Preliminary contribution to the investigation of the geosites from Apuseni Mountains (Romania)

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Key words: cultural geomorphology, geosites, Apuseni Mountains.

Abstract. The relief together with other elements of the natural landscape (the lithology, the waters, the vegetation etc) and the anthropic component has always represented an important touristic potential of the Apuseni Mountains. The enormous interest towards this potential led to a new direction in the geomorphological research, the so-called ”cultural geomorphology”. The present paper aims at applying the cultural geomorphology to a concrete geographical space from Romania, The Apuseni Mountains, despite the fact that the tourist potential of this area is very valuable, at both national and European level, at present, it is not used enough. In this study we made an attempt to identify the factors and agents which have contributed to the formation of the geosites, their classification according to certain criteria.

1. Introduction

The new discipline being defined as „the study of the geomorphological component of a territory, both as the culture of the landscape is concerned and also the interactions with the cultural heritage of archaeological, historical, architectural type etc” (Panizza, Piacente, 2003, p. 3). Geosites (synonym terms: geomorphological sites, geosites, geotope etc), according to a restrictive definition are: geological and geomorphological „objects” that have a scientifical value for a better understanding of the history of the Earth, be it historical-cultural, aesthetic or socio-economic, „a form of the landscape with peculiar and significant geomorphological attributes, which qualifies it as a component of the cultural patrimony (general sense) of a territory” (Panizza and Piacente, 1993, 2003, Panizza 2005). The geological and geomorphological patrimony is part of the cultural landscape in a general sense, or even of the architectural type ecc; it is what Panizza and Piacente (2003) call „integrated cultural landscape”, the definition being privileged in a „touristic” interpretation of the landscape promotion. There is no standard dimension of the geosites, neither maximum, nor minimum, some geosites being punctual (eg. the erratic blocks), others more extended (eg. fields of dunes, glacial valleys ecc), some of the latter being confused with „geomorphological landscapes”, „parts of the terrestrial landscape, seen, perceived and often exploited by the human beings. (.... )” (Reynard, 2004). „The active” geosites allow the visualization of the morphological processes in action: active volcanoes, erosional drainage ecc, but also the quantification of their action (eg. an active iceberg), while the „passive” ones contain the proof of the processes that took place in the past and they are values as the history of the Earth is concerned (eg. climatic variations ecc).

The paper approaches an investigation and classification of the geosites of the Apuseni Mountains (Romania), (fig. 1). The tourist potential of the Apuseni Mountains represented by the great variety and beauty of the relief is highly valuable at a national, European level and even worldwide, but insufficiently used.
In Romania the first association of tourism and environmental protection was created at the beginning of the 19th century and in this respect the First National Conference was organized on this topic. The first publication dedicated to nature preservation was “The Protection of Nature in Romania” (Borza, 1924). In 1930 the first law for nature preservation was promulgated and a Commission for the Monuments of Nature was set up. In 1935 the first National Park was set in the Retezat Mountains (Southern Carpathians) and in 1938 the first protected geologic site was created: the Basaltic Columns Detunatele from Apuseni Mountains. In 1950 the State passed a new bill for the nature protection and tens of places were submitted to become monuments and geological reservations. According to the First Law of the Environment promulgated in 1973 new points and areas were permitted to be declared as protected. At present, according to the Law no. 5 from March the 6th 2000 the meaning of protected area refers to “natural or built areas, geographically and/or topographically delimited which comprise natural and/or cultural patrimony assets and are declared as such for the attainment of specific objectives of patrimony assets preservation (Bold, 1999).

Thus in order to highlight the real knowable and beneficial potential of the geological-geomorphologic patrimony expert commissions of the Romanian Academy and Water Ministry, Forestry and the Environment, in compliance to the national legislation had published an official list of the protected areas in Romania completing the first official list “Bulletin of the Commission of Natural Monuments” issued in 1943.

2. Geographical, Geomorphological and Geological outline

The Apuseni Mountains represent the western branch of the Romanian Carpathians (Fig. 1) delimited in the south by the River Mures Valley, the Transylvanian Basin in the east, the Crisul Repede River in the north and the Pannonic Plain in the west. The medium heights reach 800 m, the highest peak is located in the Bihor Mountains (Bihorul Peak) with altitude 1874 m. The relief of the Apuseni Mountains is characterized by fragmentation and energy of large relief and steep slope. The local maintaining of levelling surfaces makes it possible for human establishments to exist even at a high altitude (eg. Maguri-Marisel). The steep slopes are to be found in such sectors as the quays of the valleys, or they define the contact between volcanic formations and the depository ones. The interest is great for such a landscape in tourism for extreme sports (alpinism). The mountain sides have steep slopes and the northern position offers a high potential for establishing ski tracks (eg. Arieşeni, Baisoara, Stana de Vale ecc). The hydrographical drainage belongs to the three important river basin: that of the river Crisuri at west, that of the Somes (River Somesul Cald, River Somesul Rece, River Somesul Mic) and that of the River Mures (Aries, Ampoi) towards east. The impact is mainly a touristic one and it is given mainly by the valleys, quays and canyons, by karstic intermittent springs, and underground waters in limestone regions. In the mountain regions, especially in those of quays and canyons, people can practice rafting and sport fishing etc. The lakes are not numerous,
and the biggest ones have an anthropic nature: the Dragan Lake, The Lesu Lake and the Mihaiesti Lake. The tourist potential of the Apuseni Mountains is further increased by the underground mineral waters (eg. Boholt, Lipova etc) and by the thermal ones (eg. Geoagiu, Vata de Jos etc). The climate: the medium annual temperature is between 7°C at the foot of the mountains and 0°C on the highest peaks. Rich solide precipitations during winter have stimulated the development of winter sports at: Arieseni, Baisoara etc. At the same time the temperature variations contribute to the weathering of the rocks and as a consequence detritus and other residual elements (eg. Valcan, Detunatelele, Piatra Cetii etc) were formed.

From the geological point of view: As a result of the rifting process the Transylvanian-Panonic interplate with pre-alpine Cristalino-Mezozoic deposits and flysch deposits, Mezozoic and Neogene vulcanite was created. The karst rocks are very well represented (some 23% of all the karst surface of Romania). Their subsoil is represented by a large petrographic variety and displays various landforms. Land fragmentation is very deep in the western part were gulf depressions form. There is a large diversity in terms of ground resources: e.g mineral resources as gold/silver ores, copper and polymethalics ores, coal, bauxite, construction rocks, rare minerals: mercury, molybdenum, chrome, nickel, magnesium and mineral waters.

3. Investigation of the geosites from Apuseni Mountains

The investigation of the geosites of the Apuseni Mountains with the identification of the factors and processes which contributed to their formation constitutes a first step of the methodology which comprises description, assessment, geosites mapping and preservation proposals (fig. 2) The geosites of the Apuseni Mountains display some important scientifical valences (Panizza and Piacente, 2003): by the rare mineral, petrographic, geomorphologic, etc. occurrents, pedagogical valences which aim toward a potential interest raising for Geology and Earth Science. The tourist and economic importance, by valuable elements of landscape with the purpose of leisure or tourist exploitation. It also has a cultural importance by the influence of artistic creations and manifestations.

The factors and the agents that have contributed to the formation of the geosites from this area are: the geological structure by means of the lithological and tectonic characteristics, the hydrology by means of the permanent or temporary drainage ecc, the climatic factor (precipitations and temperature), the vegetation and the anthropic factor. The geomorphologic processes that contributed to the formation of the geosites are represented by: weathering with physical disintegration and chemical deterioration; erosion and hydric transport (rivers, torrents, ruts ecc); by process and deposits due to gravity (landslides, debris ecc); antrophic action.

4. Classification Criteria of Geosites of the Apuseni Mountains

A. Genetic Criteria

A1. Geological-geomorphological

The torrential erosion e.g. Ruginoasa Hallow, Detunatele Cliffs (basaltic columns), Bulzului Cliffs, Bedeleu Peak, Valcan Mountain, Bulzului Cliffs etc.

Fluvial erosion (gorges): all the rivers in the Crisul Repede Basin have shaped smaller or bigger defiles in the crystalline prolongation of the Apuseni Mountains: Barcaul at Marca, Crisul Repede at Ciucea-Vad, Crisul Negru at Soimi, Crisul Alb at Gurahont, Turzii Gorges (with some 60 caves, important both from a tourist and leisure point of view), Turenilor, Rametului, etc.

Caves: Bears’ Cave (fig. 3) 1,5 km long with an upper level of some 850 m planned for tourist purposes and a lower one of some 700 m unplanned and declared scientifically reservation; we can note here both a great variety of karstic formations and a great density of fossil remnants of Ursus spelaeus, with an in situ preserved skeleton in a perfect anatomic connection), Vantului cave, Focul Viu cave etc.
Fig. 2 Steps of the investigation methodology of geosites
(after Panizza and Piacente, 2003)

The surface karstic forms (cockpit dolina, karst valleys, uvalas): the karst plateau plain of Padis, Cetatile Ponorului, the karst plateau Lumea Pierduta, Vascaului Plateau, Mountains Padurea Craiului etc.

Water Falls: e.g. Moara Dracului, Bohotei.

Gullies: Bortigului (some 150 m long and 54 m deep, contains an ice block of some 30 000 mc, Campeneasa with the Boiu Karstic Intermittent Spring, Focul Viu etc

Karstic Intermittent Springs: e.g. Glabenei (the ground waters emerge drained from Cetatile Ponorului, as in a steep wall canyon of some hundreds meters with natural arcades, suspended caves which open into the middle of the walls), the Intermittent karstic spring of Călugări etc.
Lakes: snow-erosion lake (Taul Mare) or karstic: Varasoaia, among those built by people we refer here to Dragan, Lesu etc.

A2. Geomorphologic – with botanical component interest

The marshes are highly important in this respect; among the low areas we recall here those from Remeti and Geoagiu Spa and from the high areas category: Padis, Carligati-Onceasa, Mluha.

A3. Geomorphologic-anthropic geosites

a) Among the geosites with a historical-archaeological interest we can mention those situated at the extremity of the Apuseni Mountains: e.g. Marca, Finis, Siria, Soimus, Craiva etc; gold mining Rosia Montana (fig. 4) (“Alburnus Maior” gold mining of the Roman period with galleries planned for the tourist visits; the archaeologists have discovered 25 waxed plates which provide great clues about the mining history, the local inhabitants’ life and ore smelting during the Roman period). The Gold Mines of Sacaramb are a genuine mineral thesaurus here having been discovered and described for the first time in the world the very rare minerals: eukarit, jordanit, plumbogumit and skorodit.

b) Cultural-spiritual geosites. Among the geomorphosites of cultural interest we can mention the Rameti Monastery (fig. 5), Crisan, Voivozi etc.

c) Geosites of tourist interest: the tourist mountain resorts of Carligate, Stana de Vale, Arieseni, Baisoara, Geoagiu etc.

B. From the point of view of the public interest we can specify:

- geosites of local interest: e.g. Turenilor Gorge, Intregalde Gorge, Vadu-Crisului Cave, Meziad Cave, Ampoitei Stones etc.
- geosites of regional interest: e.g. Crisul Repede Gorge, Turzii Gorge, Galbenei Valley, Sighistel Valley etc.
- geosites of national interest: e.g. The Basaltic Columns Detunate, The Bears’ Cave, The Glacier Scarisoara, The Glacier Focul Viu, etc.
- geosites of international interest: e.g. the Bears’ Cave, the Basaltic Columns Detunate, The Glacier Scarisoara, The Gold Mines of Sacaramb, the karstic plateau of Padis, the Turzii Gorge;

The Apuseni Natural Park was established by means of the Government resolution, Part I, nr.190 from 26.03.2003, regarding the delimitation of the biosphere reservations, national parks and natural parks and the constitution of their administration (http://www.parcapuseni.ro/).
Conclusion

The paper is an attempt to identify the factors and agents which have contributed to the formation of geosites in Apuseni mountains, with their classification according to certain criteria. Using this starting point in the future work will be the implementation of an inventory of the geosites, with the aim to accomplishing a map which would make a first inventory of the geosites at a regional level of the Apuseni Mountains. Methodology, accompanied by a data base which can be consulted according to the interest points. The data base created and organized by sheets can offer a lot of information about: the selection and location of the geosites at the regional/local level, description and assessment, images of geomorphosites in the landscape context, bibliographical indications, and citations in the literature.

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Reintegrarea funcțională a sistemelor geomorfologice degradate ca urmare a exploatarii cărbunilor


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