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ASPECT PARAMETER FOR CHARACTERIZING A MOUNTAIN AREA BASED ON REMOTE SENSING

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Abstract:

The study aimed to analyze and characterize the ATU Lupsa area, Alba County, Romania, based on the ASPECT parameter, through remote sensing technique. In the study area, land surfaces with different types of soil texture were identified, Clayey loam texture (CLt), Clay texture (Ct), Sandy clay texture (SCt), Sandy loam - clayey texture (SLCt), and other types of texture - Varied texture (Vt). Based on the ASPECT parameter, ten classes (AC1 to AC10) were generated, which included variable land areas, in relation to soil texture. The size of the ASPECT classes varied between 217.39 ha (AC1) and 1840.39 ha (AC4). ANOVA Test confirmed significant differences between mean values and Kruskal-Wallis test confirmed significant differences between median values of ASPECT classes. Mann-Whitney (post hoc) highlighted differences between land surfaces with different types of soil texture, on ASPECT classes. Multivariate analysis assessed the correlation between ASPECT classes and soil categories (texture aspect), and the principal components confirmed 82.174% of the total variance. Cluster analysis grouped ASPECT classes and soil texture types based on similarity, in relation to the related surface values (Coph. corr. = 0.846). The highest level of similarity was recorded at the level of classes AC2 and AC10, with SDI = 22.77. A ranking of the ASPECT classes was generated based on the land area values, with the first position occupied by class AC4.

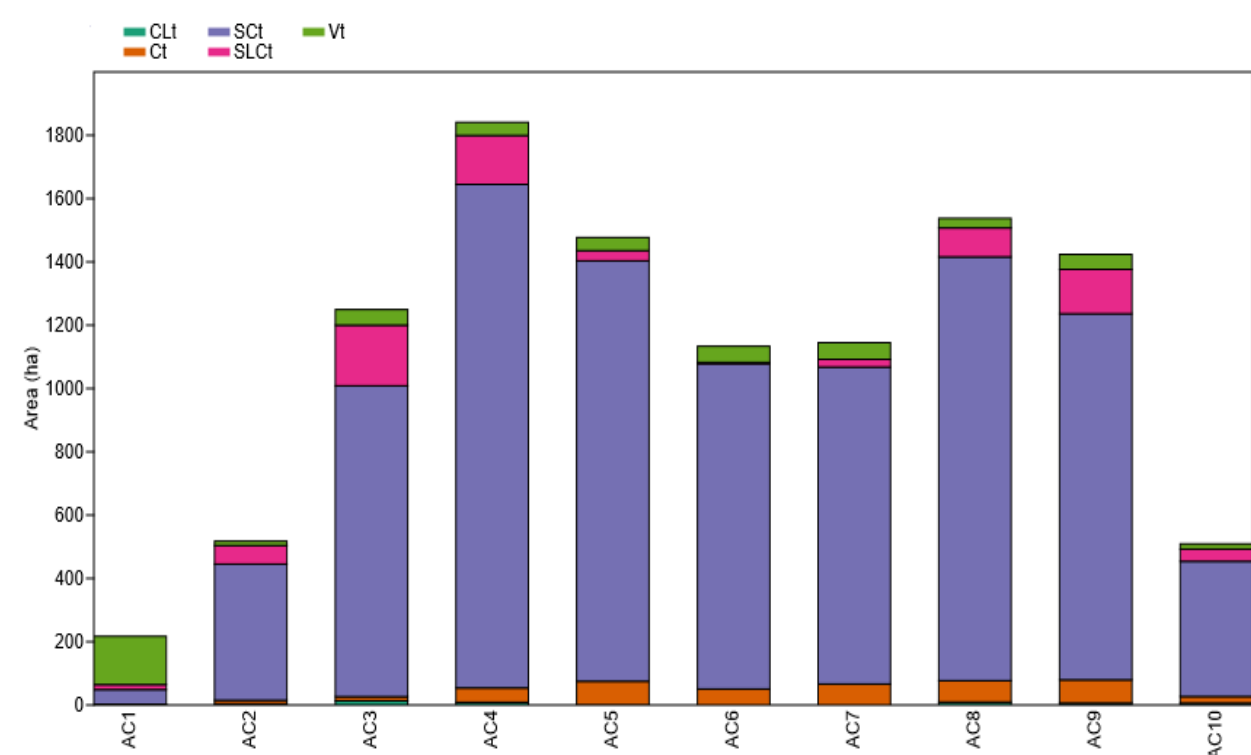
Introduction

Remote sensing enables land surface characterization using parameters like altitude, slope, exposure, vegetation, and soil. ASPECT, together with SLOPE and other terrain factors, is essential for habitat, land use, and surface change studies. In mountain areas, these parameters guide vegetation and crop placement (e.g., vineyards) and support sustainable development. This study analyzes the Lupșa area (Alba County, Romania) using remote sensing, classifying it by ASPECT and soil texture..

Material and method

The study analyzed and characterized the ATU Lupsa, Alba County, Romania, based on the ASPECT parameter. Remote sensing facilitated the acquisition of images for the area of interest. The locality of Lupșa is located on the Northern slopes of the 'Muntele Mare' and on the Southern slopes of the 'Muntii Metaliferi'. The area of interest is characterized by a predominantly mountainous relief, formed on crystalline schists and metalliferous rocks. The altitude ranges from 550 m in the 'Aries' River meadow, which crosses the commune for a distance of 19 km, to 1,350 m, in the 'Geamana' area.

Graphical representation of ASPECT classes

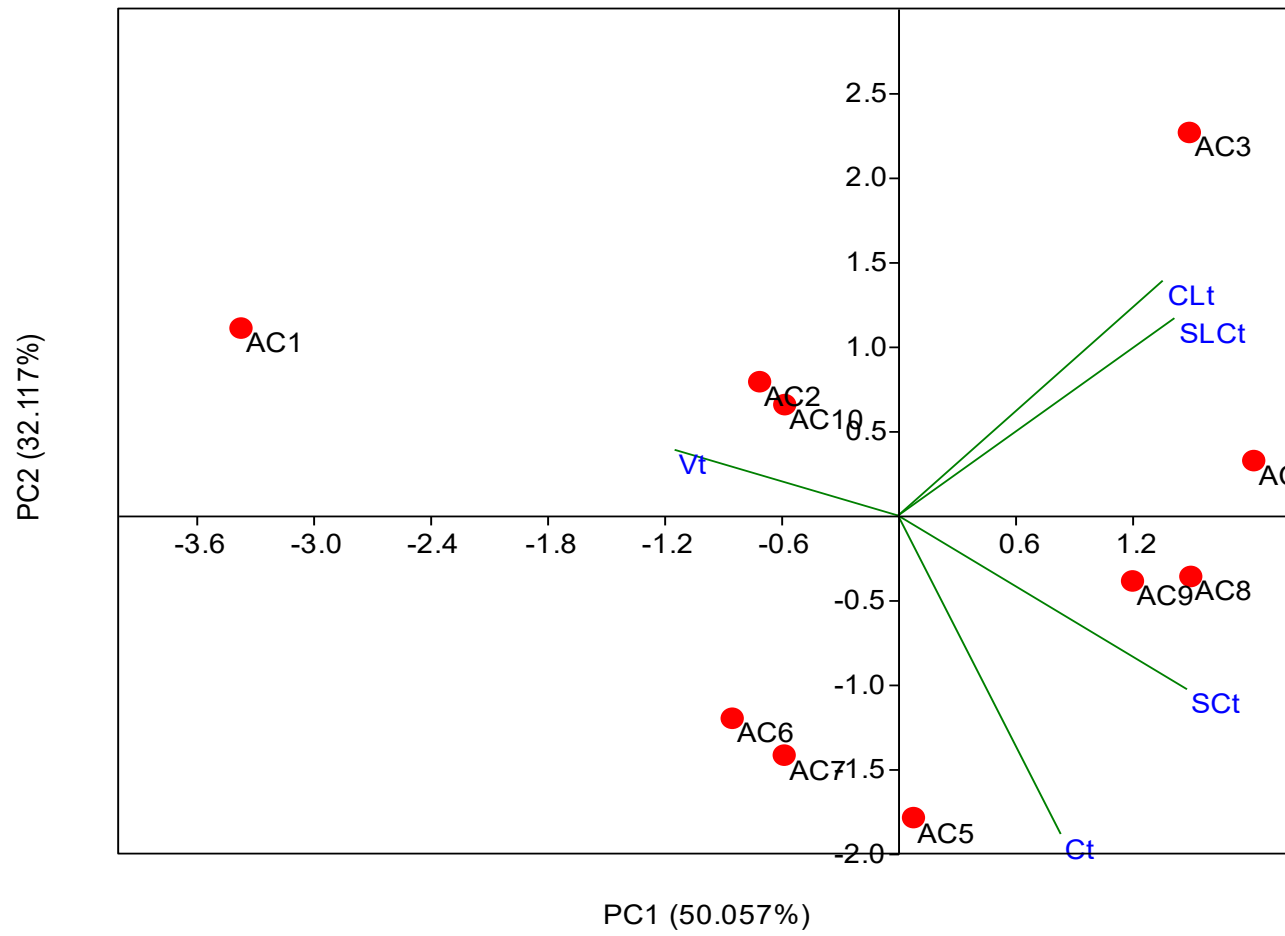


Results of ANOVA Test

Mann-Whitney test results

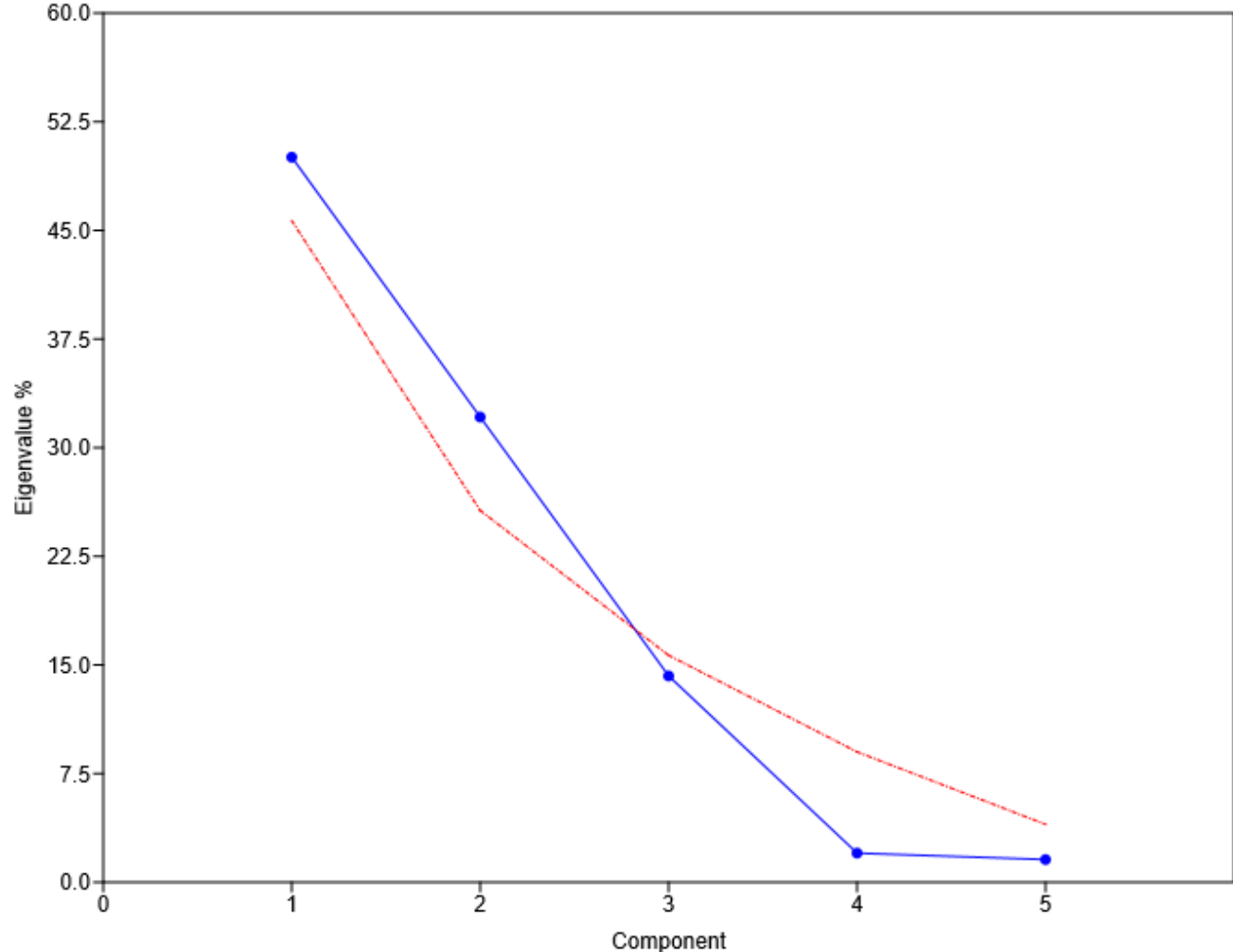
	CLt	Ct	SCt	SLCt	Vt
CLt		0.00130	0.00018	0.00076	0.00018
Ct	0.00130		0.00077	0.38470	0.96980
SCt	0.00018	0.00077		0.00077	0.00077
SLCt	0.00076	0.38470	0.00077		0.67760
Vt	0.00018	0.96980	0.00077	0.67760	

PCA diagram in relation to the ASPECT parameter and soil texture



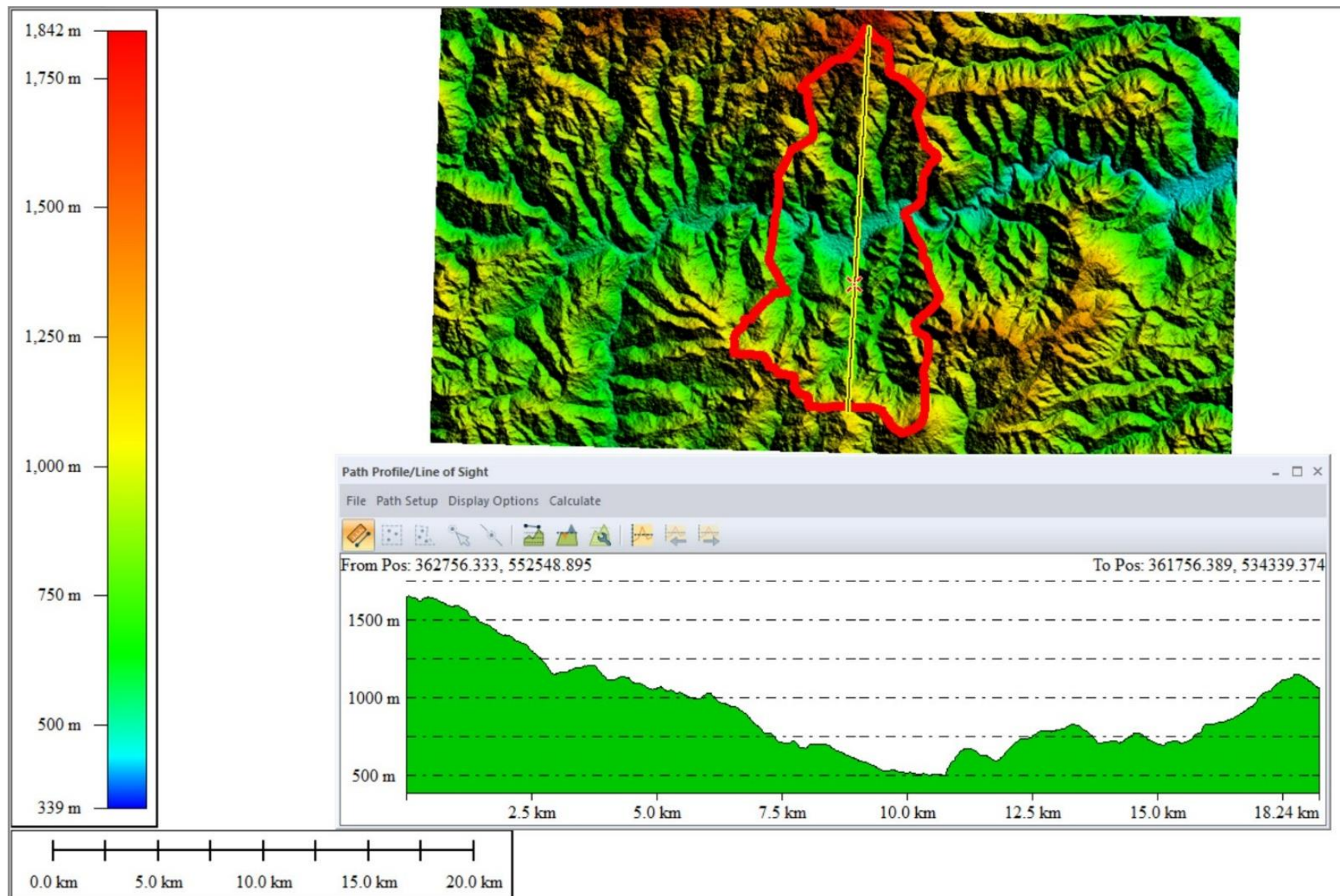
ASPECT class score in relation to Principal Components

Graphical representation of the Eigenvalue - Component relationship



Results and discussions

The area considered in the study, ATU Lupșa, is located on the northern slopes of 'Muntele Mare' and on the southern slopes of 'Muntii Metaliferi', with a specific mountainous relief. The analyzed area is characterized by The altitude ranges from 550 m (Arieș river meadow) to 1,350 m (in the 'Geamăna' area), with the longitudinal profile presented.



Conclusions

- Remote sensing facilitated the analysis of the mountainous area, ATU Lupsa, Alba County, Romania, based on the ASPECT parameter, correlated with soil texture on different surfaces in the study area.
- The ASPECT-based classification led to ten classes (AC1 to AC10), with variable surface sizes, AC1 = 217.39 ha (minimum value) and AC4 = 1840.92 ha (maximum value). The level of correlation between ASPECT classes and soil texture types was identified by PCA analysis, and the two main components (PC1, PC2) explained 82.174% of the total variance.
- Comparative analysis between ASPECT classes showed significant differences between mean and median values, and the Mann-Whitney test (post hoc) confirmed the significance of the differences between most ASPECT classes.
- Cluster analysis grouped ASPECT classes based on similarity, so that classes with similar values can be evaluated in relation to economic objectives of interest for the area considered.