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5. TECTONICĂ ȘI GEOLOGIE REGIONALĂ

RELATIONSHIPS BETWEEN SEDIMENTARY DEPOSITS AND ERUPTIVE ROCKS IN THE CONSUL UNIT (NORTH DOBROGEA) – IMPLICATIONS ON TECTONIC INTERPRETATIONS [1]

by

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Limestone. Rhyolites. Basalts. Tuff. Lava flows. Igneous activity. Bimodal magmatism. Structural analysis. Folds. Cleavage. Tectogenesis. Dobrogea — North Dobrogea — Tulcea and Consul-Niculițel zone.

Abstract

In the Consul Unit of North Dobrogea, the Lower Triassic deep water limestones and the eruptive rocks assembled into a single formation (Somova Formation) revealed spatial relations and structural geometry accounting for a two-phase deformational history. The Lower Triassic (Spathian) carbonate rocks are represented by debrites, turbidites and pelagites. The felsic volcanic rocks, except some tuffites and tuffs are effusive in nature (massive, perlitic, fluidal and breccious rhyolites). Their emplacement took place after the deposition of the main mass of calcareous sediments but before their lithification, in subaqueous environment. The mafic eruptive rocks are either interbedded in the sedimentary deposits (as basaltic lava flows, tuffs and tuffites) or as intrusive bodies in the limestones and rhyolites. This magmatism was partly subsequent to the rhyolitic volcanism and they formed together a bimodal system during the Lower Triassic. The sedimentary deposits and the eruptive rocks of the Somova Formation were folded together in two deformational phases. The first event (B_1) (Early Kimmerian) is characterized by a tight folding along the main structural trend of North Dobrogea (NW—SE); the second event (B_2), post-Liassic in age, generated symmetrical E—W trending folds. The combination of these two structural elements resulted in a characteristic structure of dome and basin type.

Résumé

Relations entre les dépots sédimentaires et les roches éruptives de l'unité de Consul (Dobrogea du Nord) — implications sur les interprétations tectoniques. L'ouvrage apporte des précisions portant sur la nature des dépôts sédimentaires et des roches éruptives (Formation de

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Somova), les relations spatiales entre ceux-ci et les déformations tectoniques qui les ont affectées. Les dépôts sédimentaires, principalement carbonatés, d'âge spathien comportent des turbidites, des débrites et des pélagites. Les volcanites acides, excepté certaines intercalations de tuffites de la partie supérieure des calcaires ainsi que des tufs à la limite, sont de nature effusive (rhyolites à textures perlitiques, fluidales et bréchiques en base, rhyolites massives). Leur mise en place s'est produite après le dépôt des sédiments calcaires et avant leur lithification dans des conditions subaquatiques. Les roches éruptives basiques sont soit intercalées dans les dépôts sédimentaires (coulées de laves, tufs), soit traversent les calcaires et les rhyolites (corps éruptifs), en attestant un magmatisme basique qui s'est produit bien avant ou après le volcanisme rhyolitique, dans le cadre d'un système bimodal, pendant le Trias inférieur. Les dépôts sédimentaires et les roches éruptives de la Formation de Somova sont plissés ensemble durant les deux phases déformationnelles. La première (B_1), d'âge kimmérien ancien, se caractérise par un plissement serré (plis déversés et plis-écaille) en concordance à la direction principale des structures nord-dobrogéennes (NV—SE) ; la deuxième (B_2) probablement postliasique, a engendré des plis symétriques orientés EV. De leur jonction a résulté une structure caractéristique de type dômes et bassins.

1. Introduction

The time-space relationships between felsic and mafic igneous rocks and associated sedimentary deposits is one of the key problems for understanding the geological structure of the Consul Unit. This problem was approached by most of the previous researchers of the Consul Unit (Murgoci, 1914 ; Savul, 1935 ; Mirăuță, Mirăuță, 1962 ; Mirăuță, 1966 ; Stiopol et al., 1975 ; Constantinescu et al., 1978, 1981, 1983 ; Vîlceanu et al., 1980 ; Manea et al., 1983 ; Baltres et al., 1984 ; Berbeleac et al., 1985 ; Nedelcu et al., 1986). In spite of the intense investigation and progress in geological knowledge of this area, various problems, mainly connected to the emplacement of rhyolites and basalts, volcanological and genetic aspects and their relations with sedimentary deposits remained partly unsolved. This is fairly due to the complex structure, which is difficult to decipher, as is shown on the previous geological maps.

The relationships between the rhyolites and the Triassic limestones of the Consul Unit are dependent on the interpretation of emplacement mode of rhyolites. Accepting the intrusive nature of rhyolites, they are implicitly subsequent to limestones (Murgoci, 1914 ; Ştefan, in Berbeleac et al., 1985, and in Nedelcu et al., 1986). The hypotheses supporting the effusive (and, possibly, partly intrusive) and/or ignimbritic nature of rhyolites regard them as interlayered in the pile of the Triassic deposits (Savul, 1935 ; Stiopol et al.. 1975 ; Constantinescu et al., 1978, 1981, 1982 ; Caraveţeanu, in Vîlceanu et al., 1980, and in Manea et al., 1983 ; Baltres et al., 1984).

The effusive nature of rhyolites implies their emplacement prior to the tectonic deformations. Their pre- or postdeformational position is not clear in the hypotheses supporting the subvolcanic nature of these rocks, as results from the interpretations of the geological profiles in the Consul Unit belonging to the mentioned authors.

This paper intends to provide additional information concerning these problems, based on the synthesis of all field data and mainly on the detailed geological mapping of the area between Valea Teilor and Iulia, carried out for the elaboration of the geological maps, scale 1 : 50,000, sheets Priopcea and Cataloi (Seghedi et al., 1985, 1986; Mirăuţă et al., 1986).

2. Geological Setting

The Consul Unit is an Alpine tectonic unit, bordered to the west by the Luncaviţa-Consul line and to the east by the Valea Teilor-Iulia line; these lines separate the Consul Unit from the Măcin Unit to the west and from the Niculiţel Unit to the east, respectively (Mirăuţă, in Patrulius et al., 1973). According to the structural interpretations of North Dobrogea, the Consul and Niculiţel units are considered by some authors as digitations of a unique tectonic unit, regarded as a nappe (Patrulius et al., 1973; Săndulescu, 1984).

The Consul Unit consists of carbonate rocks (debrites, turbidites, pelagites) and subordinately sandstones, rhyolitic and basaltic volcanics, all constituting the Somova Formation (Baltres, 1982; Baltres, in Baltres, Mirăuţă, 1987, earlier designed as the Consul Formation by Baltres, in Baltres et al., 1984). The Somova Formation has a large areal development in the Tulcea Unit, where the type locality was established.

The Somova Formation in the Consul Unit commonly overlies low grade metamorphic rocks of the Boclugea Group. At Iulia terrigenous deposits (sandstones and polymictic conglomerates), known from outcrops and subsurface, underlie the Somova Formation. These detrital deposits were assigned to the Bogza Formation (Griesbachian i.e. early Lower Triassic) developed in the Tulcea Unit (Baltres, in Baltres, Mirăuţă, 1987).

The Somova Formation was deposited during the Spathian (late Lower Triassic). This age is proved by a foraminifera assemblage containing *Meandrospira iulia* (Premoli Silva), *M. dieneri* Kristan-Tollmann and *Glomospira silensis* Dager (Baltres, in Baltres, Mirăuţă, 1987). Conodonts point to the same stratigraphic interval, although several Lower Anisian species have been also found (Mirăuţă, in Seghedi et al., 1986).

2.1. *Carbonate Rocks*

The limestones of the Somova Formation are usually banded due to the interlayering of black limestone beds and subordinate black shales. Occurrences of thick argillaceous limestones or marls are uncommon. Typical of these deposits are thick calcirudite beds, more frequent in the upper part of the sedimentary pile.

The thickness of the deposits is difficult to appreciate due to tectonic complications and to deformation of unconsolidated sediments by downslope sliding. These structures are often responsible for the abrupt changes in dip of the beds in drill cores. In the Consul Hill, the limestone thickness attains 500 m, while in the borehole 5-Iulia the formation exceeds 1,600 metres. The dip of the beds ranges between 20 and 80°.

The limestones of the Somova Formation are deep water debrites, turbidites and pelagites, each of these implying specific transport and sedimentation mechanisms.

The debrites represent coarse grained, resedimented accumulations. They constitute the lower parts of the graded sequences, showing commonly slow or abrupt transition to calcarenites.

The calcarenitic turbidites occur as beds up to ten centimetres thick, consisting of complete or incomplete Bouma sequences. The calcisiltite and calcilutite turbidites are more frequent, consisting of graded and laminated sequences (E_1 and E_2 Piper sequences).

The pelagites are slowly accumulated interturbiditic aphanitic limestones, often intensely reworked by bioturbation. Some pelagites, accumulated under reducing conditions, contain framboidal sedimentary pyrite.

The deep water limestones of the Somova Formation are clinothems, emplaced by sedimentary mechanisms implying essentially gravitational transport pocesses. They built up the continental rise or slope in the Lower Triassic sea.

2.2. *Igneous Rocks*

Rhyolites. The largest and most varied rhyolitic occurrences associated with carbonatic deposits of North Dobrogea are known in the Consul Unit. They occur as tuffites, tuffs and lava flows.

1) The beginning of the Triassic volcanic activity (Consul Hill, Coasta Păşunii) is indicated by the presence of several, centimetric or decimetric, rhyolitic tuffite interbeds at the top of the limestone pile. These consist of a mixture of igneous clasts (weakly devitrified and slightly sericitised volcanic glass, alkali feldspar, plagioclase and quartz crystalloclasts) and carbonatic material (recrystallised lithoclasts). In some coarse tuffites small metamorphic quartz and granite clasts were found. The grain size is variable, from fine to coarse psammite; the amount of volcanic material is variable.

2) In the vicinity of the limestone-rhyolite boundary (Consul Hill, Coasta Păşunii Hill, south of Lozova Hill), the main volcanic body contains metric rhyolitic tuff beds. The tuffs consist of clasts of glass, crystals, and crystalloclasts and pumice within a fine grained, devitrified rhyolitic groundmass. Sometimes they show a slight grading (Consul Hill, Coasta Păşunii Hill). The grain-size range of the tuffs is 2–3 mm. The features described are typical of ash fall tuffs.

The tuffs occurring on the southern slope of the Eschibalik Hill are apparently massive, showing inhomogeneous groundmass and oriented structure, with features suggesting advanced welding; they can be interpreted as ash flow tuffs. Their genesis may be assimilated with ignimbrite-forming processes, but lack of typical vesiculation and of glass shards suggest a subaqueous depositional environment (Fisher, Schminke, 1984).

3) The main rhyolitic body presents various textural-structural features, including massive, perlitic, brecciated and fluidal aspects. The perlitic, brecciated and fluidal structures are typical only of the basal parts of the rhyolites overlying the limestones, while most of the eruptions show a massive structure. The massive rhyolites show a more pronounced porphyritic texture. The phenocrysts are of alkali feldspar (partly albitized), quartz and plagioclase. The presence of chlorite and opaque minerals with

hexagonal outlines suggests the initial presence of a femic mineral, probably biotite. Accessory minerals are represented by zircon, sphene and apatite. The former glassy or microgranular groundmass is always devitrified. The perlitic and brecciated structural varieties show a strong secondary chloritization. All these features strongly suggest an effusive facies for most of the rhyolites, in agreement with the observations of Savul (1935). Association with tuffs , the large areal extent, the lack of any thermal and/or metasomatic contact phenomena in limestones (perhaps the most intriguing features for the previous researchers) are additional arguments for the effusive origin of most rhyolites of the Consul Unit.

Ignimbrites showing typical features of pyroclastic flow deposits occur south-east of the Consul Hill, in the vicinity of Mihai Bravu and Nicolae Bălcescu. As opposed to the rhyolites in the Lozova and Consul Hills, they are associated with Lower Triassic (Griesbachian) and Permian (?) terrigenous deposits (Mirăuţă, in Szász et al., 1981).

Mafic rocks Starting northward from the Malciu Hill, the calcareous deposits of the Consul Unit are associated with basaltic rocks, which occur either as lava flows and tuffs, or as dykes and irregular bodies.

1) Lava flows are interbedded with limestones. The rocks have a greenish colour and show aphanitic, seldom slightly porphyritic texture. The intersertal or subophitic texture are typical. In thin sections these rocks consist of plagioclase, clinopyroxene (altered to calcite, serpentinic minerals and chlorite), opaque minerals and chloritized glass. In the Malciu Hill, the rocks contain calcite or chalcedony filled vacuoles.

The thin beds (centimetric and decimetric) of basic tuffs and tuffites interbedded with limestones consist of albitized plagioclase fragments, pyroxenes (altered to epidote, chlorite, clay minerals) and a variable amount of terrigenous clasts (quartz, quartzites, carbonates).

2) Mafic rocks within dyke (on the left bank of the Pirlita Creek) generally strike N 35 – 70° . Within sills (S. l..na Creek) and dykes textural variations occur. Usually the rocks have ophitic or intergranular texture and massive structure. Their crystallinity is more pronounced compared to the effusive basalts ; rocks consist mainly of plagioclase, clinopyroxenes and opaque minerals and show various degrees of secondary transformations. Sometimes small amounts of chloritized glass are present.

An intrusive body on the northern slope of the Malciu Hill pierces both limestones and rhyolites and slightly alters them. The rock is holocrystalline, showing intergranular texture and massive structure. It consists of plagioclase feldspars and pyroxenes, transformed into serpentinic minerals and chlorite. The rock may be considered dolerite or microgabbro.

3. Relationships between Eruptive Rocks and Sedimentary Deposits

Excepting tuffites, interbedded at the top of the limestone sequence, most rhyolites overlie the Lower Triassic carbonatic deposits. This relationship is constantly seen along the boundary between limestones and rhyolites in the Lozova, Coasta Păşunii and Consul Hills. In outcrop, the rhyolite/limestone boundary is a sharp, slightly irregular contact surface (Pl. III, Fig. 1). Sometimes it is marked by dissolution voids (Pl. III, Fig. 1).

The aphanitic or porphyritic rhyolites with flow structure (western slope of the Lozova and Consul Hills) show significant aspects regarding their relationships with the limestones. Usually there is a concordance between the flow structure of basal rhyolites and limestone bedding (Pl. II, Figs. 1, 2; Pl. III, Fig. 2). The rock structure, its low crystallinity and the presence of perlites (Pl. II, Fig. 3), indicating rapid cooling, suggest subaqueous conditions for the emplacement of the rhyolitic flow. The perlitic parts represent the outer crust of the flow, quenched in contact with water, subsequently disrupted and included in the main flow mass. This explains also the lack of thermal and metasomatic phenomena in limestones next to the rhyolites.

In Coasta Pășunii Hill, detailed observations revealed an inhomogeneous mixture between the rhyolitic and carbonatic material, within a thin band of about 15–20 cm in thickness at the contact. At the boundary with the rhyolitic rock the limestone shows a slight recrystallisation band a few millimeters thick. This peculiar feature indicates that rhyolite emplacement took place soon after the deposition of the carbonatic material and before sediment lithification. The rhyolites next to the limestones may sometimes contain tiny limestone fragments.

Piercing relations of limestones by rhyolites have not been noticed. The limestones have never been found to overlie the main rhyolitic body. Apparent overlying of rhyolites by limestones or repeated interlayering of rhyolites with limestones are exclusively the result of folding.

The above observations suggest that most rhyolites constitute a single important effusive episode, with subaqueous consolidation of the acid volcanic material.

Field relations between limestones and mafic rocks indicate at least two moments for the emplacement of the latter. The basaltic volcanics (lava flows), basic tuffs and tuffites interbedded with limestones have been emplaced prior to or possibly synchronous with the beginning of the acid volcanic activity. The presence of centimetric clasts of basalts, reworked in the limestones from the western slope of the Lozova Creek (in the vicinity of the Malciu Hill, Mirăuță, in Patrulius et al., 1974; Mirăuță, in Seghedi et al., 1986) may be correlated with this moment or possibly with a previous effusive moment. The microscopic basalt xenoliths within the rhyolites from the Malciu Hill lead to the same conclusion.

The dolerite dykes and bodies show evidence for emplacement after the deposition of the main limestone sequence and even after the emplacement of the rhyolite flows (Malciu Hill) (Savul, 1935).

The synthesis of the petrographic features of the acid and mafic volcanics and their relationships with the sedimentary deposits suggest several volcanological considerations regarding the eruptive rocks of the Consul Unit.

The beginning of the volcanic activity is related to the deposition of the Griesbachian detrital deposits (at Mihai-Bravu, Nicolae Bălcescu). This activity produced typical ignimbrites, attesting a subaerial explosive volcanism.

The presence of the Spathian basaltic lava flows, tuffs and tuffites, as well as of rhyolitic tuffites, interbedded in the deep water calcareous sequence near the limestone-rhyolite boundary, suggests an initially quasi-synchronous manifestation of a mafic, effusive-explosive and of a felsic, explosive volcanism. The local occurrence of air fall or pyroclastic flow tuffs at the same level and the rhyolite-limestone field relations strongly point to the manifestation of an initially explosive, subsequently effusive subaqueous felsic volcanism, simultaneous with and subsequent to the deposition of the last carbonatic sequences of the Somova Formation. The quasi-simultaneity and spatial association of the mafic and felsic eruptive activity suggest a bimodal magmatism in the Consul Unit, previously supposed by Savu (1986). .

4. Structural Elements

The deciphering of the geological structure of the Consul Unit is based on observations regarding the nature and cartographic pattern of the rhyolite-limestone boundary, as well as on the observation of the structural elements, especially the axial plane cleavage of the folds, affecting limestones, rhyolites and basalts. Field evidence points to the presence of two generations of structural elements, suggesting two folding events successive in time and different in style, which affected the Somova Formation.

1. The first folding phase (B_1) produced overturned folds and small scale thrusts with NW–SE trends. This folding is accompanied by the development of axial plane cleavages in the hinge zones of the main folds, affecting especially the limestones and, in a lower degree, the rhyolites (Mirăuţă, 1960) (Pl. VI, Fig. 2) due to their different response to stress. A more pronounced plasticity and mobility of the limestones favoured their piercing in anticlinal fold cores (see geological sections, Pl. I) while rhyolites tend to occur in syncline cores, due to their lower plasticity and higher stratigraphic level : in a few cases, the rhyolites cover the limestones in the anticline hinges (Consului Mare Peak, Lozova Hill).

In the hinge zones, the angle between bedding and cleavage (S_0/S_1) ranges between 55–80° (Pl. V, Fig. 1). It is rarely below 30°, due to the folding of the initial bedding of limestones by gravitational folds. The frequency and distribution of the axial plane cleavages in limestones is highly variable, according to the competence of rocks. Thick sequences of calcirudites show penetrative cleavages only in fold axes (Pl. V, Fig. 2). The cleavage planes are curved and sometimes anastomozing, spaced at 5–15 cm (Pl. IV, Fig. 1). Argillaceous limestones show a more pronounced planar, parallel cleavage, seldom anastomozing (Pl. VII, Fig. 1), developed evenly throughout the folds. In this case, the spacing of the cleavage planes ranges between a few millimeters and a few centimeters. The thin calcarenitic beds interbedded in calcirudites or in argillaceous limestones form asymmetrical microfolds, associated with the main folds, with wavelengths ranging between 0,5–3 m (Pl. VII, Figs. 1, 2 ; Pl. VIII, Fig. 1). Rhyolites rarely show penetrative cleavages, which are usually spaced, rough, accompanied by chlorite and sericite recrystallisation. Cleavage refraction is common at the boundary between tuffites and limestones in the northern and western parts of the Consul Hill.

At least three axes of major folds of this folding system, with a wavelength of about 500 m, were identified. The direction of the axial planes ranges between 145–170°, dipping 75–90° to SW. Reverse dips occur on the eastern slope of the Consul Hill. The main folds are accompanied by overturned folds and minor thrusts, reaching meters or tens of meters in size (Pl. VIII, Fig. 2).

All these features reveal a tight folding of the Somova Formation, as a consequence of strong compressions. The maximum compression zone was attained in the Consul Hill, where the tightest folding occurs. Drilling operations in the iron ore accumulation area at Iulia revealed the presence of rhyolites at depths up to 300 m. In good agreement with field observations, this situation suggests a complex structure of the Consul Unit, including overturned folds and high-angle reverse faults (Baltres, in Baltres et al., 1984).

The main folds (B_1) resulted during the first folding event have the same structural trend (NW–SE) as the entire fold belt of North Dobrogea. The consequence of this folding was the reduction in initial width of the Consul Unit by at least three times. The present maximum width of this area does not exceed 2 km.

2. The existence of a second folding event is suggested by the highly irregular pattern of the limestone-rhyolite boundary, showing pinching and swelling along an E–W trend (Pl. I). Detailed outcrop observations revealed structural elements of a later folding phase, subsequent to that responsible for the development of the NW–SE trending axial plane cleavage. The second folding (B_2) refolds the axial plane cleavages of the main folds (Pl. IX, Figs. 1, 2) ; in some outcrops (Consul Hill, Lozova Hill), a second, crenulation cleavage (S_2) develops, associated to this folding of kink type. The (S_2) cleavages have E–W trends and steep dips to the N or S.

These observations suggest that the second generation folds are open, symmetrical folds, with wavelengths of about 1 km. It is supposed that the intensity of this folding event was lower, having, however, important implications within the Alpine fold belt of North Dobrogea. The angle between the axial planes of the two generations of folds range between 45–60° (Pl. IX, Figs. 1, 2, 3). The interference of these two generations of folds resulted in a dome and basin structural pattern of the Triassic deposits in the Consul Unit.

5. Discussion

The presence of two generations of folds affecting the Triassic deposits in the Consul Unit raises the problem of timing of these deformational events.

The first deformation, connected to the development of the main thrusts in North Dobrogea, is considered Early Kimmerian (Mirăuță, 1966 ; Săndulescu, 1984). In the Tulcea Unit, the Mesozoic formations are involved also in two tectogeneses, the second folding being assigned to the Late Kimmerian (intra-Neocomian) or Mesocretaceous events (Săndulescu, 1984). The preservation of the Early Kimmerian structural trends (NW—SE) during the second folding is implicitly accepted. E—W structural trends are known in the Măcin Unit of North Dobrogea, belonging to a main Variscan event (Seghedi, 1985, 1986). E—W trending folds of the Mesozoic deposits occur on some maps of the Tulcea Unit (Mirăuță et al., 1985). The cartographic pattern of the various formations and tectonic units in North Dobrogea suggest that Mesozoic formations of the Tulcea Unit, including Lower-Middle Jurassic deposits, are also involved into this second folding event, subsequent to the Early Kimmerian phase. These considerations indicate a certain post-Triassic, highly probably post-Liassic age of the second folding which affects the Mesozoic rocks of the Consul Unit. Further investigations on the tectonic style of the Mesozoic deposits in different units of North Dobrogea will possibly provide additional information concerning this problem.

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RELAŢIILE DINTRE DEPOZITELE SEDIMENTARE ŞI ROCILE ERUPTIVE DIN UNITATEA DE CONSUL (DOBROGEA DE NORD) — IMPLICAŢII ASUPRA INTERPRETĂRILOR TECTONICE

(Rezumat)

Lucrarea aduce precizări privind natura depozitelor sedimentare şi rocilor eruptive din alcătuirea formaţiunii de Somova, asupra relaţiilor spaţiale dintre ele şi asupra deformărilor tectonice, care le-au afectat.

Unitatea de Consul este o entitate tectonică alpină, separată la vest de unitatea de Măcin prin linia tectonică Luncaviţa-Consul, iar la est, de unitatea de Niculiţel prin linia Valea Teilor-Iulia. Este alcătuită esenţial din depozite carbonatice, roci eruptive acide şi bazice, constituind împreună formaţiunea de Somova (Baltres, 1982 ; Baltres et al., 1984 ; Baltres, Mirăuţă, 1987).

Depozitele sedimentare, în esenţă carbonatice, sînt reprezentate, din punct de vedere sedimentologic, prin turbidite, debrite şi pelagite. Ele au construit taluzul de la baza pantei continentale a mării triasice inferioare.

Vulcanitele acide, cu excepţia unor intercalaţii de tufite de la partea superioară a calcarelor şi a unor tufuri la limită, sînt de natură efuzivă (riolite cu texturi perlitice, fluidale şi brecioase în bază, riolite masive în rest). Riolitele, alcătuind în esenţă o singură venire, stau în relaţii de superpoziţie faţă de calcare. Din relaţia cu depozitele carbonatice reiese punerea în loc a marii mase de riolite după sedimentarea calcarelor şi înaintea litificării lor, în condiţii subacvatice. Rocile eruptive bazice sînt fie intercalate în depozitele sedimentare (curgeri de lavă, tufuri), fie străbat atît calcarele, cît şi riolitele (corpuri, dyke-uri, silluri), atestînd un magmatism bazic desfăşurat în parte anterior, în parte ulterior vulcanismului riolitic, în cadrul unui sistem bimodal, în cursul Triasicului inferior.

Depozitele sedimentare şi rocile eruptive din formaţiunea de Somova sînt cutate împreună în două faze deformaţionale. Prima (B_1), de vîrstă chimerică veche, se caracterizează prin generarea de cute deversate şi

cute-solzi, cu planele axiale orientate NV–SE. Cutele se evidenţiază prin dezvoltarea accentuată a clivajului plan-axial în zonele de şarnieră ale cutelor majore, afectînd în special calcarele şi mai puţin riolitele, datorită comportării diferite la efortul tectonic. Au fost identificate trei axe de cută majore ale acestui sistem plicativ, cu o lungime de undă de cca 500 m. Ele sînt însoţite pe flancuri de cute deversate şi cute-solzi minore, avînd dimensiuni de ordinul metrilor şi zecilor de metri (pl. VIII, fig. 2).

Cea de a doua fază de cutare (B_2) se manifestă prin cutarea clivajului plan-axial anterior (cute kink) sau prin generarea unui clivaj plan-axial propriu, avînd orientarea aproximativ E–V. Ea a generat cute largi, simetrice, cu lungimea de undă de cca 1 km. Din îmbinarea celor două elemente structurale (B_1 şi B_2) rezultă o structură caracteristică de tip domuri şi bazine. Cea de a doua cutare (B_2) este probabil postliasică; cu toate că a avut o amploare mai redusă, implicaţiile ei se resimt la scara orogenului nord-dobrogean.

EXPLANATION OF PLATES

Plate II

Fig. 1 — Porphyritic rhyolite showing fluidal structure ; Lozova Hill.

Fig. 2. — Glassy rhyolite showing fluidal structure and flow microfolds ; sample from the Lozova Hill.

Fig. 3 — Perlitic rhyolite ; Lozova Hill ; N//, 40 ×.

Fig. 4. — Rhyolite showing a breccious texture ; Lozova Hill ; N//, 40 ×.

Plate III

Fig. 1 — Contact between rhyolites (1) and limestones (2) marked by dissolution voids ; Lozova Hill.

Fig. 2 — Contact between rhyolites and limestones ; (1) massive rhyolites, (2) fluidal rhyolites, (3) limestones ; Lozova Hill.

Plate IV

Fig. 1 — Axial plane cleavage (S_1) in calcirudites ; Lozova Hill.

Fig. 2 — Anastomosed cleavage (S_1) in calcirudites ; Consul Hill.

Plate V

Fig. 1 — Relationship between bedding (S_0) and axial plane cleavage (S_1) in an anticline hinge of folded limestones ; Lozova Hill.

Fig. 2 — Relationship between bedding (S_0) and axial plane cleavage (S_1) in the hinge of a minor overturned anticlinal fold. Note the penetrative cleavage in calcirudites (at the top) only in the fold axis ; Coasta Păşunii Hill.

Plate VI

Fig. 1 — Relationship between bedding (S_0) and axial plane cleavage (S_1) in an alternation of calcirudites and limestones. Overturned limb of an anticlinal fold. Note the different character of the cleavage in calcirudites and argillaceous limestones; south-eastern slope of the Consul Hill.

Fig. 2 — Hinge of a major anticline with limestones (1) below, and rhyolites (2) above, in the Consul Peak. Note the relationship between bedding and axial plane cleavage within limestones.

Plate VII

Fig. 1 — General aspect of the B_1 folding in an overturned aticline limb with largely developed axial plane cleavage in argillaceous limestones (1) and asymmetrical overturned microfolds in calcirudites (2); northern slope of the Consul Hill.

Fig. 2. — Minor overturned B_1 folds in the base of the northern slope of the Consul Hill.

Plate VIII

Fig. 1 — B_1 microfolds in calcarenites; northern slope of the Consul Hill.

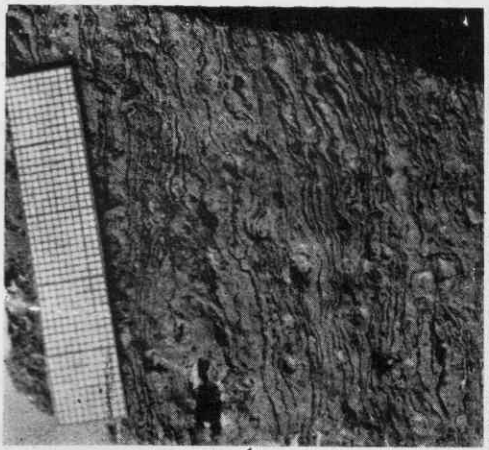
Fig. 2 — B_1 minor thrust at the foot of the northern slope of the Consul Hill.

Plate IX

Fig. 1 — Folded (B_2) axial plane cleavage (S_1) in argillaceous limestones. The hammer indicates the direction of the S_2 microfold axes; Consul Hill.

Fig. 2 — Kink microfolds (B_2) of the S_1 cleavages in limestones; Lozova Hill.

Fig. 3 — Axial plane cleavage (S_1) in limestones, refolded by B_2 folds; western side of the Lozova Creek, in front of the Malciu Hill.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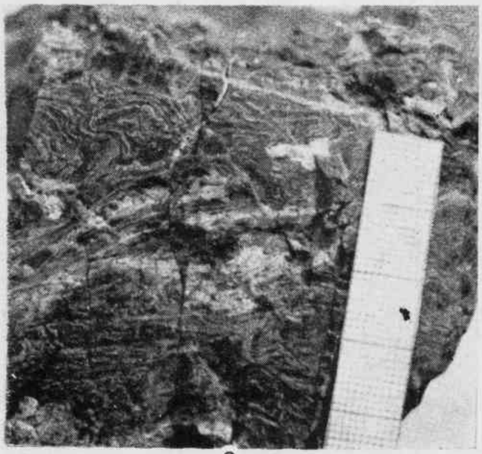
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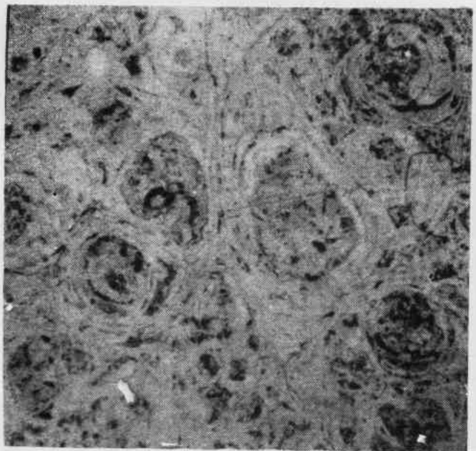
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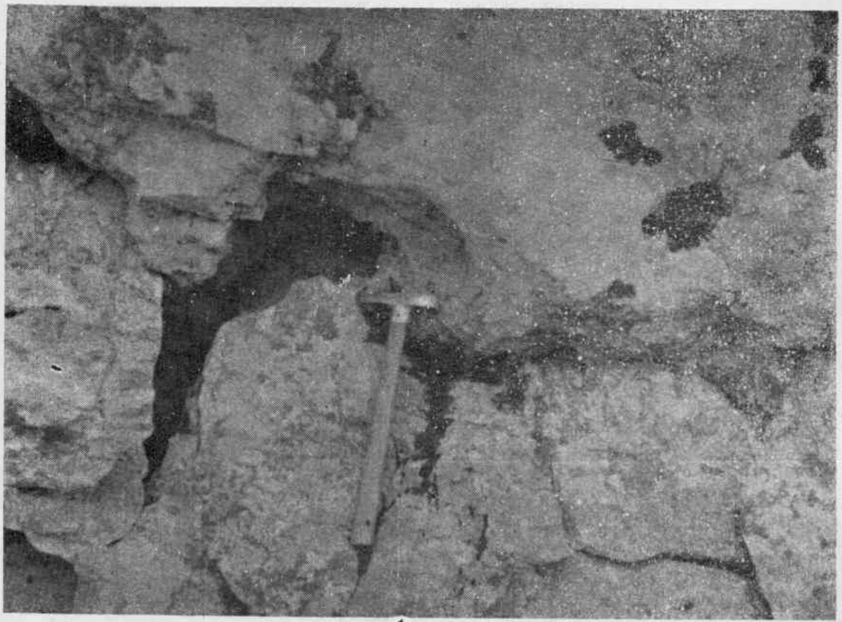

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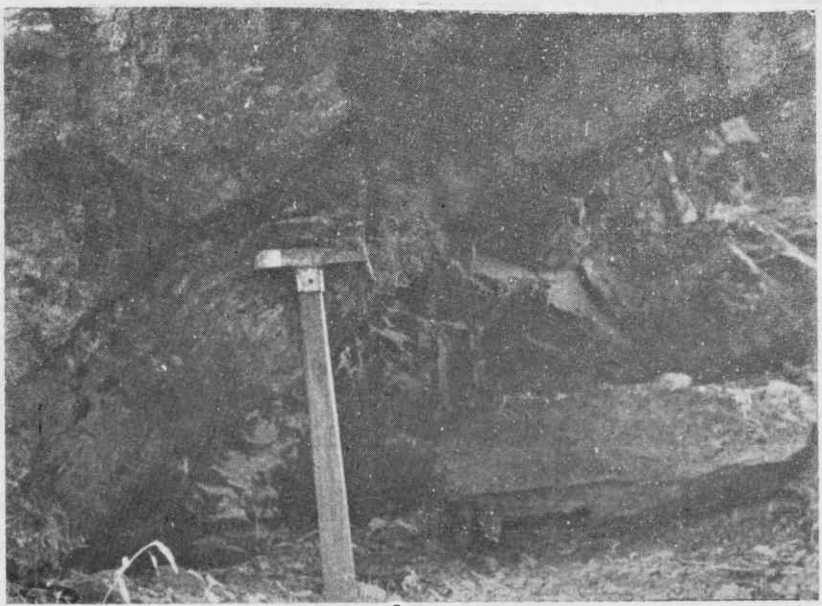

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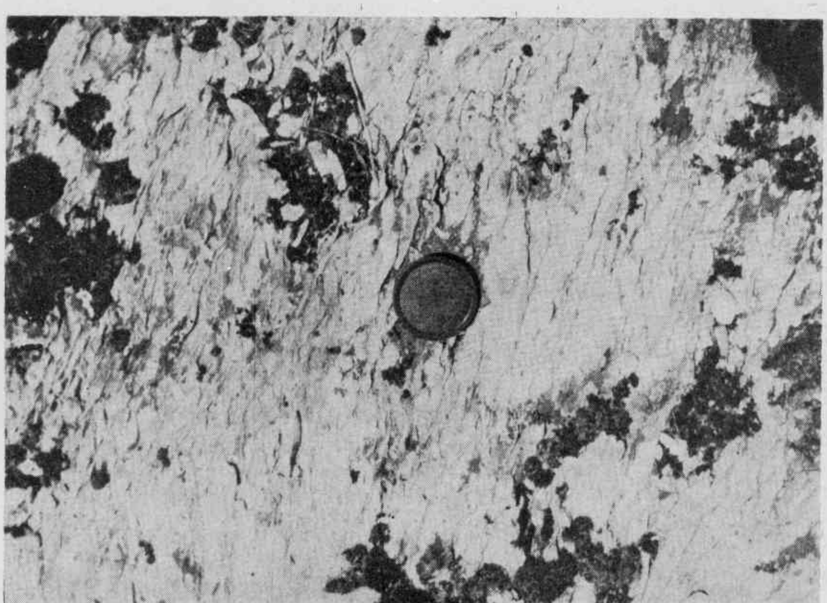

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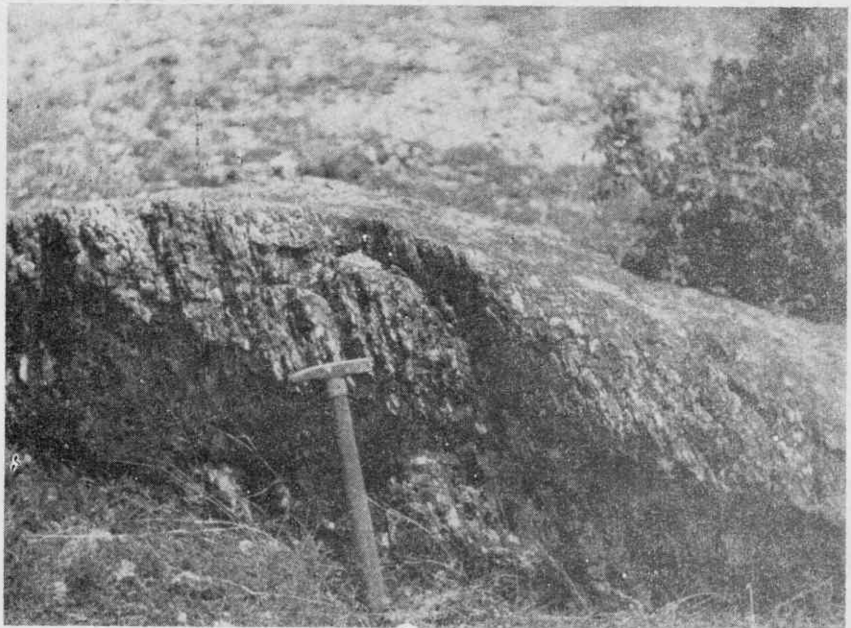

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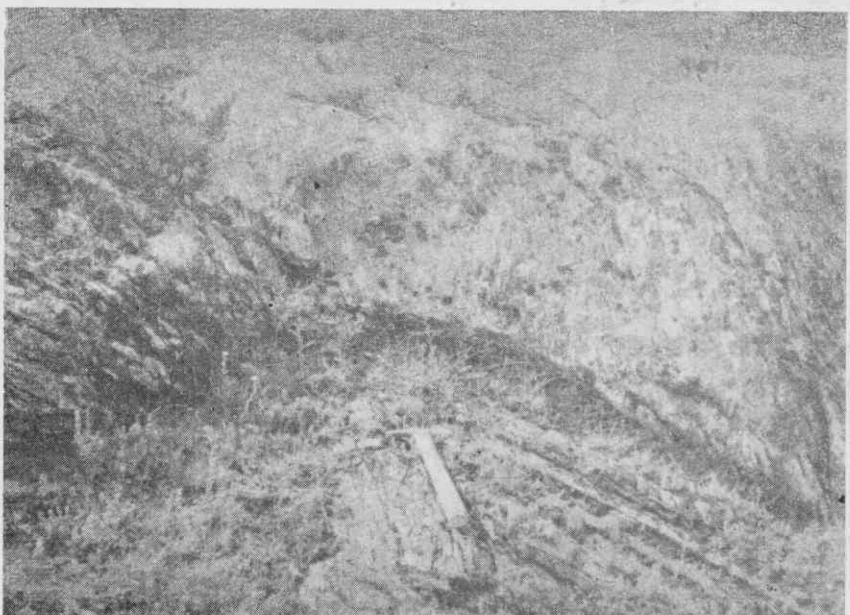

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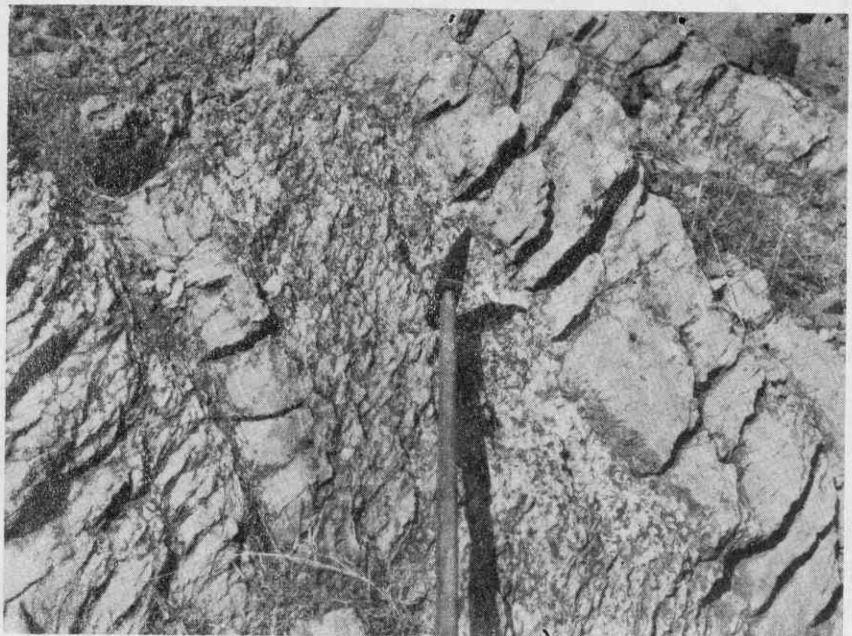

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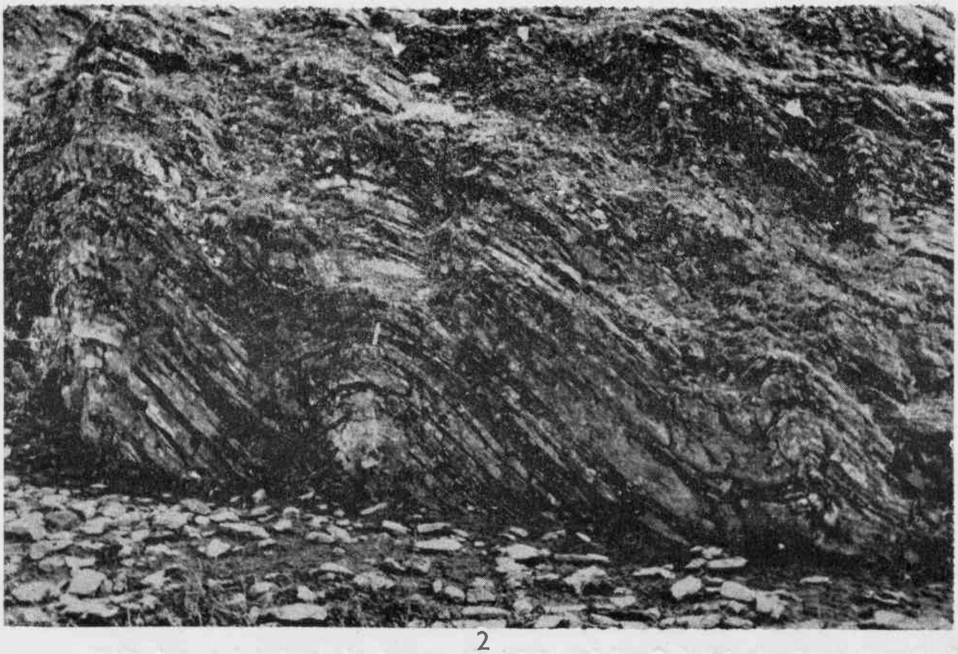

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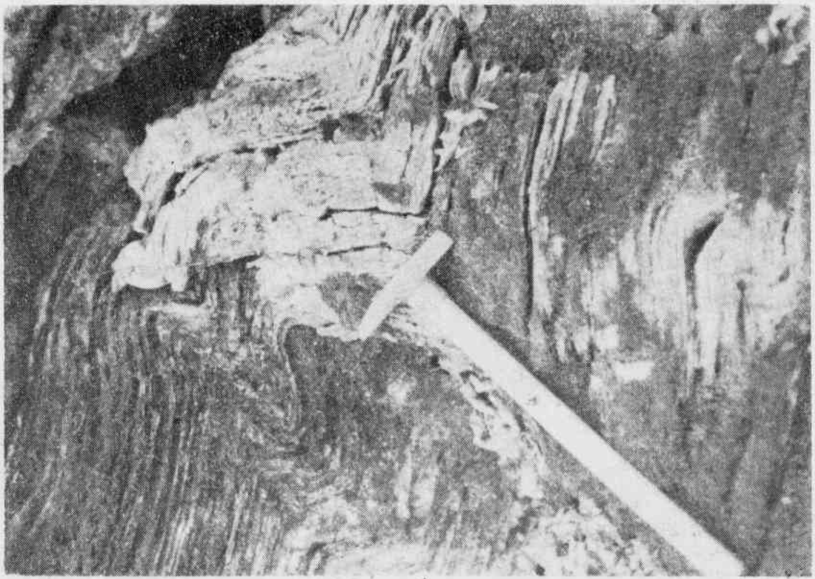

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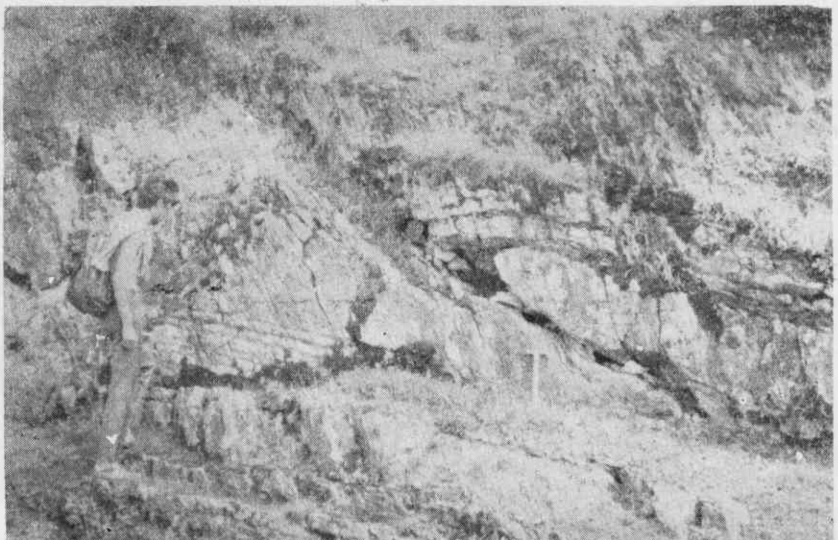

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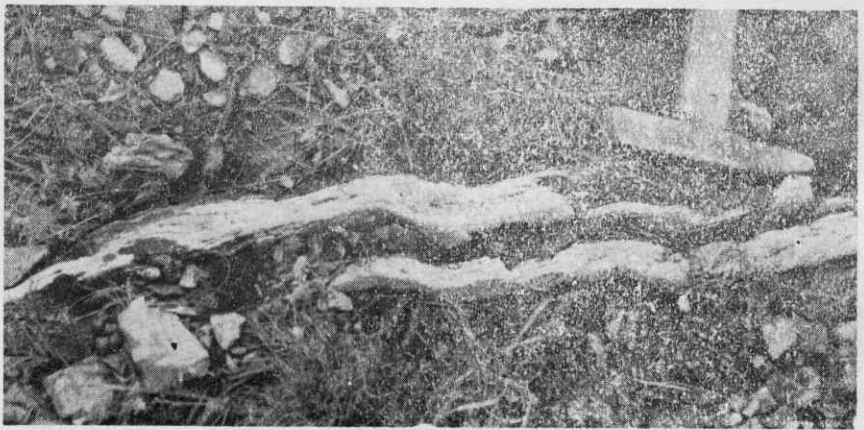

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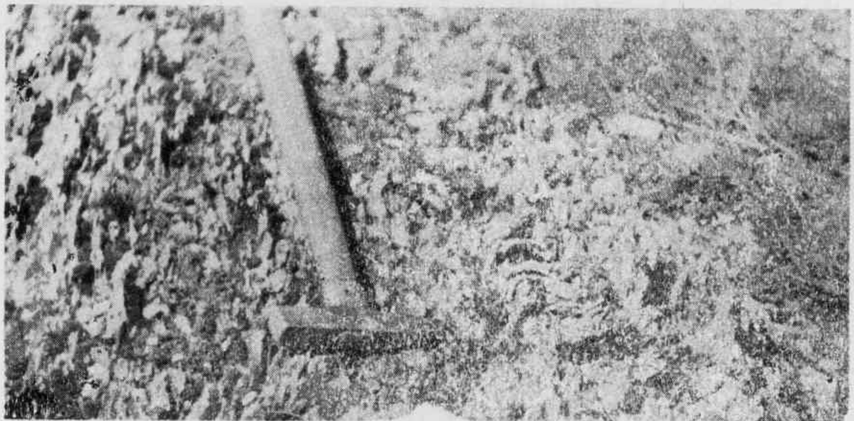

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GEOLOGICAL MAP OF THE CONSUL UNIT BETWEEN VALEA TEILOR AND IULIA

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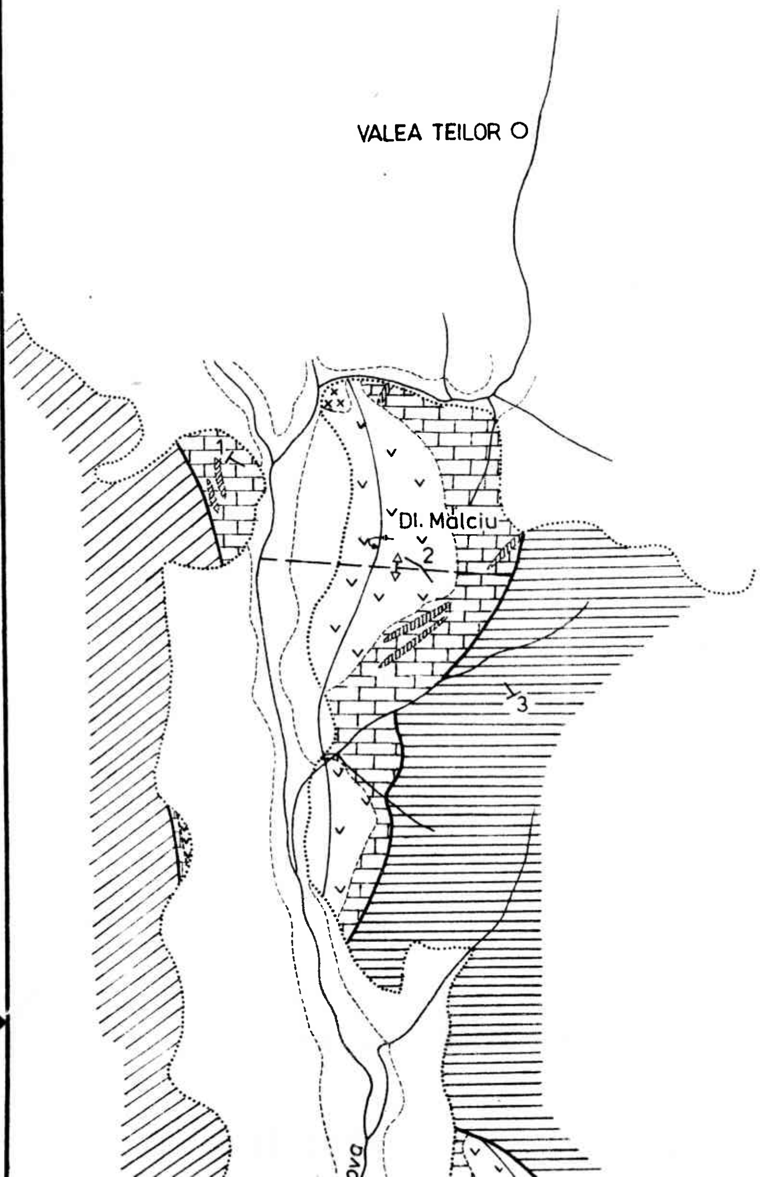

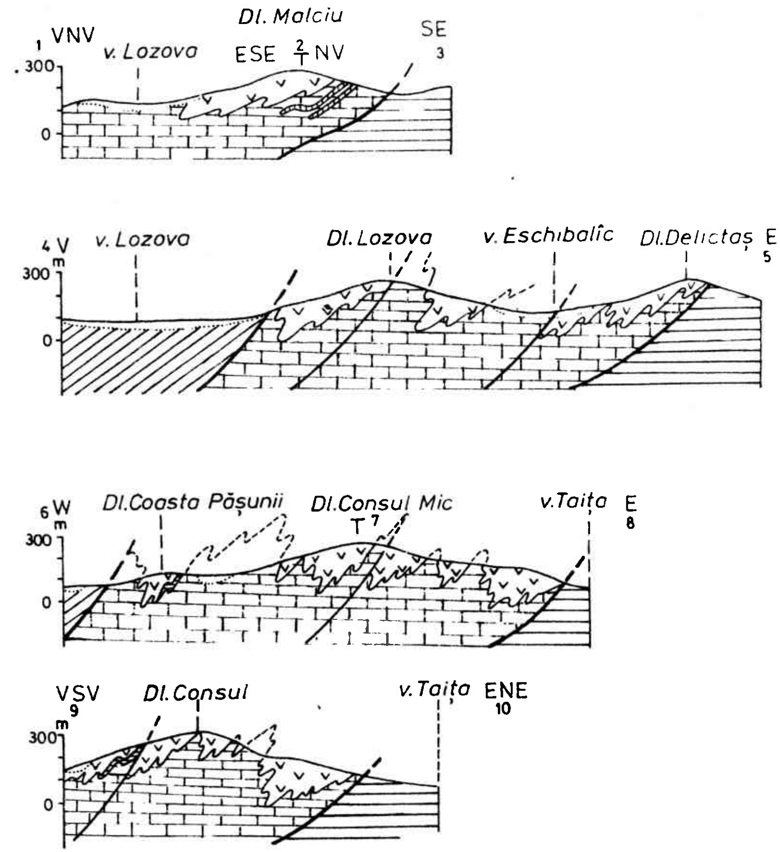

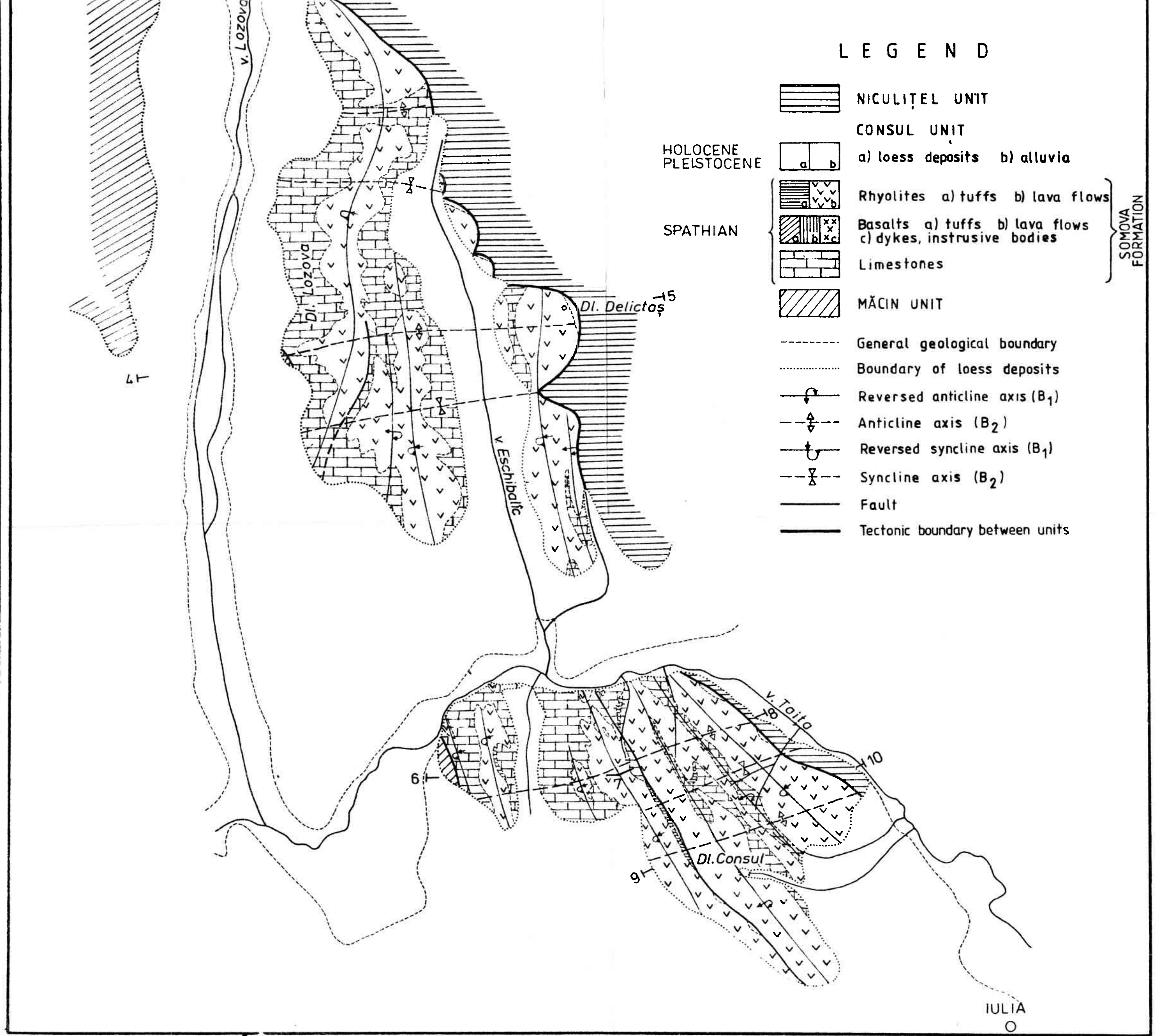

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