban parameters and the LST derived by satellite and aerial imageries in a GIS environment: the case of Bari (Italy).

Mauro Caprioli (1), Claudia Ceppi (1), Ugo Falchi (2), Francesco Mancini (1), and Mario Scarano (2)

(1) DICATECh, Technical University of Bari, Bari, Italy (m.caprioli@poliba.it), (2) Università degli Studi di Napoli Parthenope, Italy (mario.scarano@uniparthenope.it)

The use of thermal remote sensing to estimate the phenomenon of urban heat islands (UHI) and development of climate anomalies in urban context represents a consolidated approach. In the current scientific literature a widespread case studies were focused on the estimation of the relationship between features related to the urban environment and the Land Surface Temperatures (LST). The latter is a basic starting observation in the investigation on the UHI phenomenon . However, the evaluation of these relationships is rather difficult. This is due to deficiencies in the detailed knowledge of parameters able to describe geometric and qualitative properties of land covers. These properties are very often not repeatable and not easily transferable in other contexts. In addition, many of the relevant parameters are difficult to be determined at the required spatial resolution and analyses are affected by a lack in the amount of quantitative parameters used.

In addition to the LST, several useful indicators are introduced by the literature in the investigation of such phenomena. The objective of this work is to study the relationship between the LST and a set of variables that characterize the anthropic and natural domains of the urban areas, such as urban morphology, the Normalized Differenced Vegetation Index (NDVI), the Sky View Factor (SVF) and other morphometric parameters implemented within a GIS environment. The study case is the city of Bari (Southern Italy) where several recognizable morphologies exhibit a different thermal behavior.

The LST parameter was derived from a collection of satellite ASTER images collected within a period spanning from July 2001 and July 2006, whereas aerial thermal imageries were acquired on September 2013. The basic data used for the determination of the descriptive parameters of the urban environmental are derived from digital maps(Geographic Information System of the Apulia Region), Digital Elevation Model and Land Use. The analysis of satellite and aerial thermal images available at different spatial resolutions and related to varying epochs helped to highlight variables which seem more appropriate to define the relationships between the LST and the urban features at different scales of analysis. This derived relationship far from linearity and more complex rules are needed to explain the mutual dependency between the parameters. A multivariate statistical analysis was therefore used to adequately represent both the mutual relationships among the explanatory variables and between the explanatory variables and the LST.