PLIOCENE – QUATERNARY PALEOGEOGRAPHICAL EVOLUTION OF THE DACIAN BASIN (WESTERN PART)

P. ENCIU and D. BALTEANU

Institute of Geography, 12 Dimitrie Racovita Str, Bucharest, Romania

Abstract: The study of a dense network of high resolution continuous coring wells (1/5 km^2), situated in the western part of the Dacian Basin (Central Paratethys), have led to the characterization of the Pliocene-Quaternary succession of paleoenvironments.

Key words: delta, floodplain, Pliocene, Quaternary, Dacian Basin

The slow vertical movements of the three major depressions and of the three uplifts (belonging to the Moesian Platform basement), the continuous change of the depositional setting (from the inner sea during the Pontian, through the lacustrine, river-dominated deltas and upper deltaic plain in the Dacian-Middle Romanian, to the terrestrial Danube Formation in the Upper Romanian-Holocene interval) are the main factors defining the features of the Pliocene-Quaternary depositional sequences.

The existence, at the basement, of the post-Laramie paleorelief (south-to-north plunging: Vanju Mare-Prunisor Depression, Calafat-Strehaia Uplift, Lom-Filiasi Depression, east-to-west plunging: Optasi-Bals Uplift, Valea Stanciului Depression and Kozlodui-Zaval-Grecesti Uplift) and its increasing east-west differential vertical movements are of main importance for the understanding of the filling process of the western part of the Dacian Basin.

Against this background, after the progressive interruption of the link between the Pannonian and the Dacian Basin, at the end of the Pontian, the development of the radial convergent hydrographic network on the eastern slope of the Transdanubian Carpathians and the existence of the inner emerged sectors of the Calafat-Strehaia and Optasi-Bals Uplifts favored, during the Lower Dacian, in the westernmost Vanju Mare-Prunisor Depression, the rapid refreshing and extension of the Danube river-dominated delta plain (the Berbesti Formation-ca 110 m thick sands and ca 75 m thick parasequences with pebbles, sands, clays and four seams of coals).

To the east, on the major Calafat-Strehaia Uplift, a hiatal surface was identified during the Dacian, as a result of the lowering of the lake level (Central Paratethys).

Passing to the east, in the Lom-Filiasi Depression, an important south-north stream (paleo Desnatui), originally on Bulgarian emerged territory, built up a great delta (ca 150 m thick) during the Lower Dacian.

Over 500 boreholes for coal prospecting identified rare species of the Pachydacninae Family, some species of Psilunio and Jazkoa and variegated gastropods of paludal facies (NSM_{8C} biozone; Enciu and Andreescu, 1990) in the Berbesti Formation. The paleomagnetic calibration of the Berbesti Formation (Enciu et al, 1995) leads to the conclusion that this formation was deposited during the 5.3-4.8 m.y. interval.

During the Upper Dacian-Lower Romanian, the previous phase of the river-dominated mini-delta (constructive deltaic phase: the Berbesti Formation) was succeeded by the upper delta plain phase (the Jiu-Motru Formation). The lower part of the Jiu-Motru Formation contains several distributaries-fill in the main mud-filled area of the upper deltaic plain (0-115 m thick sequences with sands, silts, clays, coals or gleic paleosoils).

The paleohydrological conditions existing in the deltaic plain in the Upper Dacian favored a slight pH decrease, the depletion of the O_2 content and the increase of organic matter and sulfate values, limiting the life of the Prosodacninae Family species (NSM_9 biozone).

The middle and upper part of the Jiu-Motru Formation (Lower-Middle Romanian) preserved ca 0-125 m of river channels multistoried infill interstratified with compacting fine-grained rocks. From the north, west and south edges of the Dacian Basin to the axis of the Carpathian Foredeep (Filiasi-Turceni line), during the Middle Romanian substage, the Jiu-Motru Formation passed from proximal river stages, including alluvial fans (Caraula, Tarnava, Poroina Mare, Podari etc), to the meandering river stage.

Each parasequence consists of in-channel deposits (sands) followed by overbank fines (silts, clays, clayey coals). Episodic recurrence of the mini-lake environment: marly clays, limestone etc (Gabru, Terpezita sectors) or of the marshy inter-river distal floodplains: clayey coals, coaly clays etc (Giubega, Maracine a.o. sectors) were identified.

During the Lower and the Middle Romanian, the smooth and sculptured fresh water mollusks, pertaining to Psilunioninae Subfamily (NSM_{10}, NSM_{11} biozones; Enciu and Andreescu, 1990), flourished. On some upland sectors, the micromammalia of the genera Dolomys, Propliomys and Pliomys (dated to about 3.0 m.y.) and of the genera Mimomys, Dibolia, Desmanella and Desmana signal the increased continentality of the environment.

In the Upper Romanian-Lower Pleistocene (first part), in the conditions of a progressive but intermittent cooling of the climate, the drainage and organization mode of the hydrographic network in the western part of the Dacian Basin became much more differentiated, especially in the west-east directions. Additionally, the last uplifts of the Wallachian Tectogenesis Phase intensified the alluvia fed of the Dacian Basin edges. As a result, in its westernmost part, in the present Serbia-Romania territory, the Danube built the Alluvia Fan Member (Lower Member of the Danube Formation; Enciu, 1998).

The axial part of the Lower Member of the Danube Formation (built during the young paleohydrological stage of the river) was self-evacuated in the Middle-Upper Pleistocene (when the Danube deposited its frontal load in the north-easternmost part of the Dacian Basin).

On the southern edge of the Getic Piedmont (190-210 m elevation), on the Calafat-Strehaia Uplift line and in the axis of the Lom-Filiasi Depression (125-140 m elevation), an increasing W-E elongated strip (5-20 km wide, over 75 km long) representing the lateral portion of the Lower Member of the Danube Formation is preserved.

During the 20-th century, this lithostratigraphical unit was exploited in many places. In over 25 raw materials quarries, different pieces of Zyglophodon borsoni, Anancus arvernensis, Mammuthus (Arkidiscon) planifrons Falconer, Mammuthus planifrons meridionalis and Mammuthus meridionalis were found (Athanasiu, 1907, 1926; Liteanu & Bandrabur, 1957; Bandrabur, 1971; Mihaila et al., 1981; Enciu, 1998).

After the long Upper Romanian-Lower Pleistocene interval, when the Danube built up the alluvial fan in the west of the Dacian Basin, starting with the second part of the Gunz cold stage, the Danube cut the actual profile of the valley in its own fan. The higher relief of the Calafat-Strehaia Uplift line ensured repeated down-cutting. As a result, the progressive series of incisions, each being followed by an aggravation phase, resulted in the deposition of the stairway-like seven terraces sequence.

This sequence starts at 135-145 m above the top of the actual floodplain of the Danube. On the Calafat-Strehaia Uplift line, the seventh terrace, having around 110-120 m relative elevation (in the Castrele Traiane-Plenita sector) were slightly upraised at ca 150 m elevation. As a consequence, some studies pleaded for the existence of an eighth terrace level in the western part of the Dacian Basin (Badea, 1970).

Generally, the other six W-E extended terraces show a slight uprise along the basement uplifts and a slight tilting along the depression, respectively. The range of the hanging wall elevations of these units varies between 110-115 m (the sixth terrace), 90-95 m (the fifth

terrace), 60-110 m (the fourth terrace), 50-65 m (the third terrace), 35-50 m (the second terrace) and between 30-50 m (the first terrace).

The elevation of the same datum-level for the actual Danube floodplain ranges between 35 m a.s.l. (near the Drobeta Turnu Severin) and 25 m (around the Jiu-Danube junction).

The thickness of each alluvial sequence decreases from west (30-45 m thick of 3-4 stacked upfinning sequences around the southern extension of the Vanju Mare-Prunisor Depression) to east (one 5-10 m thick upfinning sequence, around Kozlodui-Zaval-Grecesti Uplift).

In the neighbourhood of the river, the seven sequences of the Danube terraces (the Upper Member of the Danube Formation; Enciu, 1998) are overlain by a very different thick pile of eollian sandy sheets (0-15 m). The highest values (over 10 m) are grouped around the southern portion of the Calafat-Strehaia Uplift (Maglavit-Moreni sector).

Far from the source area, above the first four terrace levels, the eollian deposits are preserved as narrow WNW-ESE strips. On the three oldest terraces, the cover of the Upper Member of the Danube Formation is made up of a succession of decimetric siltic and clayey beds (loess and paleosoils). Near the escarpment between the Getic Piedmont and the series of the seven terraces (the Oltenia Plain), the Overlying Formation consists of a 10-20 m thick pile of eolian-deluvial deposits.

In accordance with available biostratigraphical elements, the seven generations of the Danube alluvia were referred to the Lower Pleistocene (second part)-Upper Pleistocene interval.

References

Andreescu I., (1983), Biochronology and Cronostratigraphy of the Upper Pliocene and Lower Pleistocene in the Dacian Basin. An. IGR, 59, 153-160, Bucharest.

Badea L., (1970), Despre terasele fluviatile din Oltenia. Rev. roum. Geol., geogr., geophys., Sect. Geogr., XLII, Bucharest.

Balteanu D., (1997), Romania. In vol. “Geomorphologic Hazards of Europe”, Elsevier, Amsterdam.

Enciu P., Andreescu I., (1990), Stratigraphy of the Pliocene – Pleistocene deposits in the western part of the Dacian Basin. Inst. Geol. Rom., DS, 74/4 (1987), 141-156, Bucharest.

Sandulescu M., (1984), Geotectonica Romaniei. Ed.Tehn., 336p, Bucharest.