EVOLUTION OF NILE DEPOSITS INPUT DURING THE QUATERNARY AND ITS EFFECT ON EGYPTIAN COASTLINE

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Abstract

The study of prehistoric geology is an important tool to interpret the ancient civilizations and their environment. Evolution of the Nile Delta and the coastline of the Mediterranean are discussed. The dryness of North Africa was dominant, 3000 B.C., and man was stimulated to move near the valleys where he settled. Man-made actions, e.g. high dam (Egypt), impacted the stability of the southeast coast of the Mediterranean in the present time. Many authors claim that there is a global warming intensified by human activity; however, it is difficult to separate the anthropogenic impact from the natural cycles shown by paleo-studies.

Key words: Nile deposits, Quaternary, coastal changes

Introduction

The topography of the basin and the relief of the adjacent land are quite spatially variable. The coastline is very irregular and the continental shelves are narrow except near the river deltas. Geologically, it can be divided into three provinces: Western, Central and Eastern. They are subdivided into distinct basins by submarine ridges, tectonic blocks and Iberian Apennine and Hellenic peninsulas. The shape of this basin with its surrounding lands make the Mediterranean sea sensitive to paleo-climatic changes, which left their finger prints on the nature of the accumulated sediments since ancient times. The study of the Holocene, which started at about 10000 B.C., is of utmost importance to understand the past, manage and control the present coastal zone and to forecast the future global climatic and environmental changes.

Paleoclimate in the Mediterranean Sea

Sea Surface Temperature (SST) is a relevant factor affecting the climatic conditions. Ariztigui *et al.* (1) applied two techniques; $\delta^{18}O$ compositions of plankton foraminifers and alkenone index, to investigate paleoceanographic conditions in the Meso-Adriatic Depression (MAD) and their relationship with climatic changes in the Mediterranean region. Different cores were studied. The temperature estimation obtained by the mentioned two methods indicated SST of about 20° C at 5290± 40 BP and at 10940± 60 BP, and about 15° C at 13384± 100 BP. The Adriatic exists at high latitudes in the Mediterranean, therefore, it is expected that SST in the southern Mediterranean to be higher by about 3 to 4 degrees. Due to the nature of the Mediterranean Sea, its water does not mix much vertically with seawater and sediment composition is especially sensitive to climate change. Therefore, environmental signals are preserved within sediments in great details. The Mediterranean latitudes (30-45°N) lie in a sensitive transition zone between the belt of prevailing Westerly and subtropical hi-pressure belt, with variety of land, sea, islands, mountains and gulfs. In the glacial periods, the Westerly are dominant, and the climate is characterized by cold, and dry high pressure cell of Euro Asiatic continent. During interglacial maximum, there were northward shifts of the subtropical hi-pressure cell leading to climatic conditions similar to the hot-humid subtropical regime of the present day in the Gulf of Mexico. These climatic changes were reflected on supplying weathered rock detritus (2). At least 12 climatic oscillations can be recognized in this epoch (3, 4), but the critical climatic events in the Holocene record in the Mediterranean latitudes could be simplified to three main phases: The early Holocene (10000-8000 BP) is marked by a general warming trend, with increased precipitation and a wide spread return of forests, even along the north African littoral.

History of Nile Delta

According to De Heinzelin (5), the course of the present Nile as a continuous river was not established until geologically very recent times. The dating of Holocene sediments indicates that moist periods lasted 2000-3000 years and the hyper-aridity about 1000 years each. The Nile delta is presently subjected to significant coastal changes because of reduction in the Nile discharge and sediment load to the Nile promontory mouths following the construction of dams along the Nile. Since building of the High Dam, sediment discharge at the Nile promontories has reduced to near zero. The sedimentary sequences consist of wide varieties of deltaic and marine Quaternary sediments. The vertical motion of land, subsidence refers to the lowering of the land surface relative to a geodetic datum. Vertical motion varies locally depending upon rates of isostasy, tectonism, and compaction. Subsidence is generally independent on world (euostatic) sea-level changes. The valley and delta troughs of the Nile offered the only environment in Egypt that favoured the accumulation and preservation of sediment during the Quaternary, which was an epoch of intensive erosion. The field mapping of the fluviatile and associated sediments of the Nile valley and the examination of a large number of boreholes both deep and shallow show that it is possible to conceive of the Nile as having passed through five main episodes since the valley was cut down in late Miocene time. Each of these episodes was characterized by a master river system. Toward the end of each of the first four episodes (the last is still extant) the river seems to have declined or ceased entirely to flow into Egypt These five rivers are termed by Said (6). The Eonile was a late Miocene feature, which was responsible for the cutting of the modern valley to great depths. The depth of the Eonile canyon in northern Egypt reaches about 2500m No deposits of the Eonile system are known in outcrop since the river was dredging its bed to the new lowered base level of the desiccated Mediterranean. The sediments belonging to the Paleonile consist of a long series of interbedded, red brown fluviatile to fluviomarine clays and thin, fine-grained sand silt lamina, which crop out along the banks of the valley and many of the wadies which drain into it. The Protonile, was a highly competent river that carried cobble and gravel-sized sediments made up mainly of quartz and quartzite. The deposits of the Prenile are mainly of massive cross-bedded sands. The deposits of the Neonile, which is still extant, are indistinguishable from those of the present day river.

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