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THE BAHLUIEŢ CATCHMENT. GEOMORPHOLOGICAL DIVISIONING

Ionela Popa[1] Ion Ioniţă[2]

Abstract. Located in the Moldavian Plateau, at the contact between the Jijia Rolling Plain, the Suceava Plateau and the Central Moldavian Plateau, the Bahluieţ catchment is 54,866 hectares in size. All the specific landforms developed in a hilly rolling region within a general homocline structure have been identified in the study area. The highest extension belongs to the sculptural (fluvio-denudational) landforms (79%), followed by depositional (15%) and structural-lithological topography (6%).

Due to the lithology, double structural asymmetry and the varied landscape fragmentation, three areas with distinct characteristics have been identified within the Bahluieţ catchment. The northern compartment highlights the first order structural asymmetry, revealed by the subsequent valleys of Bahluieţ and Valea Oilor. The southern compartment is stretching firstly in the southern part of Jijia Rolling Plain, where the right tributaries of the Bahluiet sculptured mostly obsequent valleys, and secondly in the Coasta Iaşilor. The western compartment overlays the eastern border of Suceava Plateau, where the structural-lithological topography is prevailing.

Keywords: Bahluieţ catchment, cuesta, geomorphological divisioning, double structural asymmetry

1. Introduction

The Bahluieţ catchment, located in the Moldavian Plateau, comprises three geomorphological sub-units: the eastern border of the Suceava Plateau in west, the Coasta Iasilor as the northern border of the Central Moldavian Plateau at south (David M., 1941) and the Moldavian Plain (Băcăuanu V., 1968) represented by the Jijia Rolling Plain (Ungureanu Al., 1993) in the remaining area as the most extended subunit (Figure 1).

The Bahluieţ catchment covers 54,866 ha and from administrative point of view it is stretching entirely within the Iaşi County including almost 20 communities.

2. Material and methods

The present study required both the Geographical Information System (G.I.S.) approach by using topographic maps at 1:5,000 scale to describe the geomorphometric parameters, and field mapping. The analysis of the morphometric factors and the morphographic features are based on achieving the Digital Elevation Model (DEM) by using TNT Mips software V.6.9.

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Subsequently, a series of useful thematic maps, such as hypsometric map, slope map and exposition map have been delivered.

The geomorphological map resulted from combination of the data collected during field surveying with the information taken from thematic maps made with TNT Mips. In addition, the divisioning map was drawn, being very useful in understanding and interpreting the local landscape features.

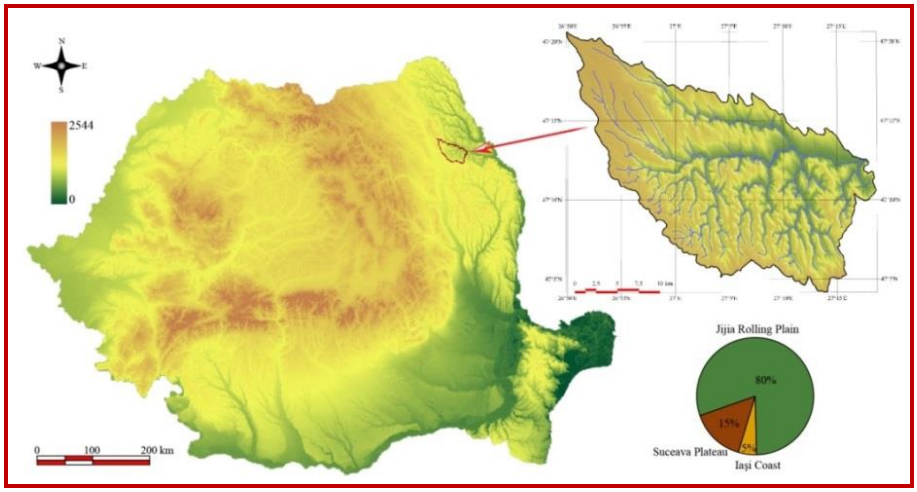

Figure 1: Geographical location of the Bahluieţ catchment

3. Results and discussions

From geomorphological point of view, the prevailing sculptural landforms are developed in general monocline structure and underlain by the Bessarabian layers deposited in marine brackish facies (*Băcăuanu V. et al., 1980*). In turn, the typical hilly, plateau relief (Coasta Iasilor and the eastern border of the Suceava Plateau) is developed in coastal facies also of Bessarabian in age *(Ştefan P., 1989, Ionesi L., 1994, Brânzilă M., 1999)*. The outcropping layers are predominantly clayey-marl with sandy seems and showing a gentle dipping to SSE of 7-8 m/km.

The study area belongs to the temperate continental climate, with mean annual temperature of 8.3-9.6˚C. The average amount of precipitation varies between 530-700 mm, with higher values in the Coasta Iasilor and Suceava Plateau and smaller ones in the Jijia Rolling Plain.

The natural vegetation comprises two zones, namely: the first one specific to the Eastern European silvo-steppe zone and secondly the forest area associated to the Central Europe *(Băcăuanu V. et al, 1980)*. Accordingly, two zonal soils classes have been identified. The Chernisols class which is weighing 60% of the total agricultural land, including mainly Chernozem and Phaeozem soil types and extending in the Jijia Rolling Plain. The Luvisols class, with Preluvosol (Entic Luvisol) and Luvosol types, is prevailing in the higher districts, the Suceava Plateau and Central Moldavian Plateau.

The main morphographic feature of the Bahluieţ catchment subscribes to the general pattern of the Jijia Rolling Plain, described by elongated rolling hills. The southern border of the catchment is dominated by the famous escarpment of Coasta Iasilor, characterized by high relief amplitude and high intensity of the present day geomorphologic processes.

From a hypsometric point of view, the average altitude reaches 159 m a.s.l., with peak relief amplitude of 376 m, between the lowest altitude of 56 m at the junction with Bahlui River and the maximum of 432 m in the Stroeşti Hill. The average value of the slopes is 13% and most of slope values (46.5% of total) are between 5-18%. These values indicate a specific type of land fragmentation which results in the presence of large, quasi-horizontal surfaces flanked by steeper slopes.

The Bahluieţ Valley is generally a subsequent one, but at catchment scale the northern looking slopes have the largest extension (23.85%) being followed by the southern facing ones (20%).

Data from Table 1 show the large extension of sculptural (fluvio-denudational) landforms within a general homocline structure. They are weighing 78.7% of the total and are followed by the depositional landforms (15.2%) and structural-lithological topography (6.1%).

Table 1: Types of landforms in the Bahluieţ catchment

No. crt.	Types of landforms	Landforms	Area	
			(ha)	(%)
1	Structural topography	Structural - lithological plateaus	*3,343*	*6.1*
2	Sculptural (fluvio-denudational) landforms within a general homocline structure	Hilltops	4,150	7.6
		Slopes, of which:	39,023	71.1
		Cuesta fronts	19,332	35.2
		Cuesta back slopes	18,957	34.6
		Morphological escarpment	735	1.3
		Total	*43,173*	*78.7*
3	Depositional landforms	Floodplains	4,698	8.5
		Fluvial terraces	976	1.8
		Glacises	2,678	4.9
		Total	*8,351*	*15.2*
	Total		**54,866**	**100**

The analysis of the morphometric characteristics and landforms within the Bahluiet catchment showed the asymmetry of some geo-morphometric parameters determined by the valley development in the general homocline structure. The main landforms are represented by the hilltops and deluvial slopes (Figure 2). Most of the slopes are actually either cuesta back slopes or cuesta fronts and their facing is strongly connected to the double structural asymmetry in the Moldavian Plateau as described by *Ioniţă I. (1998, 2000)*. The dominant cuesta fronts have a general northern orientation controlled by the first order structural asymmetry, while western cuesta fronts are associated to the second order structural asymmetry revealed mostly by the obsequent valleys.

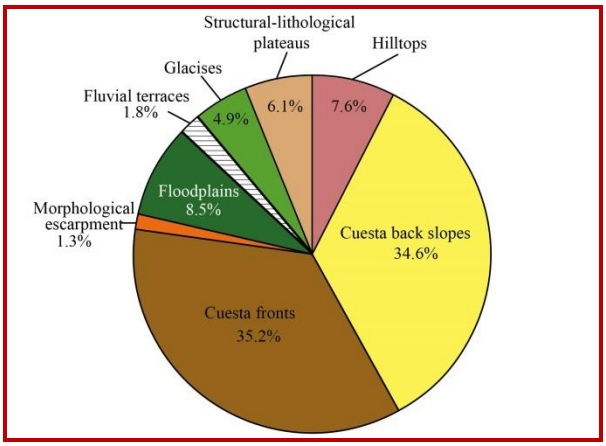

Figure 2: Types of landforms in the Bahluieţ catchment

Two thirds of the catchment develops on the right side, but due to the double structural asymmetry and the varied landscape fragmentation, it was possible to identify three areas with distinct characteristics within the study area, namely (Figure 3):

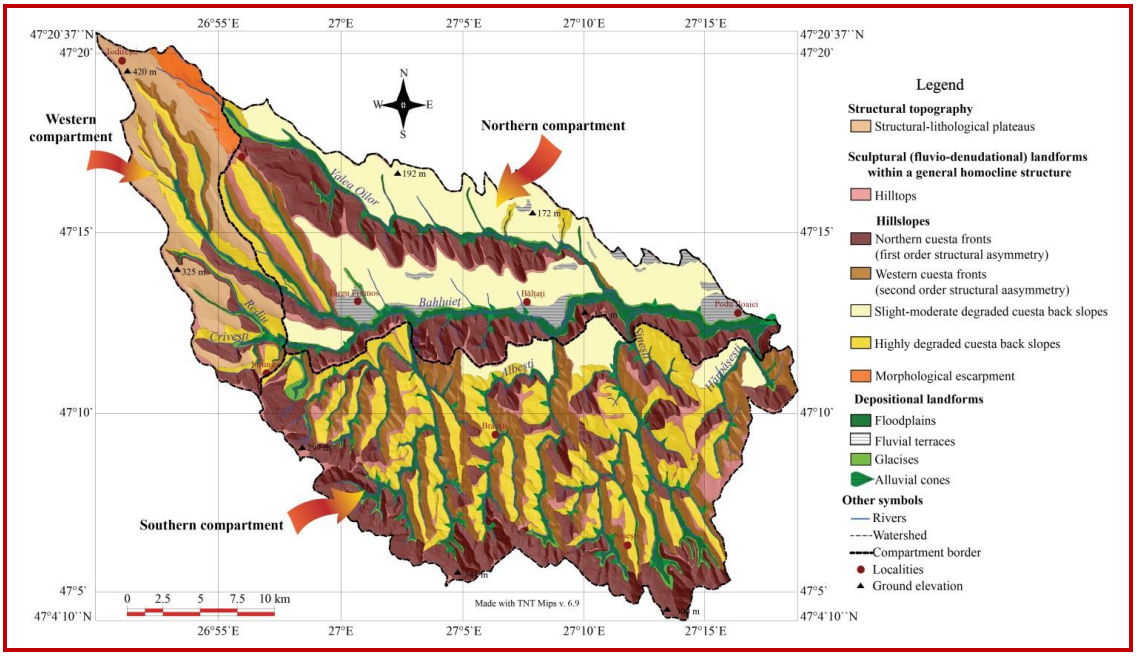

Figure 3: The geomorphological divisioning map within the Bahluieţ catchment

- **The Northern compartment** that occupies 36% of the catchment. It is entirely located in the Jijia Rolling Plain in the area under the subsequent valleys of Bahluiet and Valea Oilor, downstream of Costeşti, highlighting the first structural asymmetry. Therefore, their left valley-side is a typical southern facing cuesta back slope, widely extended and mantled by well-developed system of fluvial terraces with the relative altitude up to 105 m. In contrast, the right valley-side is a classic northern looking cuesta front, sparsely dissected (as in Valea Oilor), or heavily incised by right tributaries of the Bahluieţ.

The most representative example is the Bahluieţ Valley downstream the town of Târgu Frumos until the junction with Bahlui River. Thus, in the middle and lower catchment, the Bahluieţ Valley shows an asymmetric cross-section, typified by a northern front and a large cuesta back slope, which is in favor of agriculture and human settlements (Figure 4).

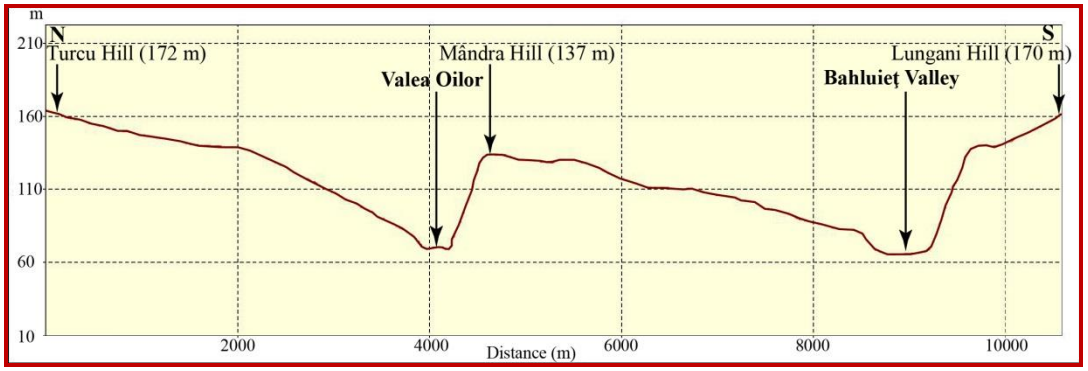

Figure 4: Cross-section through Oilor and Bahluieţ Valleys (the first structural asymmetry)

The valley of the main right tributary, Valea Oilor reveals the same characteristics, emphasizing the features of the first structural asymmetry (Figure 5).

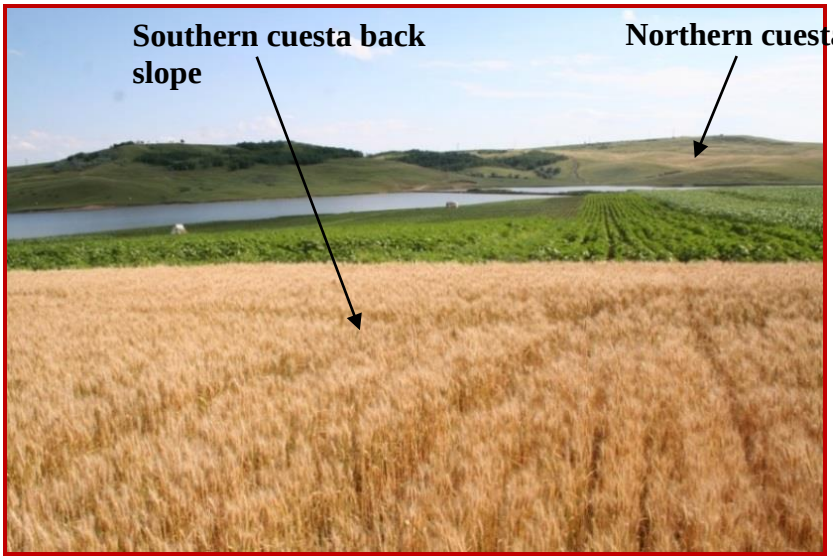

Figure 5: The subsequent valley of Oilor downstream of Podişu, illustrating the first structural asymmetry (22.06.2011)

- **The Southern compartment** showing the broadest extension and comprising almost half of the catchment. It is stretching primarily in the southern area of the Jijia Rolling Plain and secondly in the Coasta Iaşilor. The younger obsequent valleys, such as Brăeşti, Sineşti, Albeşti, Goeşti, Ciunca are emphasizing the second order structural asymmetry, typified by western looking cuesta fronts and eastern facing cuesta back slopes (Figures 6 and 7). However, there are also included some subsequent reaches and thus the particular feature of some valleys over here is consisting in a zig-zag pattern. In addition, the Coasta Iasilor from

the southern edge of this area is depicting the first order structural asymmetry. The sculptural landforms are extending almost exclusively, while the fluvial terraces are missing.

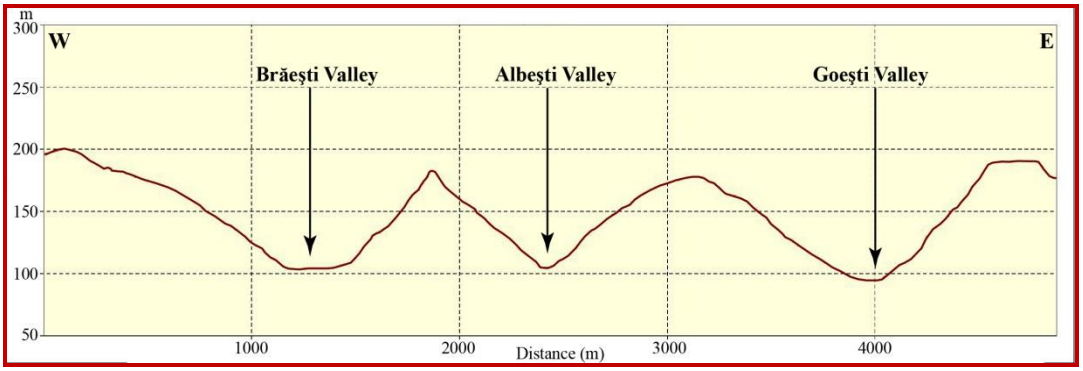

Figure 6: Cross-section through the obsequent valleys from the southern compartment of the Bahluieţ catchment (the second structural asymmetry)

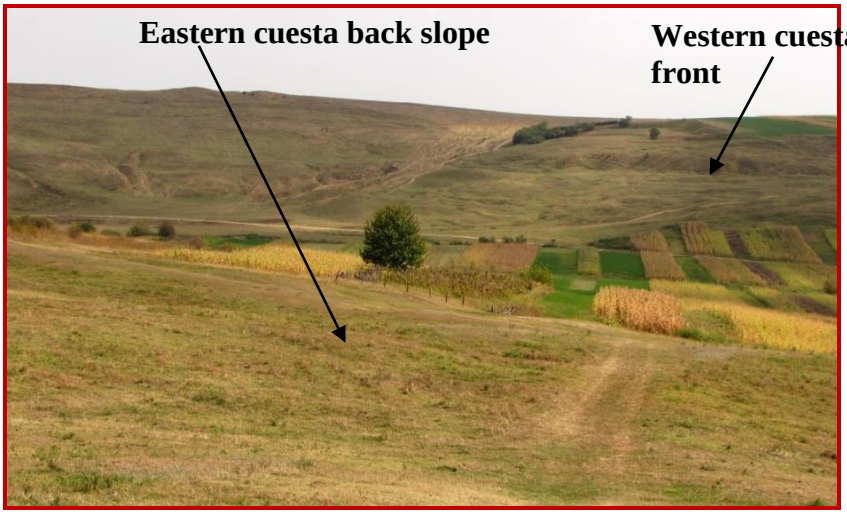

Figure 7: The obsequent valley of Albeşti, upstream of Brăeşti, illustrating the second structural asymmetry (07.09.2014)

- **The Western compartment** is 8,114 ha in size, representing 14.7% of the total. This area includes the southeastern border of the Suceava Plateau. Its main feature refers to, on one hand, the contrast between the structural-lithological plateaus incised by small canyons along some reaches of the valleys, and, on the other hand, the presenceof the morphological escarpment, Dealul-Mare Hârlău at north of Cucuteni village.

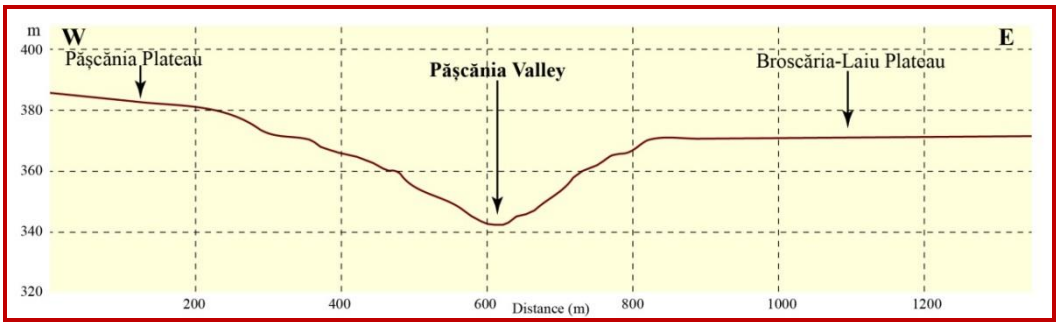

Figure 8: Cross-section through the Păşcănia Valley from the western compartment of the Bahluieţ catchment

In the western compartment, the structural-lithological topography is prevailing. This type of landforms imposes through structural – lithological plateaus, which hold a weight of 6% of the entire catchment. The most extended structural platform is located between Stroieşti and Vaşcani and was called by *Tufescu V.*, (1937) "The Broscăria - Laiu structural Platform" (Figure 9).

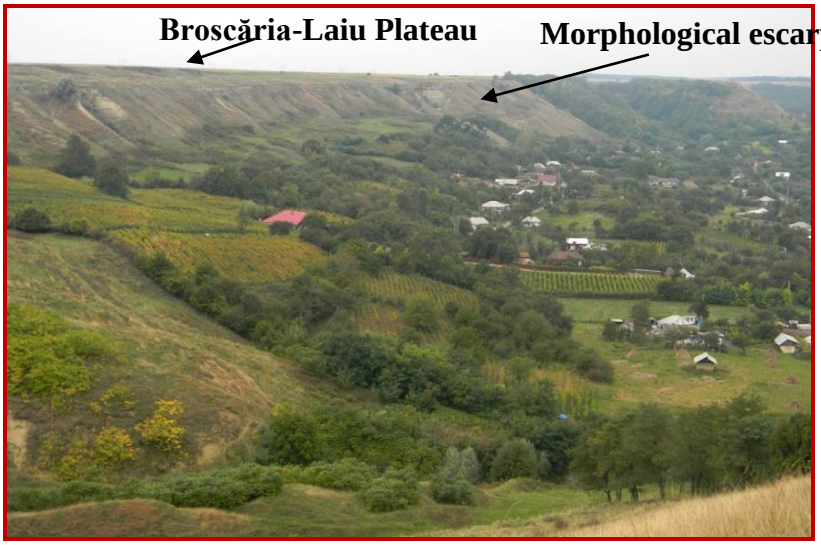

Figure 9: The Broscăria - Laiu Platform and the morphological escarpment in the western compartment of the Bahluieţ catchment, south to Băiceni village (06.10.2009)

Conclusions

The analysis of the morphometric characteristics and landforms within the Bahluiet catchment showed the large extension of sculptural (fluvio-denudational) landforms within a general homocline structure. They are weighing 79% of the total and are followed by the depositional landforms (15%) and structural-lithological topography (6%). On the background of the lithology, double structural asymmetry and the varied landscape fragmentation, three areas with distinct characteristics have been identified within the study area. The northern compartment underlines the first structural asymmetry, revealed by the typical subsequent valleys of Bahluieţ and Valea Oilor. The southern compartment is stretching in the southern part of Jijia Rolling Plain where the right tributaries of the Bahluieţ sculptured mostly

obsequent valleys. However, the Coasta Iaşilor from the southern edge of the study area is depicting the first order structural asymmetry. The western compartment is specific to the Suceava Plateau, where the structural topography is prevailing.

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