APPLICATION OF RELIEF'S FRAGMENTATION DEPTH ESTIMATION METHOD FOR CODRY PLATEAU AREA, REPUBLIC OF MOLDOVA

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***Резюме**. Рассмотрены сравнительные характеристики различных методов для оценки глубины фрагментации рельефа. Смоделированы карты относительной высоты с использованием Цифровой Модели Рельефа.*

***Key words:** Digital Elevation Model, relief's fragmentation depth, values histogram.*

***Rezumat:** Au fost precautate caracteristicile comparative ale diferitor metode de apreciere a adâncimii fragmentării a reliefului. Au fost modelate hărţile altitudinii relative, utilizând Modelul Numeric al Reliefului.*

***Cuvinte-cheie:** modelul numeric al reliefului, adâncimea fragmentarii reliefului, histograma valorilor.*

Introduction

In the last decades there were developed GIS technologies that allow quick and effective modeling of many derivations from Digital Elevation Model. Relief's fragmentation depth is one of such derivations playing an important role in climatic indexes modeling, and mainly for average seasonal temperatures modeling.

Materials and methods

Fragmentation depth or relative altitude is a substantially suitable form for expensing relief's quantitative characteristics. Relief's fragmentation depth's average value is calculated as average height between profile's two neighbor inflexion points oriented perpendicularly to the main relief lines [1].

Thus, if we take the number of inflexion points throughout the duration of one profile as M, then fragmentation's average depth characteristic for this profile's zone will be calculated according to the following formula:

$H_m = (h_1 + h_2 + \ldots + h_{m+1}) / m + 1$, (1)

where h_1, h_2…are the differences in heights between neighbor inflexion points. [2]

A more simplified variant and one which is more adopted to algorythmization, will be the one using moving window of a given size and form and fragmentation's depth calculation for every iteration through the given altitude matrix. The classical method uses moving window with the size of one kilometer and is used on topographical maps, minimum and maximum altitude points are identified with low accuracy degree. [3].

Investigation results

ArcGIS 9.2 software provides a more flexible method for this sort of calculations. The sizes and form of the moving window are selected by the user, and minimum and maximum altitudes calculation is executed with high accuracy.

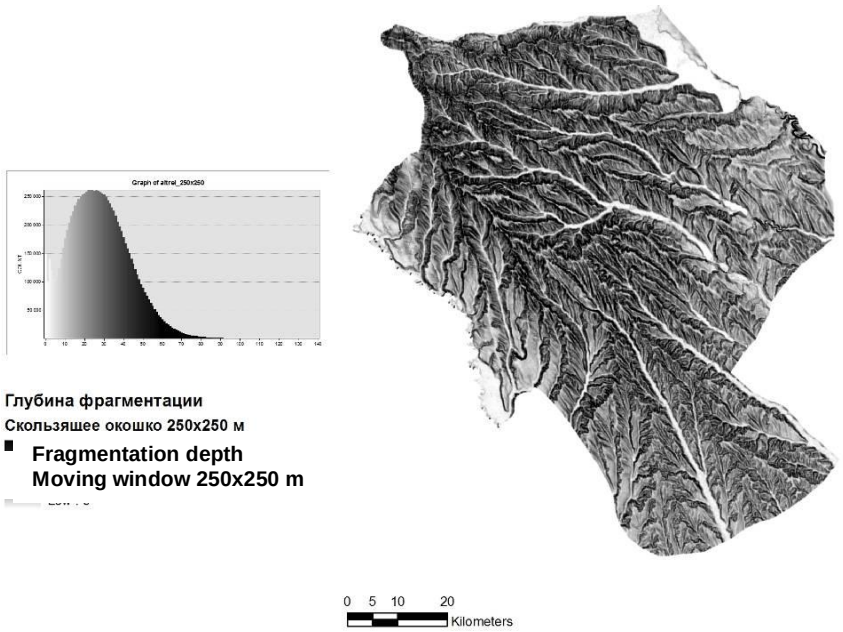

Figure 1. **Fragmentation depth (m) of Codry Plateau's relief modeled using moving window with dimensions of 250x250 m**

Spatial Analyst Tools Package that includes Map Algebra tool allows calculating desired fragmentation depth by the following formula:

Grid: RELREF = (focalmax (DEM, rectangle, <width>, <height>) –

focalmin (DEM, rectangle, <width>, <height>), (2)

where DEM – Digital Elevation Model, rectangle – the form of the moving window, <width>, <height> - its size. [3, 4, 5]

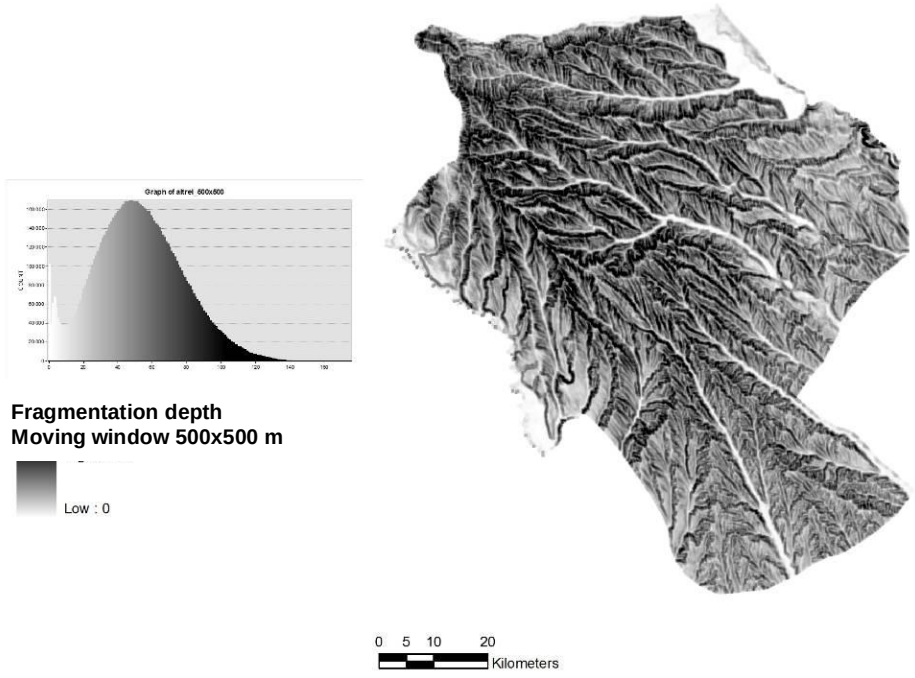

Figure 2. **Fragmentation depth (m) of Codry Plateau's relief modelled using moving window with dimensions of 500x500 m**

Relief's fragmentation depth maps calculated on the basis of Digital Elevation Model (cell size is 30 m) is shown hereafter using moving window with dimensions of 250x250, 500x500 and 1000x1000 m for Codry Plateau Region (fig. 1, 2, 3).

Fragmentation depth's values histogram shows a more uniform distribution of values when using a moving square of side 1000 m and consequently a more adequate result in comparison with histograms obtained for relative altitudes using moving squares of 250x250 m and 500x500 m dimensions correspondingly. Spatial distribution of relief's fragmentation depth also depends from both Digital Elevation Model's cell size and used moving window dimension.

At the same time the limits of obtained fragmentation depth models also change in dependence of moving window dimension.

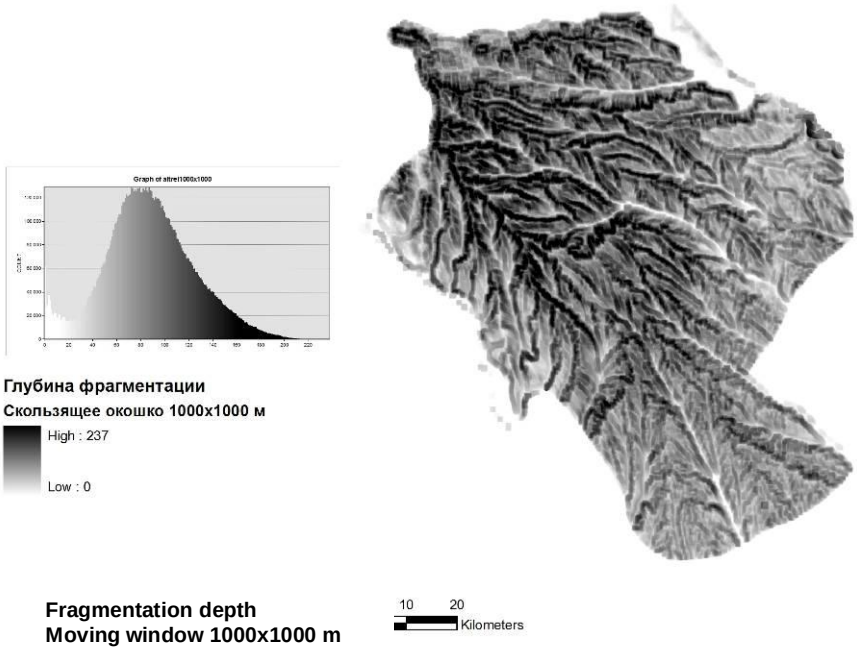

Figure 3. Fragmentation depth (m) of Codry Plateau's relief modeled using moving window with dimensions of 1000x1000 m.

The values vary from minimum interval of 0 - 140 m (moving window of side 250 m), till maximum interval of 0 - 237 m, obtained by using moving window of 1000x1000 m dimensions. Consequently, the most adequate size for moving window for Digital Elevation Model with cell size equal to 30 meters is a square of side 1000 m. The spatial distribution obtained with it is confirmed by the investigations that were carried out earlier using classical methods [6].

Conclusion

Therefore we can conclude that in order to obtain the most adequate reflection of fragmentation depth or relative altitude map it would be relevant to use Digital Elevation Model of a corresponding cell size and maximum possible square size. The obtained fragmentation depth digital model map can be used

both for relief's particularities analysis and for statistical analysis and further modeling of thermic and humidification climatic indexes.

References

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