CENOZOIC MOLASSE BASINS IN KOSOVO AND THEIR GEODYNAMIC EVOLUTION

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Abstract. *From the Oligocene to Recent, Kosovo was part of the South Balkan extensional region. Extension began in the eastern and southeastern regions of Kosovo during the Early Oligocene with the formation of Dardane and Morava e Binçes - Gjilan molasse basins. Following a period of crustal shortening at the end of the Late Oligocene to the Early Miocene, a second period of Neogene extension commenced that continues to the present and resulted in the formation of the Fushe-Kosovo, Drenica and Dukagjini molasse basins. Six cycles can be defined during the Oligocene to Recent extension. These basins were closed and slightly deformed into asymmetric syncline structures either at the end of the Late Miocene or at the end of the Pliocene. Subsequently Kosovo formed part of an uplifted continental area that was exposed to denudation processes that led to the development of the current landscape. The neotectonic normal faulting occurred during the Pliocene-Quaternary in eastern regions of Albania and eastwards into Kosovo and Macedonia. This tectonism created well-defined horst and graben structures. The Dukagjini and Fushe-Kosovo basins, which are subdivided into numerous blocks and depressions, provide the evidence for these tectonic events.*

Keywords: *Kosovo, Balkans, molasse basins, extensional tectonics.*

Rezumat. Bazinele cenozoice de molasă din Kosovo şi evoluţia lor geodinamică. *Din Oligocen până în prezent, Kosovo a făcut parte din regiunea de extensiune sud-balcanică. Extensiunea a început în părţile de est şi sud-est ale regiunii Kosovo în timpul Oligocenului timpuriu când s-au format bazinele de molasă Dardane şi Morava e Binçes - Gjilan. După o perioadă de micşorare crustală de la sfârşitul Oligocenului superior până în Miocenul timpuriu, a debutat o nouă extensiune în Neogen, care se continuă şi în prezent şi a dus la formarea bazinelor de molasă Fushe-Kosovo, Drenica şi Dukagjini. Pot fi evindeţiate 6 cicluri din oligocen până în prezent. Aceste bazine au fost închise şi uşor deformate în structuri sinclinale asimetrice fie la sfârşitul Miocenului superior, fie la sfârşitul Pliocenului. Astfel, Kosovo a făcut parte dintr-o zonă continentală înălţată care a fost expusă proceselor de denudaţie care au dus la formarea peisajului actual. Falierea neotectonică normală s-a produs în Pliocen – Cuaternar în regiunile estice ale Albaniei şi spre est în Kosovo şi Macedonia. Acestă tectonică a creat structuri de horsturi şi grabene bine definite. Bazinele Dukagjini şi Fushe-Kosovo, care sunt subdivizate în numeroase bloxuri şi depresiuni, reprezintă dovezi ale evenimentelor tectonice.*

Cuvinte cheie: *Kosovo, Balcani, bazine de molasă, tectonică extensională.*

1. INTRODUCTION

Two periods of regional extension, interrupted by a period of compression (Late Oligocene-Early Miocene) occurred in Kosovo from the Early Oligocene to the present.

These extensional events in Kosovo comprise part of the South Balkan extensional region that, in addition to Kosovo, includes Northern Greece, Macedonia, Eastern Albania, Montenegro and Serbia.

This contribution concerns the Oligocene to Recent geodynamic evolution of Kosovo based on the data provided by the Cenozoic molasse basins.

The deep sedimentary sequences of the Cenozoic basins are rarely exposed, as they are covered by Pliocene or Quaternary deposits. Thus, most of the geological data from these basins is from boreholes and occasional exposures.

The basement of the Cenozoic basins in Kosovo had a long and complex tectonic evolution. The pre-Cenozoic basement rocks related to several major tectonic units, from East to West:

(1) Dardan Massif (part of Serbian-Macedonian Massif),
(2) Vardar Zone,
(3) Sharri Zone,
(4) Ophiolite Zone,
(5) Durmitori Zone (MALIQI, 2001; ELEZAJ, 2002).

2. CENOZOIC BASINS IN KOSOVO

The Cenozoic formations are widespread in Kosovo, covering about 40% of its territory. They include sedimentary and volcano-sedimentary rocks that were deposited in marine and lacustrine environments.

The oldest sediments in Kosovo are Oligocene, but the presence of Eocene sediments in Macedonia and the Presheva regions suggest that they also exist in Kosovo.

The Cenozoic sedimentary basins in Kosovo are, from west to east, as it follows (Fig. 1):

1. Dukagjini Basin, divided into smaller sub-basins: Peja, Gjakova, Prizreni and Bellanica;
2. Drenica (Drenasi) Basin;
3. Fushe-Kosovo Basin, divided into the sub-basins: Besiana (Podujeva) and Morava e Binçes-Gjilan;
4. Dardane (Kamenica) Basin;
5. Besiana (Podujeva) Basin (ELEZAJ, 2002; ELEZAJ and KODRA, 2008).

The Fushe-Kosovo and Drenica basins are filled with Middle and Late Miocene molasse successions, while the Dukagjini Basin with Middle-Late Miocene and Pliocene molasse sequences. Besiana and Prizreni sub-basins are filled

only with Pliocene molasse sediments (Fig. 2). The Dardane Basin is filled with an Oligocene and Miocene molasse succession. As a rule, the Quaternary transgressively overlies the molasse successions in all these Cenozoic basins.

The Dukagjini Basin, which is the largest one, has a peculiar subsided structure, surrounded from north, west and south by uplifted blocks that emerged during the neotectonic evolution. It is a slight deformed asymmetric syncline with low dipping flanks (the north-eastern flank is the largest one).

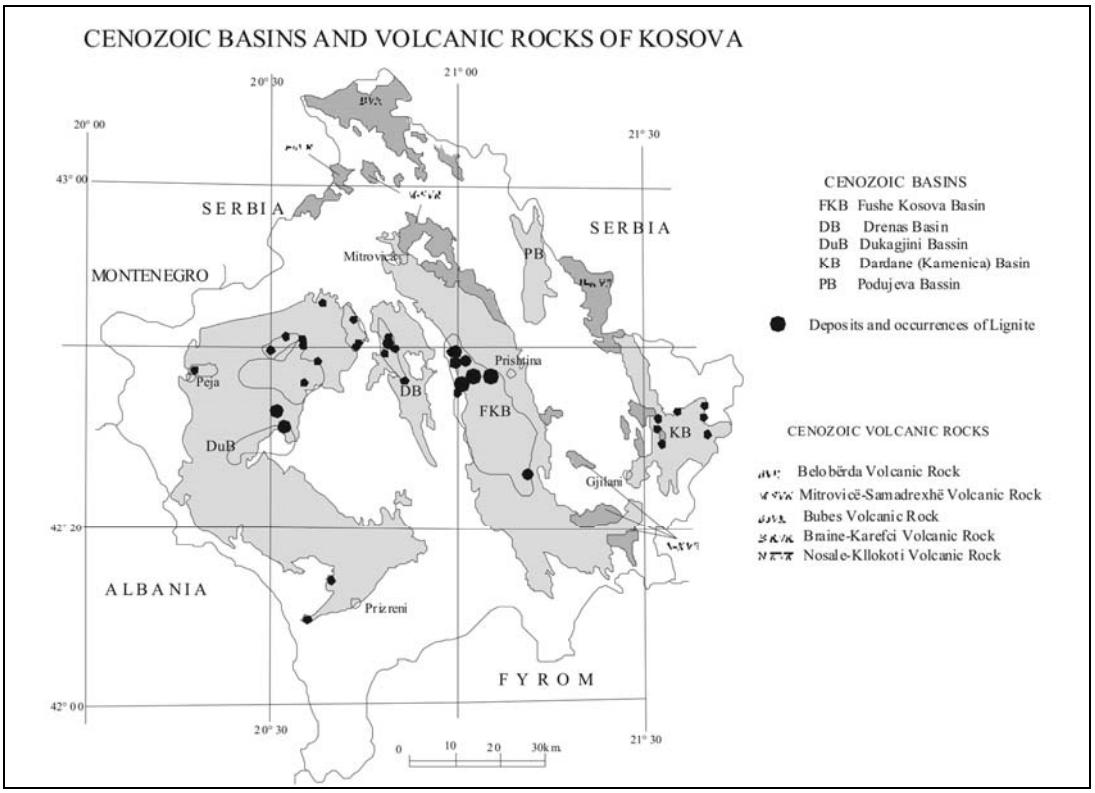

Figure 1. Cenozoic Basins and Volcanic Rocks of Kosova.
Figura 1. Bazinele cenozoice şi rocile vulcanice din Kosovo.

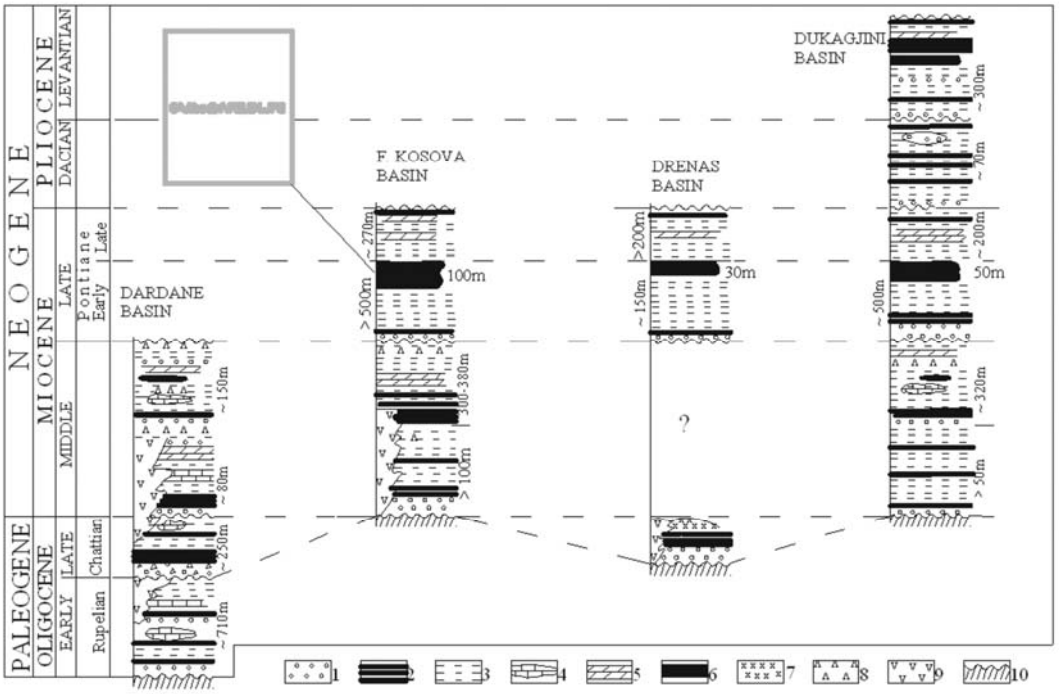

Figure 2. Stratigraphic Cenozoic column of Kosova
1-Conglomerate, 2-Sandstone, 3-Clay, 4- Limestone, 5-Marl, 6-Lignite, 7-Magnesite, 8-Tuff, 9-Eruptive rock, 10-Basement.
Figura 2. Coloană stratigrafică cenozoică din Kosovo
1-Conglomerate, 2- Gresie, 3-Argilă, 4- Calcar, 5-Marnă, 6-Lignit, 7-Magnezit, 8-Tuf, 9-Rocă eruptivă, 10-Fundament.

The Fushe-Kosovo Basin exposes a low asymmetric depression (into which the bottom of pre-molasse deposits is west-tilting.)

During the Pliocene, the Dukagjini and Fushe-Kosovo basins as well as their surroundings were deformed by strong extensional tectonism that resulted in the subdivision of these terranes by normal faulting (see Fig. 3 and 4). In the Fushe-Kosovo Basin the normal faults also penetrate into the basement rocks that underlie the molasse succession.

2.1 Stratigraphy

The stratigraphy of these sedimentary basins is outlined in ELEZAJ & KODRA, 2008.

PALAEOGENE. Palaeogene rocks in Kosovo occur in the north (Mitrovica and Besiana), as well as in eastern and south-eastern Kosovo. They transgress older formations and include Early Oligocene marine and volcano-sedimentary as well as Late Oligocene sedimentary and volcano-sedimentary sediments.

Early Oligocene. The Early Oligocene sedimentary sequence in the Morava e Binçes - Gjilan Basin begins with conglomerates passing upward into sandstones and claystones with coral and lithotamnic limestone lenses marked by the following marine fauna:

a) gastropods: *Cerithium plicatum, C. vivari, Diastoma costellatum elongatum, Natica (Ampullina) giberosa, N. (Ampullina) sigaretina, N. (Ampullina)* cf. *radula, N.* cf. *angustata, Strombus* sp.

b) corals: *Stylocoenia taurinensis, St. microphthalma, St. minuscola, Stilophora distans, St. cf. conferta, Astrocoenia multigrosa, Astracopora compressa, Phyllocoenia irradiata, Ph. (Heliastraea) hebertish (Pheliastraea) lucasiana, H. immersa, H. colunaris, Dimorphostraea iridians, Isastrea affinis, I. michelottina* etc., and

c) bivalves: *Macrosolen hollowaysii, Ostrea gigantica, Pecten cf. bucherii, Meretrix incrassata*.

Early Oligocene (Rupelian). These deposits are widespread in east and southeast Kosovo, from Besiana Basin and eastwards to southeastern part of Fushe-Kosovo Basin, in Ferizaj and Kaçanik. They are represented by a volcano-sedimentary series, transgressing basal conglomerates with clasts of diabase and gabbro as well as Late Cretaceous flysch. The stratigraphic section in the Morava e Binçes - Gjilan Basin begins with conglomerates passing upward into coral limestones, claystones, sandstones and volcanic rocks.

The following faunal assemblages occur:

a) corals: *Stylina suessi, Stylocoenia taurinensis, Cyathimorpha gregaria, Phyllocoenia irradians, Thamnastae centrifuga, Heliastraea forojuhensis, H. cylindrica,* etc.

b) bivalves: *Ostrea (Picnodonta) broungniarti, Spondylus cisalpinus* etc., and

c) gastropods: *Megatylotus crassatinus*, numulites: *Nummulites intermedius* and *N. incrassatus*. from that *N. intermedius e M. Crassatinus,* markers for the Rupelian stage.

The volcanic rocks are trachytes, latites, tracho-leucite breccias and tuffs.

Late Oligocene. These deposits are generally located in eastern Kosovo, in the Dardane region and partly in the Dubovc and Smrekonica regions. They are represented by lacustrine sediments, intruded by volcanic rocks.

In the Dardane Basin the Late Oligocene section is marked by basal conglomerates, passing upwards into clays, marls, sandstones, limestones and tuffites. A macroflora including *Gomtonia sp. Qurcus neriofolia, Driophylum curticellense, Sequoia sterbergi, Grevilea haerengiana, Andromeda protogena, Zizyphus zizyphoides, Bumelia sp.* etc., documents the Late Oligocene.

The Lece andesitic complex is the same age.

The Late Oligocene deposits are also found on the northeast margin of the Drenica Basin, where it is represented by the Dubovci magnesite series and Smrekonica calc-trachytes.

NEOGENE. The Neogene in Kosovo include Miocene and, occasionally, Pliocene sequences that are found in the Fushe-Kosovo, Dukagjini, Drenica and Dardane molasse basins. They include sedimentary sequences developed in lacustrine environments, particularly during the Pontian and Pliocene. These basins are distinguished by their coal-bearing beds (Fig. 2).

MIOCENE. The Miocene sequences are represented by the Early Miocene (?), Middle to Late Miocene and Late Miocene.

Middle Miocene. The Middle Miocene successions are located in Dardane (Krivareka), Dukagjini and Fushe-Kosovo basins, and include sandstones, marls, and occasional tuffites. The data demonstrate that the Dukagjini and Fushe-Kosovo basins were a single molasse basin during the Middle Miocene.

In Dardane Basin, the Middle Miocene deposits are divided into three clastic levels.

Middle and Late Miocene (undivided). These sequences are found in the Dukagjini and Fushe-Kosovo Basins, and transgress over the Late Cretaceous limestones, as well as over magmatic and metamorphic rocks. Three lithofacial horizons are distinguished from bottom to top: basal, carbonate, and sandstone-claystone, the last including coal strata.

Late Miocene. The Late Miocene sequences are found in the Fushe-Kosovo, Dukagjini and Drenica Basins.

These Late Miocene lake sediments have an important extension in the fore-mentioned basins, which may have been interconnected. The coal forming environment developed in the Late Pontian and resulted in the formation of thick strata.

Early Pontian. The Early Pontian sediments are located within the Fushe-Kosovo, Dukagjini and Drenica basins. There are two main horizons: a Early clastic horizon and a coal-bearing towards the top.

In Fushe-Kosovo Basin the Early Pontian includes terrigenous molasse series that is 50 m thick. The coal-bearing strata range from 40 m to 100 m in thickness.

The claystones within the coal-bearing sequence host a rich microflora: *Verrucatosporites fagus, Polypodiaceae, Reticuloidosporites secundus, Polypodiaceae, Monocolpopollenites tranquillus, Palme, Pityosporites microalatus, Pinus naploxylon.*

In the Drenica Basin, the Early Pontian sediments transgress over Palaeogene and Late Cretaceous formations. The coal-bearing horizon is thinner, from only some meters up to 40 m thick. In the Dukagjini Basin the coal bearing horizon belongs to the Middle and Late Miocene succession and is up to 50 m thick.

Late Pontian. The Late Pontian deposits occur in the basins mentioned above.

In the Fushe-Kosovo Basin the Late Pontian sediments transgress over the Early Pontian coal-bearing horizon. The following fauna is reported from the northwest of the basin: *Congeria ornithopsis, Viviparus viquesneli, Kosovia ornatia dhe Melanopsis decollata*, markers for the Late Pontian.

In the Dukagjini Basin the Late Pontian sediments are developed as a terrigenous sequence, with molluscs and ostracods: *Congeria ornithopsis, Viviparus kujarçensis, V. tetracarinatus, V. bicarinatus, V. lilianus, V. micricus, Kosovia ornata, K. kompressa, K. bouei, K. cf. pavlovi, Melanopsis decollata, Neritodonta veljentinensis, Candona stupeli, C. marginata, krusevoense, C. hvosnoica, C. cf. Veljae, Ilyocypris sp*. The sequence is about 200 m thick.

PLIOCENE. Pliocene deposits are found only in the western and southern sectors of the Dukagjini Basin, where they transgress over the Middle and Late Miocene.

The absence of Pliocene sediments in the other basins, such as the Fushe-Kosovo and particularly the Peja sub-basin, demonstrates that sedimentation in these basins was concluded during the Pontian. Pliocene subsidence in the southern part of Dukagjini Basin (Prizreni sub-basin) resulted in the deposition of lacustrine deposits, including clays, sands and gravels interbedded with thin coal strata.

The Pliocene sediments are sub-divided into the Dacian and Levantian. These sediments are flat-lying and 350-400 m thick in the Prizreni sub-basin. The Levantian sediments transgress over Late Cretaceous carbonate rocks, and contain freshwater molluscs: *Dreissensia munsteri hvosnoensis, Viviparus dukagjiensis, V. conica, V. dinici, V. lomejkoi, Lythoglyphus fascus, Unio sp., Anodonta sp.,* and ostracods*: Candona sp., C. ex.gr.fabaeformis. Paracandona sp. A.B, ilyocypris cf.gibba, J.cf. bradyi,* as well as flora*: Quercus pseudocastanea, Quercus sp., Monocotyledonae div.gen.sp.indet.*

In the Besiana (Podujeva) sub-basin the Pliocene sediments transgress over the Late Cretaceous limestones, and the sequence includes gravels, sands and clays.

QUATERNARY. Pleistocene. Pleistocene sediments, 10-30 m thick, are represented by sands, gravels and sandy clays and found principally in the Dukagjini, Drenica and Fushe-Kosovo basins, where they overlie Miocene or Pliocene sequences, and rarely Late Cretaceous ("Senonian") flysch.

Sedimentation in the Gjakova Lake ceased at the end of Pliocene (Romanian) or at the beginning of Pleistocene. Subsequently the whole Kosovo area gradually developed the present-day landscape: a continental area exposed to erosion processes.

2.2 Stratigraphic Setting of Coal Fields in Kosovo

The correlation of stratigraphic logs from the Fushe-Kosovo, Dukagjini (Peja sub-basin) and Drenica molasse basins demonstrate that the coal-bearing sequences formed during the Early Pontian (Late Miocene).

The coal field sequences are composed of the following rocks, from bottom to top:

i) Terrigenous, 500 m thick in Fushe-Kosovo Basin, composed of gravels at the lower part, passing upwards into sandstones, marls and clays.

ii) Coal of lignite type, 100 m thick in Fushe-Kosovo Basin, form a sequence of lignite coal that is some meters up to 10's meters thick, with interbedded clays, marls and carbonatic tuffs that are millimetres or centimetres thick, only rarely decimetres thick.

Multicoloured clays occur at the base of the coal sequence.

The Early Pontian is overlain by Late Pontian carbonate clays.

The absence of the Pliocene in Fushe-Kosovo and Drenica basins demonstrate that sedimentation in these basins ceased at the end of the Late Miocene.

The Fushe-Kosovo lignite field, extending NNW for about 30 km in a syncline structure, is estimated as one among of the biggest in Europe. The Dukagjini lignite field is the second biggest one in Kosovo.

3. CENOZOIC GEODYNAMIC EVOLUTION OF KOSOVO

Two principal sedimentary molasse basins were developed in Kosovo from the Early Oligocene to Recent time. The basins were formed on basement and reflect two major periods of extensional deformation interrupted by a short period of compression.

3.1 Periods of Extensional Deformations

The main geodynamic evolution events registered during the Cenozoic in Kosovo are the following:

i) Oligocene extensional regime,

ii) Latest Oligocene - Early Miocene compressional regime,
iii) Middle Miocene - Pleistocene extensional regime.

i) The Oligocene extensional regime

After the Illyrian compression phase occurred during the late Eocene to early Oligocene, the so-called Illyrian tectogenesis resulted in westward thrusting of the internal units the Kosovo was part of South Balkan extensional region, as northern part of the Aegean extensional regime.

Extension began in the Early Oligocene in east and southeast Kosovo, establishing the Dardane and Morava e Binces - Gjilan molasse basins.

Similar molasse basins also developed in eastern FYROM, parallel to similar basins in adjacent Bulgaria, as well as in Presheva region.

The oldest period of extension and basin development in FYROM began in the late Eocene and was marked by various types of basins with sedimentary sequences ranging from late Eocene to Oligocene (DUMURDZANOV et al., 2005). Basins of this type are also found in the Presheva region. Based on the data from the adjacent territories around Kosovo, it is presumed that the oldest sediments in the Kosovo Oligocene basins are Late Eocene, but this remains to be checked by future studies.

This extension period can be divided into two sedimentary cycles, as follows:
- Early Oligocene - Cycle I
- Late Oligocene - Cycle II

Early Oligocene: Cycle I

In the Early Oligocene the typical marine facies had evolved into epicontinental shallow water environments. The presence of Early Oligocene deposits in the deeper parts of the basins demonstrates the existence of a large marine basin connected with the Mediterranean Tethyian Basin.

The lowermost part of the Early Oligocene sedimentary succession in the Dardane Basin is represented by conglomerates, passing upward into sandstones and claystones with coral limestone lenses. This succession is overlain by a volcanic-sedimentary series, containing coral limestones. A large volcanic eruption, marked by trachitic, latitic and leucitic lavas, as well as by breccias and tuffs, occurs in East and Southeast Kosovo.

Late Oligocene: Cycle II

During the Late Oligocene the first continental lacustrine and fluvial sedimentary facies, with intercalated volcanic and pyroclastics, were deposited within lake basins that developed from the Early Oligocene marine basins. The magnesite deposits in the Dubovci area are connected with this effusive-sedimentary series.

ii) The End of Late Oligocene to Early Miocene period of compression regime

A period of compression affected the Kosovo area at the end of the Late Oligocene and persisted until the early Miocene in two short Pyrenean and Savian tectonic events.

These short episodes of deformation were followed by erosion, which reduced the landscape to a low relief.

iii) The Middle Miocene to Pleistocene period of extensional regime

Following a brief period of compression in the Late Oligocene to Early Miocene, a second period of Neogene extension began that has continued up to present. During this period the Fushe-Kosovo, Dukagjini and Drenica molasse basins were established.

The Neogene was characterized by continental conditions similar to those that were established in the late Oligocene.

Following a short period of erosion and the development of a low-relief landscape, a second period of extension began in the late Early Miocene (?) or Middle Miocene time and became the dominant mode of deformation from then to the present. This extensional period can be divided into four sedimentation cycles, as follows:

- Pleistocene - Cycle VI,
- Late Pliocene - Cycle V,
- Late Miocene - Early Pliocene - Cycle IV,
- Middle Miocene - Cycle III,

In eastern Albania, west of Kosovo, the Librazhdi and Mati molasse basins transgressively overlie the Mirdita ophiolite zone, and are filled with Middle-Late Miocene lacustrine deposits (PASHKO, 1976). In FYROM, south of Kosovo, Miocene basins of this age range are also developed (ARSOVSKI, 1997). In Kosovo, sedimentation commenced in the Middle Miocene, and transgressively overlies basement rocks of different tectonic units (ELEZAJ, 2002).

Middle Miocene: Cycle III

The Middle Miocene lacustrine deposition was characterized by a transgressive sedimentary facies (conglomerates, sandstones, clays, marls and tuffs) of considerable thickness that occurs throughout almost all Kosovo territory. The coal strata within Dukagjini and Dardane Basins were deposited at this time.

Late Miocene – Early Pliocene: Cycle IV

The Late Miocene (Pontian) sediments transgressively overlie the Middle Miocene sequence and host the very important Early Pontian coal-bearing succession in the Fushe-Kosovo, Drenica and Dukagjini Basins.

The formation of the lignite coal deposits of lignite type during the Early Pontian within lacustrine basins, especially in the Fushe-Kosovo Basin, demonstrate the presence of suitable paleogeographic conditions and optimal climate existed for the coal-formation process.

At the end of the Late Miocene sedimentation in the Fushe-Kosovo and Drenica lacustrine basins ceased and the sequences were slightly deformed. Early Pliocene sedimentation continued only in the Dukagjini Basin with the deposition of sands, clays and marls.

Late Pliocene: Cycle V

A Late Pliocene (Levantian) a transgressive succession, represented by sands, clays and marls, with coal strata in its lower part, was deposited.

Sedimentation in the Dukagjini Basin (Gjakova Sub-basin) ceased at the end of the Pliocene (Levantian) or Early Pleistocene, when finally it was also slightly deformed.

Subsequently the Kosovo territory developed its present-day landscape: a continental area with predominance of erosional processes.

Pleistocene: Cycle VI

Sedimentary rocks of Pleistocene age (cycle VI) are the most widespread Cenozoic deposits in Kosovo. In many places they cover older Cenozoic deposits. The Pleistocene age (cycle VI) tectonic activity is characterized by a general uplift and development of glacial deposits. Subsidence and formation of the present Aegean Sea, and the simultaneous elevation of the Balkan Peninsula, resulted in the burial of lacustrine deposits by glaciofluvial and proluvial-alluvial material as well as the draining of the lake system.

The Dukagjini and Fushe-Kosovo Basins were the site of subsidence during the Pleistocene that resulted in the deposition of around 30 m of poorly sorted gravels.

3.2 Neotectonic (Pliocene-Quaternary) Normal Faulting Tectonics

Strong and progressive uplift occurred throughout the Mediterranean Region, including Greece, Albania, Kosovo, FYROM and many other countries to the east and north-west, during the Pliocene-Quaternary and resulted in normal faulting. This faulting established there a well-defined horst-and-graben structural morphology (ALIAJ, 1998; ELEZAJ, 2002, 2008; MERCIER et al., 1989) in the region.

In Albania and its surroundings the neotectonic orogene is divided into two domains: a coastal domain of compression dominated by northwest to north-northwest striking thrusts and folds, and an interior domain of extension dominated by north-striking normal faults. The commencement of neotectonic activity in the Pliocene was marked by extensional tectonics, which affected the interior domain of the country and created its horst-graben structures (Aliaj, 1998).

The Dukagjini and Fushe-Kosovo Basins and surrounding areas were deformed during the Pliocene-Quaternary by a strong extensional tectonics that resulted in the subdivision of these terranes by normal faulting (see Figs. 3 and 4). In the Fushe-Kosovo Basin the normal faults penetrate not only the complete sedimentary succession, but also the underlying basement rocks.

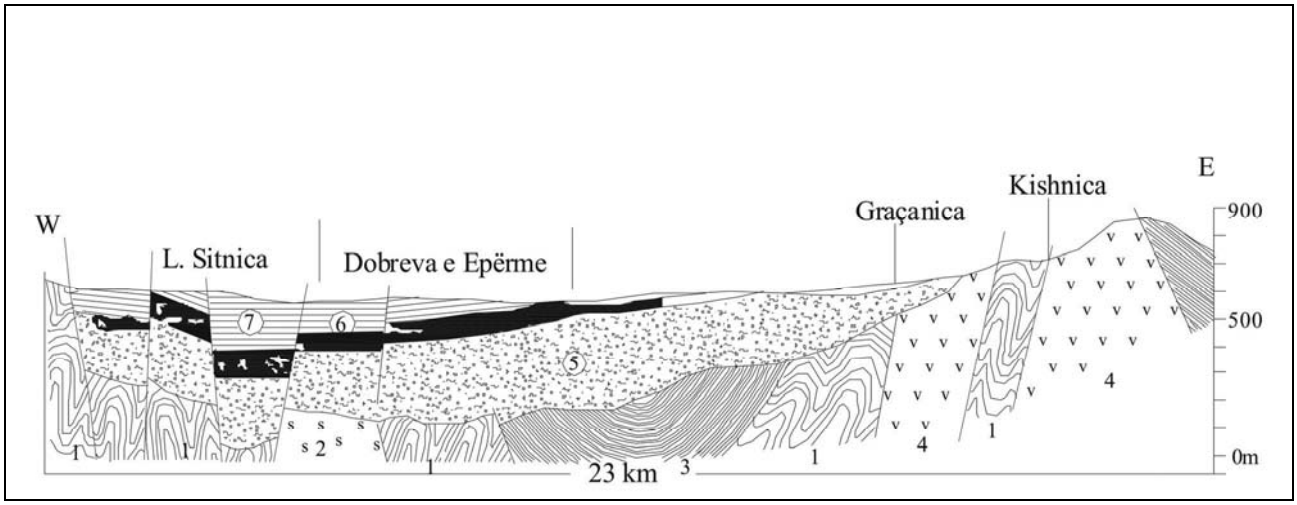

Figure 3. Geological cross – section through Fushë – Kosova Basin
1-Metamorphic Paleozoic rocks, 2-Ophiolite rocks, 3-Upper Cretaceous deposits, 4-Effusive rocks, 5-Upper Miocene sediments, 6-Lower Pontian lignites, 7-Upper Pontian cover.

Figura 3. Secțiune geologică în bazinul Fushë-Kosovo
1-roci metamorfice paleozoice, 2-roci ofiolitice, 3-depozite din Cretacicul Superior, 4-roci efuzive, 5-sedimente din Miocenul Superior, 6-lingnit din Ponțianul Inferior, 7-strat Ponțian Superior.

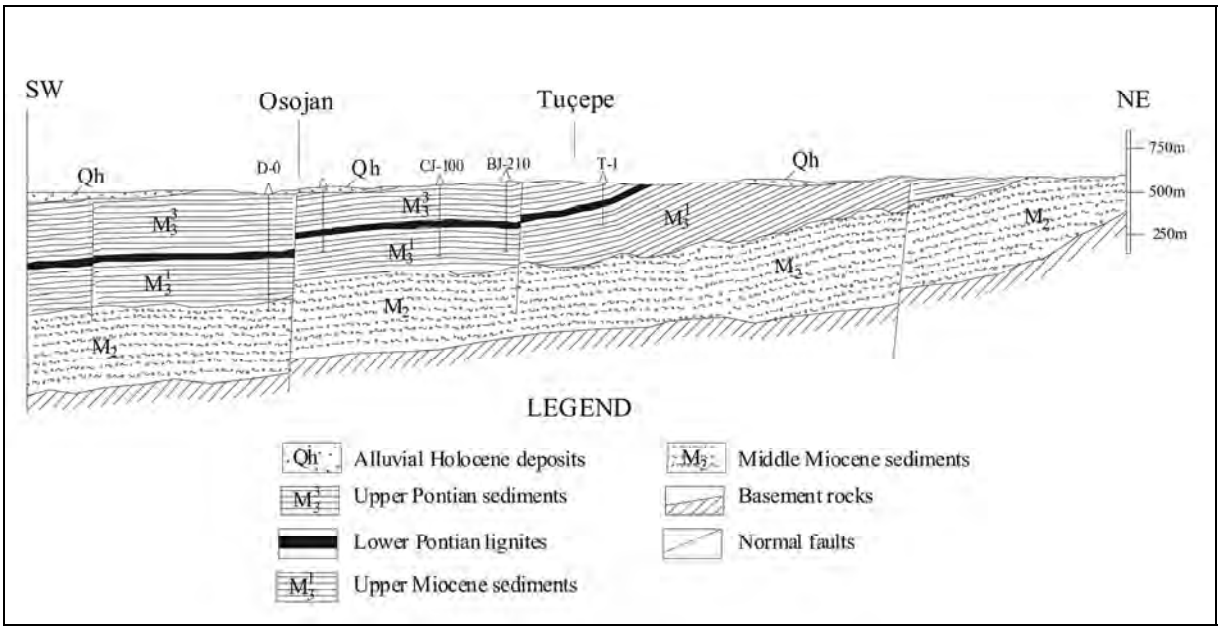

Figure 4. Geologic cross – section through Dukagjin Basin (Osojan-Tuçepe).
Figura 4. Profil geologic în Bazinul Dukagjin (Osojan-Tuçepe).

Due to this strong normal faulting tectonism during the Pliocene-Quaternary Kosovo is characterized by horst and graben structures.

4. CONCLUSIONS

During the Cenozoic, Kosovo experienced two periods of extension separated by two brief periods of compression.

The first period of extension Early to Late Oligocene established the Dardane and Morava e Binçes-Gjilan molasse basins. These basins were deformed by NW-trending thrust faults and folds during the Late Oligocene to Early Miocene time. This period of compression was short-lived and followed by a period of erosion that resulted in a landscape of low relief.

The second period of extension began in the Middle Miocene and has continued to the present, during which the Fushe-Kosovo, Drenica and Dukagjini Basins were established. At the end of the Late Miocene sedimentation ceased in the Fushe-Kosovo and Drenica lacustrine basins and subsequently weakly deformed in asymmetric syncline structures.

Pliocene sedimentation continued only in the Dukagjini Basin, where it ceased at the end of the Pliocene (Levantian) or Pleistocene, when it was slightly deformed into an asymmetric syncline.

Two other small basins: the Prizreni and Besiana (Podujeva) Sub-basins were established during the Pliocene. They were closed and deformed at the end of Pliocene.

Subsequently, the entire Kosovo territory acquired its present-day landscape: a continental area with predominance of erosional processes.

The neotectonic normal faulting period during the Pliocene-Quaternary in the eastern regions of Albania, Kosovo, FYROM and other countries, created there a well-defined horst-and-graben structural morphology.

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