

**The Petrographic Analysis of the Paleogene Deposits,  
North Eastern zone of Getic Depression:  
Petrotypes, Provenance Area Reconstruction and Interstitial Space Evolution**

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The Oligocene Cheia Conglomerates and Corbi Sandstone formations are exposed on the northern side of the Getic Depression. The purpose of this paper is to analyze the depositional facies and facies successions, petrography and diagenetic history in order to understand and characterize the properties of the hydrocarbon reservoirs contained within the two lithostratigraphic units.

Both formations have no lateral continuity. Cheia Conglomerates are exposed along the Cheia, Olanesti and Muireasca valleys. A maximum thickness of 500 m is recorded at Cheia. The formation thins westward until pinches out along the Olt Valley. The formation is predominantly gravelly except for the upper part where it becomes finer-grained. The Corbi Sandstone is exposed along the Raul Doamnei and Valsan valleys.

From both formations were measured stratigraphic sections in the field and both were sampled for laboratory analyses. The latter include grain-size sieving, thin-sections microscopy, acetate peels and staining of the carbonate specimens, calcimetry and paleomagnetism.

Nine sedimentary facies have been recognized within the Cheia Conglomerate Formation. These are: chaotic matrix-supported conglomerates; massive conglomerates with cobbles; massive conglomerates with pebbles; planar bedded conglomerates; conglomerate-sandstone couplets; massive granular sandstone; planar bedded sandstone, heterolithic interbedded sandstones and mudstones and laminated mudstones. All the sedimentary structures recognized in the facies suggest deposition from gravitational density flows. The most coarse-grained chaotic deposits are interpreted as resulting from debris flow deposition. The clast-supported conglomerates display intensive scouring (channeled features), graded bedding, and normal grading typical for deposition from high-density turbidity currents. The planar bedded conglomerates is interpreted as deposited from a traction-carpet whereas the sandstone dominated facies represent either deposition from high-density turbidity flow or from low-density turbidity currents.

Same criteria were applied to the Corbi Sandstone Formation and ten sedimentary facies have been recognized. These are: massive pebble to cobble conglomerates, massive pebble conglomerate, planar pebble conglomerate; massive granular sandstone; normal grading sandstone; massive sandstone; planar bedded sandstone; interbedded heterolithic sandstone and mudstones; siltstone-mudstone couplets; laminated mudstone. They are all resulting from deposition from turbidity currents either high density gravelly-sandy or low density flows. The planar pebble conglomerate is thought to originate from deposition from a traction carpet.

Most of the facies successions (sequences) within the Cheia Conglomerates are 3-5 m thick, display a fining and thinning upward trend and are interpreted as submarine channel deposits. Intense erosion generated a dominant amalgamation pattern for the entire formation (higher order sequence), within which, individual facies successions (channel fill or lower order sequences) can still be recognized. Towards the top the Cheia

Conglomerates Formation becomes sandier. The lower contact of the Cheia Formation with the underlying Olanesti Marls is gradational.

Within the Corbi Sandstone the succession is divided into five orders of sequences labeled in ascending order from I to V. The I order sequence is represented by 10-100 cm thick interbedded sandstones and mudstones. The order II comprises units with an average of 1.5 m thickness deposited from a single channelized gravelly density flow. Few II order amalgamated units into a 15 m thick package separated by a mudstone dominated unit represent a III order sequence. The IV order sequence is 15 to 25 m thick and represents a channel-levee association. The V order is Corbi Formation Sandstone and is interpreted as a succession of vertically stacked channel-levee sequences.

The facies model of the Cheia Conglomerates is probably a gravel rich point-source turbidity system. The Corbi Sandstone is interpreted as a sand-rich/mud point-source turbidity system.

Petrographic analysis helped to establish the two formations petrotypes, to determine the provenance area characteristics, to characterize the diagenetic processes and to evaluate the hydrocarbon potential as the interstitial space evolution indicates. The Cheia Conglomerates petrotypes are: orthoconglomerates, polymictic paraconglomerates, and lithic sandstones, and for the fine facies calcareous clay. Metamorphic lithoclasts are the most common (70-80%) followed by the sedimentary rocks as limestones and lithic clays (20-30%). Metamorphic lithoclasts are represented by orthoclazic gneisses, garnets gnaisses, garnet micaschists with muscovites and biotites. Beside these there are amphibolite with hornblende and plagioclase, fresh and retromorphosed eclogites. Philonian lithoclaste as pegmatite shows Q, Fk and Fp big crystals. Carbonatic rocks are represented by crystalline limestone. From the sedimentary lithoclastes the limestones displays the following petrotypes: pelsparites, intrasparites, biosparites, micrites. Usually they look like breccia (calcirudit), the same sample showing few petrotypes. They are highly fractured, with few fracture generations, cementated with pure calcite, Fe calcite, and dolomite. Other sedimentary lithoclaste found are the lithic sandstones formed by Q, F and lithic fragments, especially carbonate sedimentary lithoclasts (pelsparites) with an high diagenetic signature: carbonated cement, micritic matrix recrystalization, carbonate metasomatic processes on feldspars and Q, authigen Q overgrowth on alogen Q. Big quantity of feldspars, up to 50% in some samples (arkose), indicates a rapid sedimentation, without a signature of the climate (due to the rapidity of the process).

The theory indicates a metamorphic source and secondary a plutonic one, as shown by provenience and the arid climate. The rapid transport would determine the same result in an humid and warm climate. Nevertheless the sedimentation rate is too slow to create the available sedimentation space in the basin. This can be done either by tectonic forces (subsidence and/or uplifting of the source area) or eustasy. Based on the macroscopic field observations – the high frequency of the carbonate lithoclasts in Cheia conglomerates relatively to Calimanesti conglomerates and other old sedimentary formations, we support the theoretic hypothesis, the uplift of the carbonate platform in the Getic domain and forming of an available sedimentary space in the basin in an extensional regime, which determined a rapid sedimentation.

Corbi Sandstones petrotypes are typical for sub-quartz sandstones, sub-feldspathic sandstones, lithic sandstones and oligomictic paraconglomerates and polimictic orthoconglomerates. Major lithoclasts in these ruditic facies are ocular gneisses,

quartzite, micaschists, milonite and sedimentary lithoclasts: polymictic orthoconglomerate, lithic sandstones, limestones and clays.

The study of granoclasts of the two stratigraphic units (feldspars and Q) as shown by their form and alteration degree determined the separation of the two categories: fresh granoclasts and recycled granoclasts. After the granulometry features and extinction there are metamorphic and plutonic facies. Particle composition of the Cheia Conglomerates shown a lot of similarity with metamorphic petrotypes from the Capatanii Mountains (with a gneissic composition) and with Cretacic and Eocene sediments from which we suspect that they were recycled. As well the Corbi Sandstone indicate some commune characteristics, as indicated by the comparative analysis with the metamorphic formations from the Fagaras Mountains - the southern part, and older sedimentary formations in the northern part (that could represent the source area for the Oligocene deposits).

Olanesti Marls and Pucioasa like Formation are adjacent deposits and their facieses are very fine. After calcimetry analysis I determined the  $\text{CaCO}_3$  proportion about 5-15%. Also, I had analyzed 10 samples with X ray. A qualitative determination suggests the fallow minerals: smectite, illite and chlorite. The petrotype dominant of these fine formations are calcareous argils.

Diagenic analysis indicated similar evolution for the two formations: local cementation with carbonatic poikilithic cement formed in a final evolutionary stage. However, Corbi Sandstone, have a silicious, ferrous and clayey cement beside the poikilithic cement from the huge nodules (meters) that does not clogged totally the sandstone pores. No proof of deep cementation was found, therefore these deposits did not pass the oil window, and the primary porosity was big, determining a good storage quality of the rock.

Both Cheia Conglomerates and Corbi Sandstones are good reservoirs for hydrocarbons as the bodies geometry, diagenic characteristics (high porosity) and poronecrotic processes that affected the locally the deposits in a final diagenetic stage indicates.