

Another view on the Țibău Mountains terrain fragmentation

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Vol. 28/2018, 70-77



ABSTRACT: Belonging to Maramureșului and Bucovinei Carpathians from northern part of Romania Țibău Mountains consist in two quasi parallel tectogenetic compartments, separated by Țibău river longitudinal valley. Overall, morphometrical analysis of Țibău Mountains landforms shows a wide range of values, therefore that particular mountain unit displays intermediate features between Obcina Mesrecănișului and Maramureșului mountain ranges.

KEY WORDS: crystalline-Mesozoic zone, terrain fragmentation, mountain mass, interfluves, mountain class, mountain saddle.

1. Introduction

The Țibău Mountains belong to the northern compartment with a Pre-Alpine shear nappe structures of the crystalline-Mesozoic zone (ZCM) which corresponds to the initial stages of the Eastern Carpathians formation. As a geo-structural unit it includes the first generation of structures in the Alpine orogeny, in which, besides the pre-Mesozoic sedimentary formations, there are also pre-Alpine metamorphic formations. The crystalline schist foundation is located in the median part of the Țibău Mountains in the form of a NW-SE oriented strip according to the general geological structure of the ZCM in the northern Carpathians and forms the "backbone" of the tectonic-structural arrangement of the studied territory (Figure 1).

In a recent study (Vodă, Al., 2013) it is proposed to branch out the Dragoș Vodă (FDV) fault towards the SE on Cîrlibaba-Zugreni-Crucea-Holdița line, the segment called Cîrlibaba-Broșteni fault (FCB) respectively to the south, on the line north of Bretila-north of Fluturica-Cîrlibaba valley at the confluence of Tătarca Mică creek –Tătarca Mică valley up to its source westward from Obcioara peak (1251.2 m), segment called Dragoș Vodă-Tătarca fault (FDVT) and then Tătarca fault (Fig. 2). We believe that the tectonic downward plunge of the compartment located north of Dragoș Vodă-Tătarca Fault is responsible for the existence of low-level mountain saddles with continuity of direction, both in the area of Țibău Mountains and in the area of Obcina Mestecăniș.

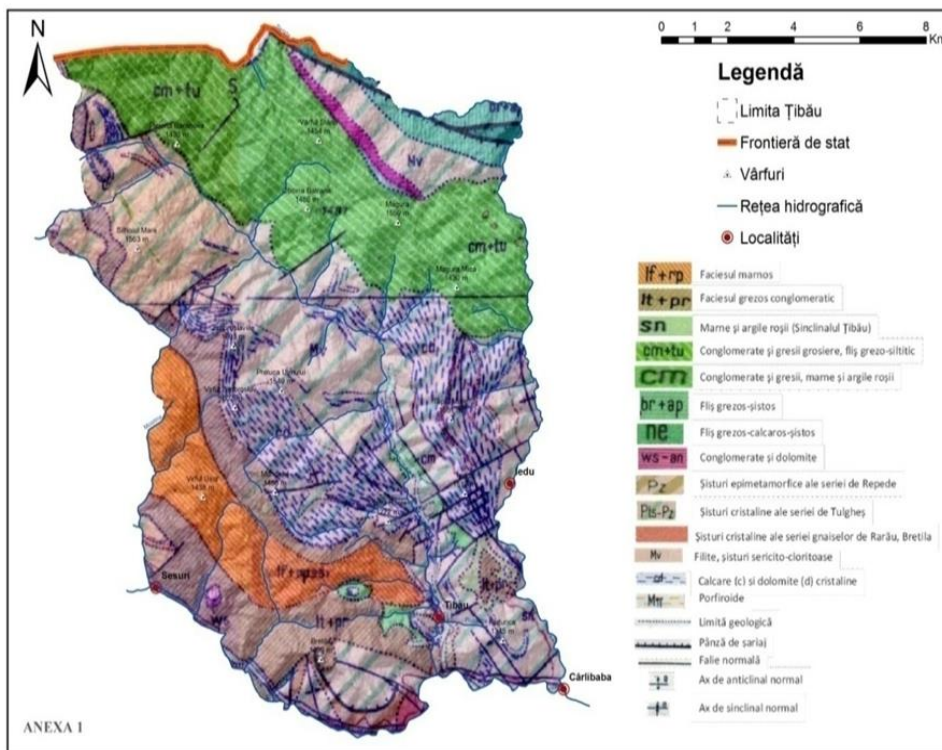


Figure 1 Geological map of Țibău Mountains. Personal archive.

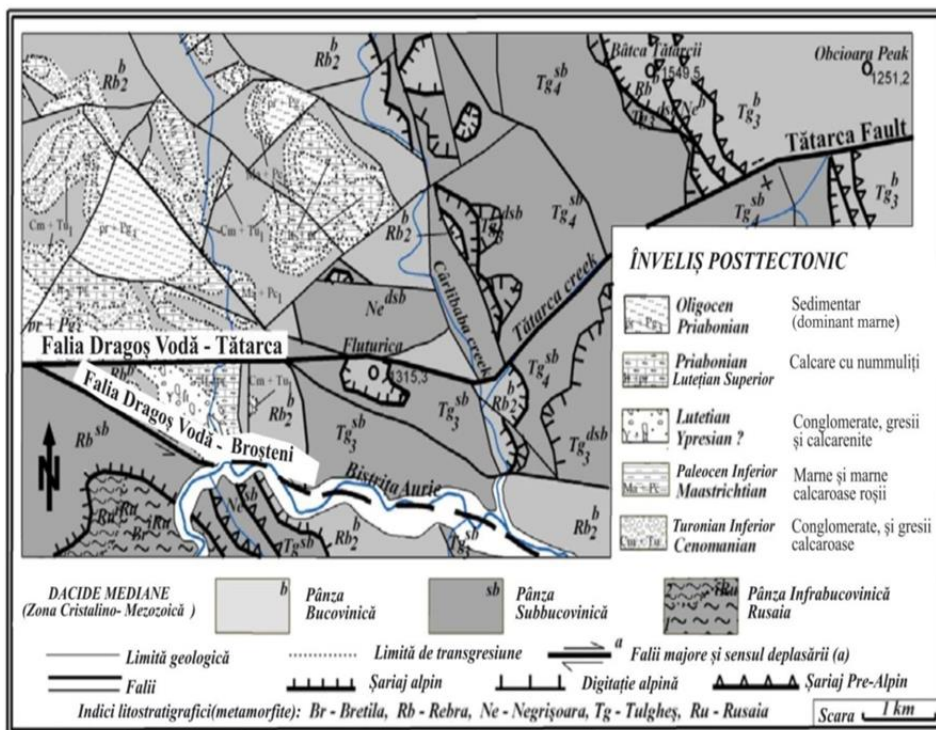


Figure 2 Simplified geological map of Cîrlibaba-Țibău area (processed after Al. Vodă, 2013).

2. Methods

The vertical fragmentation of the mountainous terrain from the watersheds dividing line down is a characteristic of the mountain morphology, where the mountain mass is represented by its interfluves and the fragmentation of the latter can give you a real view of the ruggedness of the mountain mass in an area such as the Țibău Mountains. At the same time, the mountain class can also lead to a classification of the mountain mass according to its most important discontinuities, from the level of its interfluves and not according to the hydrographical system that is insinuated on a lack of a mountain mass. The mountain class is defined in terms of closed concentric contour lines on a topographic map. A group of concentric closed contour lines, situated at the top of an inter-fluvial sector or mountain peak, define a first class mountain. Higher class mountains can be defined as a cluster of closed contour lines containing lower class mountains that have at least one closed contour line for each class. Thus, a higher class mountain will have a number of deep mountain saddles that vary greatly in altitude, and, in exchange, a mountain with superficial mountain saddles (shallow depths) or located at similar elevations, will be identified as a lower class mountain if its area is not large enough to include other mountainous areas. (Mândrescu, M., 2003). We used the Digital Land Elevation Model (SRTM) to identify clusters of contour lines and establish the areas of different mountain classes, the geological maps 1:200,000 (Rădăuți and Vișeu sheets), 1:50,000 (Ineu sheet), 1:25,000 (Geomold Cămpulung Moldovenesc archive) for correlations between landforms, lithology and tectonics, and the QGIS program for generating maps of mountain classes.

3. Results

The first-class mountains, the smallest ones, are the plateaux located at the top of the two inter-fluvial ridges Tapu-Iedu-Magura, respectively the Zambroslaviile (Figure 3). In the first case, there are Țapu Mare (1661 m.), Țapul Mic (1614 m.), Dealul Măgurii (1559 m. Fig. 4), Iedul (1517 m.), and others above 1500 m from the sea level, such as Dealul Stâniei (1453.6 m), Obcina Bătrână (1486 m), Baranova (1430 m), Fluturica (1345 m). In the second case there are Zambroslaviile (1603 m.), Zimbroslov (1602 m.), Preluca Ulmului (1549 m.), as well as others above 1500 m such as Muncelul (1466 m.), Măgurița (1466 m.), Vârful Ușor (1438 m.), Bretița (1488 m.). Most of the mountain saddles that fragment the first-class mountains are superficial (shallow), located on the ridge (the highest ones) and on the flanks (the lowest ones). The great relative altitude variation can be attributed to the different degree of adaptation of the landforms to the geological structure and to the selective resistance to erosion of the lithographic complexes. The total area of the 1st class mountains is approximately 1770 hectares.

The 2nd class (intermediate) mountains highlight the two longitudinal inter-fluvial ridges separated by the Țibău river valley because they contain smaller mountains and are fragmented by deeper mountain saddles which vary greatly in relative elevation (Fig.5). Tapu-Iedu ridge, oriented NW to SE for over 20 km between Stâniei peak (1454 m) to the north and Fluturica peak (1345 m) to the south, wider on the northern end (10-12 km) and narrower on the southern end (3-4 km), dominates the eastern sector of the mountain compartment. It has a complex morphological shape with transversal profile widening and narrowing, as well as variations in longitudinal profile relative elevations. (Figure 6) For this sector, the northern limit of the mountain class "climbs up" to 1350 meters above sea level.

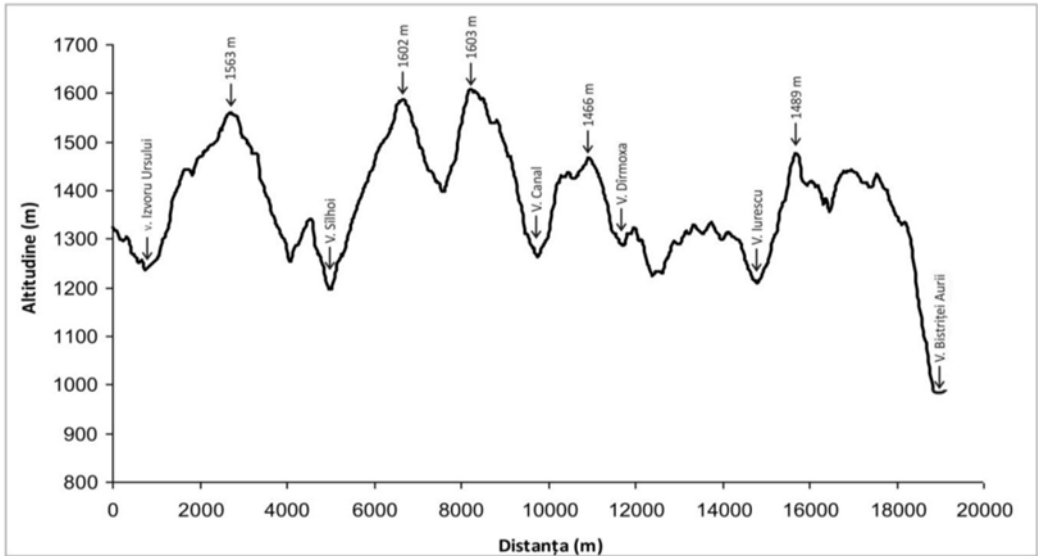


Figure 7 Zimbroslii Mountains longitudinal profile. Personal archive.

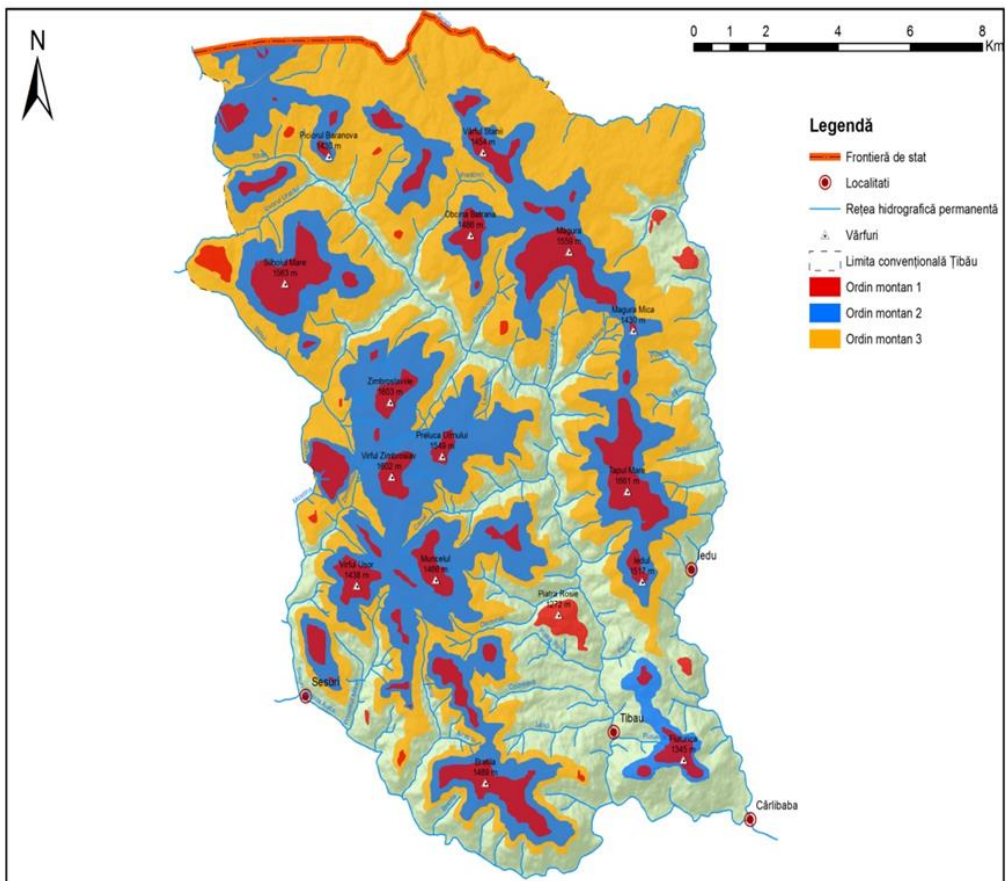


Figure 8 3-rd class Țibău Mountains. Personal archive.

For the delimitation of the highest class mountain, we pinpointed the deepest mountain saddle that we located near the source of the Precioloc (Precilor) creek, near the southern end of Iedu-Țapu Ridge, at 1190 meters above sea level. Therefore, we considered the 1200-meter contour line the limit of the 3rd class mountain and we noticed on the map that this contour line "cuts off" the valleys very well. (Figure 8). Overall the 3rd class mountain area is approximately 7223 hectares.

4. Conclusion

The analysis itself raises a series of difficulties as follows: the limits of mountain orders must be closed on significant orographic discontinuities (e.g. important valleys, valley origins, major lithological contacts) in such manner that the tectonic factor is present, the presence of detached heights but linked to the highest class mountain by shallow flanking mountain saddles can be attributed to the outcrop of hard rocks formation and particular erosion intensity, the careful use of the massive term for the mountains of different classes. Thus, we were able to differentiate a more like small and medium-height mountains area, with mountain saddles, more than 1200 m. above sea level, corresponding to the 1st to 3rd class mountains occupying $\frac{3}{4}$ of the total area and a more like basin area, without mountain saddles, below 1200 m., occupying $\frac{1}{4}$ of the same area.

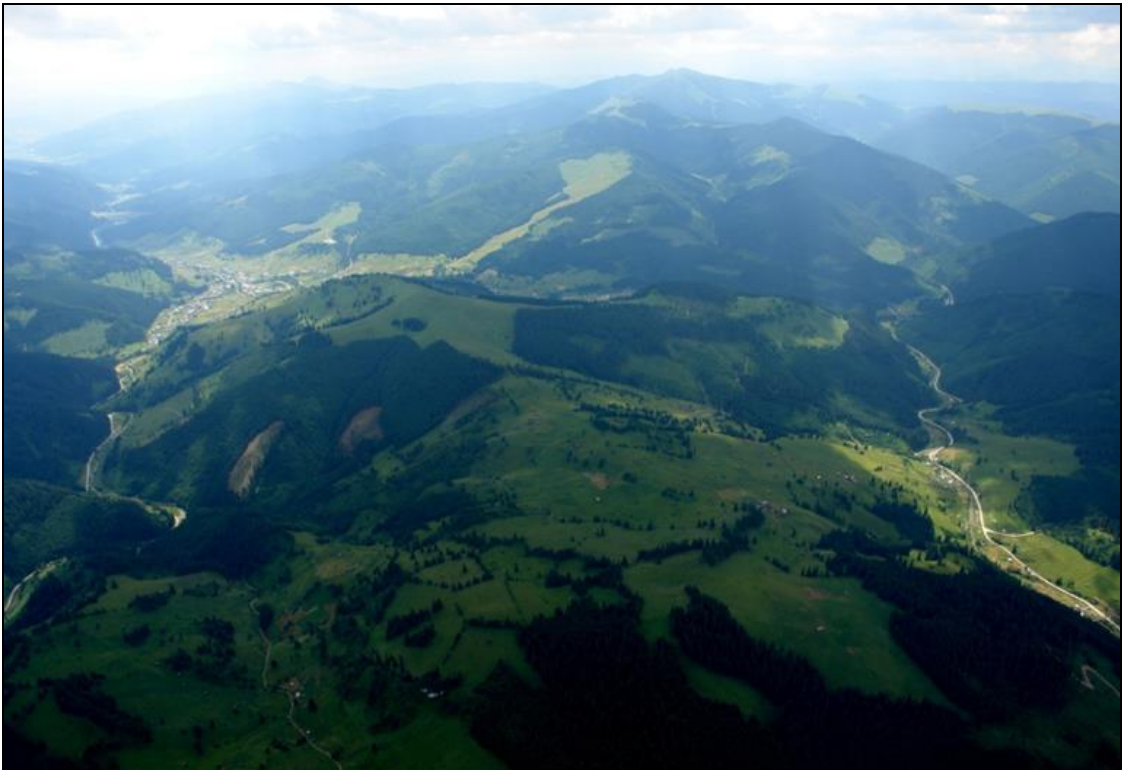


Figure 9 Cîrlibaba valley (lef side) and Țibău valley (right side) parallelism and radial shape of Fluturica massif (1345 m). Aerial view. Personal archive.

The limit between those two areas present a sinuous route, with advances of secondary interfluves in more like basin area and penetrations of secondary valleys within a more like small and medium-height mountains area. The fluvial erosion processes, in relation to other types of

exogenous processes especially exerted on the “so called” Țibău basin, determined the confinement of the hypsometric surface situated at 1200 m above the sea level, conditioning therefore, the increase of the hypsometric surface situated below 1200 m. The 2nd mountains class of Fluturica best correspond to the classical sense of a mountain massif (Posea, G., 1986) because: it presents itself like a compact mass of crystalline shale, imposing towards Cîrlibaba Veche and Valea Bistriței villages, with mature landforms which does not give maximum elevation because it was affected by intense tectonics and evolved at the same time according to the very low near local levels (Cîrlibaba valley and Țibău valley), with radial shape interfluves, steep slopes and more like gorges sections of Bistrița Aurie and Cîrlibaba valleys at the intersection with crystalline rocks (Figure 9).

We also believe that the sectors witch exceeds 1400 m above the sea level are fragments of the Carpathian SII medium surface, which levels all the maximum heights, from where they pass over the lateral interfluves, called plaiuri and obcine, and it is possible that first class mountains represent SII 2 surface dating back to the Sarmatian-Meotian, tectonic deformation or lithological levels of the SII medium surface (Posea, G., 1997). The Țibău Mountains (Țapului-Zîmbroslaviile according to the local toponymy) are 3rd class mountains, better separated from the Obcina Mestecăniș, the most imposing of the Obcinile Bucovinei mountain range through Cîrlibaba valley in comparison with the 3rd class mountains of Southern Maramureș, namely the Jupania-Komanova ridge, Toroiaga Massif and Cearcănu-Prislop ridge (Mândrescu M, 2003). Overall the morphometric analysis of the landforms of the Tibau Mountains reveals that this mountainous unit has intermediate characteristics between Obcina Mestecanișului and Maramureșului mountain ranges.

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