

TOPOCLIMATIC MAPPING IN CENTRAL MORAVIA (CZECH REPUBLIC)

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Abstract:

The study deals with some results of topoclimatic mapping in central part of Moravia. Training area is covered by maps sheet 24-22 Olomouc, scale 1 : 50.000 and represents the territory 456 km². The map was constructed using the relief parameters as slopes inclination, aspects and the knowledge about morphographic types of georelief, respectively. By this way was possible to design theoretic insolation. Both the parameters the georelief and irradiance with regards on the active surface characters made possible to delimitate areas with typical topoclimate. Next phase of research was the spatial analysis.

1. Introduction

The research area is situated in the central part of Moravia, Czech Republic. The district city Olomouc with more than 100.000 inhabitants can be considered as an organic central point of the region. A large part of this territory as a plain, used for intensive agricultural production. Partly wooded hilly karstland is an important water reservoir. The belt of flood forest along the Morava river has been proclaimed as the natural protection area. Olomouc city and its surrounding is thought to be the site with intense economic activity that influences very important the environment quality.

The topoclimate is understood to be one of the specific categories of climate. On the other hand the topoclimate is a characteristic feature for climate, being formed rigorous under influence of a local georelief and its active surface, (e.g. M.M. Yoshino, 1975).

2. The construction principle of a topoclimatic map

A base for the construction of this kind of climatic map, topographic map 24-22 Olomouc at the scale 1 : 50.000 has been selected. The size of the

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elementary area (grid cell) was chosen to be 500 x 500 meters. The parameters necessary for each cell were investigated:

- altitude
- slope angle (see Tab. 2)
- aspect (see Tab. 3)
- morphographic type of georelief (see Tab. 1)
- dominating type of active surface
- theoretic solar potential with regards to the energy balance at the earth's surface (in April) as a combination both the slope angle and aspect (see Tab. 4).

The features a-c can be gained by the digitizing of the topographic map and subsequent processing by using of the fitting computer's programs, e.g. GIS software.

Because as the aspects as the slope inclination permit to appreciate the rate of the illumination of the elementary cells the author stated the actual value of the potential direct radiation relative to this value at horizontal plain. In this way the classification on the primary cells into 5 classes was made (see Tab. 4).

The combination of the knowledge about values of the theoretic solar potential, dominating morphographic types of the georelief, dominating types of active surface, respectively, issued into topoclimatic classification and its spatial localisation.

3. Spatial analysis of the topoclimatic categories

The individual categories of the topoclimate were designated in the plain, in the hillyland and in the highland, respectively. In the adjoining overview are remarked all topoclimatic classes include their total/relative areas in km²/%.

3.1 Topoclimate of plains

The plains cover the area 150,65 km² on the map sheet and there was designated 6 specific categories of the topoclimate. The topoclimate of the plains (is not more specified) occurrences in the all areas that were determined as a plain during morphographic classification of the georelief.

- topoclimate of plains with low housing (16,12 km²-10,73 %)
- topoclimate of flood plain forest (20,33 km²-13,49 %)
- topoclimate of more large watersurfaces (1,38 km²-0,90 %)
- topoclimate of plain with possibility of the occurrence of local temperature inversion (8,44 km²-5,60 %)
- topoclimate of plain with low housing and with possibility of local temperature inversion (1,36 km²-0,90 %)

3.2 Topoclimate of hillylands

There is possible to define higher number of classes of topoclimatic categories due to predominant morphographic type of this georelief and as its more large

area as more variable landscape architecture in the hillyland. On the map sheet could be found 17 classes.

- topoclimate of foot plateau (116,01 km²-51,14 %)
- topoclimate of foot plateau with low housing (15,55 km²-6,85 %)
- topoclimate of foot plateau with high housing(3,75 km²-1,65 %)
- topoclimate of convex forms merged with surroundings (3,67 km²-1,62 %)
- topoclimate of very good insolated slopes (0,14 km²-0,06 %)
- topoclimate of good insolated slopes (1,31 km²-0,58 %)
- topoclimate of good insolated slopes with possibility of katabatic streaming (0,54 km²-0,24 %)
- topoclimate of normally insolated slopes (54,75 km²-24,13 %)
- topoclimate of normally insolated slopes with possibility of katabatic stream (15,62 km²-6,89 %)
- topoclimate of normally insolated slopes with low housing (4,74 km²-2,09 %)
- topoclimate of less insolated slopes (0,55 km²-0,24 %)
- topoclimate of low insolated slopes (0,35 km²-0,15 %)
- topoclimate of the areas with possibility of local temperature inversion (1,40 km²-0,62 %)
- topoclimate of the areas with low housing and with possibility of local temperature inversion (0,51 km²-0,22 %)
- topoclimate of concave forms (6,75 km²-2,98 %)
- topoclimate of concave forms with low housing (0,89 km²-0,39 %)
- topoclimate of the lakes (0,32 km²-0,14 %)

3.3 Topoclimate of the highlands

Even if these topoclimate categories allocate on the topoclimatic map the least area (78,88 km²) in highlands their number is relatively high (13).

- topoclimate of foot plateau
- topoclimate of foot plateau with low housing (1,85 km²-2,35 %)
- topoclimate of convex forms raising above the surroundings (1,01 km²-1,28 %)
- topoclimate of convex forms merged with surroundings (1,25 km²-1,58 %)
- topoclimate of very good insolated slopes (2,23 km²-2,83 %)
- topoclimate of good insolated slopes (25,58 km²-32,43 %)
- topoclimate of very good insolated slopes with possibility of katabatic stream (0,25 km²-0,32 %)
- topoclimate of normally insolated slopes (18,59 km²-23,57 %)
- topoclimate of normally insolated slopes with possibility of katabatic stream (15,06 km²-19,09 %)
- topoclimate of normally insolated slopes with low housing (3,29 km²-4,17 %)
- topoclimate of less insolated slopes (1,11 km²-1,41 %)

- topoclimate of concave forms (7,86 km²-9,96 %)
- topoclimate of concave forms with low housing (0,61 km²-0,77 %)

Tab. 1: Morphographic types of georelief

Type of georelief	Total area (km ²)	Rel. area (km ²)
plain	150,65	33,01
hillyland	226,85	49,71
highland	78,88	17,28
Total	456,38	100,00

Tab. 2: The slopes inclination

Slope inclination	Total area (km ²)	Rel. area (%)
0,0 – 2,0 deg	303,86	66,58
2,1 – 5,0 deg	24,78	27,34
5,1 – 10,0 deg	21,07	4,62
10,1 – 15,0 deg	4,72	1,03
>15,1 deg	1,95	0,43

Tab. 3: The aspects of slopes

Aspects	Total area (km ²)	Rel. area (%)
north	30,04	6,58
south	26,11	5,72
west	32,70	7,17
east	65,52	14,36

Tab. 4: Potential solar radiation (1=low, 2=less, 3=normal, 4=more, 5=very good)

Slope (deg)	Aspect		
	South	East/West	North
< 5,5	3	3	3
5,1 – 10,0	4	3	2
10,1 – 15,0	4	3	2
15,1 – 20,0	5	3	1
20,0 >			

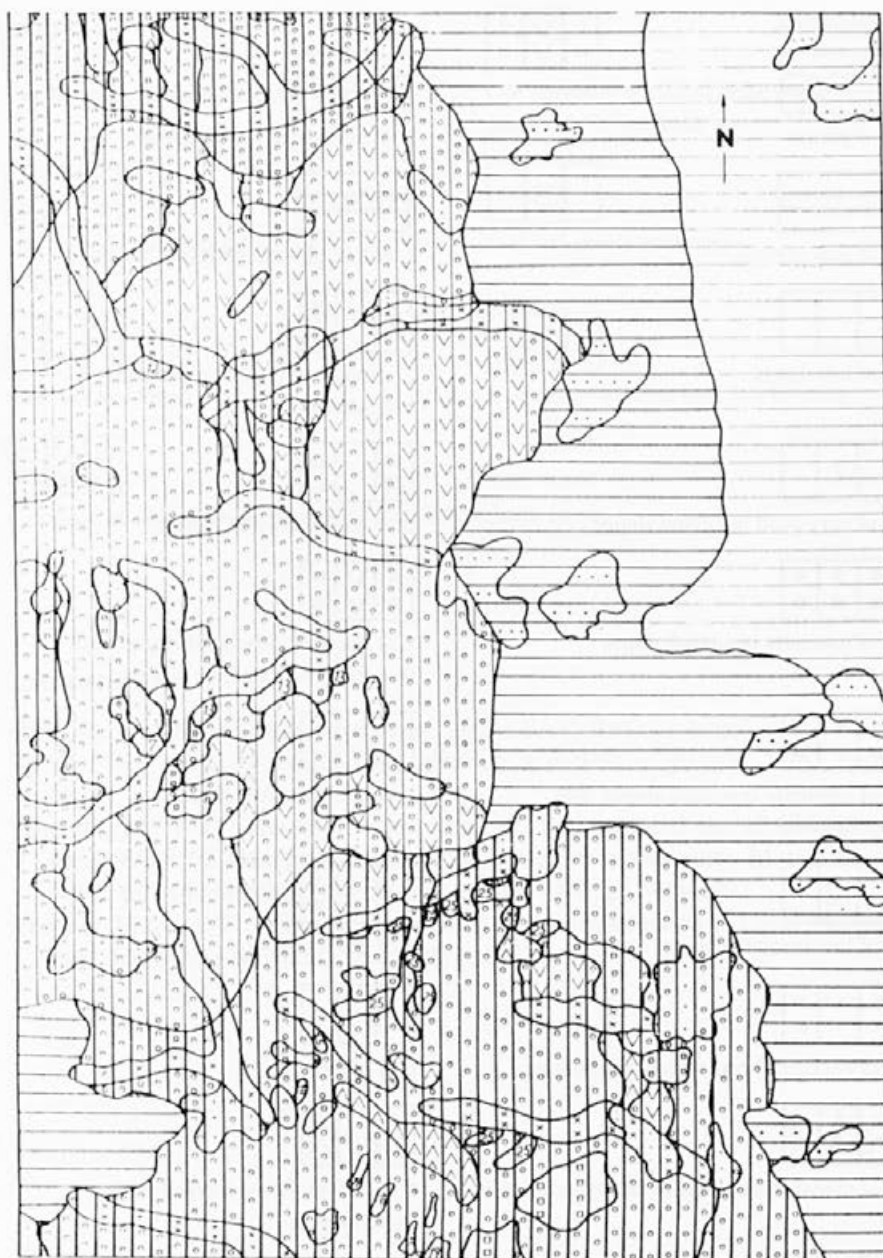
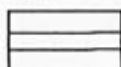
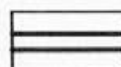


Fig. 1: The topoclimatic map (the section of map sheet 24-22 Olomouc).

Explanation:



t. of plains



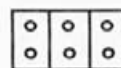
t. of foot plateau



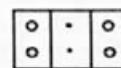
t. of hillylands



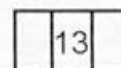
t. of very good insolated slopes



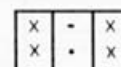
t. of normally insolated slopes



t. of normally insolated slopes with low housing



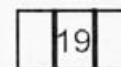
t. of low insolated slopes



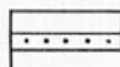
t. of concave forms with low housing



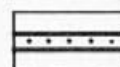
t. of convex forms raising above surroundings



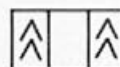
t. of very good insolated slopes



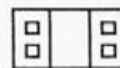
t. of plain with low housing



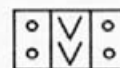
t. of foot plateau with low housing



t. of convex forms merged with surroundings



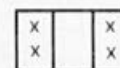
t. of good insolated slopes



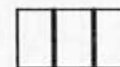
t. of normally insolated slopes with possibility of katabatic stream



t. of less insolated slopes



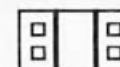
t. of concave forms



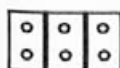
t. of highlands



t. of convex forms merged with surroundings



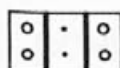
t. of good insolated slopes



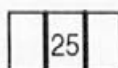
t. of normally insulated slopes



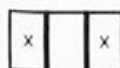
t. of normally insulated slopes with possibility of katabatic stream



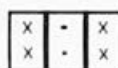
t. of normally insulated slopes with low housing



t. of less insulated slopes



t. of concave forms



t. of concave forms with low housing



t. of good insulated slopes with possibility of katabatic stream

Literature:

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