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Monitoring the Urban Growth on Vitosha Northeast Slope by Time Series Analysis

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In last decades satellites are routinely used in solving large amount of Earth observation (EO) tasks. One of the phenomena that can be easily noted from EO images is the urban sprawl caused by urbanization process and formation of megacities. Two concurrent processes are observed in urban area enlargement - the loss of vegetation cover by soil sealing and the increase of impervious surfaces. The area for this specific study was selected due to its economic attractiveness and closeness to one of the biggest national parks – mountain Vitosha. Better identification of the ongoing changes in this particular area is considered to be of public interest.

The basic task of this research was to trace the city growth by means of multispectral data and spectral indices and list possible reasons for the changes occurred. Important advantage in case instruments onboard satellites are used in such scenarios are the global coverage, repeatability, provision of historical data sets, and data consistency from one instrument to its successor. Other goal set in this study is establish method for better delineation of built/nobuilt areas as trade off between widely used spectral indices used for change detection in urban areas and the density of the buildings in the selected area derived by means of subpixel mixture analysis. These tasks were achieved by creating several new vector layers corresponding to shape and area of the land use change in the studied area.
In the framework of this study used are the freely provided by USGS multispectral data from the series of TM/ETM+ instruments onboard Landsat satellites. The product used for tasks aforementioned is level L1T(G) radiometrically corrected and orthotransformed images that has been verified in large number of experiments and cited in numerous publications. For ground truthing several sources have been used - orthophoto images for visual inspection and CLC vector layers for years 1990, 2000, 2006 and 2012.