P16-5 AN ENHANCED 3D INTERPRETATION OF GEOPHYSICAL DATA WITHIN THE DANUBE DELTA[1]

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Danube Delta is located on the Romanian coast of the western Black Sea Basin, in the septentrional part of the Region of Dobrogea. The relatively unconsolidated sediments of the delta edifice lie and totally cover the older geological formations that belong, from North to South, to Scythian Platform, North Dobrogea folded belt and Moesian Platform. Each of these main geotectonic macro-units has a quite different lithology and geological history.

The Scythian Platform (Figure 1), represented here by the down-lifted compartment of the Predobrogean Depression, is conventionally bordered southward by the Sf. Gheorghe fault. The depression's basement has not been found yet by any structural well drilled so far, but it probably consists of Caledonian and Cadomian age formations (Sandulescu, 1984). The depression's sedimentary cover comprises deposits with ages ranging from Paleozoic to Quaternary. Geological formations were attributed (Patrut et al., 1983) to the Paleozoic, Lower Triassic, Middle-Upper Triassic, Jurassic, Lower Cretaceous and Sarmatian-Pliocene sedimentary cycles.

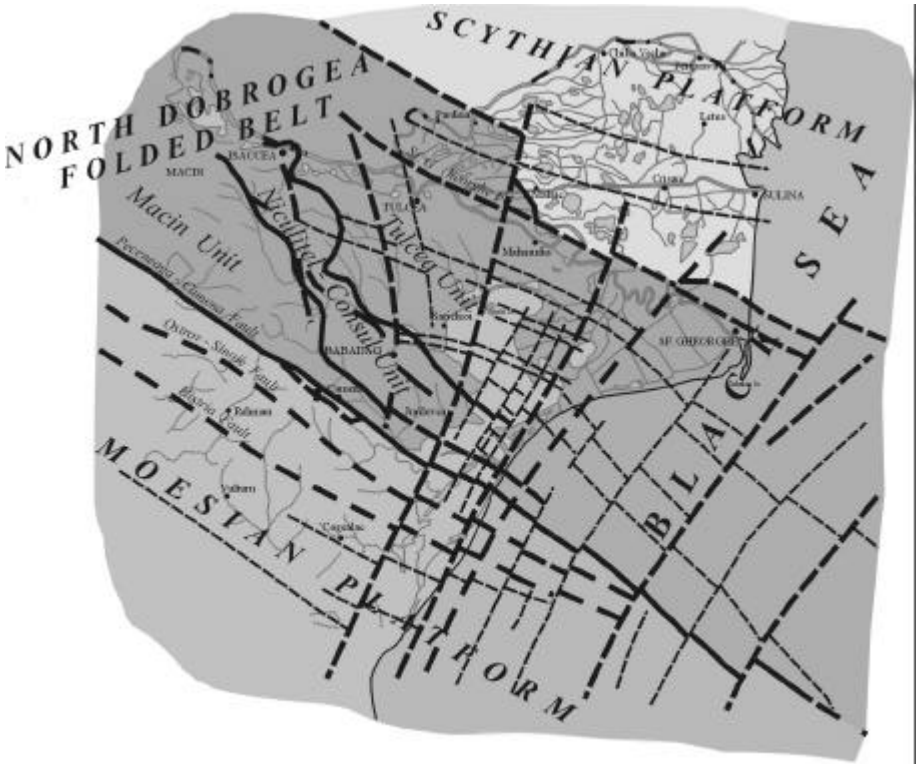

Figure 1 Enhanced geotectonic sketch of northern Dobrogea, by gravity and magnetic data

Within the North Dobrogea folded belt, bordered northward by the Sf. Gheorghe fault and southward by the Peceneaga-Camena crustal fault, three main geotectonic units were separated, each of

them representing a tectonic nappe and over-thrusting one-another from south-west to north-east. The internal nappe, called the Macin Unit has a very complicated geological structure, comprising mesometamorphic, magmatic and sedimentary rocks of Paleozoic and Mesozoic ages. The median geotectonic nappe, named the Niculitel-Consul Unit is mostly Triassic. It comprises mainly limestone and detrital rocks, among which variable bulks of volcanic and igneous rocks are intercalated. This geological unit is considered (Visarion et al., 1990) to be the ophiolitical scar of the intracontinental type rift active during the Triassic (Seghedi & Szakacs, 1994). The external tectonic nappe, called the Tulcea Unit, which over-thrusts the sedimentary of the Scythian Platform, comprises epimetamorphosed Precabbrian strata and sedimentary formations of Paleozoic and Mesozoic ages, all associated with acid to basic igneous rocks.

The geological formations belonging to the North Dobrogea folded belt are covered, approximately on its meridional half, by the Upper Cretaceous and younger deposits of the Badabag Basin, that prolongs, beneath the southern Danube Delta's sediments, towards the Histria Depression located on the Black Sea continental shelf.

Southward of Peceneaga-Camena crustal fault, the Central Dobrogea mega-unit is located. It represents an up-lifted compartment of the Moesian Platform. In this sector, the christaline basement practically outcrops and consists of mesometamorphic rocks of Precadomian age and epimetamorphic green schist of Cadomian age.

According to Panin (1996), the unconsolidated sediments of the Danube Delta complex consist of marine and lacustrine littoral deposits, fluvial deposits, marsh deposits and loess-like deposits of ages ranging from 11,700 years BP to present. The thickness of delta deposits, determined by high resolution seismics (Spanoche & Panin, 1997), ranges between 10 to over 200 m. The greatest delta sediments thickness was reached eastward of Razelm lake.

Regional scale gravity and magnetic (vertical component) measurements covered the entire Danube Delta during the '60 (Airinei, 1968). The national aeromagnetic project (Cristescu & Stefanciuc, 1968), conducted also during the mid-'60, covered most of the Romanian territory, including the Danube Delta area. Detailed gravity and magnetic surveys, have been carried out in the southern Danube Delta starting from late '80 (Dimitriu, 1996; Dimitriu & Eufrosin, 1997; Besutiu, 1998).

Seismics have been performed within the Danube Delta during two phases; the first was carried out between 1966 and 1969 along more than 400 km of analogic recorded seismic lines and the second in 1981, by improved digital recording means, along 35 km of seismic lines located on the southern littoral beach-ridges belts.

Several stratigraphic and structural deep wells have been drilled during time within Danube Delta area. The results of the completed drilling project, synthesized by Patrut et al. (1983), compiled with results of the above mentioned seismic surveys, practically ended the deciphering process of the Predobrogean depression's deep geological structure down to approximately 3,000 m depth.

The main aim of the paper is to bring into a new, enhanced interpretation the valuable structural and lithological information offered by gravity and magnetics investigation methods. The great advantage of "on-surface" distribution of gravity (figure 2) and magnetics data, is to be fully engaged in order to improve and trans-correlate the ''on-side'' and ''on-line'' detailed informations offered respectively by wells and seismic cross-sections.

Data selected from the cross-sections publish by Patrut et al. (1983), and depths to Conrad and Moho discontinuities (Cristea et al., 1994) are compiled all together in 2D gravity and magnetics modeling. On surface gravity and magnetic effects, due to distinct and relative well known geological bodies (e.g. Danube Delta unconsolidated sediments complex) are computed by 3D modeling and extracted from the geophysical anomalies maps.

Structural and izobath maps relative to some charecteristic levels, compiled by data gathered from different sources (i.e. Patrut et al., 1983; Zelinski et al., 1987; Rogoza et al., 1988) are also used in order to evaluate the gravity and magnetic effects of the deep geological structure. Through a complex integration of all available data, an enhanced 3D geological structure knowledge is finally reached. Furthermore, the geological knowledge's frontier may be pushed deeper, beyond the limits reached previously by wells and prospecting seismics interpretation.

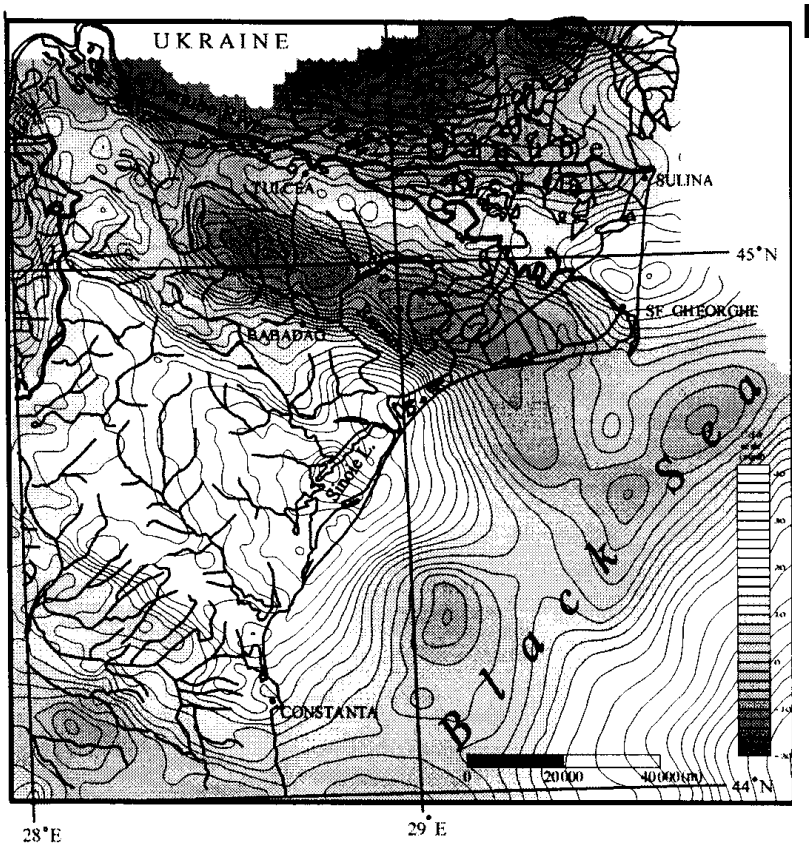

Figure 2 The regional gravity anomaly map of the Danube Delta and the surrounding areas. Onshore gravity data according to Botezatu (1955[1]), Băcioiu (1955[1]), Suceavă (1961[1]), Airinei (1962-1966[1]) and Nicolescu (1990[1]) and offshore data according to Sava (in Panin et al., 1987[1])

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