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ANALYSIS OF THE PEAKS IN THE BUCEGI MOUNTAINS WITH RELEVANCE FOR SPORTS TOURISM ACTIVITIES

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ABSTRACT. Mountain peaks are geographical landmarks that arouse the interest of tourists practicing mountain tourism activities. Summiting a peak is an important reason, both for the views it offers over the landscape and for the personal satisfaction of reaching that point, which requires fitness and will. In addition to the recreational approach, the peaks can also be analyzed from a geo-morphometric point of view, concerning their shape, altitude, and prominence, aspects that matter in sports tourism activities. In this context, the present work aims to analyze the peaks of the Bucegi Mountains and establish their prominence. It is also aimed at the practical side of the problem, materialized through the methodological approach included in the research.

Keywords: *outdoor sport activities, mountain tourism, topographical prominence, key-saddle, parent-peak, sub-peak, lineage, orometric dominance, suspended syncline*

REZUMAT. Vârfurile munţilor sunt repere geografice care stârnesc interesul turiştilor care practică activităţi de turism montan. Adjudecarea unui vârf reprezintă un motiv important, atât pentru perspectivele oferite asupra peisajului, cât şi pentru satisfacţia personală de a fi atins acel punct, care necesită condiţie fizică şi voinţă. Pe lângă abordarea agrementală, vârfurile pot fi analizate şi din punct de vedere geomorfometric, cu referire la forma, altitudinea şi proeminenţa acestora, aspecte care contează în activităţile de turism sportiv. În acest context, lucrarea de faţă îşi propune să analizeze vârfurile din Munţii Bucegi şi să stabilească proeminenţa acestora. De asemenea, este vizată şi latură practică a problemei, materializată prin demersul metodologic inclus în cercetare.

Cuvinte-cheie: *activităţi sportive în aer liber, turism montan, proeminenţă montană, înşeuare-cheie, vârf-părinte, sub-vârfuri, descendenţă genetică, dominanţă orometrică, sinclinal suspendat*

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INTRODUCTION

Peaks, as geomorphological entities, can be defined from two perspectives:

1) as a position within a morpho-geographical system: the peaks represent geomorphological structures located at the terminal upper part of a mountain, a point called the top of the mountain (Fig. 1).

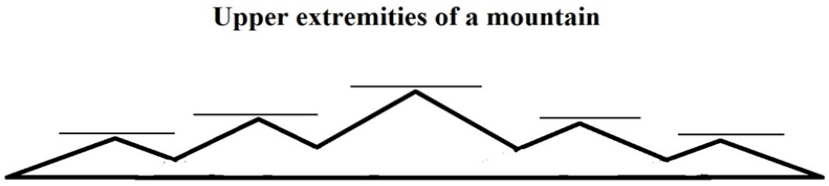

Figure 1. The position of peaks within a mountain ridge

2) as geomorphology: the peaks represent prominences located in the plane of the peaks (rises), defined by morpho graphic elements (base, shape, flanks, upper extremity) and specific morphometric elements (altitude, inclination, and length of the flanks, the difference in level between the base and the upper extremity) (Fig. 2).

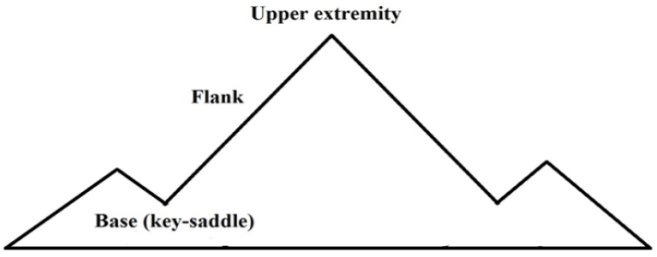

Figure 2. The morphological elements of a peak

These geomorphological structures appeared in the process of modeling mountain spaces, several factors contributing to their detachment, such as petrography (rock type), structural heritage (the presentation of geological bodies), hydro-atmospheric factors (precipitation, thermic variations, winds, ice), biogeographic factors (action of vegetation, organisms), and anthropic factors (man and his activities).

Certain genetic (age), altimetric (height), and spatial (distance between peaks) relationships are established between the peaks located on a mountain peak. These ratios are very important in determining the prominence because the peaks differ from each other in rank.

The highest peaks are considered parent-peaks, and the peaks located below their altitude represent sub-peaks, of rank I, II, III, etc. In this context, lower rank peaks are subordinated to higher rank peaks, and their prominence is established by them (fig. 3). Finally, all sub-peaks are subordinated to the parent-peak, in a so-called lineage.

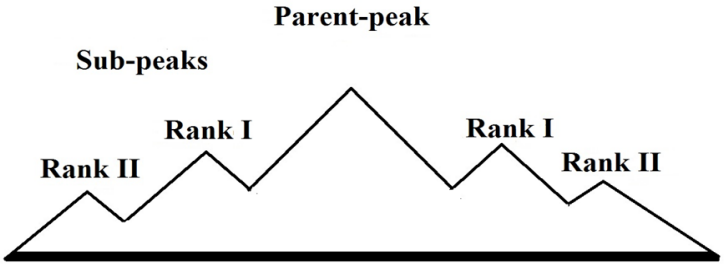

Figure 3. The ranks of the mountain peaks

The topographic prominence (rise) can be defined as the difference in level between the base of the peak, called the key-saddle, and its upper extremity (top).

Concerns regarding the establishment of topographic prominence, began in Great Britain at the end of the 19th century, when attempts were made to establish geomorphological structures with "mountain" status in England, Wales and Ireland (Munro, 1891; Donald, 1935; Nuttall & Nuttall (1989, 1990); Dawson, 1992; Graham, 1992; Dewey, 1995; Dawson, 1997a; Dawson, 1997b; Munro & Bearhop, 1997).

For this, the height of the structures and the minimum protrusion of the peaks were taken into account. Thus, structures that had altitudes above 600 m and minimum prominence above 15 m (30, 55, 150 m) were considered mountains. In 1991, Richard Goedeke, sets the minimum prominence of a peak of importance for mountaineering, at 30 m, as long as the classical rope length for mountaineering, a value also adopted by the UIAA, in 1994.

In the USA, the minimum value of the prominence of an important peak is 91 m. For the Alps, the works of Höhne (1993) Grimm and Mattmüller (2004), Helman (2005) and Goedeke (2006) can be mentioned. At a general and methodological level, the works of Schmidt (2018) and Stubbemann et al. (2019) stand out.

The value of topographic prominence is relevant in mountain recreational activities because peaks represent targets that must be climbed for several reasons:

- they are the highest surfaces of the mountain, which attract attention and interest;
- offers viewpoints over the surrounding regions;
- involves special physical and mental demands to be achieved;
- constitute targets with competitive sports connotations.

Because of this, the altitude and prominence of the peaks, along with the aesthetic component, induced by the shape (conical, pyramidal, dome) and the detailed relief of the flanks (slopes, steps, steeps, ravines, ridges, glacial cirques, debris fields, etc.) are the most important reasons for approaching the peaks and practicing mountain recreational activities (Bîca, 2019, 2021).

METHODOLOGY

For the realization of the present work, the following methodological stages were completed:

- consultation of specialized literature regarding the approach to peaks and topographic prominence (Munro, 1891; Donald, 1935; Nuttall&Nuttall, 1989, 1990); Dawson, 1992; Graham, 1992; Höhne, 1993; Dewey, 1995; Dawson, 1997a; Dawson, 1997b; Munro, Bearhop, 1997); Grimm&Mattmüller, 2004; Helman, 2005; Goedeke, 2006, Schmidt, 2018; Stubbemann et al., 2019; Bîca, 2019, 2021);
- consulting some works related to the Bucegi Mountains (Oncescu, 1965; Mihăilescu, 1969; Coteț, 1973; Săndulescu, 1984; Geografia României, 1984; Harta Geologică a României, 1967; Harta Topografică a României, 1980; Bucegi-Harta Turistică, 1995);
- carrying out field observations in the Bucegi Mountains area.

Study area

The Bucegi Mountains are located in the Southern Carpathians, between the Prahova Valley to the east, the Bran Corridor to the northwest, and the Brăteiului Valley to the southwest (fig. 4). From a tectonic-structural point of view, Bucegi Mountains represents a suspended syncline, with a horst aspect, which dominates the surrounding regions through steep tectonic steeps, which make it spectacular and picturesque.

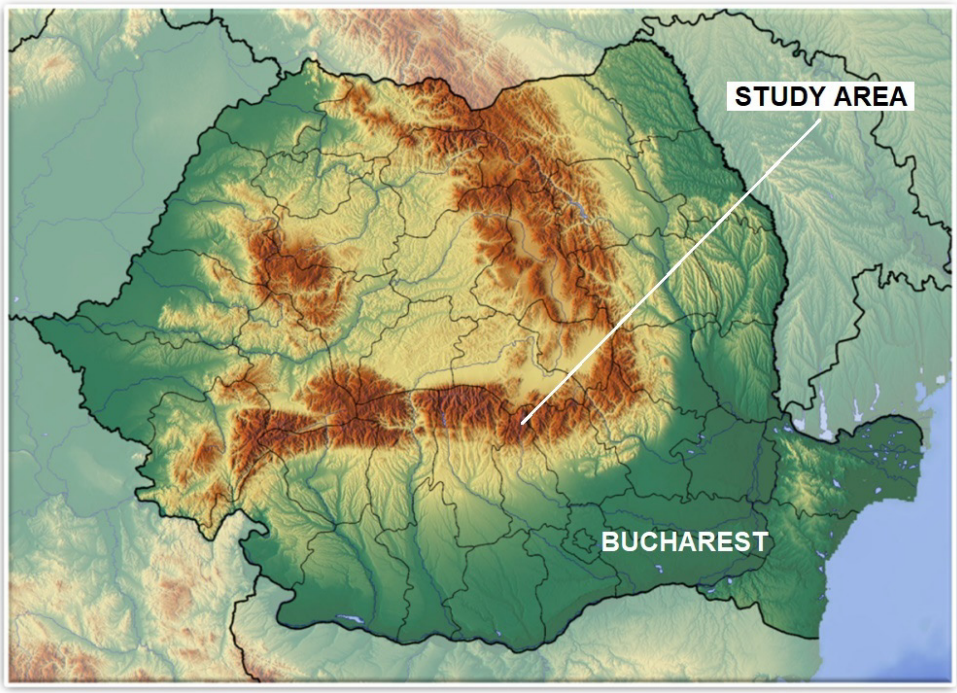

Figure 4. The geographic position of Bucegi Mountains within Romanian Carpathians (source: Harta României Grafică 3D Online-with changes)

The composition of this mountain unit includes Jurassic limestones, Bucegi conglomerates, and sandstones, rocks that have generated relief forms of great aesthetic value, a fact that attracts many visitors.

From a geomorphological perspective, the horst of the Bucegi Mountains is composed of two distinct subunits:

a) The basin of the suspended syncline, located at altitudes of 1500-2400 m, oriented and inclined from north to south, within which two subunits are distinguished:

1) Bucegi Plateau, drained by the Izvorul Dorului stream;

2) The upper valley of Ialomita;

b) The flanks of the syncline, characterized by vigorous steeps, within which there is a spectacularly detailed relief, made up of storied cuestas fronts, steep valleys, glacial valleys, ridges, ravines, structural steps, shelves, etc. (Fig. 5).

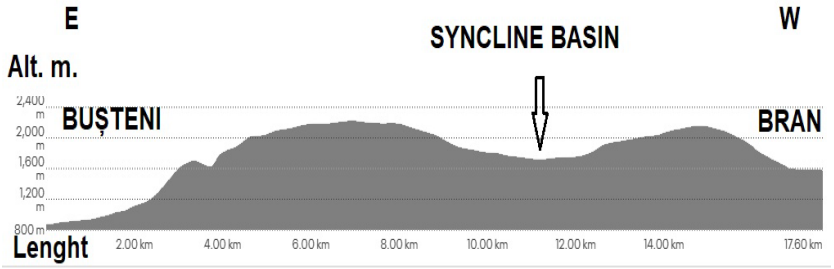

Figure 5. Geomorphological profile through the horst of the Bucegi Mountains (source: www.mapmyhike.com-with changes)

The Oro-hydrographic pattern of the suspended syncline basin is represented by:

- the external peaks, superimposed on the frame of the syncline, open to the south in the shape of a horseshoe, marked by the highest peaks;
- the valleys of Ialomița and Izvorul Dorului, separated from the peak of Cocora-Nucet;
- secondary ridges, plateaus, and erosive-structural bridges that converge towards the Ialomița Valley and the Izvorul Dorului Valley (fig. 6).

The oro-hydrographic system of the flanks of the suspended syncline consists of ridges that separate the tributary valleys of the Prahova River, to the east, the Râșnoava River, to the north, the Bârsa River, to the northeast, and the Ialomița River, to the southwest.

RESULTS AND DISCUSSION

Peak genesis and distribution

The factors that contributed to the formation of the peaks of the Bucegi Mountains are:

- the rocks, represented by conglomerates and sandstones, whose hardness and composition imposed the differential erosion, and determined the shape of the peaks;
- suspended syncline structure, a fact that determined the modeling of the main peaks on the edge of the ridges that form the frame of the syncline basin;
- subaerial erosion, which acted differently, depending on the hardness of the rocks, on the flanks, and the trough of the suspended syncline.

Therefore, depending on their position within the suspended syncline, the following categories of erosive-structural peaks are distinguished:

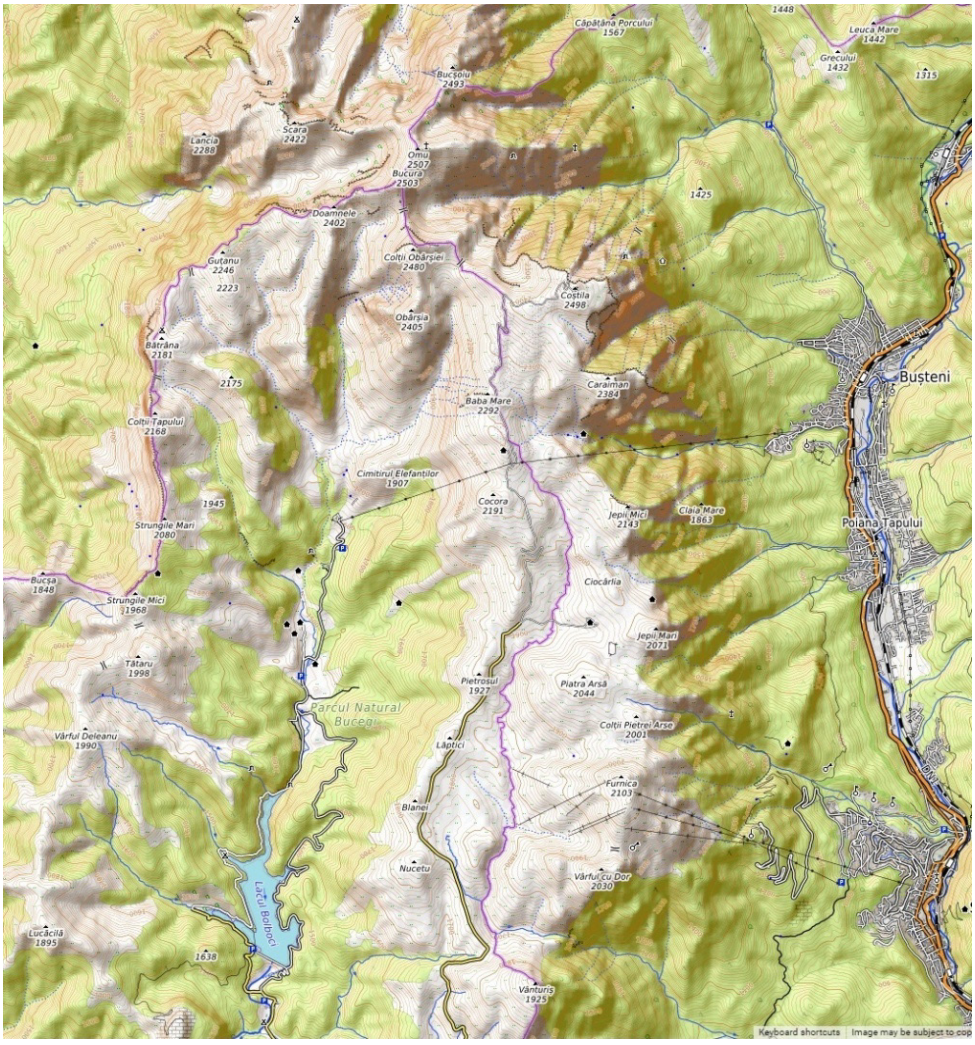

Figure 6. The Oro-hydrographic system of Bucegi Mountains
(source: https://elevation.maplogs.com/)

1) The peaks on the external frame of the syncline:

- Colţii Obârşiei, Coştila, Caraiman, Jepii Mici, Jepii Mari, Piatra Arsă, Furnica, Vârful cu Dor, Vânturiş (eastern ridge); these peaks dominate the Bucegi Plateau;

- Doamnele, Guţanu, Bătrâna, Colţii Ţapului, Strungile Mari, Strungile Mici, Tătaru, Deleanu, Lucăcilă (western ridge); these peaks dominate the Ialomiţei Valley (fig. 7, 8);

2) Peaks modeled inside the suspended syncline, on the edge of the internal cuesta, which separates the Izvorul Dorului Valley from the Ialomiţa Valley, oriented with the front towards the Izvorul Dorului Valley: Baba Mare, Cocora, Lăptici, Blana, Nucet (fig. 9);

3) Peaks modeled on the outside of the suspended syncline, on the edge of the suspended syncline: Bucşoiu, Scara, Lancia, Omu şi Bucura Dumbravă.

From an altimetric perspective, the peaks of the Bucegi Mountains decrease in altitude from north to south, by the sinking of the suspended syncline in the same direction.

Figure 7. The peaks from eastern ridge of the Bucegi Mountains (source: Google Earth-with changes)

Figure 8. The peaks from western ridge of the Bucegi Mountains (source: Google Earth-with changes)

Figure 9. The peaks from internal ridge of the Bucegi Mountains (source: Google Earth-with changes)

The shape of the peaks

Depending on the behavior of the rocks during erosion and the structure, the main peaks of the Bucegi Mountains, on the eastern summit and the western summit, have an asymmetrical shape, having a steep external flank, which coincides with the tectonic steeps facing the Prahova valley, the Bran corridor and the valley Brăteiului, and a gentler internal flank, represented by structural bridges that go down to the valley of Izvorul Dorului and the valley of Ialomița. Also, the peaks on the internal ridge have an asymmetric profile, because they are modelled on the monoclinal structure inside the syncline (e.g. Obârșia, Nucet, etc.). In some cases, their upper part (top) presents a detailed rocky relief (Omu, Bucșoiu, Baba Mare, Lancia, Tătaru, Strungile Mari, Strungile Mici, Colții Țapului, Nucet, etc.).

From a geometrical point of view, according to the profile and detailed relief, several categories of peaks have been defined, as follows:

-sharp peaks: Bucșoiu, Colții Obârșiei, Obârșia, Baba Mare, Lancia, Furnica, Vârful cu Dor, Vânturiș, Strungile Mari, Strungile Mici;

-beveled peaks: Omu, Coștila, Doamnele, Scara, Batrâna, Guțanu, Tătaru, Lucăcilă, Jepii Mici, Jepii Mari, Piatra Arsă, Blana, Nucet;

-rounded tops: Cocora, Deleanu, Lăptici;

-narrow and elongated tips: Bucura Dumbrăva.

The rank of the peaks and subordination relations between them

The following elements were taken into account in establishing the rank of the peaks: the elevation, prominence, and position of the peak relative to the other peaks on the ridge on which it is located. Therefore, we have the following situation:

a) parent-peak: Omu (2507 m);

b) first rank peaks: peaks over 2400 m (Bucura Dumbravă, Bucșoiu, Coștila, Colții Obârșiei);

c) rank II peaks: Scala (2422 m), Obârsia (2405 m), Doamnele (2402 m);

d) rank III peaks: Baba Mare (2292 m), Lancia (2288 m), Cocora (2191 m), Guțanu (2246 m);

e) rank IV peaks: Batrâna (2181 m), Colții Țapului (2168 m), Jepii Mici (2143 m), Furnica (2103 m), Jepii Mari (2071 m);

f) rank V peaks: Strungile Mari, Tătaru, Deleanu, Piatra Arsă, Vârful cu Dor;

g) rank VI peaks: Lucăcila;

h) rank VII peaks: Lespezi, Dichiu.

Topographic prominence and orometric dominance of peaks

Based on the topographical map of Romania, scale 1:25 000, the altitude of the peaks and key saddles was extracted, after which the graph of the peaks was drawn up, and the ratios between them were established. The peak graph represents the altimetric sequence of the peaks within a ridge, to analyze the genetic and altimetric relationships between them, as well as to establish the rank for each peak, and the subordination relationships between the peaks.

This graph was developed with the help of the Excell program, in which the elevations of the peaks and the associated key saddles were entered (Figure10, 11, 12). Based on the key-saddles, the prominence of each peak was calculated using the formula: Pp=Pa-Aks, where Pp=peak prominence, Pa=peak altitude, and Aks=altitude of the key-saddle (table 1, 2, 3).

Finally, the orographic dominance of each peak was established, based on the formula Od=Pp/Pax100, where Od=orometric dominance, Pp=peak prominence, and Pa=peak altitude. The orometric dominance shows us the importance of the respective peak in the orographic system of the Bucegi Mountains and within the main peaks.

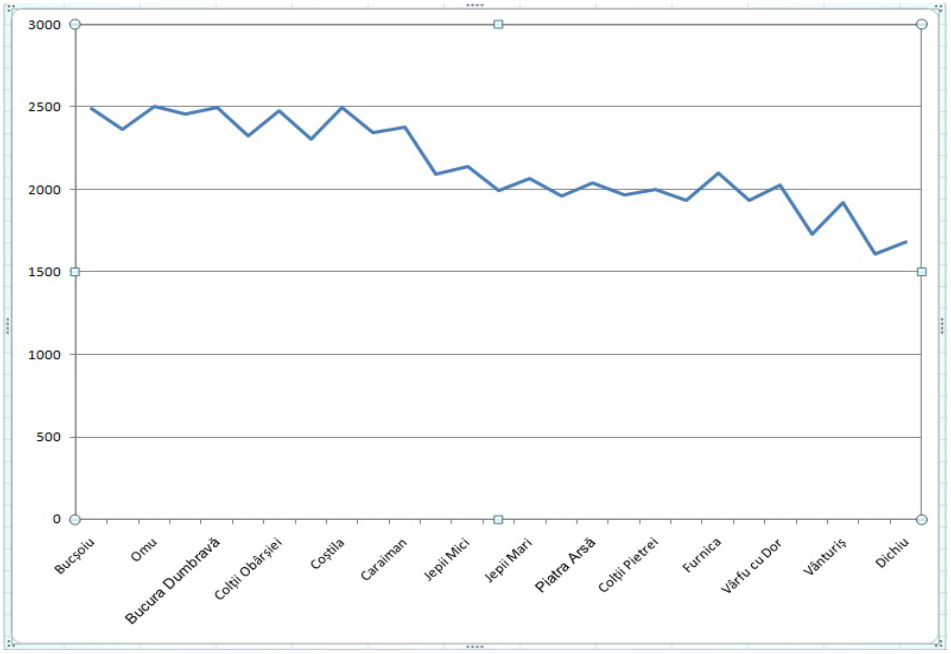

Figure 10. The graphic of the peaks from Eastern Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

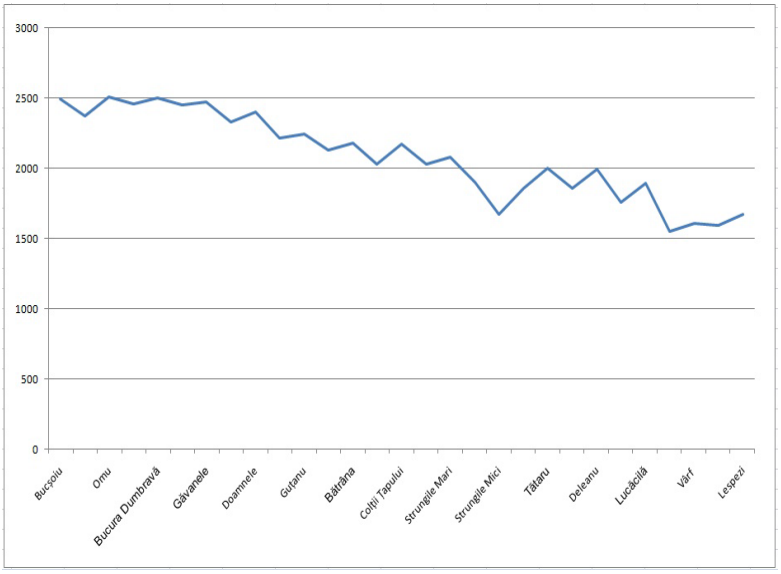

Figure 11. The graphic of the peaks from Western Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

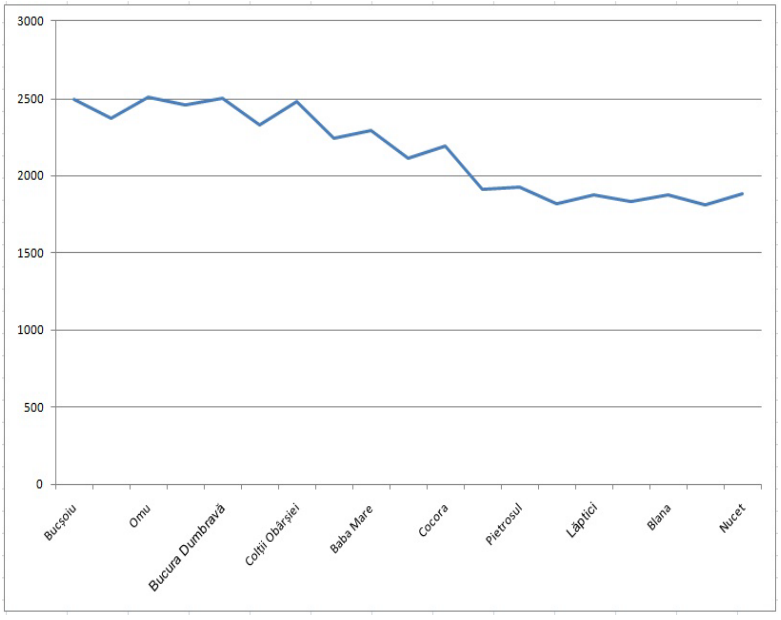

Figure 12. The graphic of the peaks from Internal Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

The smaller the difference between the prominence value and the peak altitude, the greater the orometric dominance/the greater the prominence, the greater the orometric dominance. Peaks with high prominence are also distinguished by high values of orometric dominance. The most prominent peaks are: Vânturiş (195 m), Coştila (189 m), Furnica (168 m), Colţii Obârşiei (150 m), Colţii Ţapului (143 m), Deleanu (130 m), Bucşoiu (122 m), Scara (122 m), Lucăcilă (115 m).

Table 1. The prominence of the peaks around the Omu peak and on the western summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Bucşoiu	2492	2370	122	4.89	peak
2	Omu	2507	-	-	-	parent-peak
3	Scara	2422	2300	122	5.03	peak
4	Lancia	2288	2190	98	4.2	peak
5	Bucura Dumbravă	2503	2460	43	0.17	peak
6	Găvanele	2472	2450	22	0.88	summit
7	Doamnele	2402	2330	72	2.99	peak
8	Guţanu	2246	2215	31	1.38	peak
9	Bătrâna	2181	2130	58	2.65	peak
10	Colţii Ţapului	2168	2025	143	6.59	peak
11	Strungile Mari	2080	2030	50	2.40	peak
12	Strungile Mici	1968	1900	68	3.45	peak
13	Tătarul	1998	1860	138	6.90	peak
14	Deleanu	1990	1860	130	6.53	peak
15	Lucăcilă	1895	1780	115	6,06	peak
16	Vârf	1610	1550	60	3.72	peak
17	Lespezi	1670	1590	80	4.79	peak

Table 2. The prominence of the peaks on the internal summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Colţii Obârşiei	2480	2330	150	6.04	peak
2	Obârşia	2405	2340	65	2.7	peak
4	Coştila	2498	2309	189	7.56	peak
5	Baba Mare	2294	2240	54	2.35	peak
6	Cocora	2191	2115	76	3.46	peak
7	Pietrosul	1927	1910	17	0.88	summit
8	Lăptici	1872	1820	52	2.77	peak
9	Blana	1875	1830	45	2.4	peak
10	Nucet	1881	1810	71	3.77	peak

Table 3. The prominence of the peaks on the eastern summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Coştila	2498	2309	189	7.56	peak
2	Caraiman	2384	2345	39	1.63	peak
3	Jepii Mici	2143	2095	48	2.23	peak
4	Jepii Mari	2071	1995	76	3.66	peak
5	Piatra Arsă	2044	1965	79	3.86	peak
6	Colţii Pietrei	2001	1970	31	1.54	peak
7	Furnica	2103	1935	168	7.98	peak
8	Vârful cu Dor	2030	1935	95	4.67	peak
9	Vânturiş	1925	1730	195	10.12	peak
10	Dichiu	1685	1610	75	4.45	peak

In terms of orometric dominance, the most dominant peaks within the synclinal basin and in the plane of the ridges on which they are located are Vânturiş (10.12), Furnica (7.98), Coştila (7.56), Tătaru (6.90), Colţii Ţapului (6.59), Deleanu (6.53), Lucăcilă (6.06), and Colţii Obârşiei (6.04).

The relevance of the peaks of the Bucegi Mountains for sports tourism

Due to the high altitude, low prominence, and friendly shape, the peaks of Bucegi Mountains are included in various sports tourism activities, such as:

a) hiking, ski touring, and mountain biking:

- consecrated peaks: Omu, Bucura Dumbravă, Bucşoiu, Colţii Obârşiei, Obârşia, Coştila, Caraiman, Jepii Mici, Jepii Mari, Furnica, Vârful cu Dor, Doamnele, Tătaru etc.;
- these peaks offer viewpoints towards the Bucegi Plateau, the Ialomiţei Valley, the Bran Couloir, and the Prahova Valley;

b) mass sports competitions:

- Scara Skyrace (25 km): includes Scara Peak;
- Omu Marathon (40 km): includes Scara, Omu, Doamnele, Guţanu and Bătrâna Peaks;

c) paragliding launches:

- Coştila, Caraiman, Jepii Mici, Furnica;

d) climbing:

- the walls of Jepii Mici, Caraiman, Coştila, Bucşoiu peaks, and the ridge of Strungile Mari-Strungile Mici.

Ski areas, and sports complexes (Piatra Arsă National Sports Complex), have been arranged on the inner, gentler flank of some peaks (Furnica, Vârful

cu Dor-Valea Izvorul Dorului). Finally, some peaks have cultural-historical connotations, such as the Caraiman Peak, on which the Heroes' Monument is located, a very visited objective.

CONCLUSIONS

The Bucegi Massif represents a very important, iconic tourist attraction for mountain tourism, due to several factors, such as:

-its external aesthetic appearance (steep flanks);

-proximity to cities and tourist resorts: Braşov, Ploiesti, Bucharest, Predeal, Buşteni, Sinaia, Râşnov, Bran, Zărneşti, Codlea;

- the existence of the altitude plateau, which is very accessible to a wide range of tourists;

- access by cable car to the height plateau from Sinaia, and Buşteni Resorts;

- car access to the Ialomiţa Valley (Padina area), and the Bucegi Plateau (Babele Road, TransBucegi Road);

- the perspectives on the surrounding mountain landscape: the Leaota Mountains, the Baiului Mountains, the Ciucaş Mountains, the Piatra Mare Mountains, the Postăvaru Mountains, the Piatra Craiului Mountains, the Prahova Valley, the Braşov Depression, and the Bran-Rucăr Corridor.

The genesis and shape of the peaks are the result of the geological constitution (conglomerates, sandstones) and the structure in the form of a suspended syncline, a fact that is reflected in the reduced values of their prominence, making them very accessible from the Bucegilor Plateau or from the summit plane on which find out.

This permissiveness of the relief and the peaks determined the early tourist equipment of the mountain area, and led to the registration of very large flows of visitors, with consequences for the environment (erosion, waste) and the tourist act (crowding, accidents).

REFERENCES

Academia Română (1984). *Geografia României, Carpaţii Româneşti şi Depresiunea Transilvaniei* (vol.III), Bucureşti: Ed. Academiei RSR

Bîca, I., (2019). The Prominence of the peaks from the Rodnei Mountains (Romania) with relevant for mountaineering. Methodological and practical aspects, *Studia UBB Educatio Artis Gymnasticae, LXIV (3),* 89 - 104

Bîca, I., (2021). Topographical prominence of peaks from Fagaras Mountains (Romania), with relevance to mountain activities. Methodological and practical aspects, *SUBB Educatio Artis Gymnasticae, LXVI (3),* 107-118

Coteț, P., (1973). *Geomorfologia României*, București: Ed. Tehnică.

Comitetul de Stat al Geologiei (1967). *Harta Geologică a României, foaia Brașov, scara 1:200000*, București: Institutul Geologic.

Direcția Topografică Militară (1980). *Harta Topografică a României, scara 1:25000*. București: Direcția Topografică Militară

Harta Turistică (1995). *Harta Turistică Bucegi*. București: Ed. Sport-Turism Mihăilescu

V., (1969). *Geografia fizică a României*, București: Ed. Științifică.

Oncescu, N., (1965). *Geologia României*, București: Ed. Tehnică.

Săndulescu, M., (1984). *Geotectonica României*, București: Ed. Tehnică.