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Danube Delta, Genesis, Evolution and Sedimentology

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The Danube Delta can be divided into three major depositional systems (fig.1,2): the delta plain with a total area of about 5,800 sqKm, from which the marine delta plain area is of 1,800 sqKm; the delta front with an area of ca.1,300 sqKm, divided into delta-front platform (800 sq Km) and delta-front slope (ca.500 sqKm) extending off-shore to a water depth of 30-40 m; the prodelta lies off-shore, at the base of the delta-front slope till 50-60 m depth, covering an area of more than 5,500 sqKm. The delta front and especially the prodelta display a pattern of sub-marine channels, 4-10 m deep, bordered by lateral levees; these channels seem to constitute discharge ways of turbid flow yield by the river distributaries at high flood. Beyond the prodelta seaward there is the continental shelf with a thin, non-consolidated, actual sediment cover (fig.2). Here we can identify the pattern of the channels followed by the Danube during the low sea level periods towards the shelf edge, more precisely to the canyon Viteaz (fig.1). It is also to notice the existence of some deformational processes of nonconsolidated sediments, such as: rotational slides, affecting the superficial layer of 10-30 m thick, mass- or mud-flows, collapse depressions etc.

The delta development is controled by: the river sediment input (the Danube average sediment discharge is ca.50.10⁶ t/y out of which 5-8.10⁶ t/y sandy material); the prevailance of winds from the northern sector (40-50 % of instances); the predominance of southward trending of marine currents; the long-shore sediment drift directed also towards the South; the relatively important values of wave power etc. The interaction of these factors is controlling the delta morphological type, the geometry of the volumes of deltaic deposits, the assimetry of the deltas of Danube's distributaries and their development and evolution. In the end to characterize the delta sediment distribution and the magnitude of fluvial and marine processes controlling the delta shape and development there were used the indices of protrusion (Ipr),of crenulation (Icr) and of sediment distribution or skewness (Sk) proposed by Coleman and Wright (1971).

The Danube Delta overlaps the predobrogean Depression which, in its turn, lies mainly on the Scythian Platform. The sequence of the Scythian Platform cover deposits which constitute the filling material of the Predobrogen Depression display six sdimentation cycles (Paleozoic, Lower Triassic, Middle-Upper Triassic, Jurassic, Lower Cretaceous and Sarmatian-Pliocene)(Patrut et al., 1983). The Danube Delta is situated in a area of high mobility of the Earth crust, repeatedly affected by strong subsidences and important sediment accumulations. The deltaic conditions were settled here during the Quaternary, when the Danube started flowing into the Black Sea basin.

The Danube Delta edifice is build up of a sequence of detrital deposits of tens to 300-400 meters thick formed mainly during the Upper Pleistocene (Karangatian, Surojskian, Neoeuxinian) and the Holocene. The Holocene evolution of the Danube Delta include the following main phases: (1) the formation of the Letea-Caraorman initial spit, 11,700-7,500 years BP; (2) the Sf. Gheorghe I Delta, 9,000-7,200 years BP; (3) the Sulina Delta, 7,200-2,000 years BP; (4) the Sf.Gheorghe II and Chilia Deltas, 2,000 years BP- present; (5) the Cosna-Sinoie Delta, 3,500-1,500 years BP.

The Danube delta plain displays a few main facies types of sediments, as follows (fig.4):(I) marine littoral deposits of two types: type"a", formed by the longshore drift from the North (from the mouths of rivers Southern Bug, Dniester and Dnieper) and type"b", of Danubian origin; (II) lacustrian littoral deposits, forming the Stipoc and Rosca-Suez lacustrian spits; (III) fluvial deposits, genetically related to the Danube distributaries system, include several types: bed-load and mouth-bar deposits, subaqueous and subaerial natural levees deposits, crevasse and crevasse-splay deposits, point bar and meander belts deposits, decantation deposits into intradeltaic depressions and interdistributary area etc.; (IV) marsh deposits;(V) loess-like deposits.

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