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# Paleogeographic reconstruction of a segment of the North-Tethyan margin in Bulgaria from Barremian to Albian

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*Key words:* Paleogeographic maps, palinspastic cross-sections, North-Tethyan margin, Barremian to Albian, Bulgaria.
*Mots clés:* Cartes paléogéographiques, transects palinspastiques, Marge Nord-Téthysienne, Barrémien à Albien, Bulgarie.

ABSTRACT

In this synthetic work are reconstructed seven paleogeographic maps corresponding to the main stages of the geodynamic evolution, from Barremian to Albian, along a complex segment of the North-Tethyan margin in Bulgaria. This reconstruction follows the recent publication of three paleogeographic maps related to the Berriasian - Hauterivian interval. The herein proposed facies maps are explained by palinspastic cross-sections, variously oriented, showing the geometric assemblage of the most classic formations used in the Bulgarian literature, constrained by a new biostratigraphy, particularly founded on ammonites, and our recent studies in terms of sequence stratigraphy. Between the emerged (or eroded) areas of the Romanian Dobrogea to the north and the Rhodopes/Serbo-Macedonian massif to the south (itself fringing the Tethyan oceanic crust), the Bulgarian Balkanides and Moesia correspond during early/middle Cretaceous times to a wide east-west oriented arm of the sea, filled up during the Hauterivian by the terrigenous series of the "Axial Basin". Just before the Barremian, this basin was flanked, to the south, by a mobile boundary subdivided into fault-blocks (supplying the basin in siliciclastics) and, to the north/north-east, by a much stabler margin (Russe). From Barremian to lower Aptian, an incessant competition occurs between the thick terrigenous basinal sediments (generally external/distal) and the rudist/orbitolinid- bearing "Urgonian-type" carbonate platforms, overlying alignments of shoals (Russe, Lovech, Vratsa, Brestnitsa, Eleshnitsa, Simeonovo), either separated or coalescent. Locally, turbidites with olistolites of Urgonian limestones have been induced by extensional movements, generating sedimentary slopes. During middle/late Aptian, the carbonate platforms drown, then completely disappear and only the terrigenous sedimentation continues within a more and more reduced Axial Basin. During the Albian, the tectonic inversion (first compressions) of the Austrian phase induces the creation of a narrow, but anoxic, foreland basin probably supplied in glaucony by the erosion of hypothetic meridional laterites.

RESUME

Dans ce travail synthétique sont reconstituées sept cartes paléogéographiques correspondant aux étapes les plus marquantes de l'évolution géodynamique, du Barrémien à l'Albien, d'un segment complexe de la marge nord-téthysienne en Bulgarie. Cette reconstruction fait suite à la récente publication de trois cartes de ce type relatives à l'intervalle Berriasien - Hauterivien. Les cartes de faciès ici proposés sont assorties de transects palinspastiques d'orientations variées représentant la géométrie supposée des formations les plus classiques de la littérature bulgare, contrainte par une biostratigraphie nouvelle, particulièrement fondée sur les ammonites, et nos études récentes de stratigraphie séquentielle. Entre les moles émergés (ou érodés) de la Dobrogea roumaine au nord et du Rhodope /Massif Serbo-Macédonien au sud (lequel borde directement l'Océan Téthysien), les Balkanides et la Moesie bulgares correspondent, au Crétacé inférieur, à un large bras de mer orienté est - ouest, rempli à l'Hauterivien par les marnes du «Bassin Axial». Ce bassin s'appuyait, au sud, sur une étroite bordure mobile articulée en gradins pourvoyeurs de détritiques et, au nord/nord-est, sur une marge plus large et beaucoup plus stable. A partir du Barrémien et jusqu'au Bédoulien inclus, s'installe une incessante compétition entre les épais terrigènes de bassin (généralement externe/distal) et les plates-formes carbonatées à rudistes et orbitolinidés, de type «Urgonien», occupant des chapelets de hauts-fonds (Ruse, Lovech, Vratsa, Brestnitsa, Eleshnitsa, Simeonovo), parfois distincts, parfois coalescents. Localement, des turbidites à olistolites d' «Urgonien» montrent l'importance des mouvements extensifs générateurs de pentes sédimentaires sur les bordures des hauts-fonds. Au Gargasien puis au Clansayésien, les plates-formes carbonatées s'ennoient puis disparaissent et seule la sédimentation terrigène perdure dans un «Bassin Axial» de plus en plus réduit. A l'Albien enfin, l'inversion tectonique (premières compressions de la Phase Autrichienne) induit l'apparition d'un bassin d'avant-pays, rétréci mais anoxique, alimenté en glauconie par l'érosion d'hypothétiques latérites méridionales.

## Introduction

The topic of this paper is to reconstruct from Barremian to Albian the successive paleogeographies of this intermediate arm of sea separating Rhodopes from Dobrogea. This reconstruction follows our three paleogeographic maps of the Berriasian - Hauterivian interval, recently published (Minkovska et al. 2002). According to the previous works of several Bulgarian authors such as Nikolov (1987), Nikolov & Tzankov (1997), Nikolov & Ruskova (1999) and to the conclusions of the international programme "Peritethys", it was established that the

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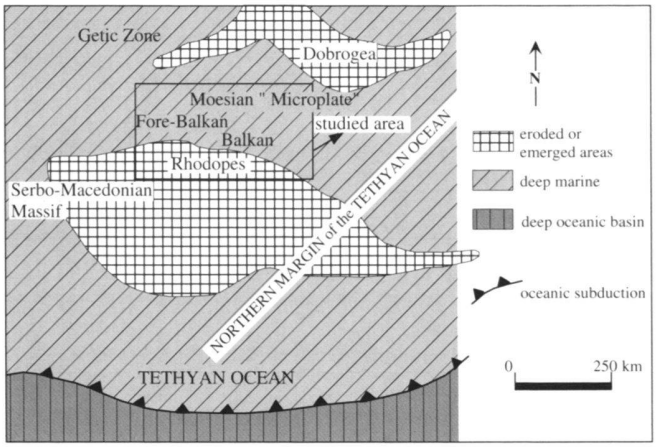


Fig. 1. Simplified paleogeographical map of the herein studied Peri-Tethyan area during the early Aptian (112–114 Ma). According to Masse, coord. (map n°13, 2000).

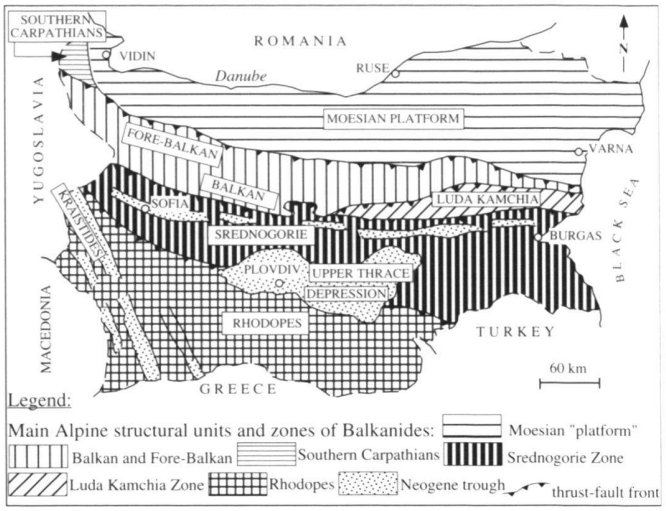


Fig. 2. Structural sketch-map of Bulgaria (according to Ivanov 1988).

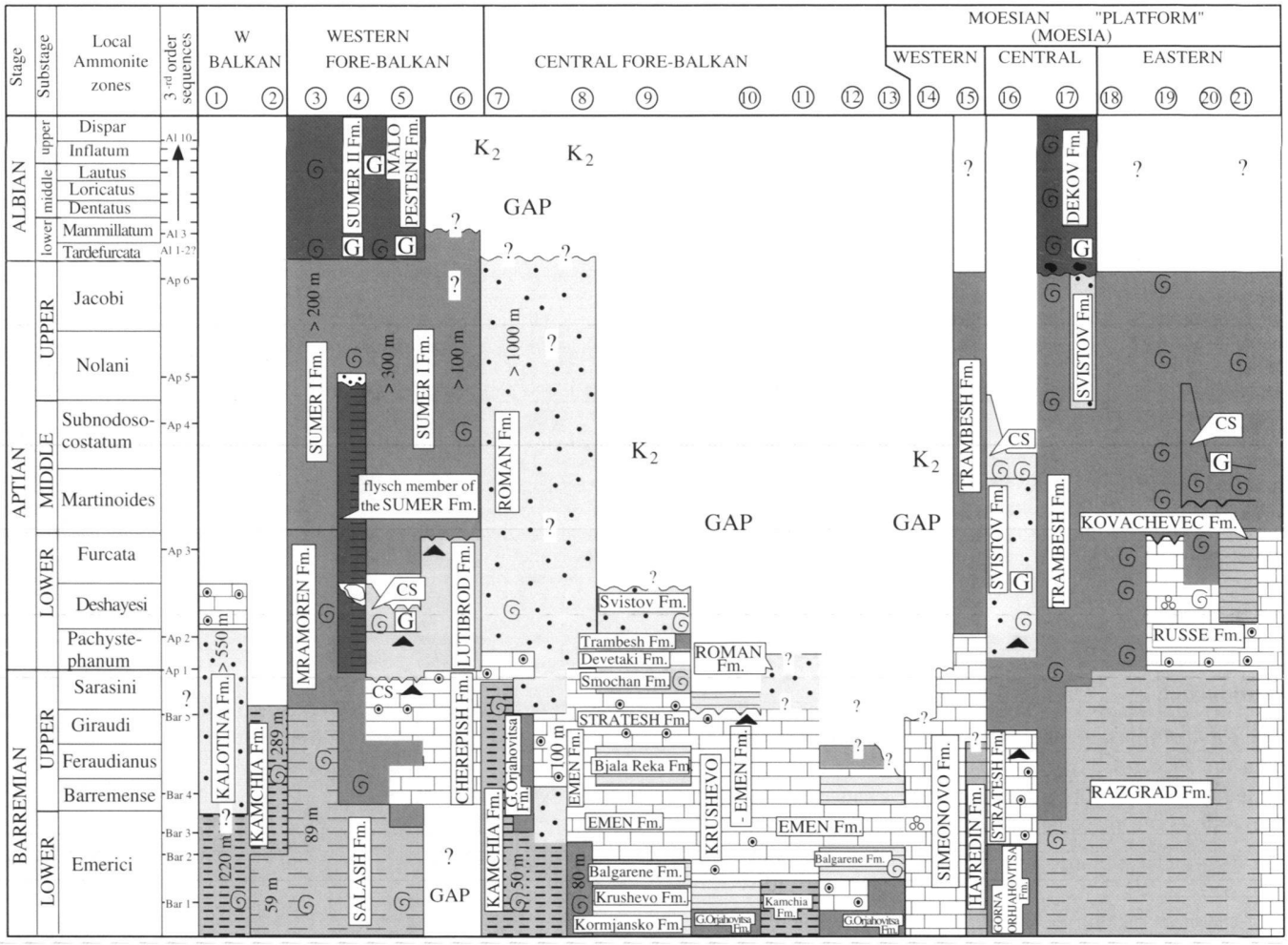


Fig. 3. Barremian-Albian stratigraphic columns from the Balkanides to the Moesian "microplate", compiled from various publications quoted in the text and our original works. See Fig. 4 for legend and list of reference sections.

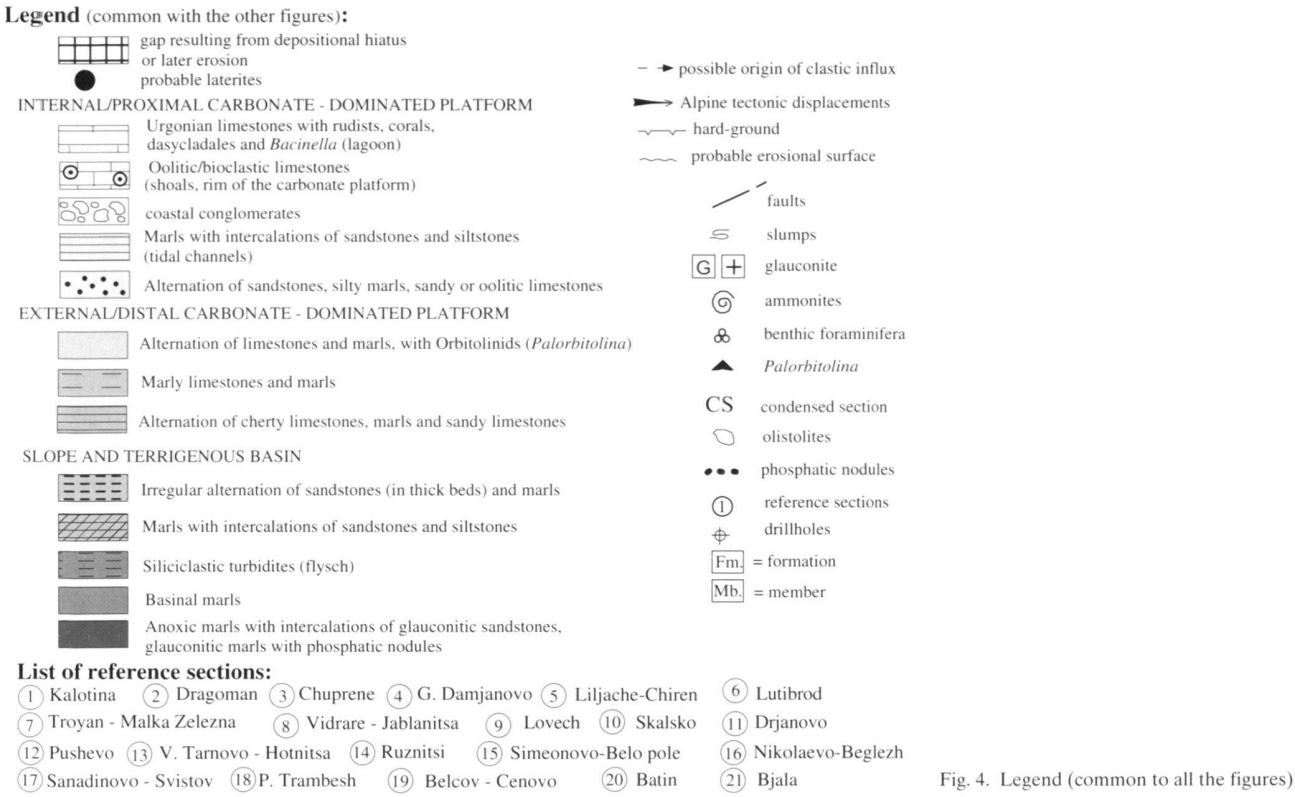


Fig. 4. Legend (common to all the figures)

territory of the present Bulgaria corresponded, during early Cretaceous times, to a complex segment of the North-Tethyan margin. The map n° 13 of this last programme, devoted to the early Aptian (Masse coord., 2000), showed the subdivision of this segment into three main paleogeographic domains in the south flanking the cratonic Ukrainian Shield (Fig. 1): a) the emerged /eroded area of the Romanian Dobrogea; b) a wide east-west oriented arm of sea, on the site of the future Bulgarian Balkanides (Balkan and Fore-Balkan) and Moesia (= Moesian microplate); c) farther to the south, a new emerged/ eroded area, called "Thracian Island" in the Bulgarian literature (Nikolov &Tzankov 1997) and situated on the site of the present Rhodope massif and the southern part of the Srednogorie zone. Far to the south, extended the Tethyan oceanic crust northwards subducted (Fig. 1).

During the latest stages of the Early Cretaceous, appears a continuous competition between the carbonate platforms characterized by rudists, corals and orbitolinids ( "Urgonian" facies) and the external/distal (containing lots of ammonites) or internal/proximal subsiding terrigenous basins. This period corresponds to the transition between an extensional/transtensional tectonic phase (inducing differential subsidences until the Aptian) and, since the Albian, a compressional/transpressional tectonic phase generating the first foreland basins ("Austrian" orogen). The deposits of the herein studied interval crop out within six Alpine structural units (Ivanov 1988) (Fig. 2): to the north, the Moesia (or "Moesian platform/microplate"), subtabular and generally not folded by the Alpine compressions; to the south, the Fore-Balkan, the Balkan, the Srednogorie zone, the Kraistides (sensu Bonchev 1957) and the Luda Kamchia zone, all folded by the Alpine polyphase tectonics. The herein proposed reconstructions have been done from two data sources: the synthesis, systematically reinterpreted (Fig. 3, 4), of a number of Bulgarian and French-Bulgarian works published during the three last decades and, also, on the new field works accomplished by our team, principally carried out on sequence stratigraphy and local ammonite biozonation (Fig. 3). So we will describe seven successive paleogeographic stages [lowermost Barremian, Barremian, uppermost Barremian, Bedoulian (=lower Aptian), Gargasian (=middle Aptian), Clansayesian (= uppermost Aptian) and middle Albian], illustrated by facies maps and some palinspastic sections (of various orientations) obtained after unfolding of the later Alpine compressional structures and hypothetical (believed reasonable) appreciation of their degree of allochtony.

## I. The Hauterivian heritage: a wide terrigenous basin

The studied area (central and northern Bulgaria, to the north of the Rhodopes) essentially corresponds, during the Hauterivian, to a wide centrifugal terrigenous basin called "Axial

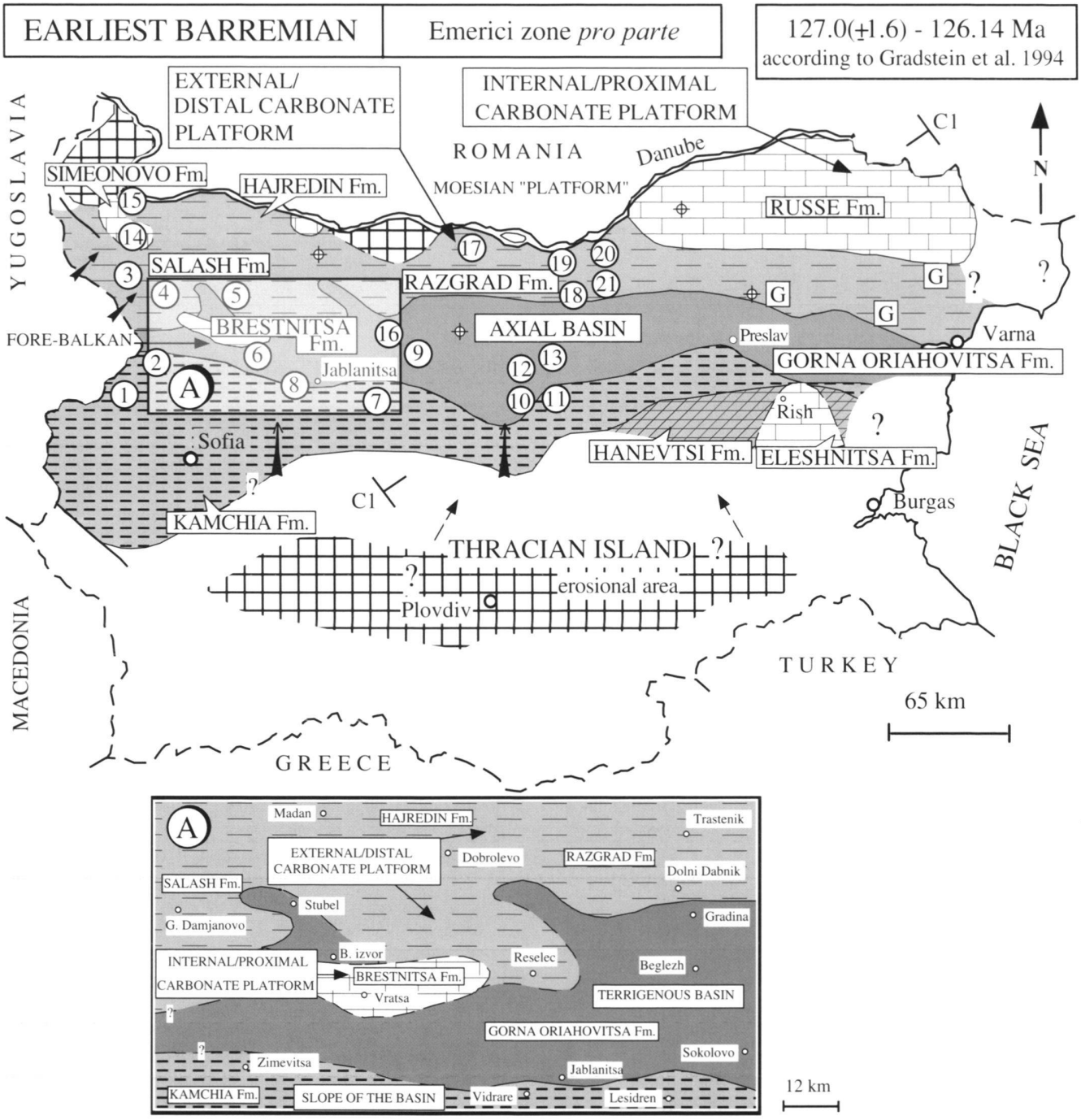


Fig. 5. Earliest Barremian (Emerici zone *pro parte*) paleogeographic map. See Fig. 4 for legend. Numerical ages according to Gradstein et al., 1994.

Basin" (Nikolov 1987, Nikolov & Ruskova 1999; Minkovska et al. 2002) filled up by the marls, marly limestones and/or siliciclastics of the following formations: Razgrad, Hajredin, Salash, Mramoren, Gorna Oriahovitsa, Kamchia and Hanevtsi. East-west to south-east/north-west oriented, this subsiding basin fringed the northern coast of the "Thracian Island" which was devoid of deposits (by emersion or later erosion) during early/middle Cretaceous. This northern limit was already clearly organized into fault-blocks (or steps), more or less tilted and generated by extensional tectonics (Minkovska et al. 2002) oc-

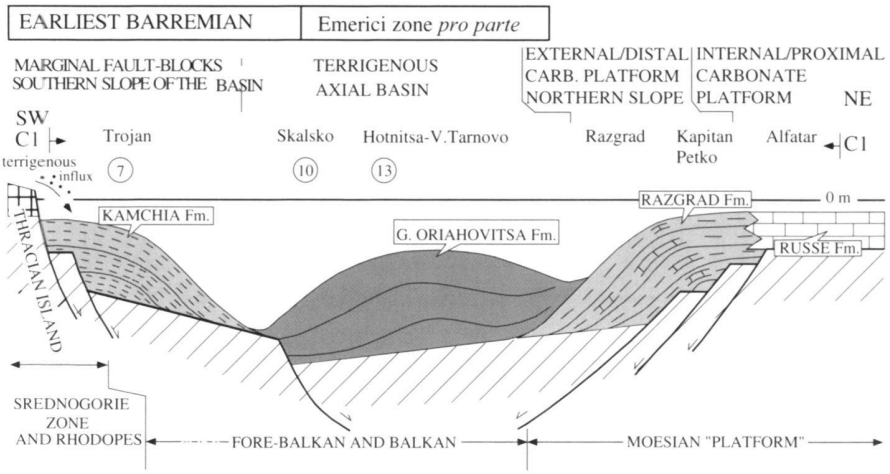


Fig. 6. Palinspastic SW-NE cross-section C1-C1 (Fig. 5), from the "Thracian Island" (Rhodopes and Srednogorie zone) and Fore-Balkan/Balkan towards the Moesian "microplate" (north-eastern Bulgaria); thicknesses of the formations not to scale. See Fig. 4 for legend.

curring from Tithonian/Berriasian. Some residual carbonate platforms subsisted, particularly to the north-east of Moesia (Russe Fm.) and, in the Fore-Balkan, around Vratsa, but veritable "Urgonian" facies did not yet appear.

**II. During the Barremian: maximum extension of the "Urgonian -type" carbonate platforms.**

Resulting both from eustatic sea level changes and extensional/transtensional tectonics, several calcareous platforms appear at that time, then increase in size and coalesce, where lagoonal rudists (such as *Toucasia*, *Requienia*, *Polyconites*, *Monopleura*), orbitolinids (such as *Dictyoconus balkanicus* and *Palorbitolina lenticularis*) and dasycladales (*Salpingoporella, Clypeina*, etc.) lived. These platforms are covered by "Bahamian-type" shoals of various sizes. Always supplied from the south by the probable erosion of the "Thracian Island" (Rhodopes), the terrigenous "Axial Basin", inherited from the Hauterivian, still exists but becomes subdivided, since the beginning of the Barremian, into several sub-basins separated by "Urgonian" shoals.

*1) During the lowermost Barremian (Fig. 5, 6), Emerici zone pro parte.*

The dissymmetry of this segment of passive margin, as already quoted from the Berriasian (Minkovska et al. 2002), is still well enough marked by: a) a stable boundary to the north-east, always formed by the Russe "Urgonian" carbonate platform (= "plate-forme du Danube", Ivanov et al. 1997) which slightly progrades eastwards (Tetovo, Senovo and Vetovo) by means of intermediate external facies (Razgrad Formation and Hajredin Formation); b) a more mobile boundary to the south, structured into marginal fault-blocks, already more or less tilted, supplying in siliciclastics the forestepping sygmoid bodies of the Kamchia Fm. (Fig. 6). The latter consists of more than 500 m of an irregular alternation of amalgamated sandstones and marls. Its Barremian age is evidenced by some ammonites collected from west to east (Nikolov 1987; Mandov & Nikolov 2001). Only the isolated block of Rish-Bjala Reka, to the south-east, is overlain by "Urgonian" limestones (Eleshnitsa Fm., reaching from the lower Barremian /Emerici zone/ to the lower Aptian /Deshayesi zone/, Nikolov 1987; Peybernès et al. 1998). The marls (including sandy and silty intercalations) of the Hanevtsi Fm., well represented from the Hauterivian on a large part of the southern margin of the "Axial Basin" (central and eastern Fore-Balkan), become now restricted to the area situated between the town of Gabrovo (Jantra valley) and the Black Sea. During early Barremian (Emerici zone), Hanevtsi Fm. marls are only represented within the southernmost units of the eastern Fore-Balkan (Kotel; north-east and east of Ticha; Bjala Reka; Veselinovo), around the subreefal carbonate "islets" of the Eleshnitsa Fm. (Emerici zone). There, they are considered as transitional facies from those limestones to the terrigenous "Axial Basin" situated more to the north. The axis of this basin is underlined by the Gorna Oriahovitsa Fm. marls and the Salash Fm. marly limestones (to the north-west) where lots of ammonites have been collected. The Brestnitsa shoal, to the west, partially remains characterized (Fig. 5, A) by the presence, along a northwest-southeast fault-zone, the very small "Urgonian" platforms (with massive limestones containing rudists, Nikolov & Ruskova, 1993; Peybernès et al. 2000; Nikolov et al. 2001), particularly the platform marked by the Simeonovo Fm. (Magura Fm., Nikolov et al 2001) close to the Carpathians (Ruznitsi, n° 14, Fig. 3, 5), and another (unnamed) platform identified in subsurface on the bank of the Danube (R-1 drillhole, Orjahovo).

*2) During the Barremian (Fig. 7, 8), from the top of the Emerici zone to the Barremense zone.*

The paleogeography becomes more complicated with the formation of an alignment of coalescent shoals between Lovech and Veliko Tarnovo (central Fore-Balkan). These are covered

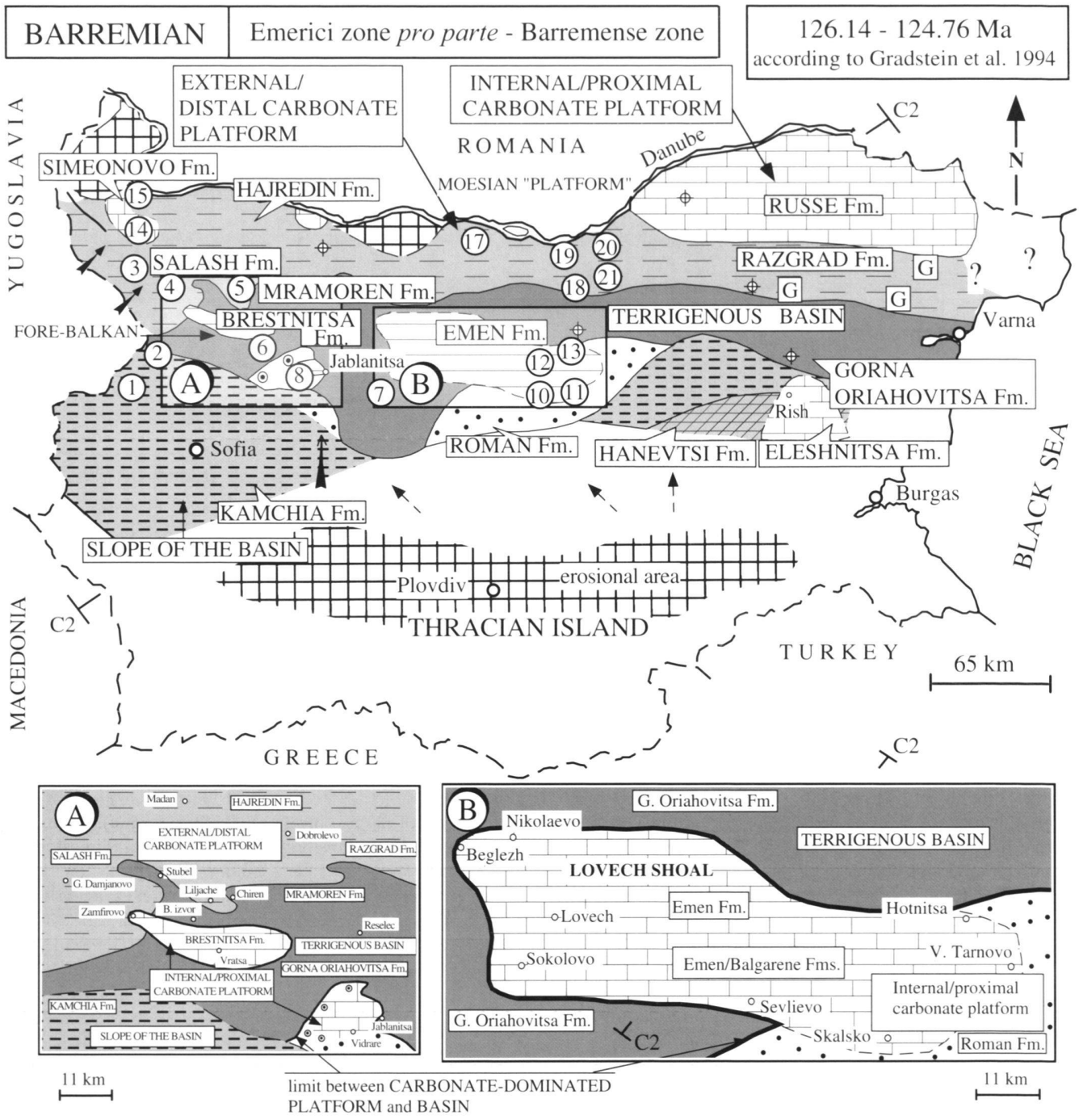


Fig. 7. Barremian (Emerici *pro parte* – Barremense zones) paleogeographic map. See Fig. 4 for legend.

by the "Urgonian Group of Lovech" (Khristchev 1966) laid down on a new "Urgonian" platform called "Lovech platform" (= "plate-forme de Lovec-Veliko Tarnovo, Ivanov et al. 1997). This important unit was recently analyzed and interpreted in terms of sequence stratigraphy in several papers issued by our French-Bulgarian working group (Ivanov et al. 1997; Peybernès et al. 1998). It consists in an alternation of carbonate and terrigenous/carbonate formations deposited within the lower Barremian (top of the Emerici zone) - lower Aptian (Pachystephanum zone) interval and dated by means of am-

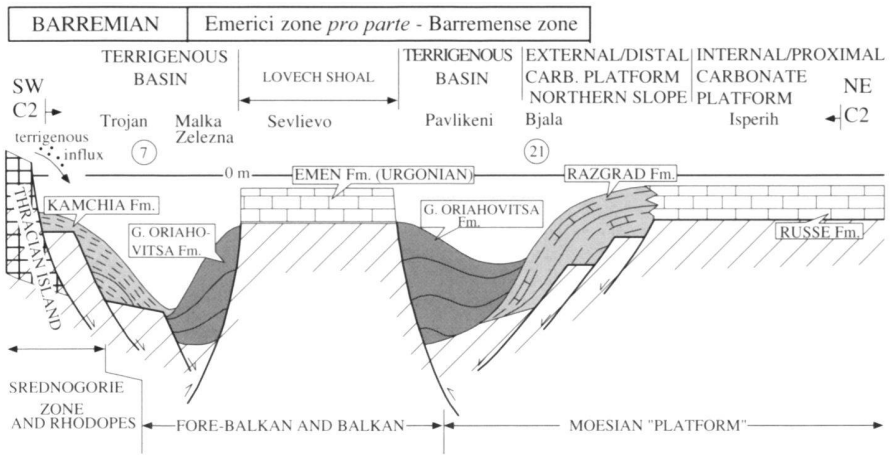


Fig. 8. Palinspastic SW-NE cross-section C2-C2 (Fig. 7), from the "Thracian Island" (Rhodopes and Srednogorie zone) and Fore-Balkan/Balkan towards the Moesian "microplate" (north-eastern Bulgaria); thicknesses of the formations not to scale. See Fig. 4 for legend.

monites, benthic foraminifera (such as *Palorbitolina lenticularis* and *Orbitolinopsis* gr. *kiliani-cuvillieri-nikolovi*) and algae (Ivanov 1995, Ivanov & Nikolov 1995; Nikolov & Parashkevanov 1995; Ivanov et al. 1997; Peybernès et al. 1979; Peybernès, Ciszak et al. 1998). This new Lovech platform extends towards the south-east with a particular internal/proximal subsiding terrigenous basin (the first one in the Bulgarian Cretaceous history) filled up by the thick sandy/carbonate complex, generally littoral, of the Roman Fm. (Fig. 7). The classic calcareous formations described in the Bulgarian literature, such as Krushevo and Emen (Barremian), Stratesh (upper Barremian) and Devetaki (lower Aptian, Pachystephanum zone) include different calcareous "Urgonian"-type facies, from the rudist/coral-bearing mudstones (open lagoon/homoclinal ramp) to oolitic/bioclastic grainstones (boundary bars and sand waves). They are generally interpreted as transgressive systems tracts (Ivanov et al. 1997). The terrigenous/carbonate formations, are successively called (from bottom to top): Kormjansko, Balgarene and Bjala Reka (lower Barremian to upper Barremian). They consist of marls with intercalations of sandstones, siltstones and/or channellized tidal limestones. Considered as the highstand wedges of the depositional sequences, they separate the main aforementioned carbonate formations and/or frequently ravine some of them along pinching out surfaces. The Smochan Fm. (Fig. 3), at the boundary between the Barremian and the Bedoulian, well dated by ammonites (Ivanov et al. 1995; Ivanov & Nikolov 1995; Ivanov et al. 1997), is made up of marls and *Palorbitolina*-bearing marly limestones, interpreted as an external/distal platform facies. This formation is related to the first deepening of this part of the southern margin and the beginning of the drowning of the Lovech platform. The "Axial Basin" becomes subdivided into two sub-basins (flanked of a third one, to the west, in the Kraistides) marked by the deposition, along their axis, of external terrigenous accumulations, containing ammonites, and known as the Gorna Oriahovitsa Fm. and the Mramoren Fm.

*3) During the uppermost Barremian (Fig. 9, 10), Giraudi and Saracini zones.*

The Lovech platform increases westwards (Stratesh Fm., in the Lovech area, central Fore-Balkan; Cherepish Fm., in the Vratsa area, western Fore-Balkan) by forestepping of the carbonate facies replacing the terrigenous facies and filling up of the former sub-basins. The carbonate deposits of the new Vratsa shoal (Fig. 9 A) ( "Vratsa Urgonian Group", Monov & Nikolov 1991; Ivanov & Nikolov 1983; Peybernès et al. 1979) are subdivided into two successive calcareous formations, the Cherepish Fm. and the Lutibrod Fm. The Cherepish Fm. consists of two superposed transgressive systems tracts (Banitsa Mb. and Liljache Mb.) correlated to the depositional sequences Barr 5 and Barr 6 of Peybernès et al. 2000. It corresponds to rudist-bearing limestones followed by oolitic/bioclastic limestones of an internal/proximal platform. The Banitsa Mb. abruptly overlies either basinal marls (Mramoren Fm. marls, Barremense zone, Liljache-Chiren area, n° 5, Fig. 3), or subreefal limestones of the Brestnitsa Fm. assigned to the Hauterivian (Minkovska et al. 2002). A rise of the sea level at the end of upper Barremian induces the progradations of the marly bodies (marls of the Drashan Mb. and of the Mramoren Fm., where late Barremian ammonites have been collected) and their pinching out within the carbonate successions of the Vratsa platform, where they are reduced to condensed sections (containing abundant ferruginous *Palorbitolina*). In the Lovech area (n° 9, Fig. 3, 9 and 10), the upper Barremian begins by the deposition of oolitic limestones situated at the base of the relatively thick (100 m) internal/proximal platform limestones of the Stratesh Fm. Further to the west (Beglezh and Nikolaevo drillhole, n° 16), an equivalent of the former oolitic limestones (Stratesh Fm.) overlies basinal ammonite-bearing marls characterizing the Gorna Oriahovitsa Fm.

To the north of the country, some previously built shoals subsist (Russe, Simeonovo) whereas the Brestnitsa one becomes progressively indistinct because covered by terrigenous influx, supplied by the erosion of the Rhodopes. The inter-

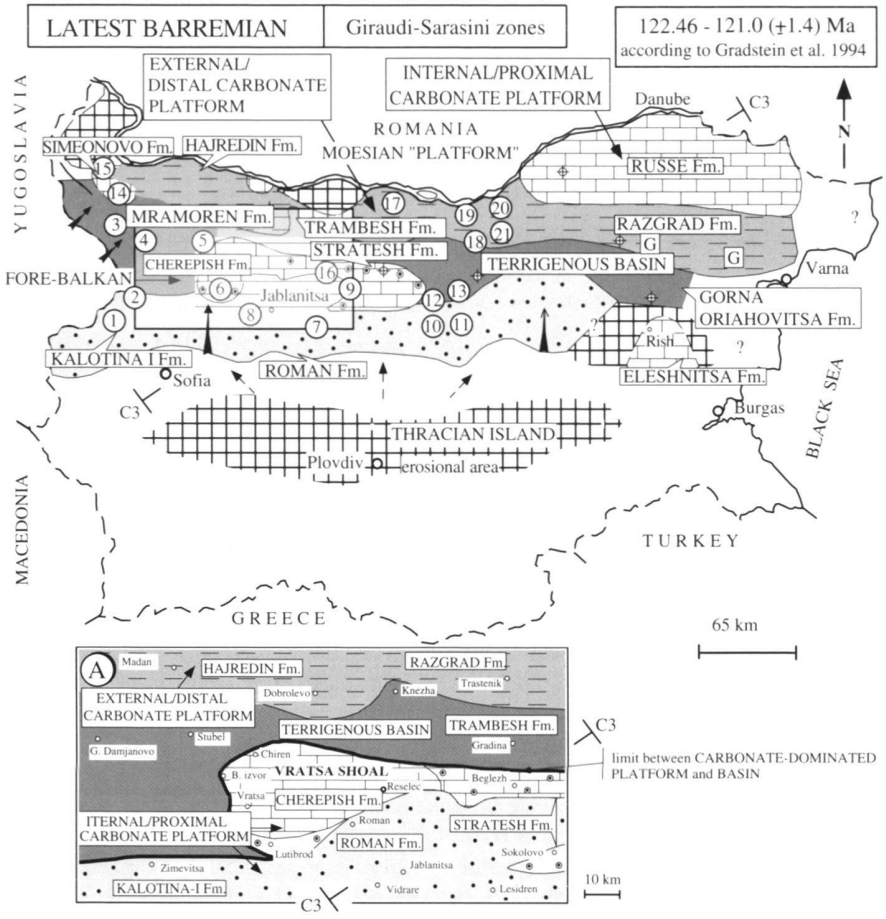


Fig. 9. Latest Barremian (Giraudi – Sarasini zones) paleogeographic map. See Fig. 4 for legend.

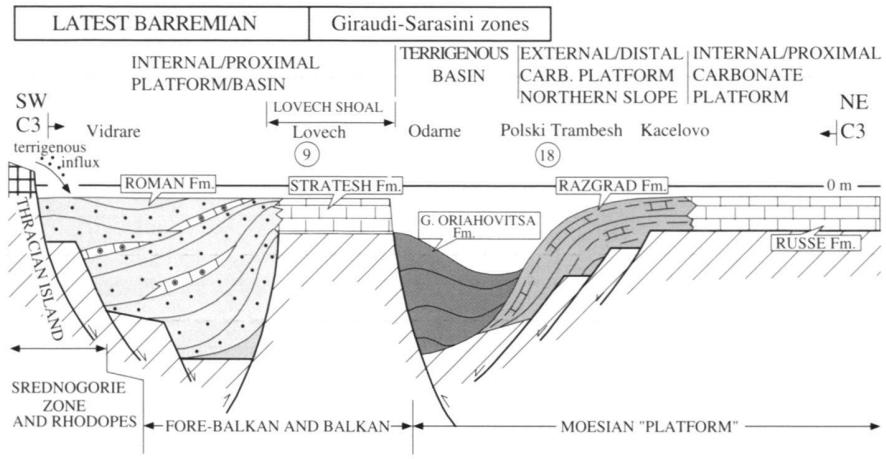


Fig. 10. Palinspastic SW-NE cross-section C3-C3 (Fig. 9), from the "Thracian Island" (Rhodopes and Srednogorie zone) and Fore-Balkan/Balkan towards the Moesian "microplate" (north-eastern Bulgaria); thicknesses of the formations not to scale. see Fig. 4 for legend.

nal/proximal sub-basin deposits situated in the southern Balkanides prograde eastwards (Roman Fm.), westwards [(Kalotina I Fm. = Balanski (Balan) Mb., 300 m in thickness, probably Barremense and Pachystephanum zones)] and northwards. This sub-basin reaches at this time its largest geographic extension which will remain unchanged until the Aptian. The two parts of the "Axial Basin" loose their individuality (= single "Bassin de Pleven-Polski Trambesh", Ivanov et al. 1997) when the Vratsa and Lovech Urgonian" shoals become coalescent. Marls of this basin include typical tempestites in some locali-

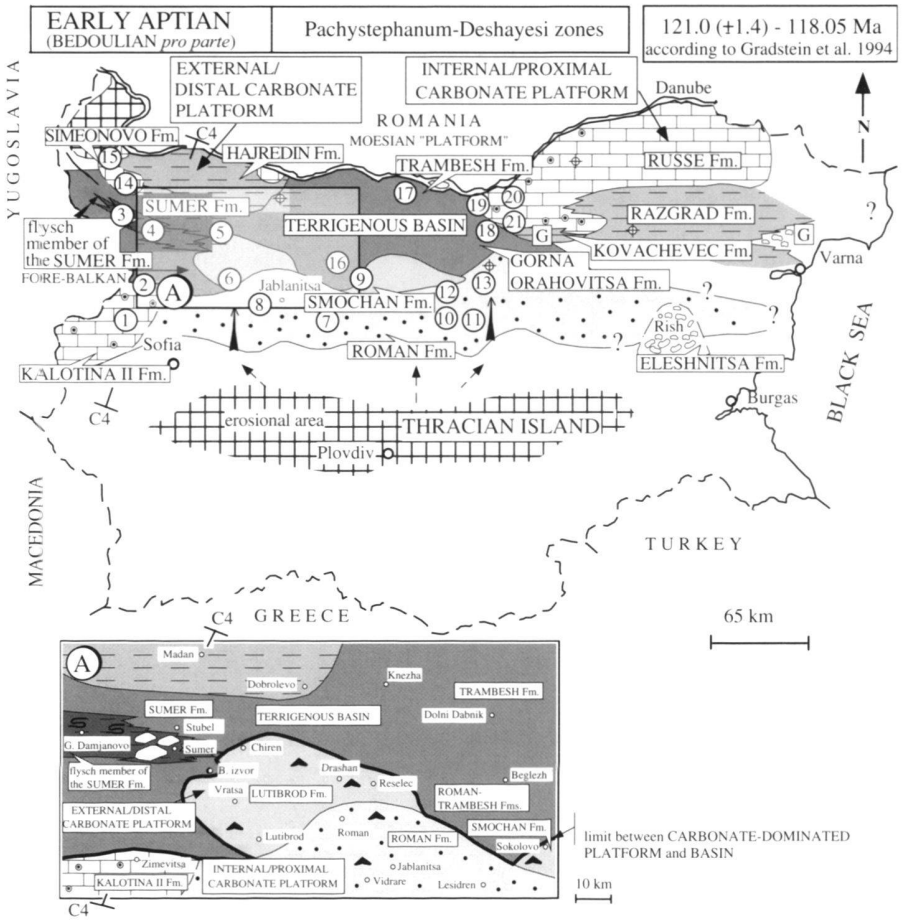


Fig. 11. Early Aptian (= Bedoulian *pro parte*, Pachystephanum – Deshayesi zones) paleogeographic map. See Fig. 4 for legend.

ties such as Sashevo (Ivanov et al. 1997). The axis of the single remaining basin deepens towards west (Serbia) and north-west (Danube) with the Mramoren Fm. and the Trambesh Fm..

**III. During the Aptian: local accumulations of turbidites, paleogeographic restriction of the marine domain and progressive disappearance of the "Urgonian" carbonate platforms.**

*1) During the early Aptian (Bedoulian pro parte, Pachystephanum and Deshayesi zones, Fig. 11, 12).*

The north-eastern platform of Russe still subsists and even increases towards the south-west with more or less sandy oolitic bodies (Pachystephanum zone, Opaka region, Ivanov 1992; Deshayesi zone, Belcov-Cenovo region, n°19, Batin, n°20 and Bjala, n° 21, Fig. 3, Ivanov & Stoykova 1998) and with a lateral transition to the terrigenous series by means of intermediate flint-bearing limestones (Kovatchevec Fm., Ivanov et al. 1997). The Lovech-Vratsa "Urgonian" shoal reduces and then disappears, its carbonates being replaced by the terrigenous accumulations of Smochan/Lutibrod Fms. with only some ultimate "Urgonian" lenses (Devetaki Fm., for example). Towards the Kalotina II Fm. [= Mb. Milbratski (Milbrat) of this same formation *sensu lato*, Mandov & Nikolov 2001], the west, becomes in the contrary more and more calcareous and particularly oolitic. The extensional tectonics rejuvenates some paleostructures and the corresponding erosion supplies coarse material (Hercynian basement, upper Jurassic and Barremian limestones) forming olistolites within canyon-cone turbidites regarded as a flysch Member of the Sumer Fm. ( "flysch de la région de Damjanovo" in: Peybernès et al. 2000). To the south-east, an equivalent of this material is also found in the elements of the coastal conglomerates of the Eleshnitsa Fm. (Deshayesi zone), particularly supplied by the erosion of "Thracian Island" (Nikolov & Khristchev 1965; Peybernès et al. 1998).

*2) During the Gargasian (middle Aptian), Martinoides and Subnodosocostatum zones (Fig. 13, 14).*

The "Urgonian" facies completely disappear. The partial drowning of the previous carbonate platforms induces the backstepping of terrigenous bodies coming from the "Axial

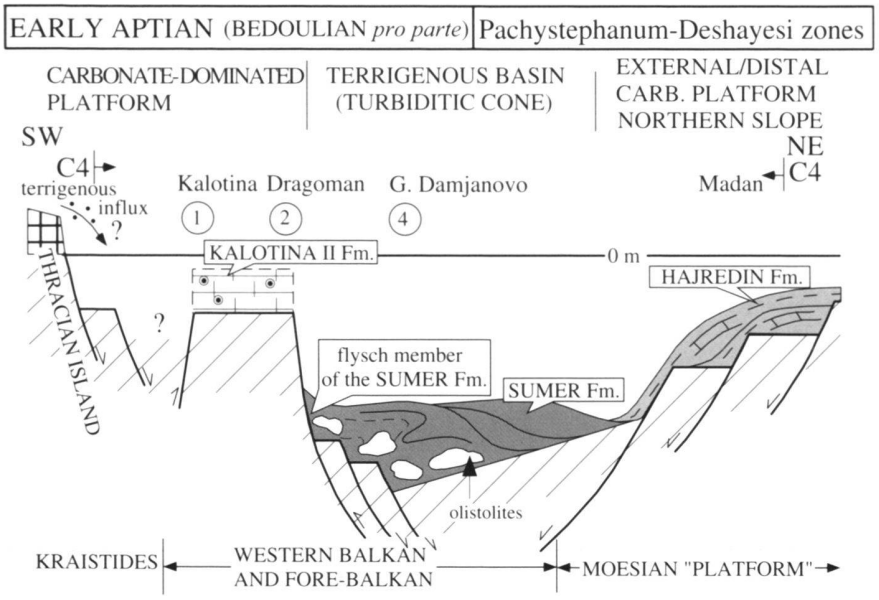


Fig. 12. Palinspastic SW-NE cross-section C4-C4 (Fig. 11), from the Kraistides and Western Balkan/Fore-Balkan towards the Moesian "microplate" (north-western Bulgaria); thicknesses of the formations not to scale. See Fig. 4 for legend.

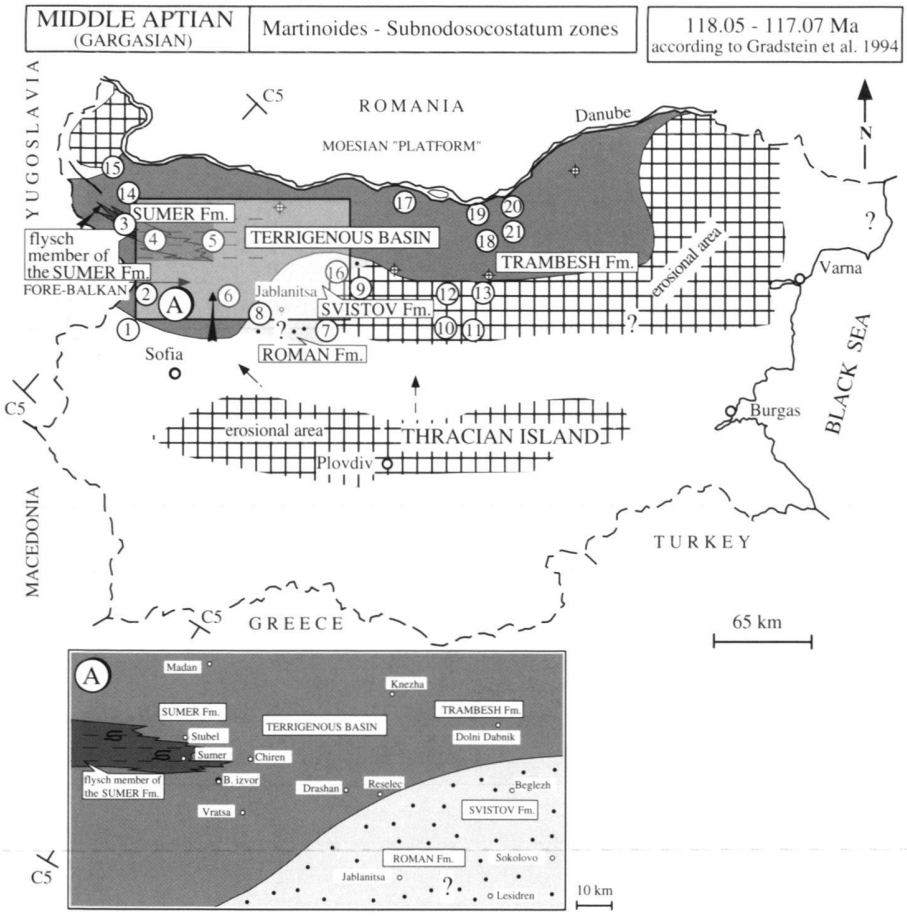


Fig. 13. Middle Aptian (= Gargasian, Martinoides – Subnodosocostatum zones) paleogeographic map. see Fig. 4 for legend.

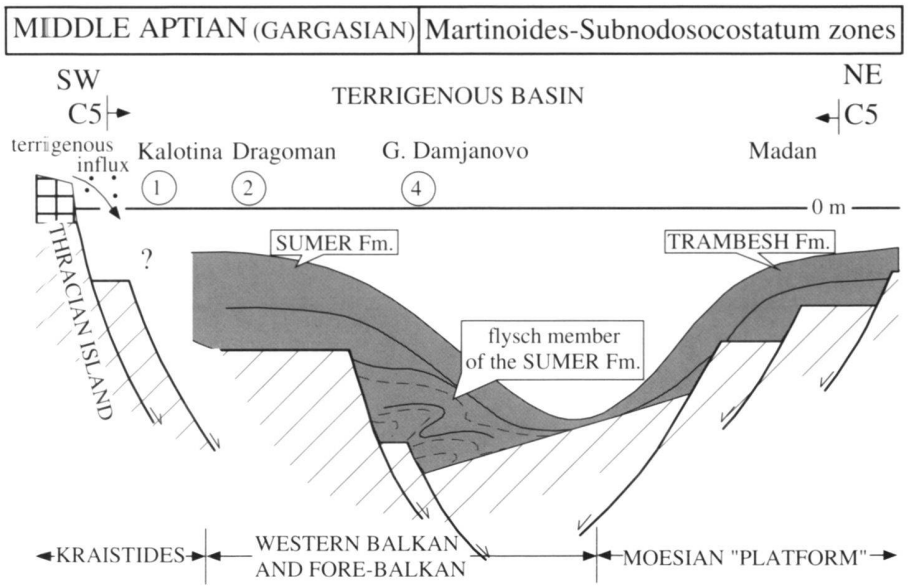


Fig. 14. Palinspastic SW-NE cross-section C5-C5 (Fig. 13), from the Kraistides and Western Balkan/Fore-Balkan towards the Moesian "microplate" (north-western Bulgaria); thicknesses of the formations not to scale. See Fig. 4 for legend.

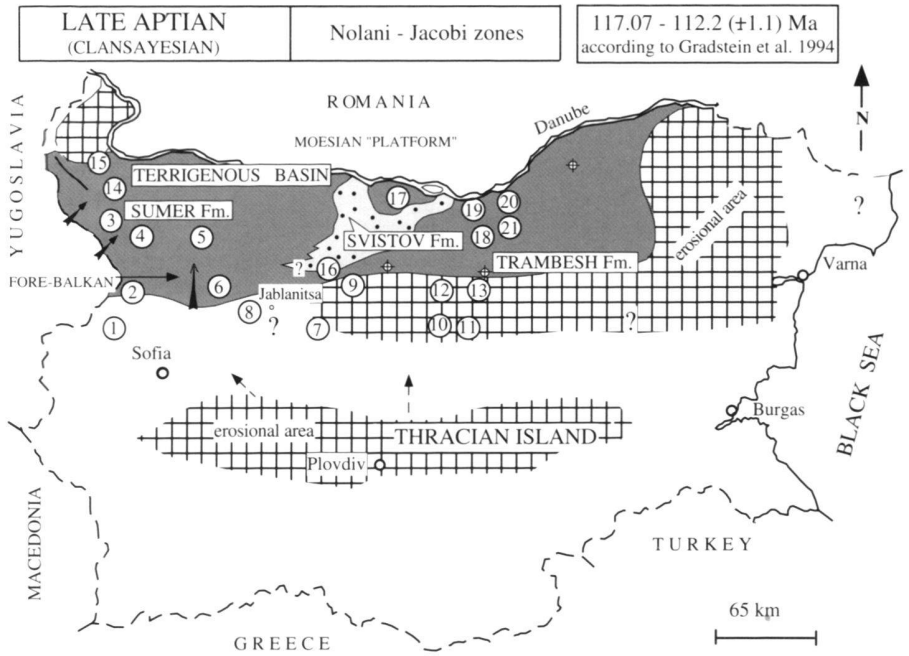


Fig. 15. Late Aptian (= Clansayesian, Nolani–Jacobi zones) paleogeographic map. See Fig. 4 for legend.

basin" (Trambesh Fm., Sumer Fm.) over the Russe and Lovech-Vratsa shoals. The southern internal/proximal basin (Roman and Svistov Fm., Nikolov et al. 1998) strongly decreases in size and fringes directly (without intermediate platform) the Axial Basin where locally deposited slumped turbidites (Peybernès et al. 2000). In the Gargasian-Albian interval, the emerged/eroded areas develop considerably at periphery of the marine realm, particularly towards the "Dobrogea island" which was, at this time, probably connected to the "Thracian island" (Rhodopes).

*3) During the Clansayesian (late Aptian), Nolani and Jacobi zones (Fig. 15).*

The paleogeographic framework does not change significantly (single Axial Basin filled up by the Trambesh Fm./Sumer Fm. marls). In the Sumer area, a remarkable ammonite-bearing condensed level containing *Venezuellinae* (Stoykova, 1990) particularly points to the Jacobi zone. This period is locally marked by the northwards migration of the internal/proximal facies (Svistov Fm., Nolani and Jacobi zones, Stoykova &

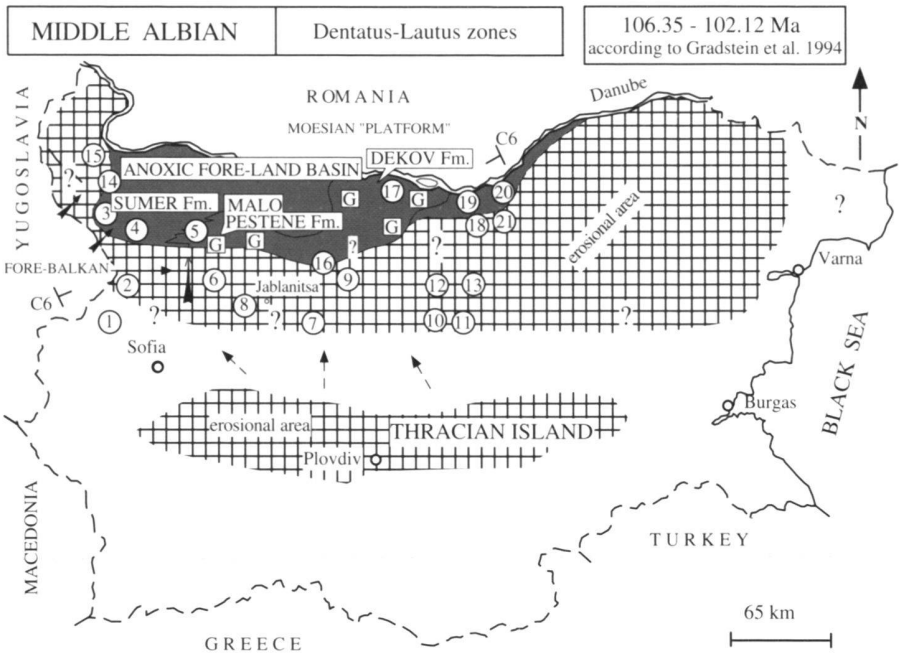


Fig. 16. Middle Albian (Dentatus – Lautus zones) paleogeographic map. See Fig. 4 for legend.

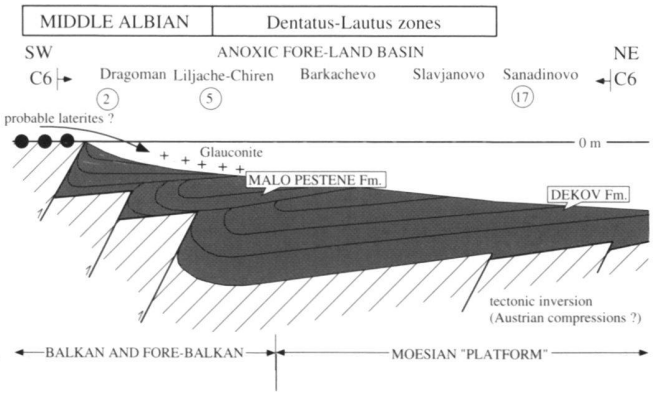


Fig. 17. Palinspastic SW-NE cross-section C6-C6 (Fig. 16), from the Balkan /Fore-Balkan towards the Moesian "microplate" (cental-north Bulgaria); thicknesses of the formations not to scale. See Fig. 4 for legend.

Ivanov 1988), probably linked to a new slightly marked north-east-southwest shoal.

### IV. During Albian, inferred first "Austrian" compressions and genesis of a single anoxic foreland basin (Fig. 16, 17).

This stage corresponds to the uniform deposition of anoxic black marls (but not black shales), locally interbedded with glauconitic green sandstones (Malo Pestene Fm., Soumer II Fm. and Dekov Fm., Ivanov et al. 1982; Ivanov & Stokova 1990; Ivanov 1991), generally containing numberous zone-ammonites (Tardefurcata, Mammillatum, Dentatus, Loricatus, Lautus and Inflatum zones, Ivanov 1991, Ivanov & Stoykova, 1990, 1997; Peybernès et al. 2000) within their numerous thin condensed sections. The marine basin considerably decreases in size on three of its sides, but is still open towards the northern part of the country and Romania. This remarkable spatial reduction of the marine basin, which is regarded from this time as a foreland basin, and also the appearance of anoxic conditions may be explained by the first tectonic inversions of the "Austrian Phase" which particularly induces the synsedimentary strike-slip motion and the overlapping of the previous fault-blocks of the southern limit then their emersion (Fig. 17). The exceptional abundance of glaucony in the Albian marine basin could be connected to the hypothetical presence of lateritic crusts on these emerged blocks, which become eroded, reworked and eventually transformed into glaucony in the marine basin.

### V. Conclusion

The reconstruction, based on a number of cross-sections and drillholes, of the seven previously described paleogeographic maps and the associated palinspastic profiles allows to reconstruct, step by step, the geodynamic evolution of the Bulgarian Balkanides and Moesia within the Barremian-Albian interval. This evolution is first characterized by a continued competition between "Urgonian-type" carbonate platforms and internal or external terrigenous basins until the earliest Aptian. Then begins the drowning and, finally, the disappearance of the former carbonate platforms under subsiding terrigenous sediments at the end of Aptian. This evolution ends in the Albian with the development of a single anoxic foreland basin, reduced in size and probably generated by the first Austrian

compressions. The passive North-Tethyan margin in Bulgaria, herein reconstructed along several palinspastic cross-sections, from Barremian to Albian, may be probably extended southwards, beyond the Rhodopes (Nikolov, Tzankov, 1997), down to the first occurrences of the Vardar crust (Tethyan ocean). Unfortunately, the lack, so far, of well characterized Early Cretaceous deposits in the Rhodopes does not allow to document this transition.

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