GENERAL DİRECTORATE OF MINERAL RESEARCH AND EXPLORATION
(MTA)

STATE DEPARTMENT OF GEOLOGY OF GEORGIA (SDG)

GEOLOGICAL INSTITUTE OF ACADEMIA OF SCIENCES OF GEORGIA
(GIN)

GEOLOGY OF THE CAUCASUS AND EASTERN BLACK SEA REGION

KAFKASYA VE DOĞU KARADENİZ BÖLGESİNİN JEOLOJİSİ

COLLOQUIUM
KOLLOKYUM

Programme and Abstracts
Program ve Özler

19-20 NOVEMBER 1997
19-20 KASIM 1997

MTA GENEL MÜDÜRLÜĞÜ KONFERANS SALONLARI
ANKARA

PROGRAMME OF THE COLLOQUIUM
19-20 NOVEMBER 1997

Hour	WEDNESDAY, 19 NOVEMBER
9.30-10.30	Openning Session General Directorate of MTA General Directorate of SDG General Directorate of GIN
10.30-11.00	Yılmaz et al. Slide show "From the Caucasus to the Anatolia"
11.00-11.30	**BREAK**
11.30-12.30	Yılmaz A. and Shota , A Geological frame of the Caucasus and Eastern Turkey.
12.30-13.30	**LUNCH**
13.30-14.00	Yılmaz et al. Geological correlation of the units along the Turkish-Georgian Border.
14.00-14.30	Adamia et al. Geodynamic Evolution of the Eastern Black Sea Region.
14.30-15.00	**BREAK**
15.00-15.30	Engin et al. Metallogenesis of the area from Trabzon to Southwestern Georgia.
15.30-16.30	Buadze et al. A study of metallogenetic units of the area in northern Turkey and southwest Georgia.
16.30-17.30	Gugushvili et al. A new type of sulphide ore deposits in subduction zones.
Hour	**THURSDAY, 20 NOVEMBER**
9.30-10.00	Aydın et al. Geophysical studies of the Turkish-Georgian border zone.
10.00-10.30	Koçak et al. Geothermal aspects of Turkish-Georgian border area.
10.30-11.00	Lazarashvili et al. Geothermal potential of the area along the Turkish-Georgian border.
11.00-11.15	**BREAK**
11.15-12.00	Tseretely et al. Engineering-geological conditions of the Turkish-Georgian border area.
12.00-12.30	Yılmaz et al. A correlation of coal deposits in southwest Georgia and northeast Turkey.
12.30-13.30	**LUNCH**
13.30-17.30	JOINT SESSION Evaluation and reviewing of the study Preparing new protocols
Hour	**FRIDAY, 21 NOVEMBER**
9.30-10.00	Departure to İzmir to visit the Geothermal fields.

Table 1. The staff of work and aspects of the project studies (P, Part time).

The Staff of Work and Contents of Study	Turkish Side	Georgian Side
Project leaders	Ali Yılmaz	Viladimir Gugushvili 1994-5 SDG Tengiz Lazarashvili 1995-6 SDG
Advisers	Tandoğan Engin	Shota Adamia
Regional geology and mapping (Chapter I)	Ali Yılmaz Torun Yılmaz İskender Kurt Mustafa Özkan Tayfun Bilgiç (P) Neşat Konak (P) Mustafa Karabıyıkoğlu (P)	Shota Adamia GIN Manana Lordkipanidze GIN Simon Kuloshvili GIN Tengiz Lazarashvili SDG Roland Beradze SDG Guram Nadareishvili SDG Robert Nadirashvili SDG Givi Maisuradze GIN Guram Abesadze SDG
Paleontology	Emin Nevzat Erkan (P) Kemal Erdoğan (P) Erdoğan İnal (P) Afet Kallioğlu (P) Aynur İnal (P) Sefer Örçen (P) Engin Ünay (P) Sevim Tuzcu (P)	Nodar Salukvadze GIN
Petrography and Geochemistry	Ş.Nihal Aydın Tuncay Ercan (P)	Manana Lordkipanidze GIN
Ore deposit studies (Chapter II)	Tandoğan Engin Necmi Yüce Murat Er	Vasha Buadze SDG Yuri Bakhtadze SDG Andro Khutsaudze SDG
Geophysical studies (Chapter III)	İbrahim Aydın Halil İbrahim Karat Hasan Kılıç Musa Kaynak Seyit Tosun Kürşat Bekar Ali Yılmaz	Tite Gakharia SDG Givi Saradjishvili SDG Anzor Meskhia SDG Tengiz Lazarashvili SDG
Geothermal aspect (Chapter IV)	Ali Koçak	Tengiz Lazarashvili SDG Guram Nadareishvili SDG
Aspect of coal studies (Chapter V)	Ali Yılmaz	Tengiz Lazarashvili SDG R.Tskvitinidze SDG A. Tsitskishvili SDG R. Nadirashvili SDG
Engineering-geological and environmental studies (Chapter VI)	Erdal Herece Ali Yılmaz	Emil Tsereteli SDG Nugzar Gogua SDG Emzar Megrelishvili SDG Dimitri Kalandadze SDG
Geodynamic evolution of the Eastern Black Sea region (Chapter VII)	Ali Yılmaz	Shota Adamia GIN Aleksandre Chabukiani GIN Tamara Chkhotua GIN

INTRODUCTION

The Objectives of the colloquium are to present the results of the Turkish-Georgian Geological Project, which carried out in 1994-1996 along the border region of Turkey and Georgia and to encourage discussions among active researches on earth sciences of the region.

GİRİŞ

Kollokyumun amacı, 1994-1996 yılları arasında Türkiye-Gürcistan sınırı boyunca uygulanan Türkiye-Gürcistan Jeoloji Projesi'nin sonuçlarını sunmak ve yerbilimleri alanında bu yörede çalışan araştımacılar arasında tartışma ortamının geliştirilmesine katkıda bulunmaktadır.

ORGANISING COMMITTEE *(DÜZENLEME KURULU)*

Güner ÜNALAN
Ali YILMAZ
Tandoğan ENGİN
İbrahim AYDIN
Ali KOÇAK
Neşat KONAK
Tuncay ERCAN
Torun YILMAZ
İskender KURT
Tamaz JANELIDZE
Shota ADAMIA
Vladimir GUGUSHVILI
Guram ABESADZE
Vaja BUADZE
Emil TSERETELY
Tengiz LAZARASHVILI

CORRESPONDANCE *(YAZIŞMA-BAŞVURU)*

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LANGUAGE *(SUNUM DİLİ)*

The language of the Colloquium is English, Turkish and Georgian. There will be also translation from Georgian to Turkish during presentations.

Kollokyum da sunular İngilizce, Türkçe ya da Gürcüce olacaktır. Gürcüce sunular Türkçe'ye çevrilecektir.

CONTENTS

GEOLOGICAL FRAME OF THE CAUCASUS AND EASTERN TURKEY

Ali YILMAZ, General Directorate of Mineral Research and Exploration, 06520, Ankara.
Shota ADAMIA, Tbilisi öState University, Department of Geology and Paleontology, 380028, Tbilisi.

A section from the Caucasus to Eastern Turkey lying between the Scythian Platform to the north and the Arabian Continent to the south represents an important geotraverse in the Mediterranean Folded Belt. It is useful to present the geological characteristics, lateral and vertical variations, similarities and differences of the region in a global frame to focus and understand the geology of the Turkish-Georgian Border area.

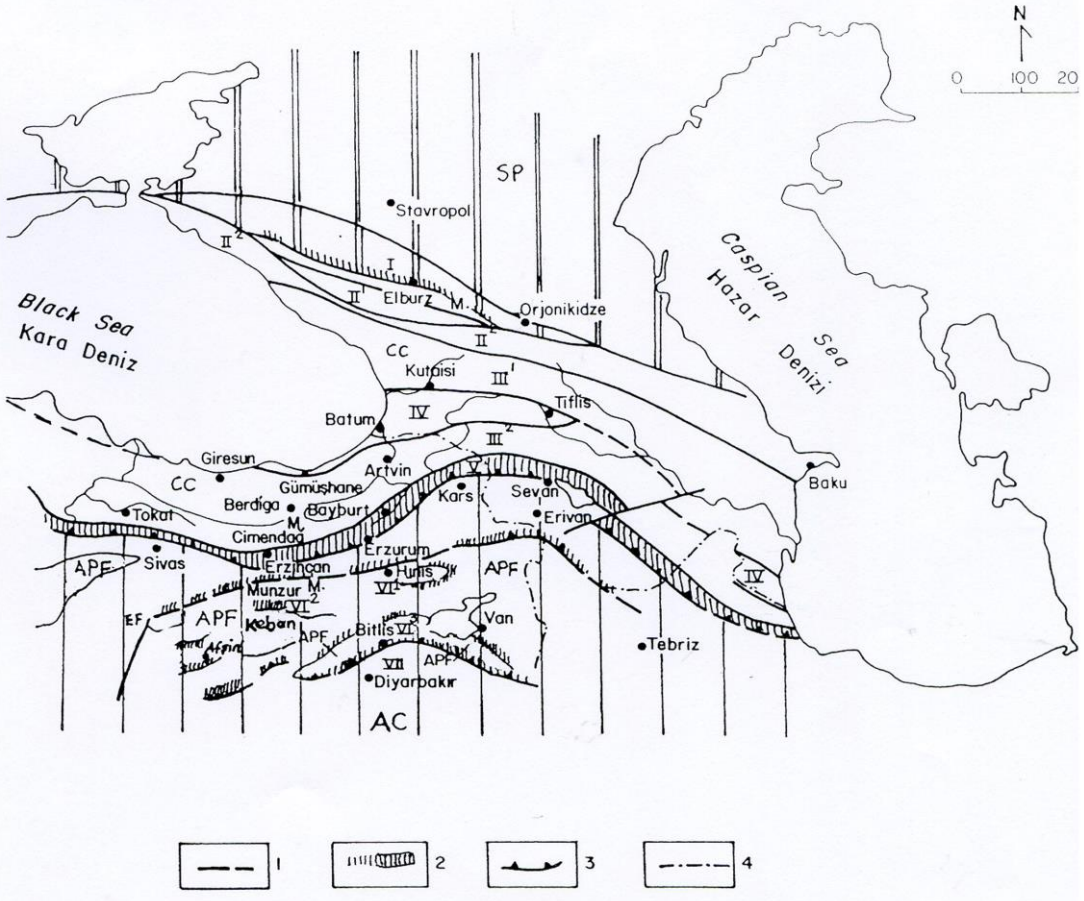
On the basis of the main geological characteristics, the rock units of the Caucasus are divided into tectonic zones (Figure, 1). Each zone has Pre-Liassic, Liassic and post-Liassic units reflecting different geotectonic environments. The northern part of the Caucasus is called the Precaucasus and Great Caucasus, the median part is the Transcaucasus and southern part is the Lesser Caucasus. In addition, the tectonic zones of the Great Caucasus lying from north to south are presented below: The Laba-Malka Zone (the Bechasinian Subzone and Forerange Subzone), the Main Range Zone, and the Southern Slope Zone. In the Transcaucasus, the Gagra-Djava Zone, and the Dzirula massif and its covers (Georgian block) are situated to the north, the Artvin-Bolnisi zone, the Bayburt-Kafan-Karabakh Zone to the south. The Rioni (Kolkhida) and Kura intermountain depressions are situated among them. The Adjara-Trialetian and Talysh Zones, which are the continuation of each other, are situated between the previous Transcaucasus zones. There is a suture between the Scythian platform and Great Caucasus arc. Late Carboniferous-Permian molasses overlie the obducted ophiolites which represent the closing of a back arc basin during Early and Middle Paleozoic. Jurassic units of the Great and Transcaucasus represent the products of rifting events. Upper Cretaceous volcano-sedimentary association of the Transcaucasus and also Pontides is a typical example of south-facing ensialic arc.

North Anatolian-Lesser Caucasian Ophiolitic Belt which is represented by pre-Coniacian ophiolites, ophiolitic melanges and fore-arc deposits, seperates the imbricated zone of Transcaucasus-Pontide arc from the Anatolian-Iranian Platform. The Anatolian-Iranian Platform represents a passive continental margin and its metamorphic equivalents throughout Paleozoic and Mesozoic. Southeastern Anatolian Ophiolitic Belt which is represented by Pre-Maastrichtian ophiolites, ophiolitic melanges ensimatic arc and fore-arc associations seperates the Anatolian-Iranian Platform from the Arabian Continent. The rock units of this belt are interpreted as a product of southern branch of Neotethyan ocean. It is noticable to emphasize that the emplacement age of the Great Caucasus ophiolites is Pre-Late Carboniferous, the Lesser Caucasus is Pre-Coniacian and Southeastern Anatolian ophiolites is Pre-Maastrictian. As a result, it can be said that a small oceanic basin of the Great Caucasus closed first and then followed by the closure of oceanic basins of the Lesser Caucasus and Southeastern Anatolia respectively. Although the Paleozoic sequence of the Arabian Continent is similar to the Paleozoic sequence of the Anatolian-Iranian Platform, Mesozoic sequence of both fragments are different. For example, the Arabian Continent is characterized by a regional uplift from Late Triassic to Barremian , and a foredeep basin formed during Campanian-Early Maastrichtian.

From the Transcaucasus to the Arabian Continent, there are local or regional unconformities between Pre-Maastrichtian rock units and Maastrchtian-Paleocene sequence which is characterized by shallow marine limestone and terrigenous clastic rocks. There are no data on relict oceanic basins along a section from the Caucasus to the Arabian Continent in Turkey during Tertiary. Middle Eocene volcanics which are

representing local tensional basins occured along the Adjara-Trialeti and Talisch zones and in places along the Eastern Pontide or the Eastern Tauride,

It is reported that the shallow marine to continental deposits of Oligocene-Early Miocene represent a regressive serie and overlie the older rock units, which are altogether deformed at the same scale. Upper Miocene-Quaternary continental deposits represent the Neotectonic molasse of the region. Tectonic and volcanic characteristics of the Caucasus molasses are similar to the characteristics of the Neotectonic fill exposed in the Eastern Anatolia, which developed under approximately N-S directed compressional processes.



Figure, 1, The Zones of the Caucasus and the north-eastern Turkey (After Yılmaz, 1989) I-Laba-Malka Zone of the Greater Caucasus, II^1-Main-Range Zone of the Greater Caucasus II^2-Southern Slope Zone of the Greater Caucasus, III^1-Gagra-DJava Zone and northern part of the Transcaucasus, IV-Adjara-Trialetian and Talysh Zones/Black Sea Coastal Zone, III^2-Somcheti-Kafan (Karabakh) Zone of the Transcaucasus/Pontid Zone, V-The Lasser Caucasian Ophiolitic Belt/North Anatolian Ophiolitic Belt, VI-The Iranian quasiplatform Lesser Caucasus: Miskhan-Zangezur and Araks Zones/Taurus Zone: Anatolian-Taurus paltform, 1-Approximate borders of the tectonic zones, 2-Ophiolitic Zones, 3-Major overthrusts, 4-Border of the states (AC, the Arabian plate; APF, the Anatolian-Iranian Platform Fragments; CC, the Cimmerian Continent; Ef, the Ecemiş Fault; SP, the Scythian Platform).

A STUDY OF TECTONIC UNITS OF THE AREA ALONG TURKISH-GEORGIAN BORDER

Ali Yılmaz, Shota Adamia**, Manana Lordkipanidze***, Torun Yılmaz*, İskender Kurt*, Guram Abesadze****, Tengiz Lazarashvili****, Roland Beradze****, Robert Nadirashvili****, Simon Kuloshvili***, Mustafa Özkan**

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***Tbilisi State University, Department of Geology and Paleontology-380028, Tbilisi/Georgia,*
****Geological Institute of the Academy of Sciences-380093, Tbilisi/Georgia,*
*****State Department of Geology-380062, Tbilisi/Georgia.*

The aim of this study is to map the border area (Fig.1,2) as a whole and evaluate the main geological characteristics of the region.

Two main tectonic units are observed along the border area, which are respectively the Adjara-Trialeti unit to the north and the Artvin-Bolnisi unit to the south. The Lowermost part of these units, particularly in the study area, is characterized by the Late Cretaceous arc association of the Eastern Pontides and Southern Transcaucasus.

Along the Adjara-Trialeti unit (Fig.3), the Maastrichtian-Paleocene hemipelagic limestones and turbiditic terrigenous clastics overlie the back-arc rocks conformably and pass gradually upwards into the Eocene volcanic rocks. Middle Eocene volcanic rocks include, from bottom to top as an alternation of turbiditic rocks and basaltic volcanics, dellenitic volcanics, and shallow marine basaltic volcanoclastic rocks. As a whole they appear to be at least 7 km. in thickness. This sequence is followed conformably by the Late Eocene shoshonitic volcanics.

Along the Artvin-Bolnisi unit (Fig.4), the Maastrichtian-Paleocene shallow marine limestone and turbiditic terrigenous clastics overlie the arc rocks and pass upwards in to the Eocene volcano-clastic rocks with local unconformities. The Middle Eocene volcanic rocks show similar succession to that of the Adjara-Trialeti unit and appear to be 1,5-2 km or less in thickness (Fig.5). This sequence is followed conformably by the Late Eocene shallow marine clastics.

In the study area of Turkish side all kinds of massive sulfide deposits occur in the upper part of asidic volcanic lavel (Kızılkaya formation) and under basaltic volcano-sedimentary sequence (Çağlayan formation), which exposes only along the transition zone of the Adjara-Trialeti and Artvin-Bolnisi units. In general porhyry and vein type sulfide deposits are found in different levels of both the Adjara-Trialeti and Artvin-Bolnisi units, which developed depending on intrusive bodies.

In spite of the differences in terms of thickness, local unconformities and type of rock units noted above, the Maastrichtian-Eocene sequences of both tectonic units can be correlable and it could also be concluded that Artvin-Bolnisi block played a marginal role for the Adjara-Trialeti basin.

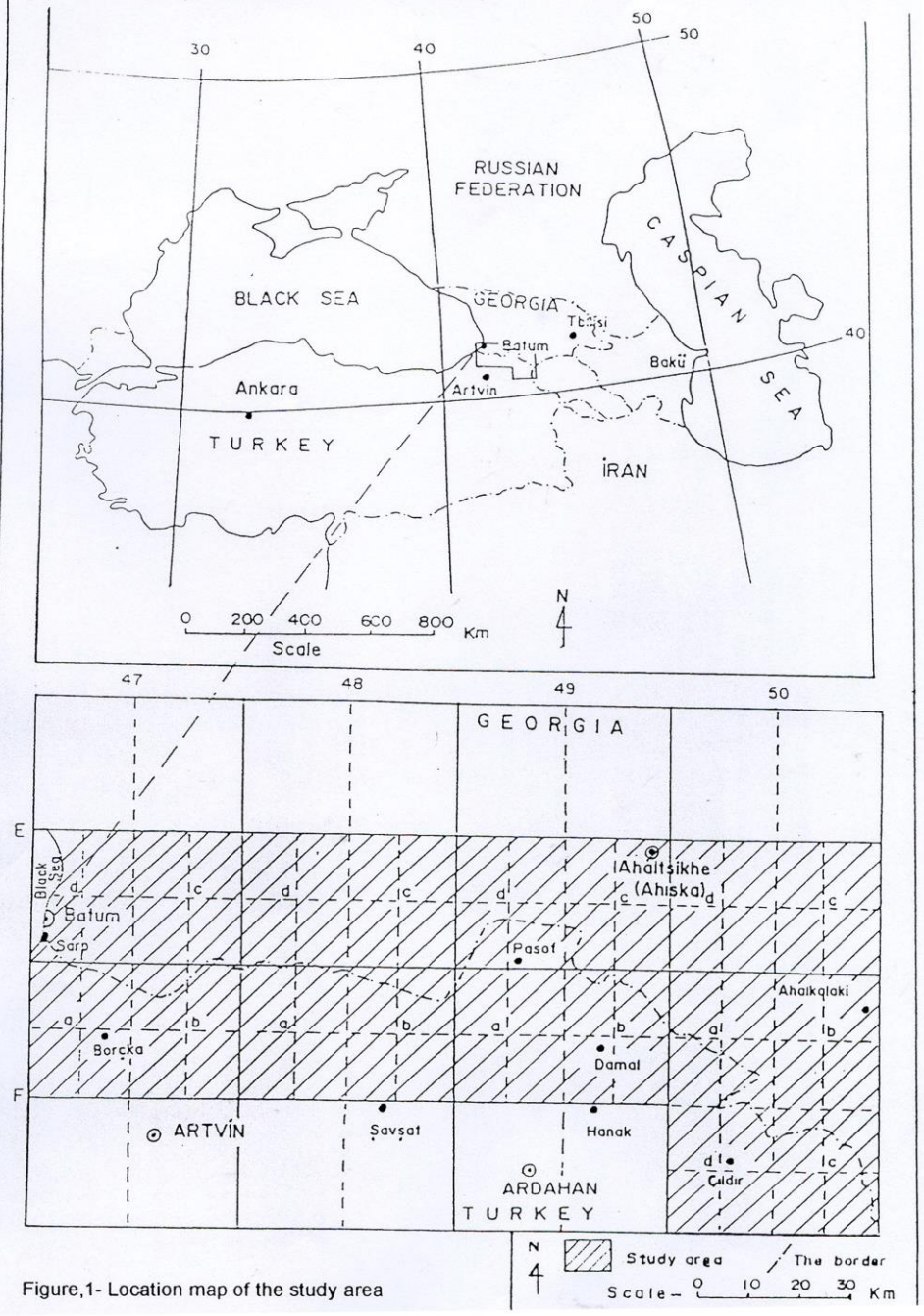
Oligocene shallow marine to continental clastics overlie the both tectonic units conformably and can be interpreted as a regressional sequence.

All these rock units presented above were folded more intensively in the Adjara-Trialeti zone and in places thrusted at the end of Oligocene-Early Miocene, along the NE-SW trend.

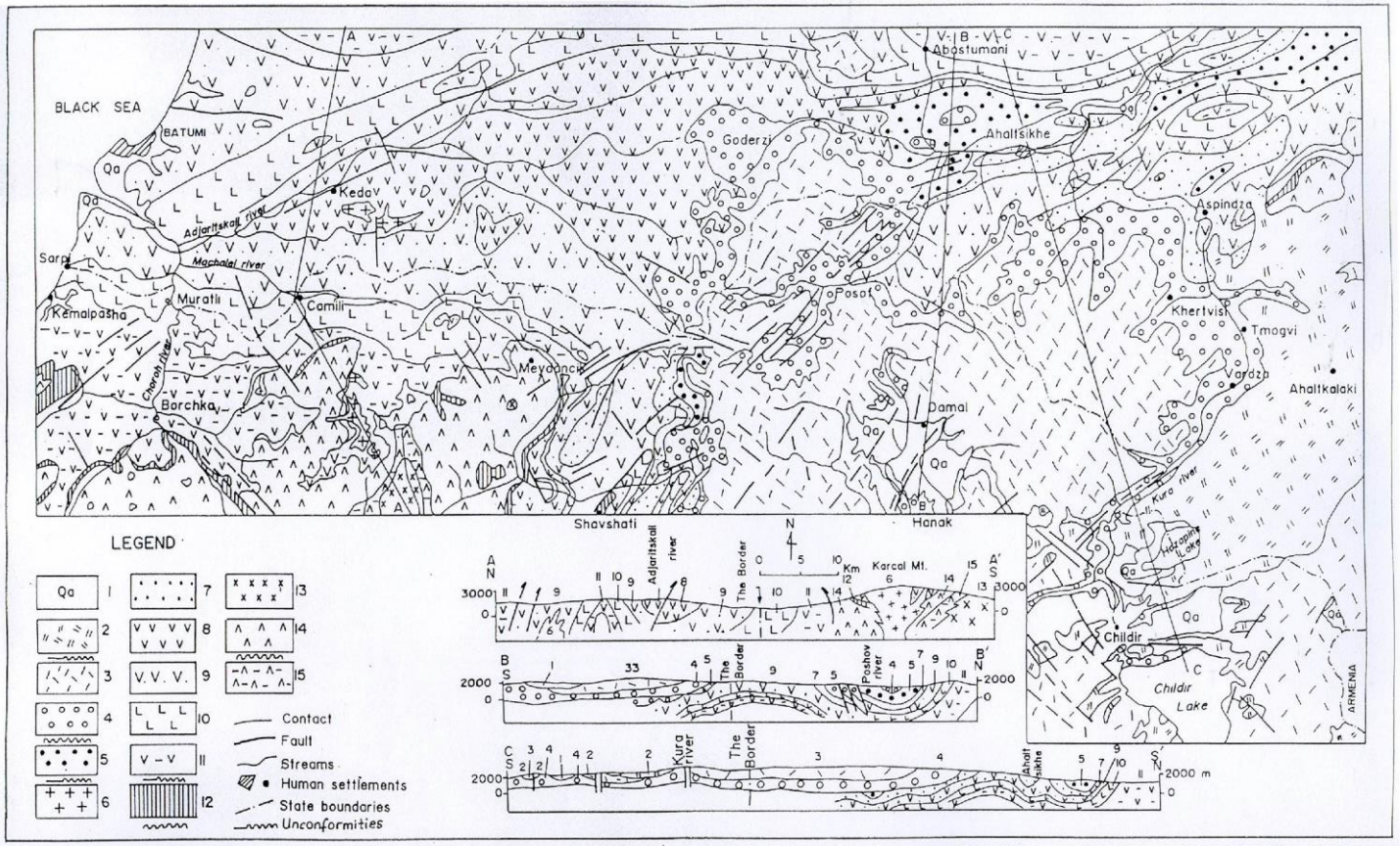
In the study area, Late Miocene-Pliocene continental clastics and volcanics and also Plio-Quaternary basalts and andesites overlie respectively all the older units unconformably and represent a molassic deposits of the new tectonic period.

As a result of this study, the following conclusions are reached : 1) The facies of Adjara-Trialeti units are traced along the Eastern Black Sea coast in Turkey as

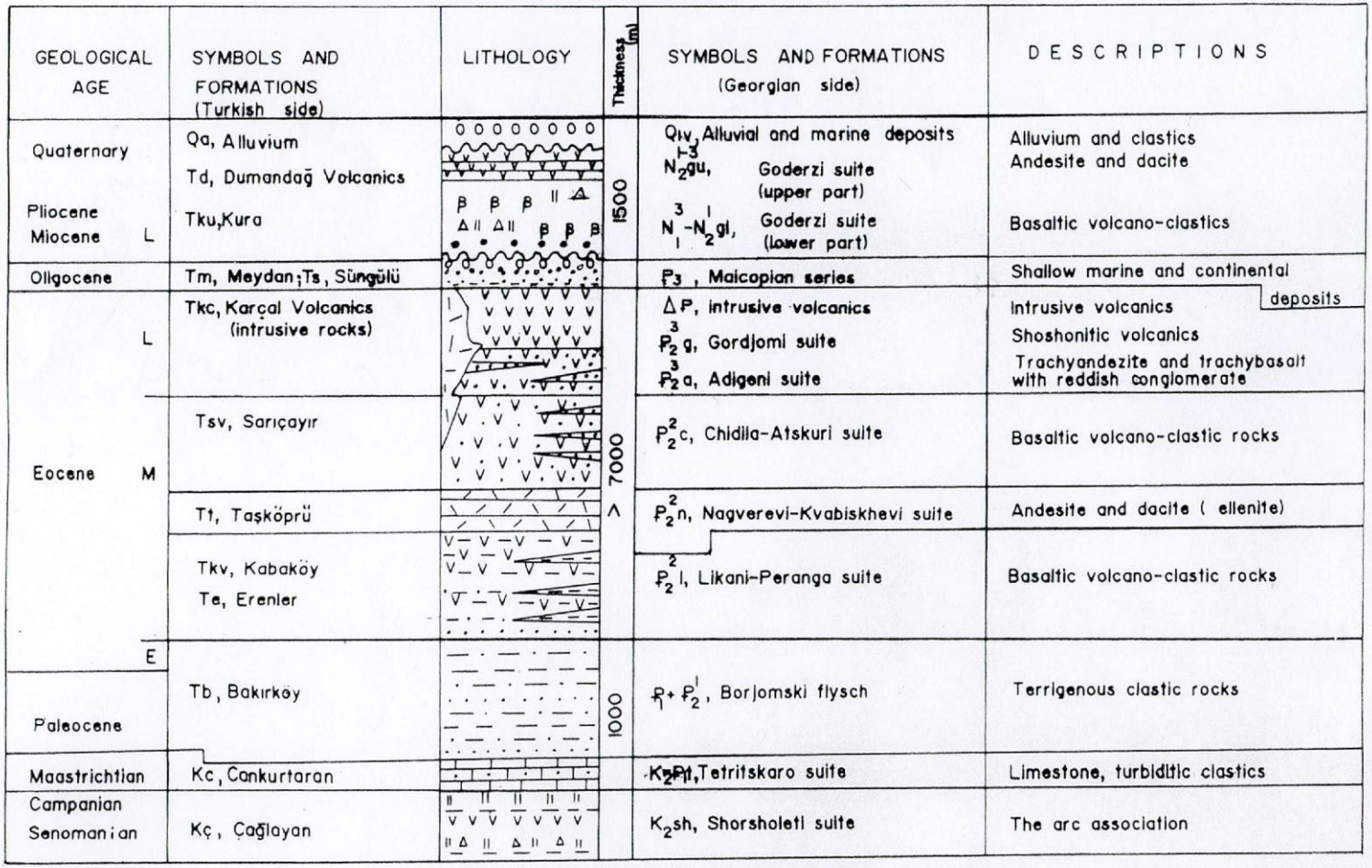
well, 2) There was not any volcanic activity during Maastrichtian to Paleocene time So it can also be noted that the Late Cretaceous arc activity ceased befor Maastrichtian time, along the border region.



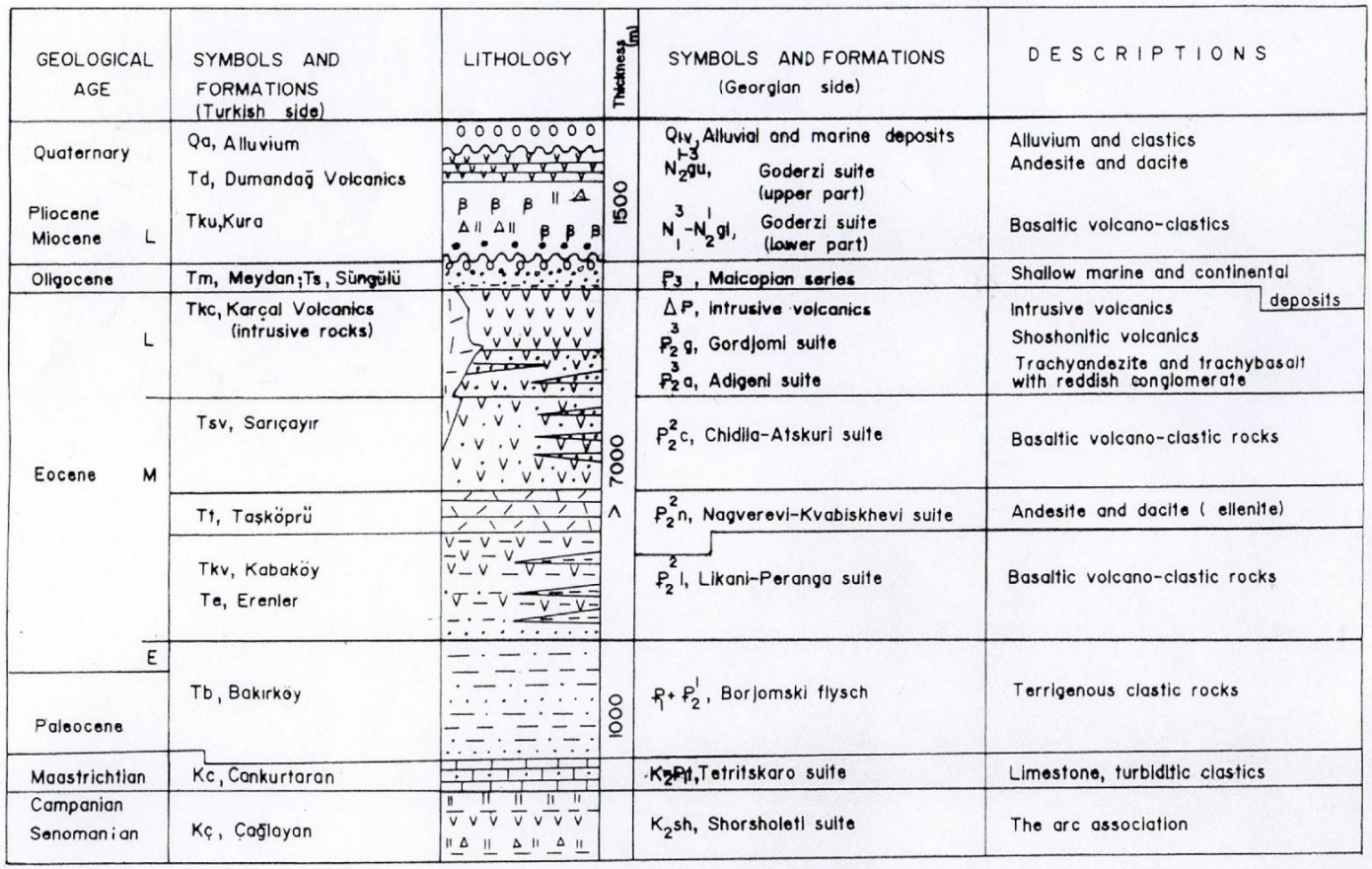
Figure,1- Location map of the study area



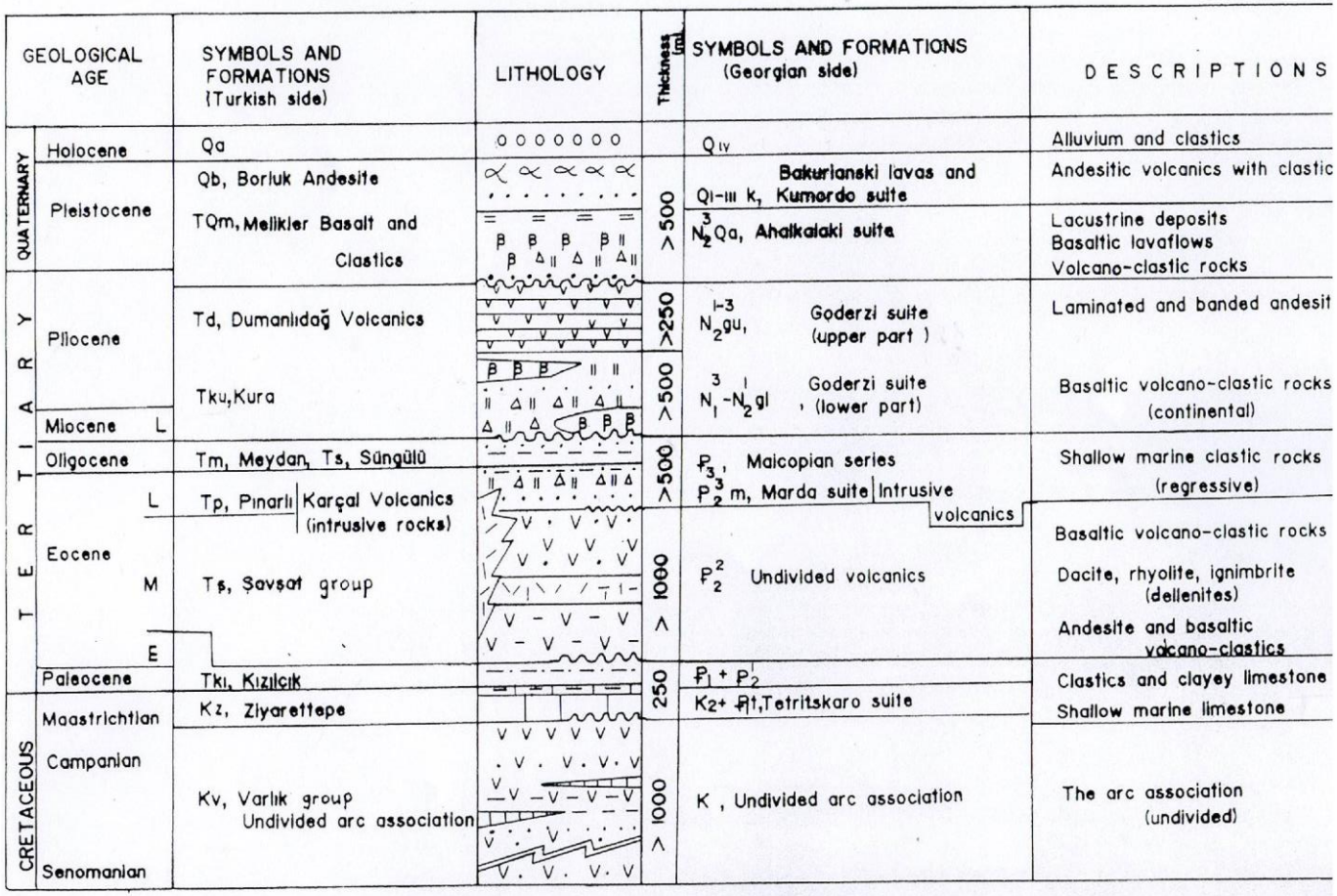
Figure, 2 , Geological map of the area along the Turkish-Georgian Border. Legend: 1)>Quaternary clastics and alluvium, 2) Quaternary basalts, in places andesites, 3) Late Pliocene andesites, 4) Late Miocene-Early Pliocene volcano-clastic rocks, in places basalt lavas 5) Oligocene clastics, 6) Late Eocene intrusive rocks, 7) Late Eocene shallow marine clastics, 8)Late Eocene shallow marine shoshonitic volcanics, 9)Middle Eocene basaltic volcano-clastics (upper part) , 10) Middle Eocene dacites (Dellenites) and andesites (middle part) 11) Middle Eocene basaltic volcano-clastics (lower part), 12) Maastrichtian-Paleocene limestone and clastics, 13) Late Cretaceous granitoids 14) Late Cretaceous arc association, 15) Pre Late Cretaceous anchimetamorphic volcano-sedimementary



Figure, 3 . Generalized columnar section of the Adjara-Trialeti unit (E, Early; M, Middle; L, Late)



Figure, 3 . Generalized columnar section of the Adjara-Trialeti unit (E, Early; M, Middle; L, Late)



Figure, 4 , Generalized columnar section of the Artvin-Bolnisi unit (E, Early; M, Middle; L, Late)

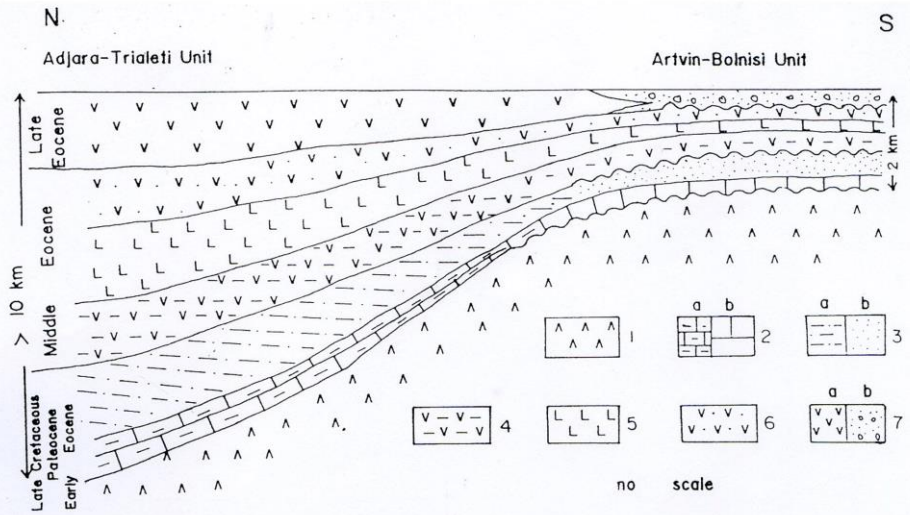


Figure 5 , Correlative relationships between the Adjara-Trialetian and the Artvin-Bolnisi units. Explanations: 1.Pre-Maastrichtian arc association, 2.Maastrichtian a)Hemipelagical limestone, b)Shallow marine carbonates, 3.Paleocene a)Turbiditic and olistostromal deposits, b)Shallow marine clastic rocks, 4.Lower part of Middle Eocene basaltic volcano-clastic rocks, 5.Middle part of Middle Eocene dellenitic-andesitic lavas, 6.Upper part of Middle Eocene basaltic volcano-clastic rocks, 7.Late Eocene a)Shoshonitic volcanic rocks, b)Shallow marine clastic rocks.

GEODYNAMIC EVOLUTION OF THE BLACK SEA REGION

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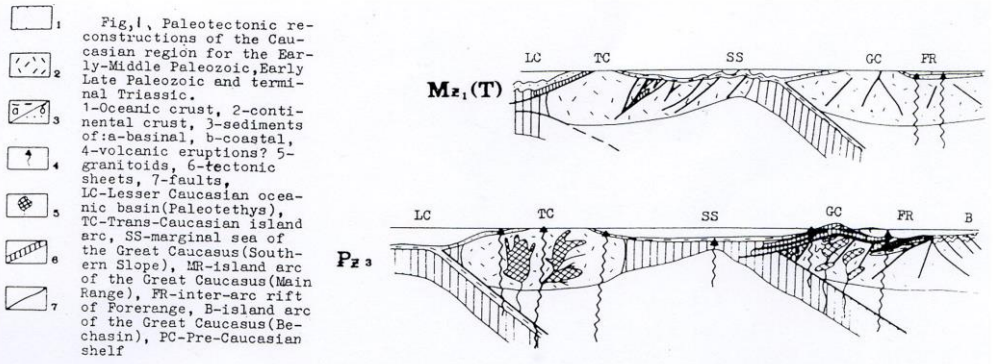
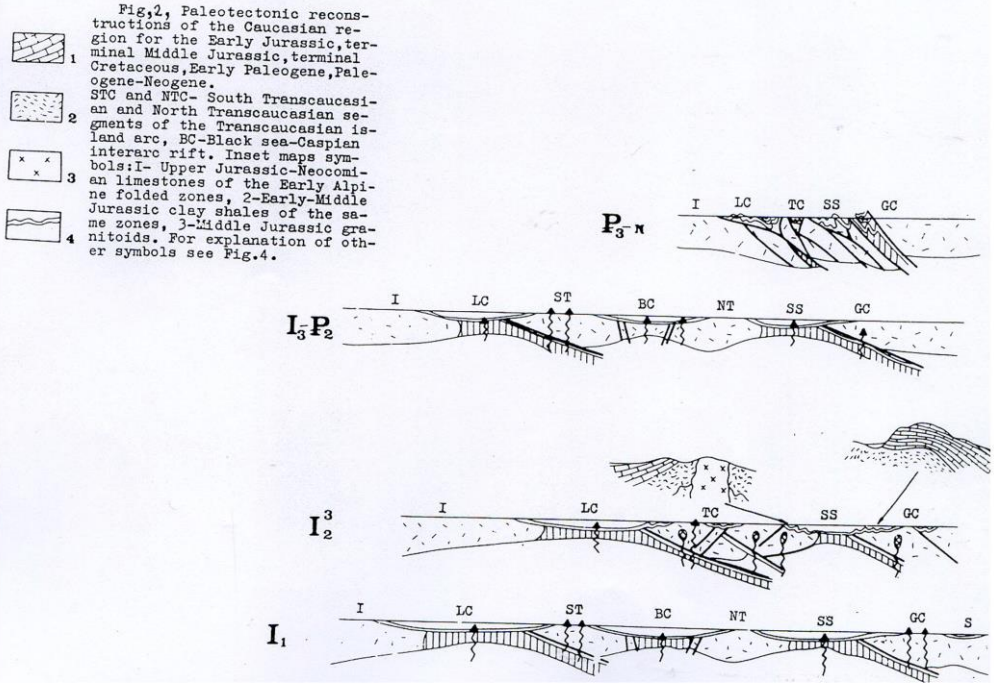
**** - Geological Institute Academia of Sciences of Georgia, 380093, Tbilisi, Georgia.*

An analysis of the Phanerozoic evolution of the Black Sea region shows that at least in Paleozoic, the region evolved as an active margin of the Northern Tethys comprising oceanic and continental arc-back arc systems (Fig.1). Counterparts of many of the Caucasian-Eastern Pontian structural units can be traced in Western Pontides, Balkans and Carpathians. Continuous development of the Paleothethys-Tethys throughout the Paleozoic-Mesozoic-Early Cenozoic is indicated by the presence of Paleozoic to Upper Cretaceous oceanic rocks, of the Lower Paleozoic to Eocene supra-subductional magmatic assemblages and by an uninterrupted deep marine Devonian to Late Eocene sedimentation in the Dizi basin of the Greater Caucasus (Fig.2). In this connection, the Dizi series represent interarc association. The whole region seems to represent a West Pacific type long living accretionary assemblage of the Lesser Caucasian - North Anatolian-Vardar branch of the Tethys.



Fig,1, Paleotectonic reconstructions of the Caucasian region for the Early-Middle Paleozoic,Early Late Paleozoic and terminal Triassic.
1-Oceanic crust, 2-continental crust, 3-sediments of:a-basinal, b-coastal, 4-volcanic eruptions? 5-granitoids, 6-tectonic sheets, 7-faults, LC-Lesser Caucasian oceanic basin(Paleotethys), TC-Trans-Caucasian island arc, SS-marginal sea of the Great Caucasus(Southern Slope), MR-island arc of the Great Caucasus(Main Range), FR-inter-arc rift of Forerange, B-island arc of the Great Caucasus(Bechasin), PC-Pre-Caucasian shelf



Fig,2, Paleotectonic reconstructions of the Caucasian region for the Early Jurassic,terminal Middle Jurassic,terminal Cretaceous,Early Paleogene,Paleogene-Neogene.
STC and NTC- South Transcaucasian and North Transcaucasian segments of the Transcaucasian island arc, BC-Black sea-Caspian interarc rift. Inset maps symbols:I- Upper Jurassic-Neocomian limestones of the Early Alpine folded zones, 2-Early-Middle Jurassic clay shales of the same zones, 3-Middle Jurassic granitoids. For explanation of other symbols see Fig.4.

METALLOGENIC STUDIES OF THE NORTHEASTERN BLACK SEA REGION OF TURKEY(East of Trabzon) AND SOUTHWESTERN GEORGIA

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**M.T.AGenel Müdürlüğü, Maden Etüt ve Arama Dairesi, 06520 Ankara, Turkey.*
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A metallogenic map at the 1/500 000 scale have been prepared of the area to the east of Trabzon, Northeastern Black Sea region, Turkey and Southwestern Georgia. 229 mineral deposits and mineralizations have been plotted on to the map. Taking the kind, genesis of the deposits and the geology into account 6 metallogenic provinces covering large areas have been designated and their descriptions have been given.

These povinces are porphyry copper-molybdenum, skarn iron, vein sulphides, volcano sedimentary(Kuroko) sulphides, volcano sedimentary manganese deposits and mineralizations. They represent the mineralizations basically from the same igneous source. In the deeper levels acidic intrusives causing porphyry and vein type mineralizations, in the upper levels intermediate-acidic volcanics causing volcano sedimentary mineralizations.

In the area porphyry copper-molybdenum deposits and mineralizations zone represent deeper levels of erosion of the mineralizing sequence. Then the succession follows upwards as vein, volcano sedimentary sulphides and volcano sedimentary manganese deposits and mineralizations. In other words volcano sedimentary manganese mineralizations represent uneroded or less eroded mineralization sequences.

The area is promising from the mineral deposits potential point of view. Mountainous terrain, poor access, long rainy seasons, heavy vegetation cover make geological studies and exploration work rather difficult. New ideas supported with new technologies would likely to lead to the discovery of new deposits. In that respect combined airborne geophysics surveys using helicopters would help detecting some unknown mineralizations in the area. On the other hand paleovolcanology-paleomorphology studies in selected areas such as Murgul, Kutlular etc. would help localizing concealed deposits.

A STUDY OF METALLOGENIC UNITS OF THE AREA IN NORTHERN TURKEY AND SOUTHWESTERN GEORGIA (METALLOGENESIS OF EAST PONTID, ADJARA-TRIALETI AND ARTVIN-BOLNISI ZONES)

Vaja Buadze, Nino Asatiani*, Tandoğan Engin**, Murat Er**, Andro Khutsaidze*, Rusudan Shubladze*, Vladimer Yaroshevich*, Necmi Yüce***

**- Georgian State Department of Geology,380062, Tbilisi, Georgia.*
***- General Directorate of Mineral Research and Exploration, 06520, Ankara, Turkey*

The project was initiated to study the mineralizations, to prepare a metallogenic map to help to delineate target areas for mineral exploration.
A metallogenic map has been prepared by transfering existing data on the mineral deposits and occurences on to the existing 1: 500 000 scale geological map.

Some laboratory tests have been carried out on the samples collected during the fiel visits to the districts. On the basis of the map pattern,the forecasting model (Fig.1) an from the laboratory tests data some evaluations could be made.
Some of the findings are:
a - 6 ore bearing systems running about NE-SW have been distinguished;
b - 15 ore districts have been recognized within the 6 ore bearing systems;
c - Each system and each district are recognized to be separate;
d - In the ore districts target areas have been identified;
e - For the discovery of mineral deposits further studies have been proposed.

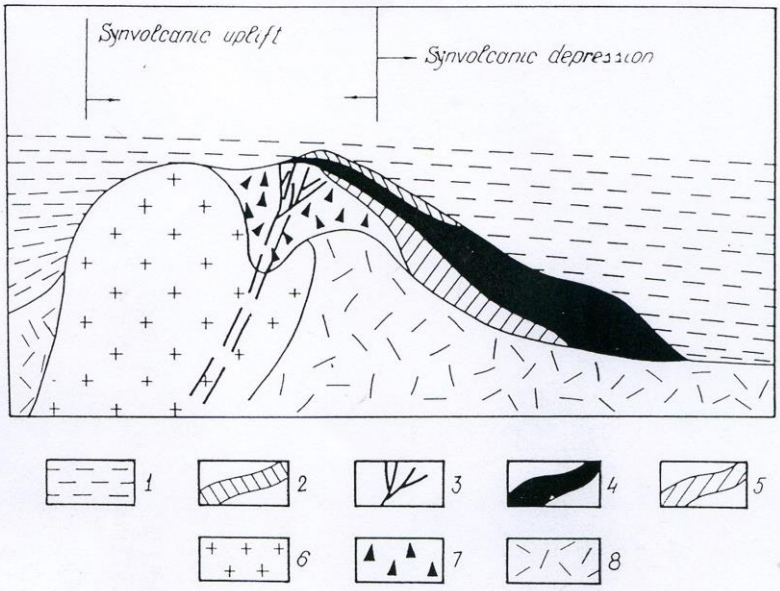

Figure 1, The forecasting model (Kuroko type)
- Tuffs of acid composition; 2 - ferruginous flinty sediments; 3 - stockwork ores; 4 - black ores (Kuroko); 5 - yellow ores (Oko); 6 - rhyolitic dome ; 7 - explosive breccias; 8 - tuffs and tuff-breccias of acidic composition

A NEW TYPE OF SULPHIDE ORE DEPOSITS IN SUBDUCTION ZONES

Vladimir I. Gugushvili , Michael A. Apkhazava**, Tandoğan Engin*** and Ali Yılmaz****

* *Geological Institute Ac.Sc. Georgia*
** *State Department of Geology of Georgia***
** *General Directorate of Mineral Research and Exploration of Turkey*

It is well known that porphyry-copper and Kuroko type deposits are mainly manifested above subduction zones. The porphyry-copper deposits are related to andesitic and dacitic stratovolcanos. Kuroko type deposits are related to postcolapse

riolitic lava domes injected at the last stage of rhyolitic ignimbrite activities, which are usually terminated by the cauldron subsidence. In the Bolnisi ore district, we studied a group of sulphide deposits which belong to the subduction zone. These deposits differ from typical porphyry-copper, as well as from Kuroko types. They are related to the felsic magmatic chamber which subsequently fed the ignimbritic activity (Fig.1). Generation of

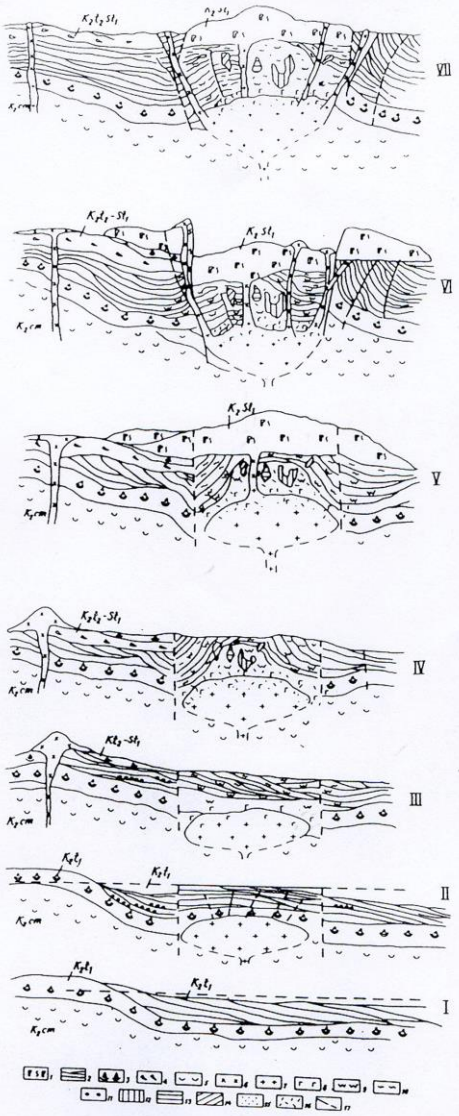

Fig. 1 . Sketch of paleogeographic development of Madneuli deposit: 1. Ignimbrites (K_2 st_1), 2. Tephroites (K_2 t_1), 3. Andesite-dacitic tuffs (Kt_2 st_1), 4. Pumice tuffs (K_2t_2 -st_1), 5. Andesitic tuffs alternates with limestones (K_2 cm),6. Rhyolitic extrusions, 7.Granodiorite, 8.Micaceous and silification, 9. Secondary quartzites, 10. Argilizites, 11. Tuff-conglomerates, 12. Pyrite and copper- pyrite ores, 13. Lead- zinc-barite ores, 14. Barite, 15. Pyritization, 16. Chloritization and carbonatization, 17. faults.

these deposits is preignimbritic and precauldron, hence,we consider them to be a new type of ore formation and we propose to distinguish this formation and name it the Bolnisi type deposit.

GEOPHYSICAL STUDIES ALONG THE TURKISH-GEORGIAN BORDER ZONE

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The geophysical studies as a part of the Turkish - Georgian Geological Project aimed to merge the existing geophysical data, to interprete the processed data and to delineate the deep geological and tectonic features of the study area.

The merged aeromagnetic and gravimetric data of both side was processed to produce conventional geophysical maps. Further, modeling studies were carried out on the profiles selected on the base of the geological and geophysical trends.

The results of geophysical studies showed that basalt covering large areas cause the high amplitude and short wave-length magnetic anomalies. The deep basic igneous rocks cause high amplitude and long wave length magnetic and positive gravity anomalies. Granitic rocks also give magnetic anomalies similar to basic rocks, but negative gravity anomalies.

The depths to the top of intrusive rocks vary from 0 to 3 km. The depth of the crust is found to be around 17 km in the west and it reaches 42 km in the east in the southeast of the study area.

The borders of discontinuities interpreted from the aeromagnetic and gravity anomalies were shown on a final interpretation map to contribute to the geological and tectonic evolution of the region (Fig.1).

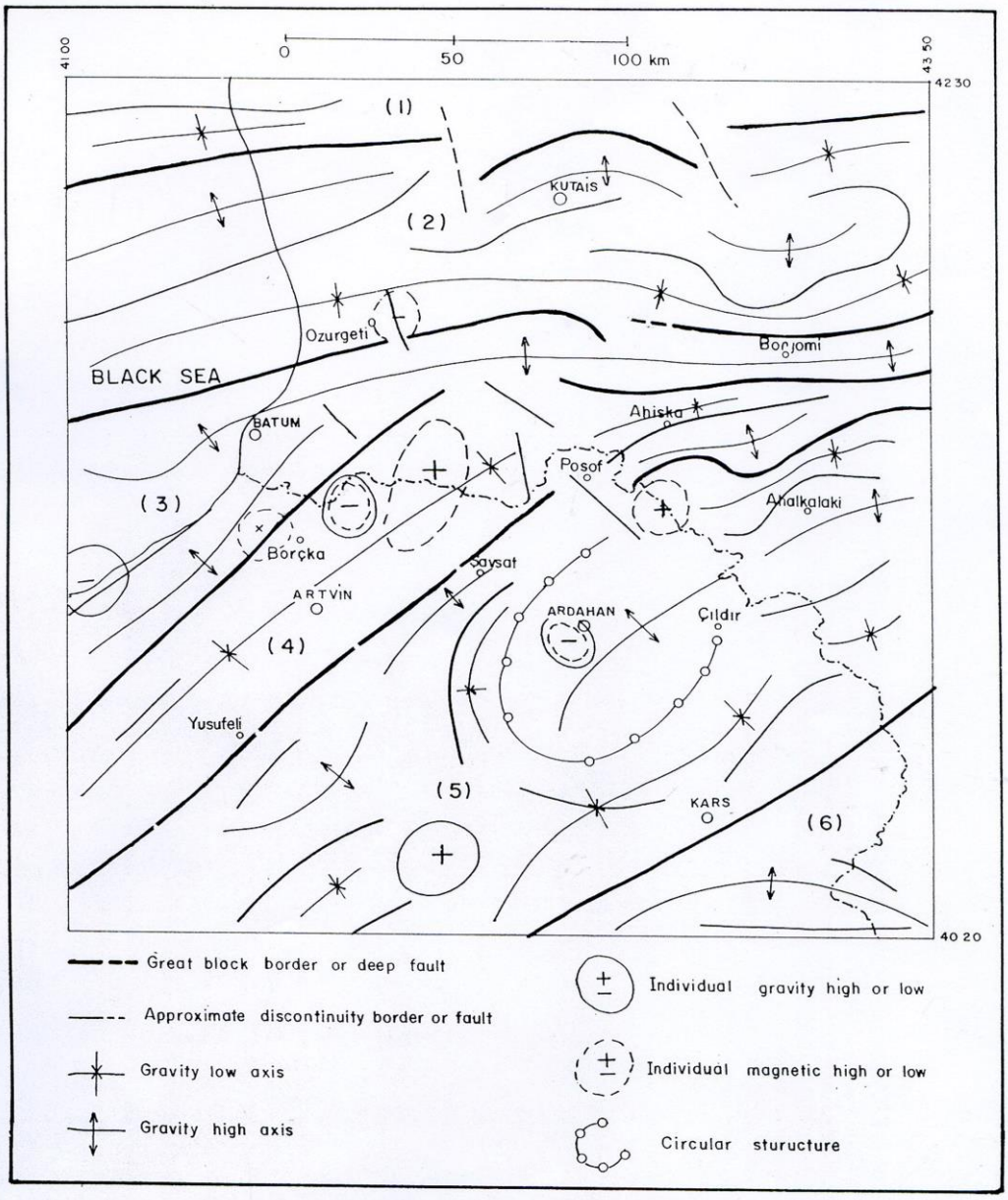

Figure 1, Integrated interpretation map of geophysical data: (1) Great Caucasus Southern zone, (2) Northern Transcaucasus zone, (3) Adjara-Trialeti zone, (4) Southern Transcaucasus(Artvin-Bolnisi) zone, (5) Bayburt-Karabakh Imbricated zone (6) North Anatolian-Lesser Caucasus Ophiolitic zone.

GEOTHERMAL ASPECTS OF THE TURKISH-GEORGIAN BORDER AREA

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In the frame of this project, a short excursion study has been carried out along both sides of the Turkish and Georgian border. During the excursion, geothermal conditions of the area have been tried to be understand by investigating hot and mineral springs. The observation of the springs in situ have revealed that the area has no high enthalpy geothermal fields, at least seems non-feasible in current economic conditons. The temperature of the springs found in the excursion area and chemistry of that springs prove this idea. The temperature of the springs range between 19°C and 68°C (drillhole discharge in Georgia) in study area and some of them are mineral waters.

Graphic technics such as Binary, Ternary Diagrams, and special Giggenbach Diagram were used to understand the deeper, mixing conditions and locations of springs in the model system. These technics have also suggested that none of the water samples from the springs are original deep geothermal fluids. The springs gain their heat energy either by mixing of very small amount of deep geothermal fluid with shallow and cool groundwater or low value conductive heat flow. However geological conditions of the area such as thickening of the crust and folding structures, particularly at Turkish side, reveals that geothermal fluids are hotter. Hot springs visited in the area are being used for balneological purposes in the both sides.

GEOTHERMAL POTENTIAL OF THE AREA ALONG THE TURKISH-GEORGIAN BORDER

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The hydrogeological and geothermal conditions of the area along the Turkish-Georgian border have been evaluated and brief descriptions of water-bearing and aquifuge complexes of rocks and mineral water deposits have been presented. There are characteristic carbon dioxide-bearing water including zones in the region. Some of them are also reflecting thermoanomaly manifestations (Fig.1). According to the results of temperatures of deep measurements of the wells, geothermal gradients are determined during the industrial-geophysical investigation. With using of thermoconductiving data of rocks, the general characteristics of the thermal field have been given in the investigated territory.

On the basis of regional hydro-geothermal invastigations, the place of the given territory is determinated in the general scheme of hydrogeothermal zonation of Georgia with using of prospective-investigative drilling data on thermo-mineral waters.

In conclusion, the main methods of further scientific-research works have been suggested. Because geothermal potential of the study area for geological-prospective works reveal new deposits of thermomineral waters.

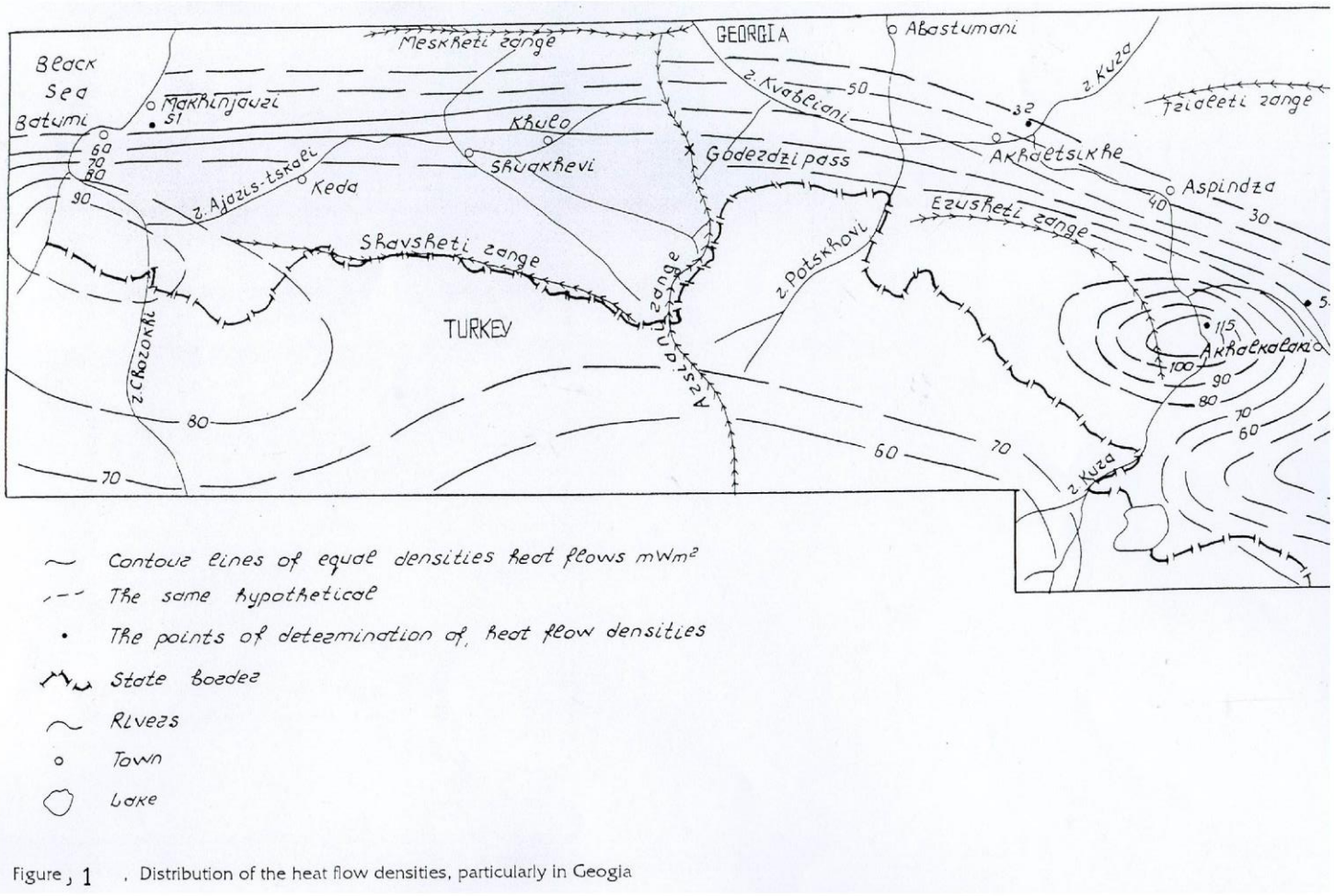

Figure 1 . Distribution of the heat flow densities, particularly in Geogia

ENGINEERING-GEOLOGICAL AND ENVIRONMENTAL STUDY ENGINEERING-GEOLOGICAL FEATURES OF THE TERRRITORY ALONG THE TURKISH-GEORGIAN BORDER

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This part of the study deals with the engineering-geological features of the Turkish-Georgian border area. According to the engineering, lithological and genetical characteristics 6 continental-cover rock formations with 14 geological-genetical complexes and 6 basic rock formations with 11 geological-genetical complexes are wholly distinguished. The general characteristics of the formations and geological-genetical complexes, their lithological and petrographical properties and varieties have been presented. There are characteristic wide spectrum of recent geodynamic processes such as landslides, rock-avalanches, erosion and abrasion. In addition, Quaternary glaciation and its fluvio-glacial sediments within the Eastern Pontides and Adjara-Trialeti mountain systems occured extensively and in the hypsometrically lower levels than the setting which was known before. As a result, the schematic engineering-geological map of the region at 1:200 000 scale has been compiled and also the main directions of further engineering-geological investigations are presented.

A CORRELATION OF COAL DEPOSITS IN SOUTHWEST GEORGIA AND NORTHEAST TURKEY

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It has been aimed to correlate the Vale and Oltu-Balkaya coal deposits on the basis of geological, tectonical and economical characteristics and contribute information on setting, occurrence and investigation methods of the coal deposits in the region.

After the correlations, it is understood that the Vale and Oltu-Balkaya Oligocene coal deposits have significant differences in view point of geological characteristics. For example, the Vale deposits, which deposited in a lagoonal setting are situated to the north of the Artvin-Bolnisi block and overlie the Eocene clastics conformably. Contrarily, the Oltu-Balkaya deposits are located to the south of Artvin-Bolnisi block, deposited in a fluvio-laccustrine environment and are erosive on the Eocene clastics. However, both coal deposits occured along tectonic zones between main tectonic units, deformed in a great scale, but have commercial importance.

Because of the Upper Miocene-Pliocene neotectonic cover, it is very difficult to determine the real patential of the coal deposits. Therefore, it is necessary to investigate the occurrence and distribution processes of these deposits with new geological studies, drilling and geophysical methods in detail.