



GENERAL DIRECTORATE OF MINERAL RESEARCH AND EXPLORATION



STATE DEPARTMENT OF GEOLOGY-GEORGIA
GEOLOGICAL INSTITUTE OF THE ACADEMIA
OF SCIENCES-GEORGIA

GEOLOGICAL STUDIES OF THE AREA ALONG
TURKISH-GEORGIAN BORDER

EDITORS

Ali YILMAZ
Tandoğan ENGİN

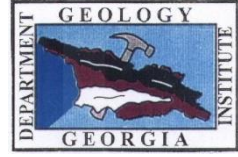
Shota ADAMIA
Tengiz LAZARSHVILI

ANKARA
2001



GENERAL DIRECTORATE
OF MINERAL RESEARCH
AND EXPLORATION (MTA)

STATE DEPARTMENT OF
GEOLOGY-GEORGIA (SDG)
&
GEOLOGICAL INSTITUTE
OF THE ACADEMIA OF
SCIENCES-GEORGIA (GIN)



GEOLOGICAL STUDIES OF THE AREA ALONG TURKISH-GEORGIAN BORDER

Maden Tetkik ve Arama Genel Müdürlüğü Yayınları,
Correlation Series, No: 1, Ankara, 388 s.

Kitap İsteme Adresi: MTA Genel Müdürlüğü, Bilimsel ve Dokümantasyon Dairesi Başkanlığı,
ANKARA

Editors

Ali YILMAZ
Tandoğan ENGİN

Shota ADAMIA
Tengiz LAZARASHVILI

ANKARA
2002

GENERAL DIRECTOR

A. Kemal IŞIKER

DIRECTOR OF SCIENTIFIC DOCUMENTATION DEPARTMENT

Sevim YILDIRIM

PUBLICATION MANAGER

Gölgün HASBAY

MTA CORRELATION SERIE NO.1**SCOPE OF THE SERIES**

The Correlation Series, a publication of MTA prepared within a scope of Report format, provides means to revive, interpret, evaluate and correlate the results of earth-sciences oriented research works of Turkey under taken in collaboration with other countries.

The Correlation Series publishes the result of the collaborative research works in order to serve for critical interest and assessment of earth scientists of other countries.

ORDER, CLAIM AND PRODUCT INQUIRES

Maden Tetkik ve Arama Genel Müdürlüğü
Bilimsel Dökümantasyon ve Tanıtma Dairesi
Basın ve Halkla İlişkiler Servisi
06520 ANKARA – TURKEY

© Maden Tetkik ve Arama Genel Müdürlüğü (MTA)

Dedicated to the memories of the Manana LORDKIPANIDZE (GIN),
Tite GAKHARIA (SDG) and
İsmail Hakkı GÜVEN (MTA)
WHO CONTRIBUTED TO, but expired during
THIS STUDY.



REPUBLIC OF TURKEY

Area : 779.452 km²

Population : 65.000.000-1997

Language : Turkish

Money unit : Turkish Lira

Capital : Ankara

Important Cities : İstanbul, İzmir, Bursa, Konya, Antalya, Diyarbakır, Erzurum, Trabzon, Samsun

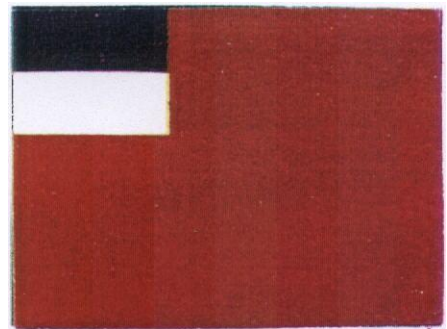
Neighbouring countries: Russia to the North, Georgia and Armenia to the Northeast, Iran to the East, Iraq and Syria to the South, Greece and Bulgaria to the Northwest.

Climate : Turkey is located in the central climatic belt, but differing climatic conditions prevail in various parts.

Natural resources : Lignite, hard coal, chromite, copper, lead, zinc, borax, manganese, cobalt, oil, iron, marble.

Main industrial fields: Textile and automotive.

Main agricultural product: Tobacco, cotton, tea, dried fruits, cereals, fresh fruits, hazel nuts.



REPUBLIC OF GEORGIA

70.000 km²

5.500.000-1997

Georgia

Lari

Tbilisi

Kutaisi, Batumi, Shuhumi, Rustavi, Gori, Akhaltsikhe (Ahiska)

Russia to the North, Azerbaijan to the East, Armenia to the South, Turkey to the Southwest.

Humid and hot, in some places subtropical climate

Agricultural land, copper, manganese, hard coal, lignite

Metallurgical production, automotive and textiles.

Cereals, mainly corn; vegetables and fruits, mainly grapes, tobacco, tea.

PREFACE

Turkey and Georgia are two friendly neighboring countries trying to develop their already good economic and cultural relations. It is well known that international relations are also reflected in personal relations, which initiates cooperation in science, art as well as in trade.

The first scientific relation between Turkey and Georgia was initiated in 1987. 'Tübitak' in Turkey and the 'Academy of Science' in Georgia, which was then still a member of the USSR, organised a joint field study in Georgia on 'ophiolites and tectonic belts of the Caucasus'. Assoc. Prof. Dr. Ali Yılmaz and Mr. İbrahim Çakmak from Turkey participated to the study. Assoc. Prof. Dr. Ali Yılmaz published a paper on this study in the MTA Bulletin in 1989.

Following the dissolution of the USSR, during the 'International Black Sea Symposium, organized by MTA in Ankara, in 1992, scientists from Georgia had a chance to have a series of meetings with their Turkish colleagues to generate joint studies in geological sciences. Dr. Ziya Gözler then the General Director of MTA, Prof. Dr. Shota Adamia, then the President of the Georgian Academy of Sciences and Prof. Dr. Vladimir Gugushvili then the President of the Georgian State Department of Geology participated in the final meeting. A group of Turkish geoscientists were invited to Georgia to work out a program to develop joint projects between the two countries. Assoc. Prof. Dr. Güner Ünal, Mr. Turgay Önal then Deputy General Directors. Assoc. Prof. Dr. Ali Yılmaz from MTA and Mr. İbrahim Turan Çakmak, Deputy General Director and Mr. Çetin Koçak from TKİ went to Georgia and signed a preliminary protocol towards joint projects on geological sciences.

The final protocol was signed in Ankara on the 2nd Nov. 1993. According to this 1/100000 scale geological studies on fundamental geological features, mineralizations, geophysics, geothermal sources and geotechniques would be jointly studied along the The-Georgia border in a zone covering 4,5 map sheets.

According to the signed protocol; the project would involve 3 years field study and 1 year evaluation and reporting. Assoc. Prof. Dr. Ali Yılmaz from the Turkish side and Prof. Dr. Vlademir Gugushvili from the Georgian side were appointed joint project leaders.

The time of the project coincided with the dissolution of Soviet Union and Georgia becoming an independent state. This resulted in some administrative changes; Dr. Tengiz Lazarashvili became the Georgian project leader. Despite some unfavourable developments the project was completed in the time planned. The efforts of the project coordinators played an important part in the successful completion of the project. Despite very unfavourable economic conditions in Georgia, successful completion of the project clearly reflects the high value given to science and joint work by the Georgian people.

Although the project was completed in 1997 the Turkish side could only publish the project papers in a book in 2001. The delay was mainly caused by some administrative changes in the Turkish side. Despite various administrative changes in both countries, successful completion of the project and publication of the book reflect the deep rooted institutional traditions in both countries.

Late Manana Lordkipanidze (GIN), Tite Gakharia (SDG), Givi Saracishvili (SDG) from Georgia and İsmail Hakkı, Güven (MTA) from Turkey worked in this project. Their Contributions are greatly acknowledged.

The book present 70 years of accumulated information in the geological sciences and provides easy correlation of the geological data. I appreciate the efforts directed to the success of the joint project and congratulate the project coordinators, scientists and the personell who worked for the success of the project. I hope this book will be a concrete step for good relations of both countries as well as all joint projects in the future and will be a reference book for the earth scientists.

Ali Kemal İŞİKER

General Director of Mineral Research and Exploration

C O N T E N T S

SUMMARY IN ENGLISH, TURKISH AND GEORGIAN,

<i>Ali Yılmaz and Tengiz Lazarashvili</i>	I
---	---

PREFACE,

<i>Ali Yılmaz, Shota Adamia, Tengiz Lazarashvili and Givi Maisuradze</i> ...	1
STUDY AREA.....	1
PURPOSE OF THE STUDY.....	3
NUMENCLATURE AND CLASSIFICATION.....	6
USEFUL AND PREPARATORY INFORMATIONS FOR READERS.....	6
GEOGRAPHICAL CHARACTERISTICS OF THE STUDY AREA.....	6
OUTLINE OF THE GEOMORPHOLOGY OF THE STUDY AREA.....	9
THE STAFF OF THE WORK.....	13
ACKNOWLEDGEMENTS.....	13
REFERENCES.....	14

A STUDY OF TECTONIC UNITS OF THE AREA ALONG

TURKISH-GEORGIAN BORDER..... 16

<i>Ali Yılmaz, Shota Adamia, Manana Lordkipanidze, Torun Yılmaz, İskender Kurt, Guram Abesadze, Tengiz Lazarashvili, Roland Beradze, Nodar Salukvadze, Simon Kuloshvili and Mustafa Özkan</i>	16
ABSTRACT.....	16
INTRODUCTION.....	17
GEOLOGICAL SETTING.....	18
TECTONIC UNITS OF THE CAUCASUS AND EASTERN TURKEY.....	20
The Scythain Platform.....	20
The Greater Caucasus.....	24
The Transcaucasus.....	26
North Anatolian-Lesser Caucasian Ophiolitic Belt.....	29
Anatolian-Iranian Platform.....	30
Southeastern Anatolian Ophiolitic Belt.....	30
The Arabian Continent.....	31
CORRELATION OF TECTONIC UNITS	32
STRATIGRAPHY OF THE BORDER AREA	34
Pre-Maastrichtian.....	34
<i>Artvin granitoids</i>	34
<i>Narlık group</i>	35
<i>Varlık group</i>	38
<i>Pirnalı granitoids</i>	40

<i>Kızılkaya formation-Gasandami suite</i>	40
<i>Çağlayan formation-Shorsholeti suite</i>	41
Maastrichtian-Danian.....	44
<i>Cankurtaran formation</i>	44
<i>Ziyarettepe formation-Tetritskaro suite</i>	49
Paleocene-Early Eocene.....	60
<i>Bakırköy formation-Borjomi suite</i>	60
<i>Kızılıçık formation</i>	64
Middle Eocene	65
<i>Sarp group and Şavşat group</i>	66
<i>Erenler formation-Likani suite</i>	66
<i>Kabaköy formation-Peranga suite</i>	70
<i>Taşpınar formation-Nagverevi suite</i>	72
<i>Sarıçayır formation-Chidila and Gorkeli suites</i>	75
Late Eocene.....	78
<i>Adigeni suite</i>	78
<i>Gordjomi suite</i>	79
<i>Pınarlı formation-Marda suite</i>	81
<i>Karçal Intrusive Rocks</i>	86
Oligocene-Early Miocene	88
<i>Meydan formation</i>	
<i>-Qvabliani series-</i>	
<i>Süngülü formation</i>	
<i>Benara-Parekha suite</i>	
<i>Vale suite</i>	
<i>Potskhovi suite</i>	90
Late Miocene-Quaternary.....	97
<i>Kura formation-Goderzi suite (lower part)</i>	97
<i>Gümüşkavak Basalt</i>	97
<i>Dumanlıdağ Volcanics-Goderzi suite (upper part)</i>	100
<i>Kaleönü Volcanics-Subvolcanic alkali rocks</i>	103
<i>Melikler Basalt-Ahalkalaki suite</i>	103
<i>Damal formation-Fluvio glacial deposits</i>	110
<i>Borluk Andesite-Kumurdo suite</i>	111
<i>Quaternary alluvial and clastic deposits-Alluvial and Marine deposits</i> ..	111
CORRELATION OF THE BORDER TECTONIC UNITS	112
TECTONICS.....	119
Pre-Maastrichtian Phase.	119
Pre-Lutetian (Pre-Middle Eocene) Phase.	119
Pre-Late Miocene Phase.....	123
Neotectonic Phase.....	124
GEOCHEMISTRY.....	127
Upper Cretaceous Volcanics.....	127

Middle-Late Eocene Volcanics.....	127
<i>Middle Eocene Volcanics</i>	130
<i>Upper Eocene Volcanics</i>	133
<i>Eocene Subvolcanic and Intrusive Rocks</i>	137
Late Miocene-Quaternary Volcanics.....	138
ECONOMIC GEOLOGY.....	142
The Murgul massive sulfide deposits.....	142
The Merisi copper-lead-zinc ore knot.....	142
The Vale (Ahaltsikhe) lignite deposit.....	143
The Kisatibi diatomite deposit.....	144
The Ahaltsikhe agate-chalcedony and zeolite deposits.....	146
Thermo-mineral and mineral waters.....	147
CONCLUSIONS.....	149
ACKNOWLEDGEMENTS.....	151
REFERENCES.....	152
GEODYNAMIC EVOLUTION OF THE BLACK SEA REGION.....	440
<i>Shota Adamia, Ali Yilmaz, Manana Lordkipanidze, Irakli Shavishvili,</i> <i>Tamara Chkotua and Alexander Chabukiani</i>	440
ABSTRACT.....	440
INTRODUCTION.....	440
LESSER CAUCASUS-NORTH ANATOLIAN-VARDAR OPHIOLITIC SUTURE.....	441
NORTH TETHYAN ISLAND ARC SYSTEM.....	445
INTERARC AND BACK ARC BASINS.....	459
POSTCOLLISIONAL EVENTS.....	464
CONCLUSIONS.....	464
REFERENCES.....	467
GEOPHYSICAL STUDIES ALONG THE TURKISH-GEORGIAN BORDER ZONE...	252
<i>İbrahim Aydın, Tite Gakharia, Ali Yilmaz, Hasan Kılıç, Halil I. Karat,</i> <i>Tengiz Lazarashvili, Givi Saradjishvili and Anzor Meskhia</i>	252
ABSTRACT.....	252
INTRODUCTION.....	253
GEOPHYSICAL BACKGROUND.....	253
DATA GATHERING SYSTEMS.....	255
Magnetometric Survey Systems.....	255
Gravimetric Survey Systems.....	255
SURVEY PROCEDURES AND PARAMETERS.....	255
Aeromagnetics.....	255
Gravity.....	256
GEOPHYSICAL DATA MERGE.....	257

PROCESS TECHNIQUES APPLIED TO GEOPHYSICAL DATA.....	257
Conventional Process Techniques.....	257
Other Process Techniques.....	260
INTERPRETATION PROCEDURE.....	260
The Regional Perspective.....	284
Detailed Interpretation.....	284
INTERPRETATION OF GEOPHYSICAL DATA.....	284
Aeromagnetics.....	285
Gravity	286
Integrated Interpretation	287
CONCLUSIONS.....	289
ACKNOWLEDGEMENTS	292
REFERENCES.....	293

METALLOGENIC STUDIES OF THE NORTHEASTERN BLACK SEA REGION

OF TURKEY (EASTERN OF TRABZON) AND SOUTHWESTERN GEORGIA 162

Tandoğan Engin, Murat Er, Necmi Yüce, Vaja Buadze, and Yuri Bakhtadze..... 162

ABSTRACT 162

INTRODUCTION 163

GEOLOGY AND METALLOGENY..... 163

 General Tectonic Setting..... 163

Geology and Mineralizations..... 164

METALLOGENIC MAP AND METALLOGENY..... 167

 Metallogenic Map 167

 Metallogeny..... 168

Manganese Mineralizations..... 168

Volcanogenic Massive Sulphide Deposits and Mineralizations..... 168

Porphyry Copper-Molybdenum Mineralizations..... 169

Skarn (Contact Metasomatic Iron Mineralizations. 170

Vein Type Copper-Lead-Zinc Mineralizations. 170

Volcanogenic Massive Sulphide Mineralization in Ophiolites 171

CONCLUSIONS 172

REFERENCES 175

A STUDY OF METALLOGENIC UNITS OF THE AREA IN NORTHERN TURKEY AND SOUTHWESTERN GEORGIA (METALLOGENESIS OF EAST PONTID, ADJARA-TRIALETI AND ARTVIN-BOLNISI ZONES)..... 176

*Vaja Buadze, Natela Asatiani, Tandoğan Engin, Murat Er, Andro Khutsaidze,
Rusudan Shubladze, Vladimir Yaroshevich and Necmi Yüce..... 176*

ABSTRACT.....	176
INTRODUCTION.....	176
TECTONIC SETTING OF GEOSTRUCTURES.....	177
VERTICAL ROWS OF ORE-BEARING LEVELS.....	178
East Pontides.....	178
Artvin-Bolnisi Zone.....	180
Adjara-Trialeti Zone.....	181
INTERPRETATIONS OF ORE-FORMING SYSTEM IN THE LIGHT OF SITUATIONS OF DEPOSITS DISCOVERING AND PECULIARITIES OF ORE COMPOSITION AND STRUCTURE.....	181
Deposits of East Pontides.....	181
<i>Copper-Porphyry Mineralization.....</i>	182
<i>Gold-Quartz-Veined Deposits.....</i>	183
<i>Copper-Polymetallic Deposits of Kuroko Type.....</i>	184
Deposits of the Artvin-Bolnisi Zone.....	190
<i>Bolnisi Segment.....</i>	190
Deposits of the Adjara-Trialeti Zone.....	192
<i>Adjara Segment.....</i>	192
PHYSICO-CHEMICAL PECULIARITIES OF FORMATIONS OF DEPOSITS	193
Eastern Pontides.....	193
<i>Porphyry-Copper Deposit of Güzelyayla.....</i>	193
<i>Güreşen Copper-Porphyric Occurrence.....</i>	194
<i>Murgul Pyrite-Polymetallic Deposit</i>	195
<i>Çarkbaş Ore Occurrence.....</i>	196
<i>Zone of Altered Ryolites 1 km of Kızılkaya.....</i>	196
<i>Akarşen Pyrite-Polymetallic Deposit</i>	196
<i>Pyrite-Polymetallic Deposit in Çayeli.....</i>	197
<i>Pyrite-Polymetallic Deposit in Erenler.....</i>	197
<i>Pyrite-Polymetallic Deposit in Kutlular</i>	197
<i>Cerattepe Pyrite-Polymetallic Deposit.....</i>	198
<i>Gold-Bearing Ore Deposit of Mastra.....</i>	198
Artvin-Bolnisi Zone.....	199
<i>Bolnisi Segment.....</i>	199
Adjara-Trialeti Zone.....	199
<i>Adjara Segments.....</i>	199
EASTERN PONTIDES GENERAL COMMENTS.....	199
Gold and Silver Content in Deposits, The Source of Sulphur.....	199
<i>Discussion of Data of Sulphide's Sulphur Isotopic Composition.....</i>	200
<i>Discussion of Data on Gold and Silver.....</i>	203

Artvin-Bolnisi Zone.....	204
<i>Bolnisi Segment</i>	204
<i>Discussion of Data on Gold and Silver</i>	206
Adjara-Trialeti Zone.....	206
<i>Adjara Segment</i>	206
METALLOGENIC ANALYSIS	212
Ore-Bearing Systems.....	212
Ore Regions.....	214
GENERAL CONCLUSIONS AND PRACTICAL RECOMMENDATIONS	220
General Conclusions.....	220
Practical Recommendations.....	224
REFERENCES	226
A NEW TYPE OF SULPHIDE ORE DEPOSITS IN SUBDUCTION ZONES.....	227
<i>Vladimir I. Gugushvili, Michael A. Apkhazava, Tandoğan Engin and Ali Yılmaz</i>	227
ABSTRACT	227
INTRODUCTION	227
GEOLOGICAL STRUCTURE OF THE BOLNISI ORE DISTRICT AND DEVELOPMENT OF THE BOLNISI VOLCANO-TECTONIC DEPRESSION.....	239
PREIGNIMBRITIC ORE DEPOSITS.....	243
DISCUSSIONS.....	248
ACKNOWLEDGEMENT.....	249
REFERENCES.....	251
A CORRELATION OF COAL DEPOSITS IN SOUTHWEST GEORGIA AND NORTHEAST TURKEY.....	362
<i>Ali Yılmaz, Tengiz Lazarashvili, Robert Nadirashvili, Aleksander Tsitskishvili</i>	362
ABSTRACT.....	362
INTRODUCTION.....	362
THE VALE COAL DEPOSIT.....	363
Geology.....	363
Tectonics.....	367
Economic Geology	367
THE OLTU-BALKAYA DEPOSIT	368
Geology	371
Tectonics.....	371
Economic Geology.....	372
CORRELATION OF THE COAL DEPOSITS	372
CONCLUSIONS	373
ACKNOWLEDGEMENTS.....	374
REFERENCES.....	375

GEOTHERMAL CHARACTERISTICS OF THE TURKISH-GEORGIAN

BORDER AREA, <i>Ali Koçak</i>	294
ABSTRACT.....	294
INTRODUCTION.....	294
GENERALIZATIONS.....	295
GEOTHERMAL AREAS ALONG THE BORDER.....	295
Hot Springs Found in the Ardahan Province.....	295
Hot Springs Found in the Artvin Province.....	296
REGIONAL GEOLOGY.....	297
General Correlation of the Geothermal Areas with the Regional Geology.....	298
General Correlation of the Geothermal Areas with the Regional Geophysical Structure.	299
INTERPRETATION OF THE CHEMICAL ANALYSES OF THE WATER SAMPLES	299
Binary Diagrams.....	299
The Cl-SO ₄ -HCO ₃ Ternary Diagram.	306
The Na-K-Mg Geothermometer.....	309
Reservoir Temperature Calculated by the Solute Geothermometers.....	311
CORRELATION WITH COUNTRY-WIDE GEOTHERMAL FEATURES	311
Correlation of the Project Area with the Heat Flow Density Map.....	311
Correlation of the Project Area with the Heat Reservoir Temperature Contour Map of Turkey.....	314
CONCLUSIONS AND SUGGESTIONS.....	314
REFERENCES.....	317

GEOTHERMAL POTENTIAL OF THE AREA ALONG THE TURKISH-GEORGIAN

BORDER, <i>Tengiz Lazarashvili</i>	318
ABSTRACT.....	318
INTRODUCTION.....	318
HYDROGEOLOGICAL CONDITIONS OF THE STUDIED AREA	319
WATER-BEARING AND AQUIFUGES COMPLEXES.....	320
Underground Waters of Upper Quaternary Sediments (Q).....	320
Water-Bearing Complex of the Lower Quaternary-Upper Pliocene Lava Sheets And Interlava Lacustrine Deposits (Q ₁ – N ₂ ³)......	321
Water-Bearing Complex of Lower Pliocene Andesites, Andesite-Dacites and Dacides (N ₂ ¹).....	322
Water-Bearing Complex of Andesite, Andesite-Dacite Tuffs, Tuffbreccias And Lava Sheets (Lower part of the Goderzi Suite (N ₁ ³ – N ₂ ¹)......	323
Water-Bearing Complexes of Clays, Clayey Marls, Andesitic Tuffs and Tuffbreccias. Adigeni Suite (P ₂ ³)......	324
Aquiferous Complexes of Middle Eocene Deposits (P ₂ ²)......	325

Water-Bearing Complexs of Upper Cretaceous Carbonaceous Suite - Limestone, marls, rarely dolomites ($K_2 Sn$)	326
Water-Bearing Complexs of Andesites, Tuffs, Tuff Breccias with Lenses of Limestones, Marls ($K_2 Tr$)	327
Water-Bearing Complexs of Tertiary and Upper Cretaceous Intrusive Rocks – Granitoids, Diorites and Gabbro – Diabases.....	328
Aquifers Complexs of Oligocene – Upper Eocene – Argillo-Arenaceous Deposits ($P_3 - P_2^3$)	329
Paleocene-Lower Eocene Weakly Aquiferous Complexs of Clays, Clayey Marls, Lutites and Sandstones of the Borjomi Suite ($P_2^1 - P_1$)	330
THERMAL-MINERAL WATERS.....	331
Carbonated Waters.....	331
Nitric Waters.....	341
NATURAL RESOURCES OF UNDERGROUND WATERS.....	345
GEOHERMAL CONDITIONS OF THE REGION.....	349
HYDROGEOHERMAL ZONATION AND GEOHERMAL POTENTIAL OF THE STUDIED TERRITORY.....	354
CONCLUSIONS.....	358
REFERENCES.....	360
ENGINEERING-GEOLOGICAL FEATURES OF THE TERRITORY ALONG THE TURKISH-GEORGIAN BORDER	376
<i>Emil Tsereteli, Nugzar Gogua, Dimitri Kalandadze, Tengiz Lazarashvili, Emzar Megrelishvili, Ali Yilmaz, Erdal Herece</i>	<i>376</i>
ABSTRACT.....	376
INTRODUCTION	376
ENGINEERING-GEOLOGICAL PROPERTIES OF THE ROCKS.....	377
Formation of the basement rocks.....	378
<i>Terrigenous Formation.....</i>	<i>378</i>
<i>Flysch Formation</i>	<i>380</i>
<i>Volcanogenic-Sedimentary Formation</i>	<i>382</i>
<i>Carbonaceous Formation</i>	<i>387</i>
<i>Contact-Metamorphic Formation</i>	<i>389</i>
<i>Magmatic Formation.....</i>	<i>390</i>
Formation of continental cover rocks.....	394
<i>Coastal-Deltaic Formation.....</i>	<i>394</i>
<i>Formations of the River Ravines.....</i>	<i>398</i>
<i>Slope Formation.....</i>	<i>402</i>
<i>Formation of the Closed Depressions.....</i>	<i>410</i>
<i>Sediments of Mountain Glaciation Formation.....</i>	<i>413</i>

<i>Tectonogenetic Formation</i>	416
RECENT GEOLOGICAL PROCESSES.....	418
Recent tectonic movements of the Earth crust and Seismicity.....	418
Recent exogenetic geological processes.....	420
<i>Dinamics of the Sea Coasline</i>	421
<i>Erosion</i>	423
<i>Landslides, Taluses and Rock Avalanches</i>	424
<i>Mudflows</i>	431
<i>Snow Avalanches</i>	433
<i>Stone Streams and Cryptogenetic Processes</i>	434
<i>Bog up</i>	435
CONCLUSIONS	436
REFERENCES	438