Sub-Recent to modern sediment facies in Manzala lagoon, Nile Delta, Egypt : natural versus man influenced factors

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The four major lagoons on the northern Nile Delta of Egypt are undergoing rapid and dramatic modification by both natural and anthropogenic factors. In order to establish a baseline database for monitoring the evolution of Manzala lagoon in the northeastern delta, a campaign of topographic measurement of the water-table of lagoon and a program of surficial sediment sampling (90 grabs and 30 short-cores) across the entire lagoon was initiated in 1990 in close collaboration between the Smithsonian Institution of Washington D.C., Ain Shams University of Cairo and University of Catania.

The surface of the lagoon (about 450 sq. Km) was reduced by 20 % between 1973 and 1987, and by 11.7 % between 1987 and 1990. If the evolution of the lagoon continues at this rate, the surface areas of Manzala will be further reduced by 1/3 by the year 2000.

Surficial samples were recovered from all environments in the Manzala lagoon, from depths of 0 to almost 1.5 m Short-cores were selected fairly evenly from the different areas of lagoon, in the southwestern area influenced by the drains coming from Nile river; in the southeastern one influenced by canals join the lagoon and in the northern area influenced by sea water).

Statistical analyses take into account grain size (% clay, silt, fine sand an coarse sand fraction) along with composition of sand fraction (identification of 300 or more grains per sample). Sand components include mineral (light and heavy mineral, mica, glauconite/verdine, pyrite, gypsum), faunal (forams, ostracods and molluscs) and floral (diatom and plant fragments).

Statistical analyses indicate the degree of relation among the various textural, mineralogical, faunal and floral variables. Four distinct and regionally specific facies are recognized on the basis of cluster analysis in the surficial environments, and another facies, absent in the modern ones, was identified in the recent samples.

The modern facies are: Proximal sandy marine, is present in the northwest lagoon area; it shows well sorted sediments very rich in light mineral (influenced by wind).

Linear silty clay lagoon, is lies just landward the sand ridges; it seems a central lagoon sediment "polluted" by the previous eolian sediments.

Silty sand (center lagoon), is the most prevalent facies in Manzala lagoon and is divided into three sub-facies: Sub-facies A: in the southern margin of the lagoon, influenced by Nile water; Sub-facies B: in the easthern-central area. The central lagoon sediment s.s.: silty and rich in light, heavy minerals and brackish shells (euryhaline); Sub-facies C: the less well-defined subfacies A and B, it is present near the center of the lagoon and southeast of El-Mataria influenced by drains. Silt, near islands and inlet, is geographically restricted to areas protected by islands and/or bays in the southern part of the lagoon.

A new facies was identified in the recent sediments: Clayey silt sediments, present in the southeastern area; that area is progressively smaller than 60 to 20 years ago; actually, it is disappearing.

Facies can be related to natural processes such as coastal sand ridges which separate the lagoon from the sea. Other facies and the rapid evolution of the surface of the lagoon are more closely related to man's impact, and include land reclamation and dredging in the Port Said and El-Mataria region, and pollution via several large drains entering the southern margin of Manzala lagoon.

For the last two reasons, we believe that the recent facies close to El-Mataria disappeared.

The statistical method applied in this investigation is now being used for study of the other modern Nile delta lagoons (Idku and Maryut), and also to interpret ancient (late Quaternary) lagoon deposits recovered in subsurface Nile Delta core sections.

Location of surficial samples (A) and mini cores (B) in Manzala lagoon, NE Nile Delta, Egypt