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Remote sensing image-based analysis for heat waves assessment hazard in urban areas

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Climate change and extreme climate events are the great environmental concerns facing mankind in the twenty first century. Surface temperatures are expected to continue to increase globally and major changes are likely to occur in the global hydrological and energy cycles.Extreme climate events like heat waves are a key manifestation of complex systems, in both the natural and human world.It was estimated that during last years regional surface warming caused the frequency, intensity and duration of heat waves to increase over Europe. During last period global warming was intensified because the global mean surface temperature has increased since the late 19th century.As urbanization has become an important contributor for global warming, Urban Heat Island (UHI) effect, will be sure to influence the regional climate, environment, and socio-economic development.
Much more, extreme climatic events as heat waves will amplify the UHI effect with severe urban ecosystem health consequences.
Remote sensing is a key to mesoscale modeling through specification of land cover distributions and creating spatial products of moisture, reflectance, and surface temperatures. Because the knowledge of urban surface energy budgets and urban heat islands is significant to assess urban climatology, global environmental change, and human–environment interactions important for planning and management practices, is very important to study land surface temperatures and urban energy budget
characteristics using the technology of satellite remote sensing imagery.
In this study MODIS and IKONOS satellite remote sensing images for 1989 to 2007 period have been selected to retrieve the urban biogeophysical parameters and brightness temperatures in relation with changes of land use/cover types over Bucharest metropolitan area, Romania. The spatial distribution of heat islands has been changed from a mixed pattern, where bare land, semi-bare land and land under development were warmer than other surface types, to extensive UHI. Our analysis showed that higher temperature in the UHI was located with a scattered pattern, which was related to certain land-cover types. In order to analyze the relationship between UHI and land-cover changes, this study attempted to employ a quantitative approach in exploring the relationship between temperature and several indices, including the Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Normalized Difference Bareness Index (NDBaI) and Normalized Difference Build-up Index (NDBI). It was found that correlations between NDVI, NDWI, NDBaI and temperature are negative when NDVI is limited in range, but positive correlation is shown between NDBI and temperature.Spectral/climatic modelling of extreme high temperature events in urban areas are providing a scientific base for heat wave hazard assessment.Heat waves events of 2003 and 2007 summers have been correlated with UHI effect for Bucharest metropolitan area.