



Multiscale/Multitemporal Urban pattern morphology monitoring in southern Italy by using Landsat TM time series

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The size distribution and the dynamic expansion of urban areas is a key issue for the management of city growth and mitigation of negative impacts on environment and ecosystems. Even if urban growth is perceived as necessary for a sustainable economy, uncontrolled or sprawling urban growth can cause various problems such as loss of open space, landscape alteration, environmental pollution, traffic congestion, infrastructure pressure, and other social and economical issues. To face these drawbacks, a continuous monitoring of the urban growth evolution in terms of type and extent of changes over time is essential for supporting planners and decision makers in future urban planning. The analysis of the city size distribution deals with different disciplines such as geography, economy, demography, ecology, physics, statistics because the evolution of a city is a dynamic process involving a number of different factors. The main issue of great importance in modelling urban growth includes spatial and temporal dynamics, scale dynamics, man-induced land use change.

The understanding and the monitoring of urban expansion processes are a challenging issue concerning the availability of both (i) time-series data set and (ii) updated information relating to current urban spatial structure and city edges in order to define and locate the evolution trends. In such a context, an effective contribution can be offered by satellite remote sensing technologies, which are able to provide both historical data archive and up-to-date imagery. Satellite technologies represent a cost-effective mean for obtaining useful data that can be easily and systematically updated for the whole globe. The use of satellite imagery along with spatial analysis techniques can be used for the monitoring and planning purposes as these enable the reporting of ongoing trends of urban growth at a detailed level.

This paper analyses the spatial characterization of urban expansion by using multitemporal Multispectral Scanner (MSS), Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM) satellite imagery. The investigation was focused on four small towns in southern Italy, for which the border was extracted from NASA Landsat images acquired in 1976 (MSS), in 1991 (TM) and 1999 (ETM).

The border was analyzed using the box counting method, which is a well-known technique to estimate the spatial fractal dimension, that quantifies the shape irregularity of an object. The obtained results show that the fractal dimension of the border of the investigated towns is a good indicator of the dynamics of the regular/irregular urban expansion.