STRATIGRAPHY AND TECTONICS OF THE UPPERMOST BUCEGI CONGLOMERATES FORMATION (ALBIAN, EASTERN CARPATHIANS, ROMANIA)

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Abstract. This paper presents a detailed lithostratigraphic investigation carried out in the Bucegi Massif, a mountainous zone from the southern part of the Eastern Carpathians. The study focused on the 50 - 70 m thick succession of four conglomerate units associated with olistoliths, intercalated in the upper part of the Babele Sandstone Member (the uppermost lithostratigraphic unit of the Albian Bucegi Conglomerates Formation). The conglomerate beds succession stands for the uppermost strata of the thick Bucegi conglomeratic accumulation. All the four conglomerate bodies are stratiform and continuous for kilometers, and show mainly constant lithofacies features on wide areas. The study emphasizes two large-scale trends of high implication on depositional interpretation. The reduced areal extension of the basal conglomerate unit, compared with the larger extension area of the overlying units 2, 3 and 4, is one of the features with genetic significance. Another remarkable characteristic is the lateral passage from the single thick conglomerate units 2, 3 and 4, to conglomerate units alternating with sandstones beds.

Key words: Bucegi Massif, Albian, lithostratigraphy, conglomerate unit, olistoliths, fining upward trend.

1. INTRODUCTION

The Bucegi Conglomerates Formation is the lithostratigraphic term referring to the extremely thick conglomerate deposits accumulated at the end of the Lower Cretaceous, that crop out in the Bucegi Massif area, at the southern extremity of the Eastern Carpathians.

Recent observations pointed out to a succession of several particular Albian conglomerate units genetically related, but with unclear stratigraphic significance. In order to proceed to sedimentology interpretations, it was essential to built up an up-to-date model of the geologic architecture in the Bucegi study area. This became the goal of a detailed stratigraphy and tectonics study that is herein presented. Our study was focused on the upper member of the Albian Bucegi Formation, namely the Babele Sandstone Member.

The present study was carried out in the Obârşia Mountain zone, between Şugărilor and Obârşiei Rivers (Fig. 1). This area is located in the northern part of the Bucegi Massif, where the map published by Patrulius (1969) shows multiple olistoliths (Fig. 2). Geographically, the study area is situated in the Prahova County, close to the central part of Romania.

The Obârşia Mountain has two topography summits, which will be frequently referred to in this paper: the Colţii Obârşiei Peak (2488 m) to the north, and a nameless summit with 2380 m elevation to the south (Fig. 1). The elevations values are reported with several meters differences by various topographic or touristic maps.

Geologic mapping was the main approach to accomplish the study objective. The map previously made by Patrulius (1969) served as a starting point, the new cartographic activity looking for more detailed geologic features. Besides the classical rock-outcrop examination, special consideration was paid to the relief morphology, capable to reveal the trend of some geological boundaries, mainly in the areas with poor quality outcrop coverage. The satellite image examination,

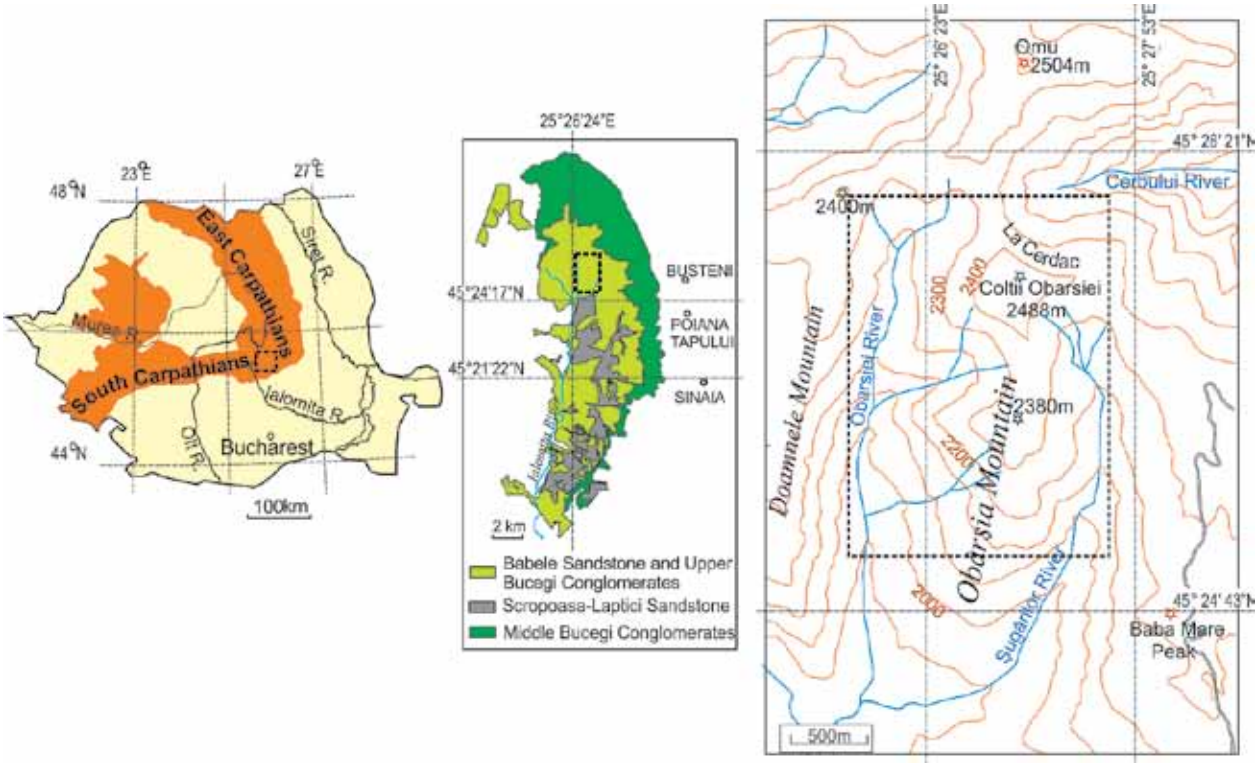

Fig. 1. Areal location of the Obârşia Mountain geology investigations. The study area location is shown on the Romania index map (left), Bucegi Massif simplified geological map (based on Patrulius, 1969) (middle) and on the Obârşia Mt. topographic map (right).

using Bing Map imagery, provided more arguments to the geologic boundaries mapping, and offered a detailed view to some critical features.

2. GEOLOGIC SETTING

2.1. Overview of the lithostratigraphy in the Bucegi Massif

The present stratigraphy outline of the Bucegi conglomeratic deposits was achieved only subsequent to the geologic study of the underlying Lower Cretaceous and overlying Upper Cretaceous deposits. The investigation of the marly-sandy flysch deposits from the Eastern Carpathians bend zone, which includes the Bucegi area, revealed the existence of relevant Aptian-Lower Albian macrofaunal assemblages. Murgeanu *et al*. (1963) present a list of fauna, including the following taxa: *Deshayesites borowae* (from Cărpiniş River), *Dufrenoya furcata, Colombiceras subpeltoceratoides, C.* aff. *tableri discoidalis*, *C.* aff. *crassicostatum*, and *Holcophylloceras* sp. (Valea Seacă River from Caraiman Mountain), *Leymeriella* aff. *revili* (Buşteni), C. sp. *tableri discoidalis* and *Parahoplites* gr. *grossouvrei* (Runcu River). Recent studies (Melinte and Jipa, 2007; Briceag *et al*., 2009) identified at the top of the flysch deposits underlaying the Bucegi Formation, the first occurrence of the nannofossil *Prediscosphaera columnata*, an Early Albian bioevent (Roth, 1983; Mutterlose, 1992), its age being 112.6 Ma (Bralower *et al*., 1997).

As concerning the deposits covering the Bucegi Formation, Murgeanu and Patrulius (1957) remarked that the Vraconian (*i.e*., latest Albian) sediments are unconformably overlying conglomerates and sandstones of the Bucegi Formation from the Dâmboviţa River area (Cotenești, Lăicăi and Bădeni localities). The Vraconian fauna of these deposits includes *Aucellina gryphaeoides, Parahibolites tourtiae* and *Puzosia subplanulata*.

So far no fossils useful for the geologic age determination were discovered in the deposits of the Bucegi Formation. This thick conglomerate deposit was assigned to a Middle and Late Albian age by Murgeanu and Patrulius (1963), taking into account their geometric position between the Aptian-Lower Albian flysch deposits and the Vraconian hemipelagic marls (Fig. 3). Subsequently, Patrulius (1969) refers to the underlying flysch deposits as not younger than the Late Aptian, while the main Bucegi Conglomerates series was assigned to the Albian.

Within the conglomerate mass of the Bucegi Massif, Murgeanu and Patrulius (1963) separated three main lithostratigraphic entities. At the base of this conglomerate accumulation are the *Lower Bucegi Conglomerates*, located in the upper part of the Aptian flysch deposits. The *Middle Bucegi Conglomerates* unit includes the major part of the Albian conglomerate assemblage. They are conformably covered by the *Upper Bucegi Conglomerates* unit, distinguished by the presence of embedded blocks and olistoliths.

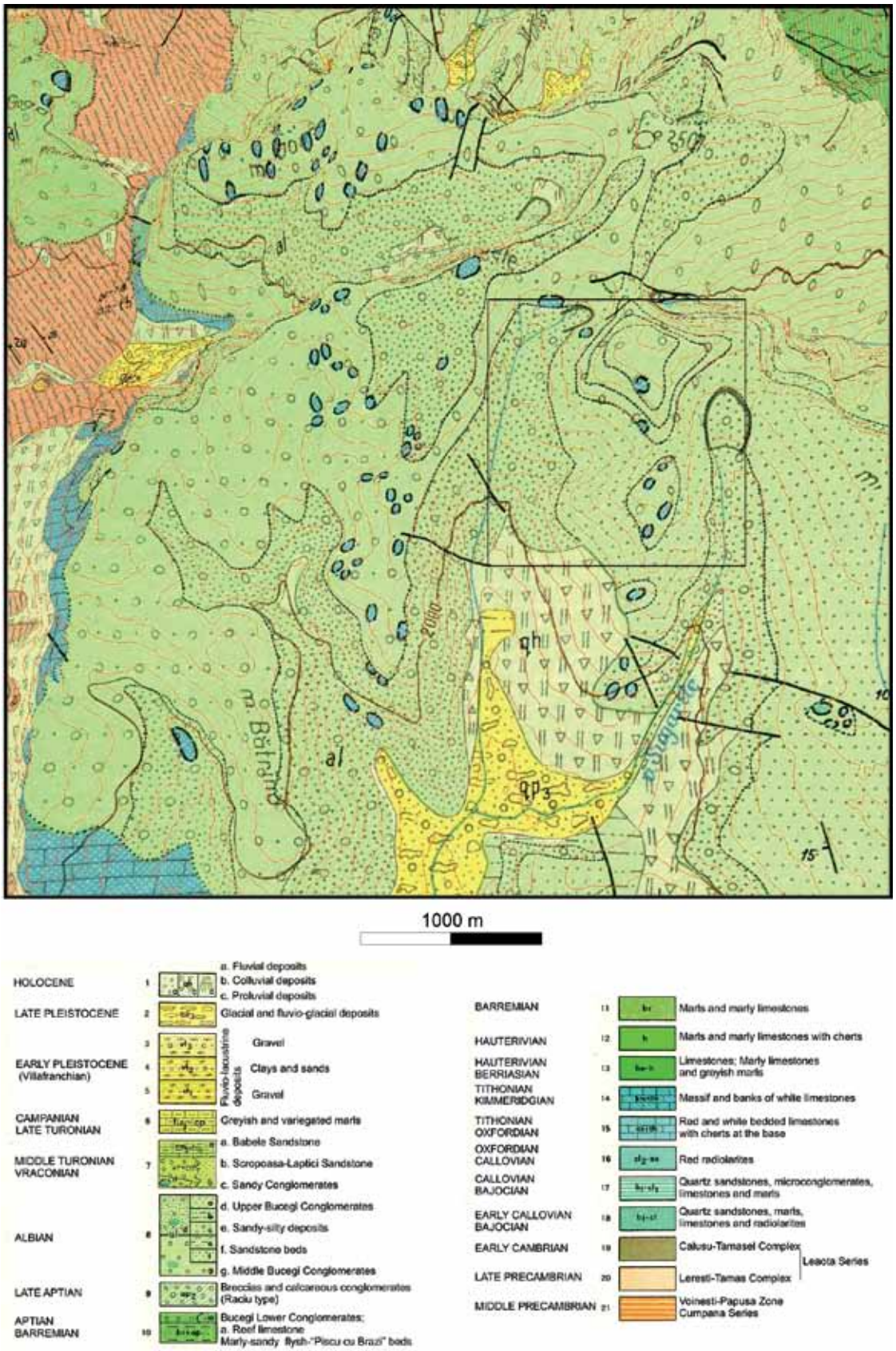

Fig 2. Study area location on the geological map of northern Bucegi Massif. From Patrulius *et al.* (1971) (geological map 1:50,000 scale, sheet 110D Moeciu). The geological map is draped on the 3D relief. Due to the perspective view, the graphic scale is approximate, mostly valid on the E-W direction.

In the lithostratigraphic column published by Murgeanu and Patrulius (1963) (Fig. 3), the upper part of the Albian Bucegi Formation is relatively finer-grained, with sandstones and microconglomerates. Patrulius (1969) described these deposits as the *Babele Sandstone*, which is the upper member of the Bucegi Formation (Fig. 4). The *Scropoasa-Lăptici Sandstone* is another sandy lithofacies unit from the Bucegi Massif, described by Patrulius (1969). Made of fine/silty sandstones with intercalated coarser-grained sandstone beds, the Scropoasa-Lăptici Sandstone unit occurs between the Middle and Upper Bucegi Conglomerates and thins out and disappears eastward (Fig. 4).

2.2. Tectonic features of the Albian deposits from the northern Bucegi Massif area

The Bucegi Formation represents the youngest Lower Cretaceous deposits of the Ceahlău Nappe unit. This is the main tectonic unit of the Outer Dacid Nappe System (Murgeanu *et al*., 1963; Dumitrescu and Săndulescu, 1968; Săndulescu, 1984), with a large spatial development.

The tectonic setting of the Bucegi Conglomerate Formation was outlined by Murgeanu and Patrulius (1963) and corroborated by Murgeanu *et al.* (1963) and Patrulius (1969). In their view, the Albian sedimentation in the Eastern Carpathian bend area (including the Bucegi Massif) developed during the Mesocretaceous tectonic movements. As Patrulius (1969) emphasized, since its early Aptian stage (end of the Bedoulian) up to its late Albian stage (pre-Vraconian), the Austrian Mesocretaceous diastrophism produced uplift and subsidence in different areas, and the emerged territory suffered strong erosion.

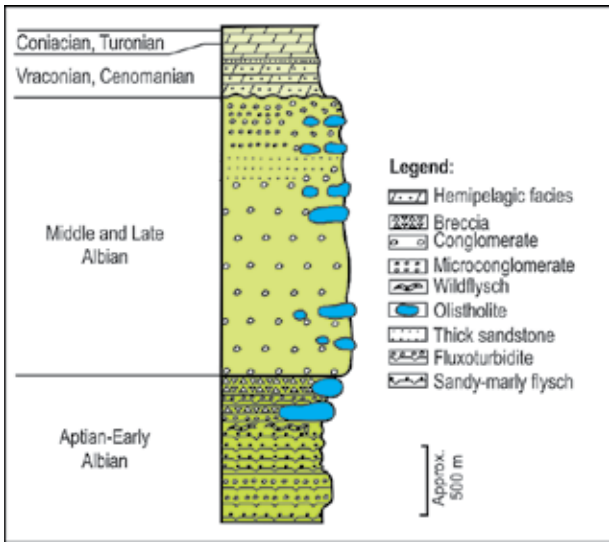

Fig. 3. Murgeanu *et al.* (1963) lithostratigraphic column of the Bucegi Conglomerates Formation. This is the first lithostratigraphic column of the entire conglomeratic accumulation from the Bucegi Massif.

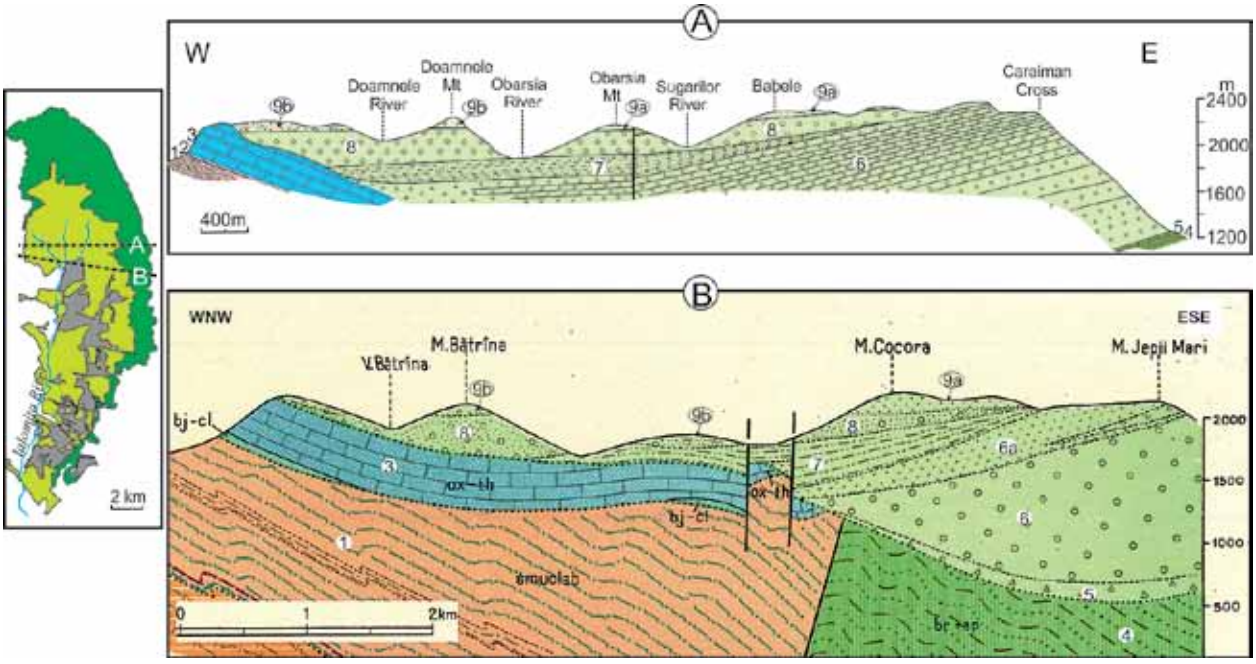

Fig. 4. Patrulius view on the Bucegi Conglomerates sedimentary architecture. **A.** Geological section in the northern part of the Bucegi Massif. Redrawn after Patrulius (1969). **B.** Geological section in the median part of the Bucegi Massif. From Patrulius *et al*. (1971). **Legend: 1.** Crystalline schists (smuclab = muscovite-chlorite schists with porphyroblastic albite). **2.** Middle Jurassic (Bajocian-Callovian). **3.** Upper Jurassic (Oxfordian-Tithonian). **4.** Aptian flysch. **5.** Raciu Breccia (Aptian). **6.** Middle Bucegi Conglomerates. **6a.** Sandstone facies. **7.** Scropoasa-Laptici Sandstone (Albian). **8.** Upper Bucegi Conglomerates and Costila conglomerates (Albian). **9a.** Babele Sandstone (Albian). **9b.** Sandstone-conglomeratic facies equivalent to Babele Sandstone (Albian). Location of the cross section lines on the index map (left).

Several longitudinal faults (in relation with the general north-south direction of the Albian deposits) from the high plateau and the eastern slope of the Bucegi, were mapped and described by Patrulius (1969) Massif. The Obârşia Mountain, the study area of the present paper, is crossed by the Jepi Valley Fault, originally identified by Oncescu (1943) and subsequently reconsidered by Patrulius (1969). This fault extends from the eastern slope of the Doamnele Mountain, continues through the south foot of the Obârşia Mountain, to the upper Jepi River (Fig. 5). Several short NNE to SW oriented faults are limiting the eastern extension of the Jepi Valley Fault.

In the southern part of Obârşia Mountain, a longitudinal fault with limited extension which crosses the Jepi Valley Fault was mapped out by Patrulius (1969). At the north extremity of the Obârşia Mountain, in the upper part of Cerbului River, Patrulius (1969) mapped two small faults (Obârşia Faults). A small graben is outlined between these faults.

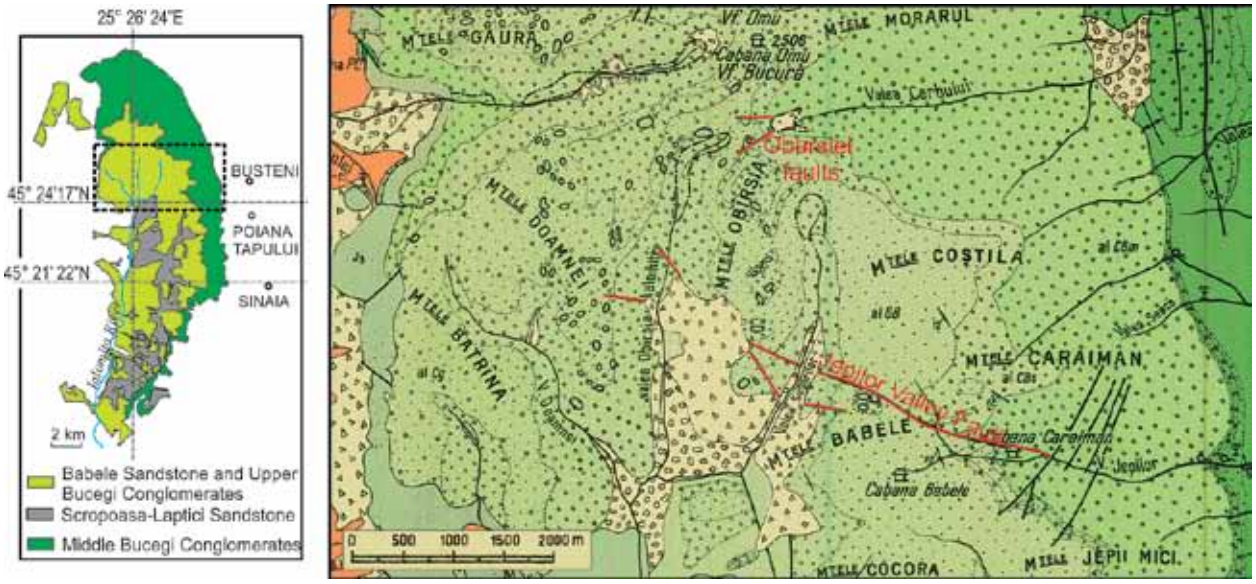

Fig. 5. The main fault lines affecting the Albian deposits in the Obârşia Mountain area (traced in red). Picture from the original geologic map by Patrulius (1969). **Legend**: **al Cbm** - Middle Bucegi Conglomerates. **al GB** - Babele Sandstone. **al Cg** - sandy conglomerates. The index map on the left (simplified Bucegi geological map, based on Patrulius, 1969) shows the location of area.

2.3. Geological map in the Obârşia Mountain area

In the initial stage (1948-1951) the entire mountainous massif was mapped by Patrulius (unpublished) at the 1:20,000 scale. When aerial photographs became available, in the 1960-1963 interval, Patrulius (1969) revised and completed the entire Bucegi Massif geologic map. In the Obârşia Mountain area, on the geological map of Patrulius (1969), the Babele Sandstone deposits are exposed on the mountain slopes, while the underlying Upper Bucegi Conglomerate deposits crop out along the Şugărilor and Obârşiei Rivers (Fig. 6).

On the two Obârşia Mountain summits, Patrulius (1969) mapped out conglomerates intercalated in deposits of the Babele Sandstone Member. These conglomerates, associated with olistoliths, were named "Obârşia-type conglomerates", and described in the book chapter (Patrulius, 1969) dealing with the Upper Bucegi Conglomerates.

Two levels of conglomerates are separated in the northern summit, *i.e.*, the Colţii Obârsiei Peak. The Obârşia-type conglomerates from the southern summit are mapped as a single body. Another conglomerate body was described south of the southern summit.

3. RESULTS

3.1. Lithostratigraphy

As illustrated by the panoramic view at the Obârşia Mountain slopes (Fig. 7), four conglomerate units associated with olistoliths are intercalated in the upper part of the Babele Sandstone Member. Visible on the satellite image (Fig. 8), the lower conglomerate unit (Unit 1) crops out at "La Cerdac" point (Fig. 9), evidenced as a 25 m high cliff. A 15-20 m thick series of sandstones and microconglomerates occurs between the conglomerate units 1 and 2. At the Colţii Obârşiei peak (the northern summit of the Obârşia Mountain), the units 2, 3 and 4 make up an amalgamated conglomerate succession, with no interbedded Babele Sandstone sediments (Fig. 9). In the area of the southern Obârşia summit, the conglomerate units 2, 3 and 4 occur as separate bodies, with consistent intercalations of Babele Sandstone deposits (Fig. 10). The conglomerate unit 1 was not identified in this area.

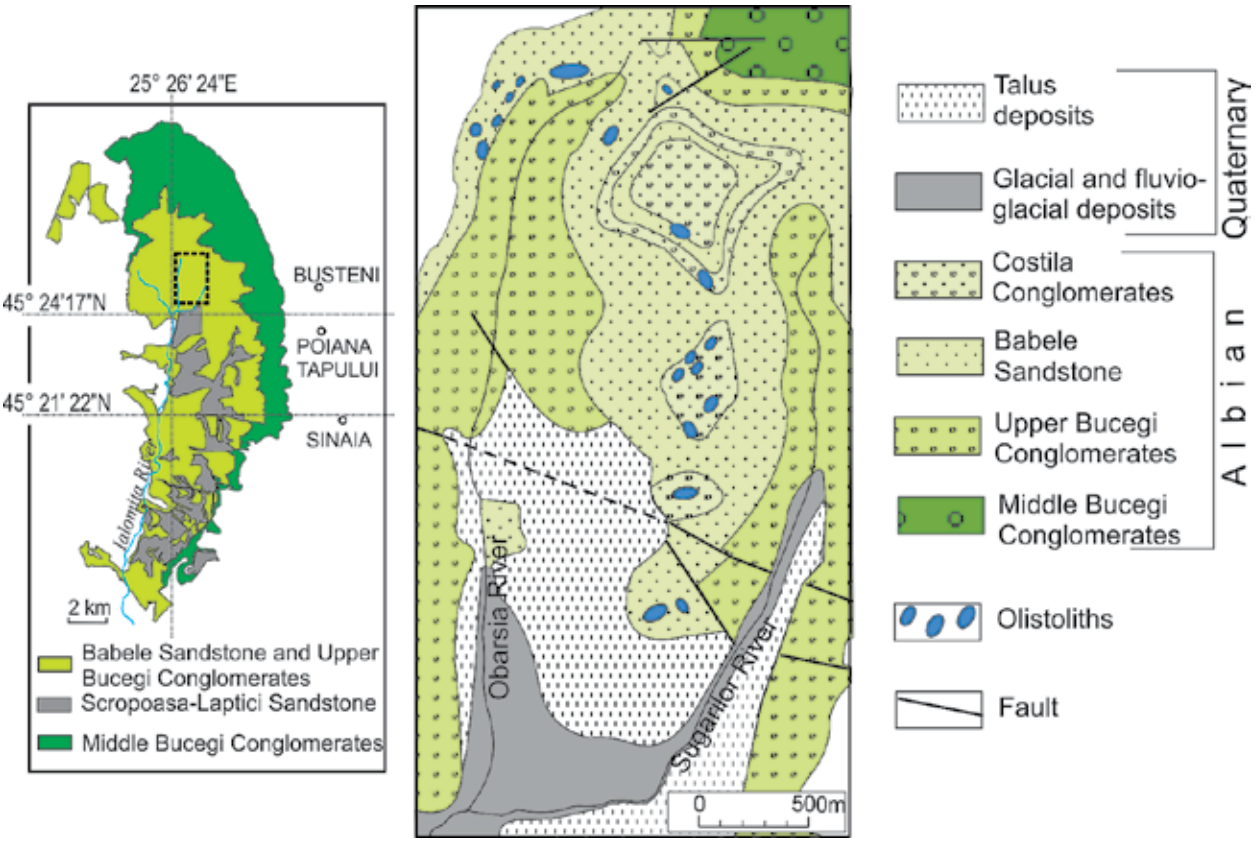

Fig. 6. Cartographic image of the Obârşia Mountain area, from the geological map of the Bucegi Mountains by Patrulius (1969). **Left** - Location of the Obârşia Mountain area, on the simplified geological map of the Bucegi Massif (based on Patrulius, 1969)

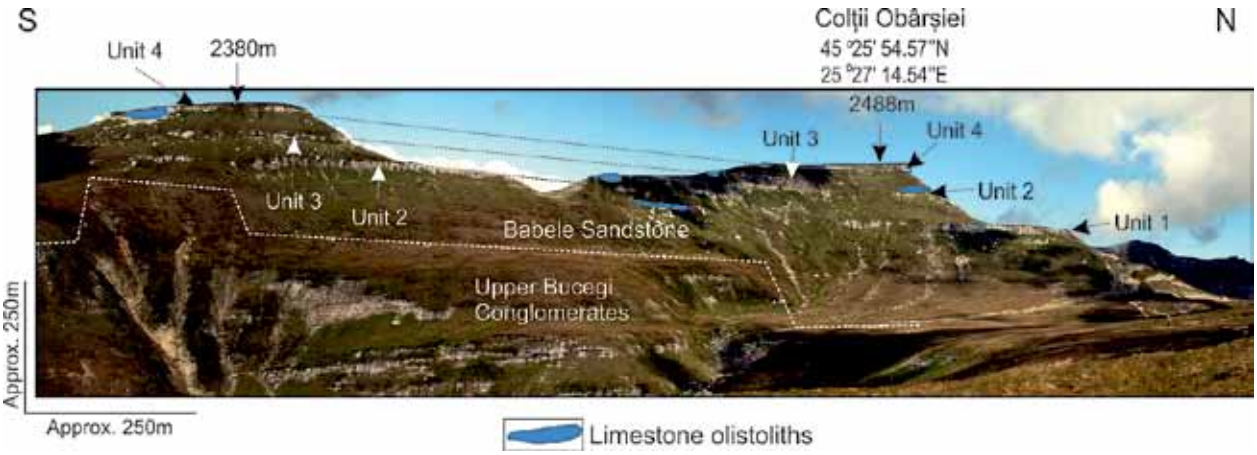

Fig. 7. Conglomerate units (1 to 4) associated with olistoliths, intercalated in the Babele Sandstone Member. View at the eastern side of the Obârşia Mountain, from the tourist path Babele-Omu.

The conglomerates forming the four units series have a poorly sorted, coarse to medium-grained texture (Fig. 11). The sandy matrix is abundant. Large clasts of more than 10 cm diameter and relatively small olistoliths (up to 10-15 m in size) are embedded in the conglomerate mass (Figs. 9 and 10). The conglomerate units 1 and 2 show individual fining upward trend (Fig. 12). At the lower part of the units, there are coarse-grained, massive conglomerates. Well-bedded, very coarse-grained sandstones occur at the top of the fining upward beds. The transition is gradual. The conglomerate units are 15 to 25 m thick. Their thickness is difficult to determine and most likely is variable. Only the conglomerate unit 1, at "La Cerdac" location (Fig. 9), clearly shows the top and bottom limits, and its thickness was correctly determined (26 m). Usually, the conglomerate unit boundaries are covered (Fig. 10), with only the upper boundary exposed. Poorly cropping out, the Babele Sandstone sediments, which occur between the conglomerate units, consist of medium and coarse-grained sandstones and micro-conglomerates, with cross and flat lamination (Fig. 13).

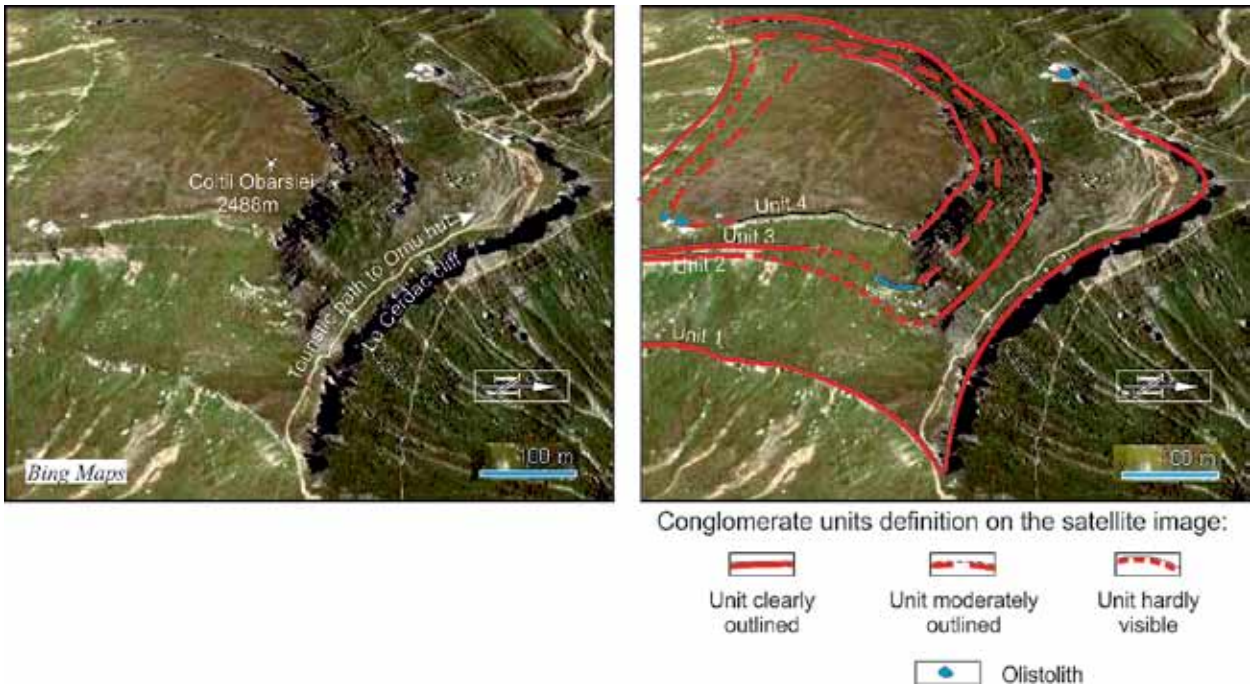

Fig. 8. Upper Albian conglomerate units associated with olistoliths in the northern part of the Obârşia Mountain. **Left** - blank Bing Maps aerial image. **Right**- conglomerate units outcrop lines traced on the aerial image.

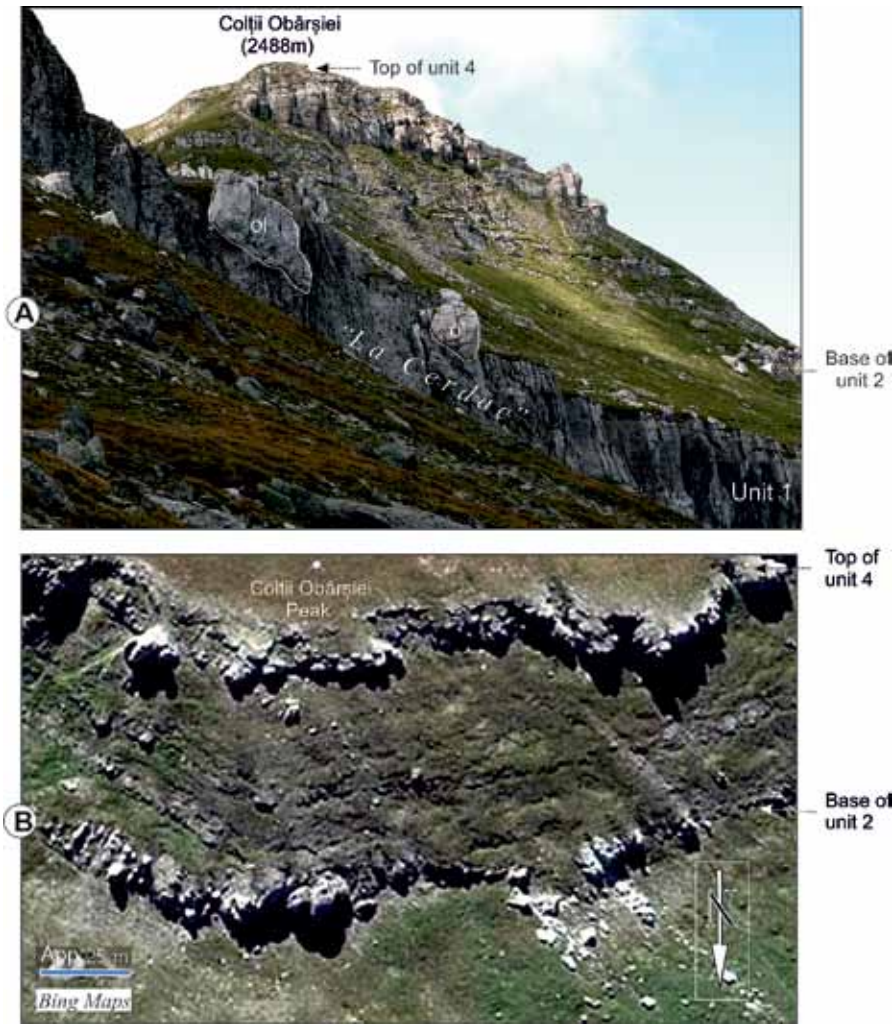

Fig.9. Conglomerate units succession at the north summit of the Obârşia Mountain. **A** - Photograph at the La Cerdac point (foreground), a 26 m high cliff representing the Unit 1 outcrop. Two small olistoliths appear in the picture (ol). The series of the conglomerate units 2, 3 and 4 is visible in the background. **B** - Aerial photograph (from Bing Maps imagery) showing the continuous conglomerate succession between the units 2 and 4. Large clasts and small olistoliths are visible at the base and the top of the succession.

◂ **Fig. 10.** Conglomerate units 2, 3 and 4 at the southern summit of the Obârşia Mountain identified on satellite image (**A**) and in photograph (**B**). Babele Sandstone deposits (**BS**) occur between the three conglomerate units. The upper picture - Bing Map satellite image.

▾ **Fig. 11.** Textural aspects of the conglomerate units from the Obârşia Mountain area (Albian). **A** - Unit 1 conglomerates, at "La Cerdac" point. **B** - Unit 2 conglomerates, close to Colţii Obârşiei Peak. **C** - Abundant sandy matrix in the Unit 3 conglomerates, south summit of the Obârşia Mountain. **D** - Large clast in the Unit 4 conglomerates, at the south summit of the Obârşia Mountain.

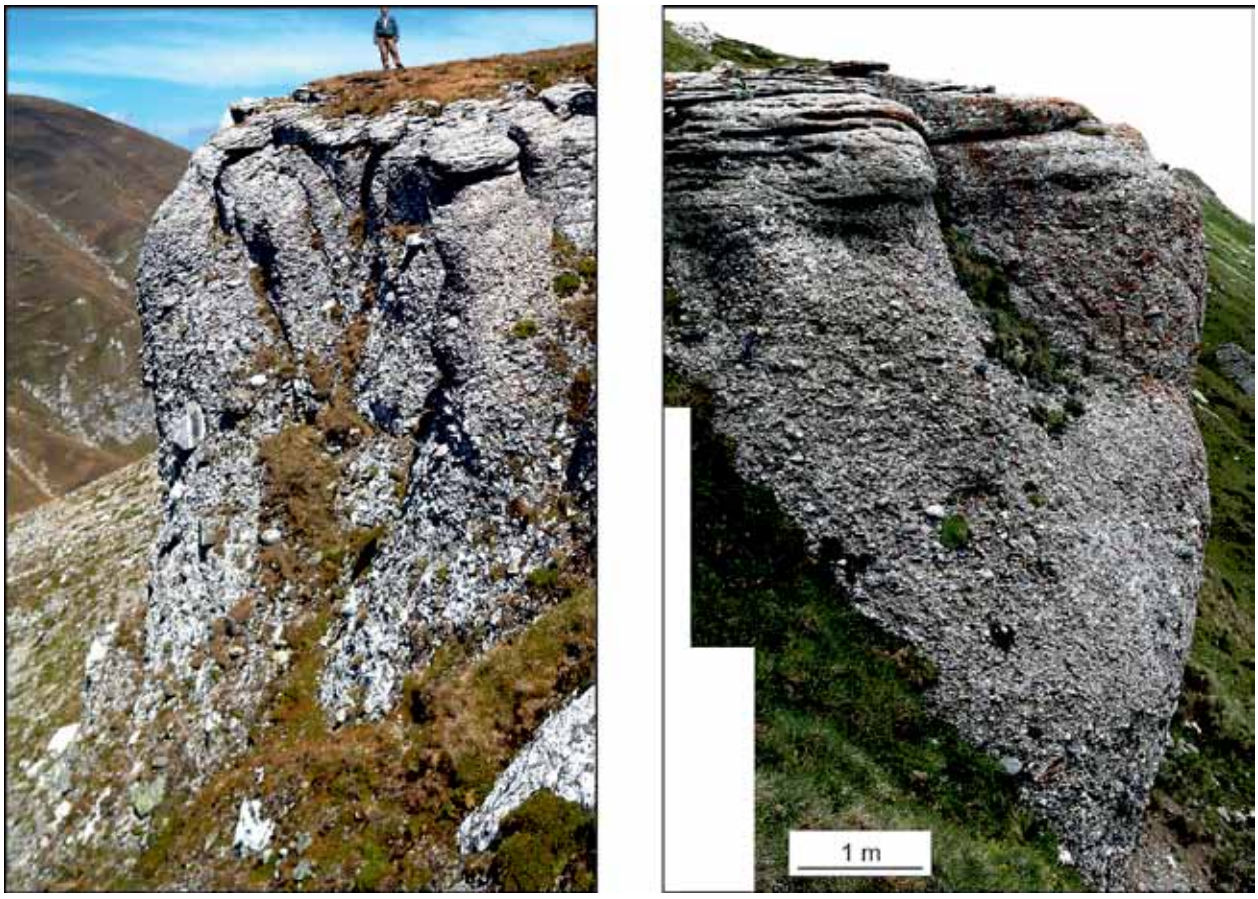

Fig. 12. Fining upward conglomerate beds, evolving from massive rudites to bedded sandstone. **Left** - Unit 1, cropping out in the saddle area between Obârşia and Cerbului rivers. **Right** - Unit 2 conglomerates, western side of the Sugarilor River.

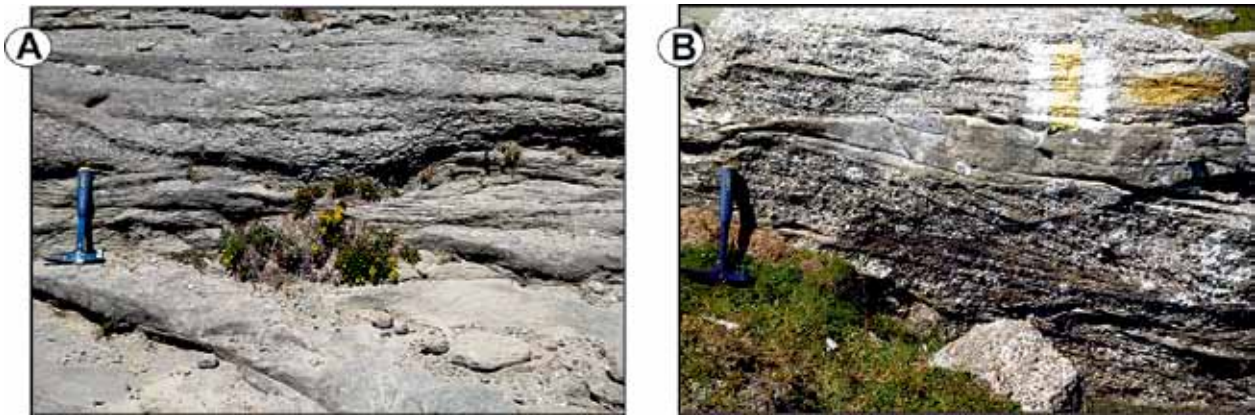

Fig 13. Sandstones and micro-conglomerates with current structures (Babele Sandstone, Albian) occurring below and between the conglomerate units 1 and 2. **A** - Microconglomerates filling a small channel, cut into middle to coarse-grained sandstones. Sediments occurring under the Unit 1 conglomerates. Tourist path to Omu chalet, at "La Cerdac" point. **B** - Medium-scale cross laminated microconglomerates with a lens-shaped sandstone body, covering Unit 1 conglomerates. "La Cerdac" point.

3.2. Detailed geological mapping

The mapping of the conglomerate units discussed in the present paper was carried out in the area of the two topography summits of the Obârşia Mountain (2488 m and 2385 m high). The outcrop lines of the conglomerate beds are roughly concentric around these heights (Fig. 14).

The outcrop condition of the mapped conglomerate beds is dominantly good or very good, but there are also sites with poor exposure or no outcrops. For a good evaluation of the conglomerate unit cartographic image, the outcrop quality is indicated on the geological map by symbols showing three degrees of confidence (Fig. 14). The high confidence symbol reflects good outcrop coverage of the conglomerate units and very good aerial image information. Poor outcrop condition or only modest satellite image information are indicated by the moderate confidence sign. The low confidence symbol applies to the absence of data, when the conglomerate beds were tentatively extended on the map between two known points. The field outcrop survey together with satellite images examination (from the Bing Map imagery) (Figs. 8 and 10) indicate that the conglomerates occur as stratiform and continuous units. The conglomerate bodies do not show significant thickness and grain-size variations across the mapped area. Unlike the conglomerate units 2, 3 and 4, which extend through all the studied area, the conglomerate unit 1 shows considerably smaller extension. This basal unit was traced only in the northeastern part of the Obârşia

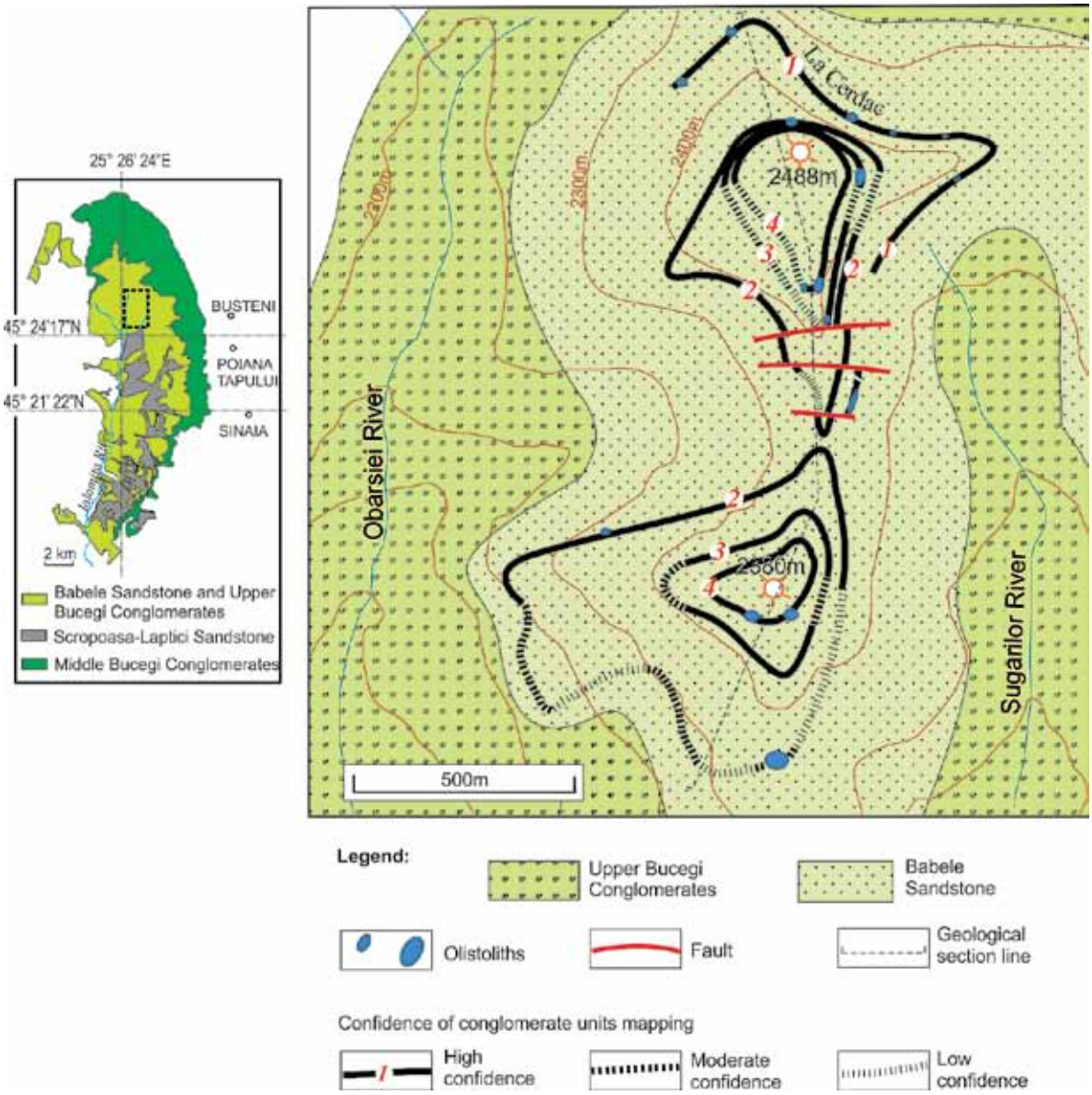

Fig. 14. Detailed geologic map of the stratiform conglomerate units intercalated in the Babele Sandstone deposits (Albian). Obârşia Mountain area, Bucegi Massif. The geological boundary between the Upper Bucegi Conglomerates and the Babele Sandstone after Patrulius (1969), with amendments. The index map on the left (simplified Bucegi geological map, based on Patrulius, 1969) shows the location of the map area. The conglomerate units are marked as 1 (lower unit), 2, 3 and 4 (upper unit).

Mountain, west and south-east of the "La Cerdac" cliff (Fig. 14). The cartographic image (Fig. 14) confirms the compact packing of the conglomerate units 2, 3 and 4, without interbedded sandy deposits, in the Colții Obârșiei Peak area. Thick Babele Sandstone deposits occur between the conglomerate units 2, 3 and 4, a fact well documented by the geologic map (Fig. 14). As it is visible from the geologic cross section (Fig. 15), the conglomerate units are part of a monoclinal in the investigation area, with a southward 6-8° apparent slope (general bed slope is around 20° according to Patrulius, 1969). The cross section shows the areal continuity of the conglomerate units 2, 3 and 4 and the southward appearance of Babele Sandstone deposits between the conglomerate entities.

3.3. Tectonics

The conglomerate units system in the Obârșia Mountain area displays a simple structural architecture. No plastic deformation was revealed, but faulting is rather common, and some of the faults affect the conglomerates units setting. On the Obârșia crest, between the two summits, direct observations and aerial or photographic images reveal fault deformation of the conglomerate units 2 and 3 (Fig.16). Three fault lines (F1, F2 and F3), with E-W or ENE-WSW trend, were mapped out. The amount of fault vertical displacement appears to be in the 15-20 m range, according to direct observations (Fig. 16).

Other faults, with similar small vertical displacement, affect older deposits from the study area, showing that faulting was probably postdepositional. Faults were detected at the boundary between the Upper Bucegi Conglomerates and the Babele Sandstone, two members of the Bucegi Formation.

4. DISCUSSION

4.1. The Albian Bucegi Conglomerates succession in terms of the IUGS stratigraphy nomenclature

Initially outlined by Murgeanu and Patrulius (1963), the complete conglomeratic succession from the Bucegi Massif was presented by Patrulius (1969). The best information on this succession comes from the published geological cross sections (Patrulius, 1969, and Patrulius *et al*., 1971) (Fig. 4).

Observing the names coined by Murgeanu and Patrulius (1963) and Patrulius (1969), in this paper we review the Bucegi Massif conglomeratic succession, according to the standards recommended by the International Subcommission on Stratigraphic Classification of IUGS (Murphy M. A. and Salvador, A., Eds., 1999) (Fig. 17).

The lithology of the Bucegi Massif conglomeratic mass is quite different, compared with the underlying Aptian sandy-marly flysch and the overlying Vraconian marls. Accordingly, this Upper Aptian – Albian succession can be considered a formation, in keeping with the International Stratigraphic Guide (Murphy M. A. and Salvador, A., Eds., 1999).

As demonstrated by Murgeanu and Patrulius (1963) and Patrulius (1969), the *Bucegi Conglomerates Formation* includes several major lithologic units, which are the component members of this formation. In these terms the Upper Aptian - Albian sedimentary architecture in the northern part of the Bucegi Massif is expressed by the succession of the following lithostratigraphic units (Fig. 17):

1. *Lower Bucegi Conglomerates Member*, the basal unit of the Bucegi Formation, represents an Upper Aptian conglomerate facies;
2. *Middle Bucegi Conglomerates Member* refers to a very powerful sedimentary accumulation (reaching 1200 m thickness), with a southward thinning trend;
3. *Scropoasa – Laptici Sandstone Member* is the finest-grained lithostratigraphic unit of the Bucegi Formation;

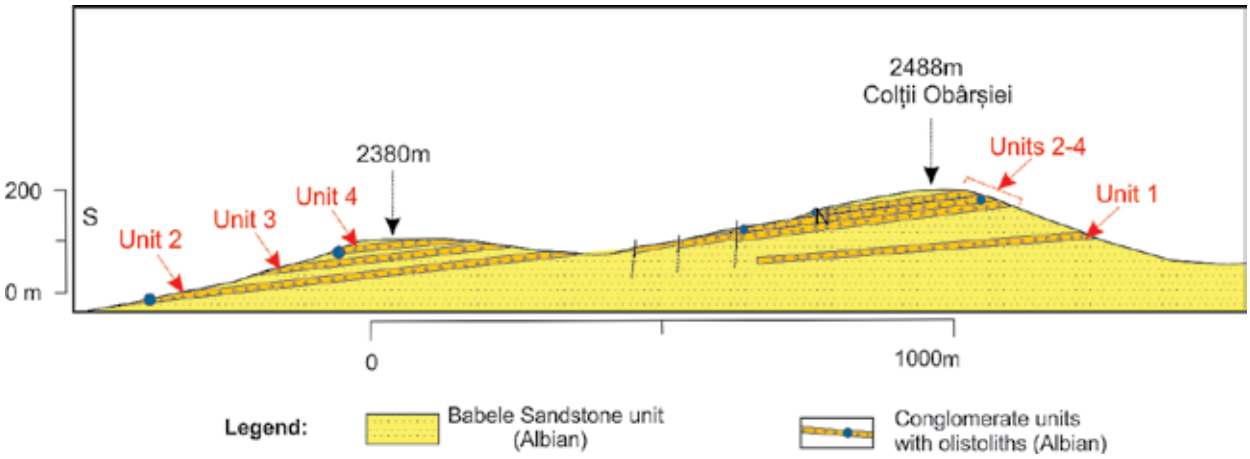

Fig. 15. Geological section showing the conglomerate units intercalated in Babele Sandstone deposits from Obârșia Mountain. The thickness of the conglomerate beds ranges from 15 to 25 m.

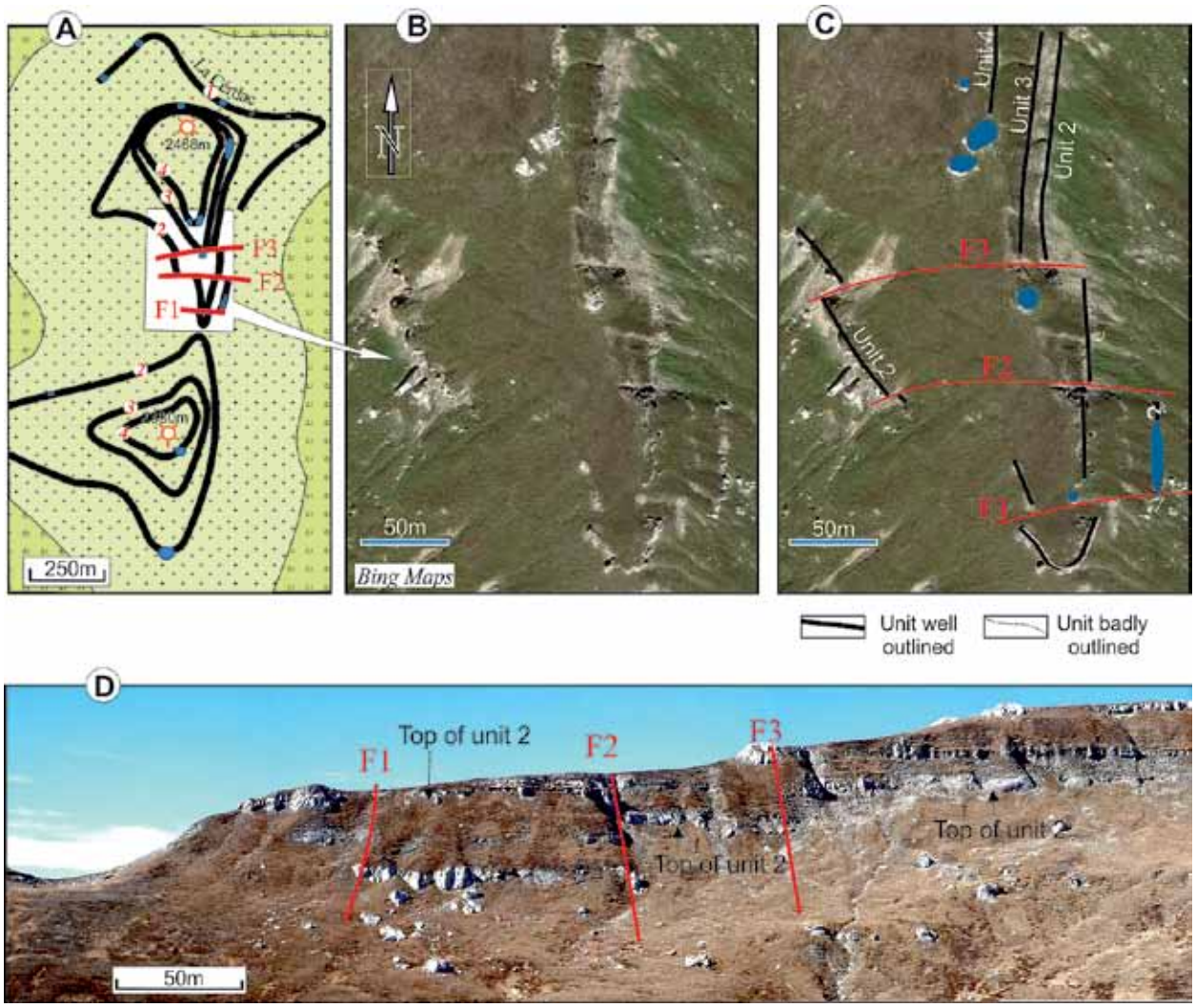

Fig. 16. The fault system affecting the conglomerate beds, on the crest of the Obârşia Mountain. **A**. Faults area location on the geological map. **B**. Blank aerial image of the faults area (from Bing Maps). **C**. Conglomerate units (and associated olistoliths) and the faults lines, edited on the aerial image. **D**. The fault lines F1, F2 and F3 marked out on the photograph of the east side of the Obârşia ridge.

in the northern and eastern parts of the Bucegi Massif it fails to occur;

4. *Upper Bucegi Conglomerates Member* refers to a several hundred meter thick body, becoming much thinner eastward;

5. *Babele Sandstone Member* represents the top part of the Bucegi Albian succession. Without a stratigraphic overlay, in the northern part of the Bucegi Massif the thickness of this unit is evaluated at no more than 200 m by Patrulius (1969) and Patrulius *et al*. (1971) (Fig. 4).

The IUGS recommended terminology is not in favor of using the terms upper and lower for the formal lithostratigraphic units. This appears to be in contradiction with the terminology of the Bucegi Formation members. The terms Lower, Middle and Upper Bucegi Conglomerates are local lithologic names given by Murgeanu and Patrulius (1963), which are in use since more than half a century. The attempt to change these names would have created serious disturbance for the students of the Eastern Carpathians Cretaceous stratigraphy.

4.2. The mapped conglomerate beds – a new lithostratigraphic unit of the Bucegi Formation

The investigations carried out during the present study outline a subsidiary conglomeratic stratigraphic unit, of at least 50 m thickness, at the upper part of the Babele Sandstone Member. According to nomenclature of the International Stratigraphic Guide (Murphy M. A. and Salvador, A., Eds., 1999), the four conglomerate bodies of this subsidiary unit will be named "beds", representing smaller rank lithostratigraphic units included in the Babele Sandstone Member (Fig. 17).

The Bed 1 to Bed 4 series stands for the uppermost strata of the Albian Bucegi Formation. The occurrence of this conglomerate accumulation, associated with olistoliths, grants

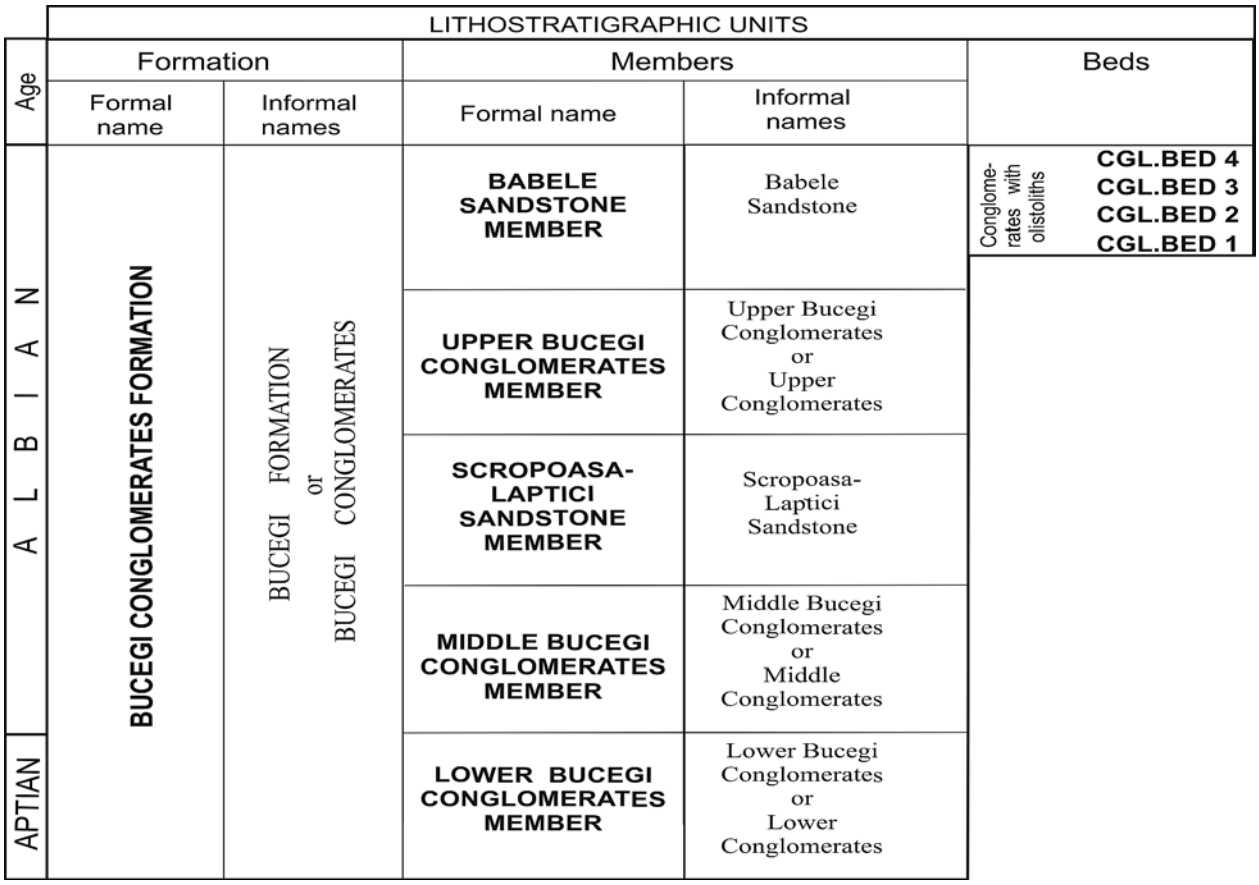

Fig. 17. Lithostratigraphic hierarchy and terminology of the conglomeratic Albian deposits in the Bucegi Massif area (Eastern Carpathians), in terms of the IUGS stratigraphy nomenclature. This stratigraphic scheme uses the well-established lithologic units names given by Murgeanu and Patrulius (1963), and Patrulius (1969).

a special genetic significance to the northern Babele Sandstone Member, as compared to the sediment accumulation of the same unit in the center and southern part of the massif.

4.4. Correlation of the conglomerate units

The geological mapping required rigorous identification of the individual conglomerate units. The units 1 and 4 were usually easy to recognize, as they make the bottom and the top of the conglomerate succession. When they are in direct contact and the cropping out conditions are poor, identification of the units 2 and 3 presents some difficulties. Sedimentary features can be used to overcome the problems.

The conglomerate unit 2 is characteristically fining upward, with continuous transition (Fig. 18A). The conglomerate unit 3 is not graded and shows thin sandstone intercalations (Fig. 18B). The difference is consistent enough to serve for outcrop identification of the two units. The use of these criteria is illustrated by the setting shown in Figure 18C, where the unit 2 directly overlaids the unit 3. The limit between the two conglomerate bodies is marked by the sandstone occurrence, representing the top of the fining upward conglomerate unit 2, while the overlying conglomerate unit 3 shows stratification and no grain-size grading.

4.5. Large-scale genetic features of the conglomerate units

The geological mapping and its stratigraphic architecture made evident two important characteristics, of high genetic significance for the Obârşia conglomerate units.

The first genetic significant feature is the restricted areal extension of the conglomerate unit 1 and the bypassing of this lower unit by the other three, upper units (Figs. 14 and 15). This is a large scale sedimentary feature documented by field work combined with satellite image examination.

Our investigations evidenced that the direct superposition of the three conglomerate units (2, 3 and 4), visible in the northern area (Figs. 9, 14 and 15), is laterally substituted with the alternation of the conglomerate units with finer-grained (dominantly sandy) deposits (Figs. 10, 14 and 15). This is the second large-scale characteristic of the conglomerate units assemblage.

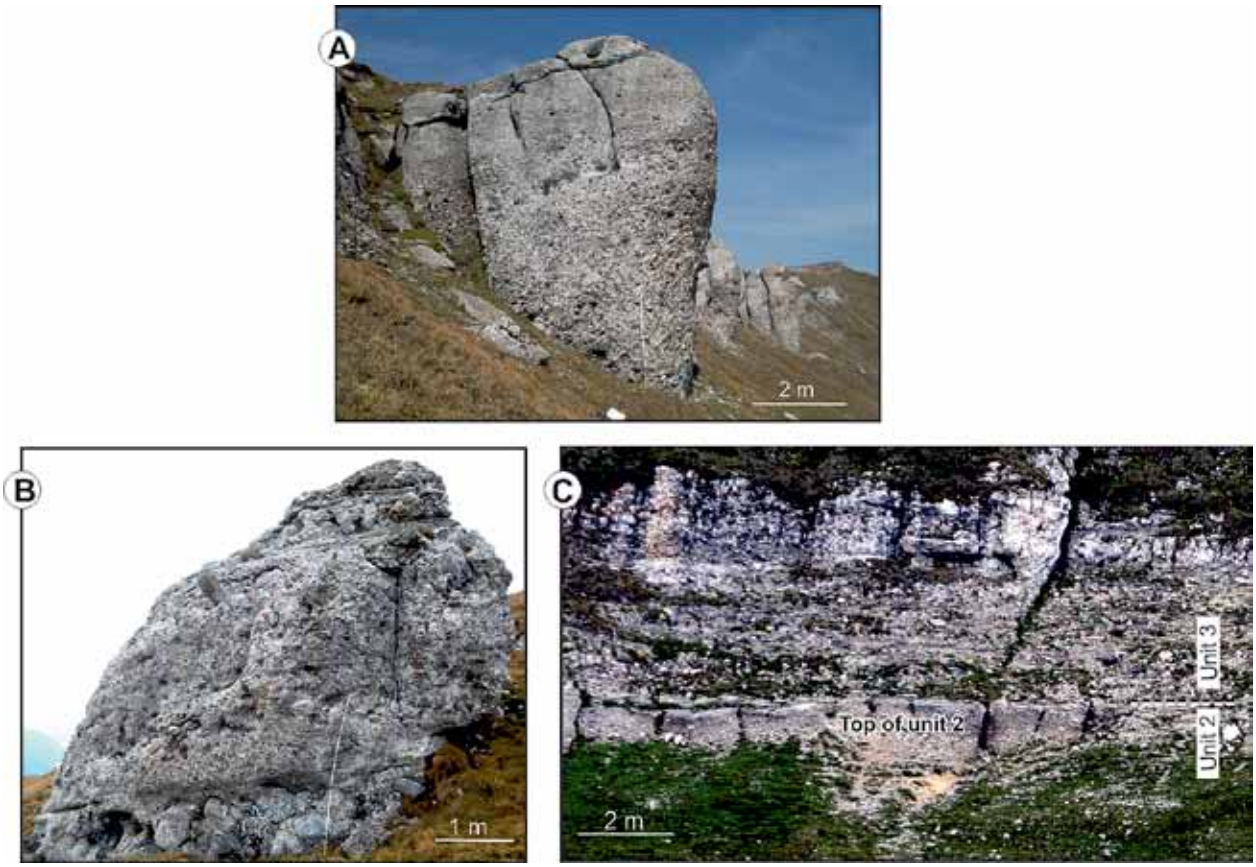

Fig. 18. Facies features used as criteria for the conglomerate unit correlation in the Obârşia Mountain area. **A**. Unit 2 is fining upward. Its top sandstone part is stratified and makes extensive and characteristic outcrops. South Obârşia Mountain, eastern side. **B**. Unit 3 shows internal bedding, with thin sandstone intercalations, and is not graded. South Obârşia Mountain, eastern side. **C**. Separation between Unit 2 and the overlying Unit 3 is based on the identification of the sandstone occurring at the top of the fining upward Unit 2. Northern part of Obârşia Mountain, the eastern side.

5. CONCLUSIONS

The Albian conglomerate deposits of the Obârşia Mountain area (northern Bucegi Massif) have been subjected to detailed field-work. The goal of the study was to investigate the stratigraphic and tectonic features of the series of four conglomerates associated with olistoliths, intercalated at the upper part of the Babele Sandstone Member, the youngest lithostratigraphic unit of the Bucegi Conglomerates Formation. The sedimentologic interpretation of the conglomerate units will be dealt with in a forthcoming study.

The four layered conglomerate bodies define a distinct lithostratigraphic assemblage. According to their stratigraphic position, the conglomerate units (also named 'beds" according to the IUGS stratigraphy nomenclature) are the uppermost strata of the thick conglomerate accumulation of the Bucegi Formation. The occurrence of the conglomerate beds conveys a special genetic meaning to the northern part of the Babele Sandstone sediment accumulation, in relationship with its finer-grained equivalent in the central and southern Bucegi Massif area.

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