LATE MESOZOIC–CENOZOIC GEODYNAMIC EVOLUTION OF THE EASTERN GEORGIAN OIL–GAZ BEARING BASIN (TRANS CAUCASUS).

Sh. A. ADAMIA[1], V.M. ALANIA[2], G. D. ANANIASHVILI[2], E. G. BOMBOLAKIS[3], G. K. CHICHUA[4], D. GIRSIASHVILI[4], R. J. MARTIN[5,] and L. TATARASHVIL[4]

[1]*Tbilisi State University, 1 Chavchavadze av., Department of Geology and Paleontology, 380028 Tbilisi, Georgia*
[2]*Geological Institute Ac. Sci., 9 M. Alexidze , 380093 Tbilisi, Georgia Boston College, Department of Geology and Geophysics, Chestnut Hill, MA 02467, USA*
[3]*Navtobsamecniero, Saknavtobi, 5/7 Tashkent str., 380060, Tbilisi, Georgia*
[4]*New England Research Inc., White River Junction, VT, USA*

Abstract: The Late Cretaceous-Cenozoic geodynamic evolution has been considered on the example of the intermontane depression of Eastern Georgia, where the Late Alpine convergence and compression resulted in the intensive deformation of rocks, formation of south-vergent and north-vergent nappe structures. Oil and gas deposits, accumulated in the tectonic traps, are confined to the autochtonous and allochthonous structures.

Introduction: Interest in Georgia, and the Caucasus on the whole, is traditionally great, due to its geopolitical position between the West and the East, complexity and variety of its geological structures, wealth of various mineral resources, including oil, natural gas etc. The region is situated at the junction of the Eurasian and Africa-Arabian lithospheric plates serving as a connecting link between the European and Asiatic segments of the Alpian-Hymalaian orogenic belt. The region under investigation, a constituent part of the Caspian oil and gas province, represented during the Mesozoic and Early Cenozoic the North Tethyan realm—active southern margin of the Eurasiatic lithospheric plate. At the pre-collisional stage of the Alpine tectonic cycle (Mesozoic-Eocene), north of the ocean Tethys, the following tectonic units were developing above the north-vergent subduction zone (Fig. 1): (1) the Transcaucasian island arc separated by the Cretaceous-Paleogene Adjara-Trialetian Intraarc rift into the South-Transcaucasian volcanic (Bayburt-Karabakh zone and Artvin-Bolnisi block) and the non-volcanic North-Transcaucasian (Georgian block) branches; (2) the backarc basin of the Greater Caucasus. During the syn – and post-collisional stages of the Alpine platetectonic cycle (Oligocene-Neogene-Quaternary) as a result of continent-continent collision inversion of relief took place; at the place of intraarc and backarc basins were formed the

mountain fold-thrust belts of the Greater and Lesser Caucasus with the Transcaucasian intermontane depression between them; the normal-marine basins of the Tethys were replaced by basins of euxinic type (Paratethys) and later on – by continental basins with subaerial conditions of sedimentation.

Geological Structure of the Region: For investigations there has been chosen a region in Eastern Georgia situated near Tbilisi, the capital of Georgia, in the middle reaches of the Kura (Mtkvari) river belonging to the Caspian Sea basin. The region is bounded on the north by the southern foothills of the Greater Caucasian range (the Kakheti ridge), and on the south by the state frontier with Azerbaijan. This territory is a transit site for principal communications of the Transcaucasus-railway Baku-Tbilisi-Poti (Batumi, Sukhumi), main highways, Baku-Tbilisi-Geihan oil and Shah-Deniz gas pipelines, etc. Here there are now situated exploited oil deposits: Samgori-Patardzeuli-Ninotsminda. Geologically, the region represents a part of the late Alpine intermontane molasse depression separating the mountainous fold thrust belts of the Greater and Lesser Caucasus. The northern boundary of the depression is the Orkhevi thrust – a frontal structure of the Southern slope thrust belt; the southern boundary is the Adjara-Trialeti thrust belt, which, within the study area, gradually submerges eastward and is overthrusted from the north by tectonic slabs of Oligocene-Neogene-Quaternary molasses. The northern margin of the region is made up of tectonic scales overthrust form the north and represented by terrigenous and carbonate turbidites of the Jurassic, Cretaceous and Paleogene – the rocks of the Greater Caucasian back-arc basin. The eastern termination of the Adjara-Trialetian zone in the vicinity of Tbilsi is composed of terrigenous turbidites of Paleocene-Lower Eocene, tuff-turbidites of Middle Eocene, terrigenous turbidites of Upper Eocene, Oligocene - Lower Miocene. In the molasse depressions of Kvemo Kartli (Lower Kartli) and Gare (Outer) Kakheti the oldest rocks exposed on day-surface are Oligocene-Lower Miocene terrigenous clastics followed by younger Neogene-Quaternary molasses. The older rocks developed in the depression – Upper Cretaceous, Lower and Middle Paleogene have been studied in the boreholes.

The structure of the described part of the Kura depression has been studied fairly well in connection with the prospecting and exploiting works for oil and gas deposits. Voluminous geological and geophysical materials are concentrated, in the first place, in “Georgian Oil” and, partly, in the universities and academic institutions. Intensive structural investigations of deep-seated horizons with the application of seismic profiling methods are being carried out now, mainly, by foreign oil companies in collaboration with the geologists from “Georgian Oil”. The description of the structure of the region is based on data of geological mapping in a 1:50000 scale and 10 seismic profiles.

The main plane of detachment confining the Kartli-Kakheti allochthon from the bottom passes inside the Maikop series. All the slabs, and scales are south-vergent, and only in the authochthon of the Georgian block faults are subvertical. The structural pattern of the Kartli-Kakheti allochthon often does not coincide with that of the authochthon. In the Gare Kakheti area two different thrust systems have been found: an upper imbricate fan that deforms Neogene strata and lower duplex composed of Paleogene and upper Cretaceous rocks. The S-vergent imbricate fan is characterized by fault-propagation folding and is transported opposite to regional transport along a roof thrust. The sole of the upper imbricates forms the roof thrust of the underlying duplex. N-vergent lower duplex is characterized by fault-bend folding. The internal structure of the duplex is poorly imaged on seismic lines and does not outcrop at the surface.

Geodynamic Evolution of the Region in Late Cretaceous-Cenozoic: There are numerous publications regarding geodynamioc evolution of the Caucasus, as well as Georgia, as its constituent part. According to some authors (Adamia et al., 1981; Evolution, 1987; Geological events, 1991), the Caucasus together with the adjacent territories of the Black Sea-Caspian Sea region represented in the Mesozoic and Early Cenozoic the North-Tethyan realm— the southern active margin of the Eurasiatic lithospheric plate. Within its limits, at the border of ocean/continent, there existed a system of island arcs, intraarc rifts and backarc basins characteristic of the pre-collisional stage of evolution of the region. The final collision of the southern and northern plates and formation of the present-day intracontinental mountainous edifice of the Caucasus occurred in the Late Alpine epoch - in the Oligocene-Neogene. Such is a general concept of the geodynamic evolution of the region, on the grounds of which we consider here the evolution of its small segment during the Late-Cenozoic time. At the turn of the Cretaceous to the Paleogene within the study area of the Transcaucasus there existed the following basins (from south to north): 1. Shallow-water island-arc normal-marine Artvin-Bolnisi basin in which accumulation of calc-alkaline volcanics, limestones and marls took place; 2. More deep water Adjara- Trialetian trough basin, superimposed on the Transcaucasian island arc as a result of the Cretaceous rifting, in which volcanic and carbonate formation were deposited; 3. Shallow-water island-arc normal-marine basin of the Georgian block with a predominantly carbonate sedimentation —the northern non-volcanic branch of the Transcaucasian Mesozoic - Early Cenozoic island arc; 4. The backarc basin of the Greater Caucasus with sedimentation of predominantly deep-marine terrigenous and carbonate turbidites. All the above mentioned units - basins were located above the active North-Tethyan zone of subduction, which occupied the place of the present-day Lesser Caucasian-North Anatolian ophiolitic suture and Bayburt-Karabakh zone. All these were developing later on, during the whole Paleocene and Eocene, under the same geodynamic conditions. However, the Eocene age is worth

special attention as a time of intensification of riftogenesis in the Adjara-Trialetian zone and further evolution of intraarc deep-marine trough with accumulation of thick sequences of basaltic volcanics, terrigenous and tuffogenous turbidites. The zone of subduction moved most likely southward to the limits of the present-day Zagros-Taurus belt. The Oligocene-Neogene and Quaternary basins situated within the intermontane depression mark the syn-and postcollisional evolution of the region; these basins represent part of the Paratethys with accumulation of sediments of closed and semiclosed basin type.

All the oil- and gas deposits located within the study territory have been most likely formed during the Alpine plate tectonic cycle. Source rocks containing **C**org on sufficient quantity were accumulated in islandarc, intraarc and backarc basins of the Alpine cycle (Jurassic-Cretaceous-Early Cenozoic) at the stages of crustal expansion-rifting of the bottom of these basins (pre-collisional stage). The syn- and postcollisional stages were probably responsible for the migration of hydracarbons to the overlying horizons and their subsequent concentration with formation of oil and gas pools under favourable reservoir-trap conditions

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