Spectral characteristics and feature selection of satellite remote sensing data for climate and anthropogenic changes assessment in Bucharest area

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Urban systems play a vital role in social and economic development in all countries. Their environmental changes can be investigated on different spatial and temporal scales. Urban and peri-urban environment dynamics is of great interest for future planning and decision making as well as in frame of local and regional changes. Changes in urban land cover include changes in biotic diversity, actual and potential primary productivity, soil quality, runoff, and sedimentation rates, and cannot be well understood without the knowledge of land use change that drives them. The study focuses on the assessment of environmental features changes for Bucharest metropolitan area, Romania by satellite remote sensing and in-situ monitoring data.

Rational feature selection from the varieties of spectral channels in the optical wavelengths of electromagnetic spectrum (VIS and NIR) is very important for effective analysis and information extraction of remote sensing data. Based on comprehensively analyses of the spectral characteristics of remote sensing data is possibly to derive environmental changes in urban areas. The information quantity contained in a band is an important parameter in evaluating the band. The deviation and entropy are often used to show information amount. Feature selection is one of the most important steps in recognition and classification of remote sensing images. Therefore, it is necessary to select features before classification. The optimal features are those that can be used to distinguish objects easily and correctly. Three factors—the information quantity of bands, the correlation between bands and the spectral characteristic (e.g. absorption specialty) of classified objects in test area Bucharest have been considered in our study. As, the spectral characteristic of an object is influenced by many factors, being difficult to define optimal feature parameters to distinguish all the objects in a whole area, a method of multi-level feature selection was suggested. On the basis of analyzing the information quantity of bands, correlation between different bands, spectral absorption characteristics of objects and object separability in bands, a fundamental method of optimum band selection and feature extraction from remote sensing data was discussed.

Spectral signatures of different terrain features have been used to extract structural patterns aiming to separate surface units and to classify the general categories. The synergetic analysis and interpretation of the different satellite images (LANDSAT: TM, ETM; MODIS, IKONOS) acquired over a period of more than 20 years reveals significant aspects regarding impacts of climate and anthropogenic changes on urban/periurban environment. It was delimited residential zones of industrial zones which are very often a source of pollution. An important role has urban green cover assessment. Have been emphasized the particularities of the functional zones from different points of view: architectural, streets and urban surface traffic, some components of urban infrastructure as well as habitat quality. The growth of Bucharest urban area in Romania has been a result of a rapid process of industrialization, and also of the increase of urban population. Information on the spatial pattern and temporal dynamics of land cover and land use of urban areas is critical to address a wide range of practical problems relating to urban regeneration, urban sustainability and rational planning policy.