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CHARACTERIZATION OF SPATIAL VARIABILITY IN THE URBAN AREA BASED ON REMOTE SENSING. CASE STUDY IN TIMISOARA CITY, ROMANIA

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Abstract

The present study analyzed the spatial variability of the urban area, in the case of plain Timisoara city, Romania, based on remote sensing. Satellite images (Landsat 8) were captured in the summer season (July - August), in the period 2013 – 2018, and 2022 as an excessively warm year. To characterize the spatial variability of the Timisoara City, NDVI (Normalized difference vegetation index), NBR (Normalized Burn Ratio), NDBI (Normalized Difference Built-Up Index) and LST (Land surface temperature) indices were calculated for each of the 48 districts in the administrative structure of the city. The priority index taken into account was LST (as an expressive index in relation to urban thermal emissivity), and by correlation analysis, negative correlations resulted between LST and NDVI (r=-0.737, year 2014, until r=-0.958, year 2018, $p<0.001$), and positive correlations between LST and NDBI (r=0.619, year 2014, up to r=0.945, year 2018, $p<0.001$). The LST variation depending on the NDVI was described by linear equations, under statistical safety conditions (the highest R^2=0.918, $p<0.001$, year 2018), and the LST variation depending on the NDBI values was described by polynomial equations of the degree 2 (years 2013, 2014, 2015) and linear equations (years 2016, 2017, 2018, 2022), the highest value R^2=0.892; $p<0.001$, year 2018. Based on PCA and Cluster analysis, the grouping of districts with low LST values (six districts) and with high LST values (11 districts) was found, in relation to the average value calculated for Timisoara city, useful information to adopt efficient strategies in the sustainable management of the considered urban ecosystem, to reduce the negative effects of heat.

Key words: Landsat 8, Last Surface Temperature (LST), Pearson's correlation, spatial variability, urban ecosystem

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