MAPPING AND MATHEMATICAL MODELLING OF SPATIAL-TEMTORAL ORGANIZATION OF STRUCTURE LANDSCAPE OF AZERBAIJAN

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ABSTRACT

At present stage of physical geography development,mainly theth paleogeography is required for quantative analysis with applying of computer,so that this analysis allows to have acces for application of complex modern mathematic models such as theory of combinations,non parametric and parametric mathematical-statistic methods,by which are succeed to discover more disctinctive pecularities in structure and development of paleolandscapes. The results is invaluable on the regional geosystem forecasting.

INTRODUCTION

In this work for the first time in Azerbaijan is applying complex methods of modern mathematics so called matrix computation in the paleolandscape investigations for description of more practicable structure and their caracteristic elements such as determination of structure's care and interrelation of structural elements of geographical complexes within the alteration of leadership in time. The investigation of paleolandscapes spatial-temporal structure by means of mathematic-geographic modelling on computer US-1035 and IBM PC AT of quantative elements of the paleolandscapes structure are taken from the Azerbaijan Republic paleolandscapes maps,which compiled by prof. M.A. Myseibov (1981 y.) for nine section of geological time: I.Upper Miocene, II.Middle Pliocene,III.Upper Pliocene (agchagil century), IV.Upper Pliocene(absheron century), V.Under Pleistocene(Baku century), VI.Middle Pleistocene (Gurgans century),VII.Middle Pleistocene(Caspian century), VIII.Middle Pleistocene(Khvalyn century(VIII)), IX.Late Pleistocene(the end of Khvalyn century), and X.Holocene (Modern century).

THE METHODS OF RESEARCH AND RESULTS

For solution of this problem with some modification which connected with character of investigation we have took the method,suggested by A.G.Topchiyev (1979 y.) and the methods mathematical-system analysis.
The work have been carried out by following stages:

Matrix analysis of paleolandscapes neighbourhood(meeting).

The goal of this analysis is to determine the leadering paleolandscapes which are the core of paleolandscapes general structure and this period of the concidering region. The second, to determine secondary elements in the paleolandscapes structure of investigated region at this period

so called core sattellite of paleolandscapes structure. To define these elements of paleolandscapes structure the A.G.Topchiyev's criteria is interprited as follows:

$$t(i)=\sum i/\sum j$$

a)Natural Complexes (NC) is appeared as one of the landscape's structure score if

$$t(i)>1$$

b)Natural Complexes appeares as a sattellite (non leading) of one or some different cores if

$$t(i)<1$$

c)Natural Complexes has a boundary distribution which is closed to incident if

$$t(i)\approx 1$$

For solution of this question we have determined occurence number of paleolandscapes in space on the paleolandscapes maps of Azerbaijan. On this bases have composed the matrix of occurence, which have determined A.G.Topchiev's criteria values.

RESULT EXAMPLE

Table 1.

Matrix of paleolandscapes neighbourhood in "Middle Pliocene" (II).

N \ N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	$\sum i$	$t(i)$
1	0	3	2	0	1	0	0	0	0	0	0	0	0	0	6	1.0
2	3	0	3	1	000		0	2	0	0	1	0	0	0	10	1.2
3	2	2	0	1	1	0	1	1	1	1	0	0	0	0	10	0.9
4	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	1.0
5	1	0	1	0	0	0	0	0	1	0	0	0	0	0	3	1.0
6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1.0
7	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2	1.0
8	0	1	1	0	0	0	0	0	0	0	1	0	0	0	3	0.7
9	0	0	1	0	1	0	0	0	0	1	0	0	0	0	3	1.0
10	0	0	1	0	0	1	1	0	1	0	0	0	1	0	5	1.0
11	0	1	0	0	0	0	0	0	0	0	0	1	1	0	4	1.0

Continuation Table 1.

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	$\sum i$	$t(i)$
12	0	0	0	0	0	0	0	0	0	0	1	0	0	3	4	1.0
13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1.0
14	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	1.0
$\sum j$	6	8	11	2	3	1	2	4	3	5	4	4	2	3		

According to the results of the Topchiyev's criteria we have composed the landscapes organization maps which reflected the leading (core structure) and subordinate care satellites-landscape) elements at the paleolandscape structure(organization).

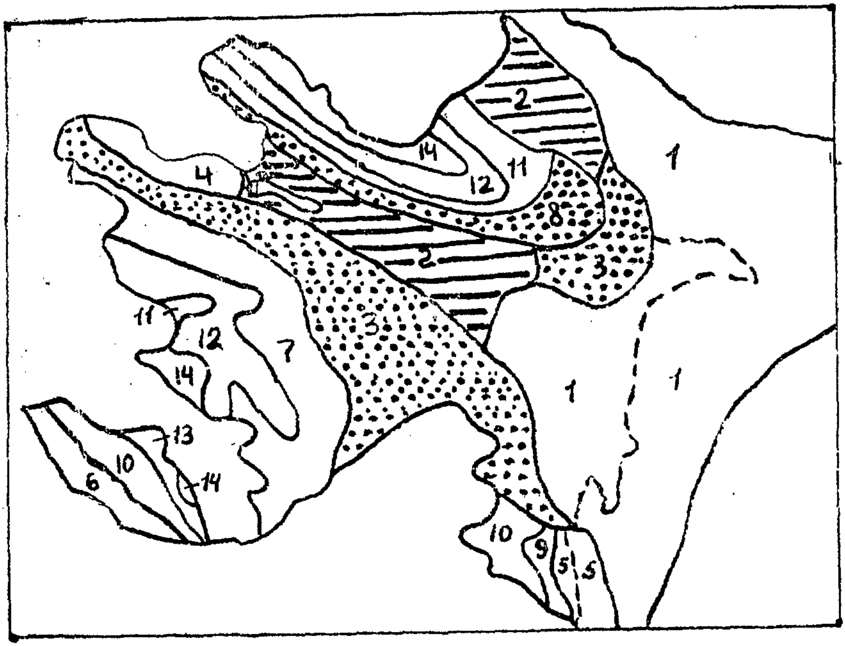

Figure 1. Map example of paleolandscape organization in "Middle Pliocene".

-Leaders of paleolandscapes organization: Plain Landscapes number 3 and Piedmount landscape 8.

-Non-leading (core satellites) of paleolandscapes organization: Plain landscapes numb.2.

-Accidental-distribution paleolandscapes- the rest.

The analyses of the paleolandscapes organization maps have discovered that:

-The leading paleolandscapes are not meeting at the Upper Miocene it showes that the paleolandscape structure core are not formed at this period so all the paleolandscapes have lead accidentally distributed character.

-Organization of paleolandscape structure showin on figure 1.

-At the Akchagil century the paleolandscape's structure cores's composition become complicated.

-At the Absheron century the cores composition is continued to become complicated.Some of middle mountains and plain landscapes are charasterized by accidental distribut tion.

-At the Baku century the middle mountains and plains paleolandscapes are gone out of the core satellites composition and become of paleolandscapes structure core. On this case at this century have created contrast and the paleolandscape structure.

-At the Gurkhans century plain and middle mountains paleolandscapes have returned to the composition of cores satellites.At this century have happened reorganization of paleolandscape structure.

-At the Caspian century high mountainous and mountainous paleolandscapes have gone out of the composition of core and become accidentally distributed elements of structure. The structure core of paleolandscapes at this century were plain and middle mountains paleolandscapes.

-At Khvalyns century high mountainious and middle mountains paleolandscapes have returned to the composition of the core's satellites. The core of paleolandscapes structure consisted of plain, foot mountainous and some where middle mountainous paleolandscapes.

-At the end of Khvalinsk century the core of paleolandscape structure consisted from plain,foot mountainious, middle mountainous and high mountainious paleolandscapes.

MATRIX ANALYSES OF POSITIONAL RESEMBLANCE

Matrix of positional resemblance was computed on the base of species and individual resemblance matrix with the help of Hemming measure,which look as follow:

$$P(i,j)=n(i,j)/(n(i)+n(j)-n(i,j));$$

where $n(i), n(j)$ -number of neighbours a "i" and "j" natural complexes, but $n(i,j)$ -the number of common neighbours, computing example(Table 2).

Table 2.

Spesies NC	Number of individual plase of landscapes													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
$S_{i(2)}$	1	0	1	1	0	0	0	1	0	0	1	0	0	0
$S_{j(3)}$	1	1	0	1	1	0	1	1	1	1	0	0	0	0
Common neighbours (here data taking of Table 1)		-	-	+	-	-	-	+	-	-	-	-	-	-

The value of positional resemblance is changed in the limits of 0-1 and can be interpreted as follows:

1. The high resemblance $0{,}60 \leq p(i,j) \leq 1{,}00$
2. Average resemblance $0{,}30 \leq p(i,j) < 0{,}60$
3. Weak resemblance $0{,}00 \leq p(i,j) < 0{,}30$

COMPUTATION EXAMPLE

Table 3.

Matrix of positional resemblance for Middle Pliocene(II).

	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0.14	.22	.33	.20	.00	.25	.50	.50	.14	.16	.00	.00	.00
2		.30	.16	.16	.00	.16	.16	.14	.14	.12	.16	.16	.00
3			.11	.11	.12	.11	.10	.11	.09	.10	.00	.11	.00
4				.25	.00	.33	.66	.25	.15	.20	.00	.00	.00
5					.00	.25	.20	.20	.15	.00	.00	.00	.00
6						.50	.00	.33	.00	.00	.00	.50	.00
7							.25	.33	.16	.00	.00	.33	.00
8								.20	.14	.16	.25	.25	.00
9									.14	.00	.25	.25	.00
10										.12	.00	.00	.00
11											.00	.00	.25
12												.33	.00
13													.00

On base this table 4 and interpretation we have lined out gramped and weakly connected elements of paleolandscapes structure of the investigated region. These structural interrelations are presented as color graph-model, which printed on computer IBM PC.

REFERENCE

Topchiev, A.G., 1979. Space organization of natural complexes and methods of its analysis, Physical Geography, Odessa, page 19-26