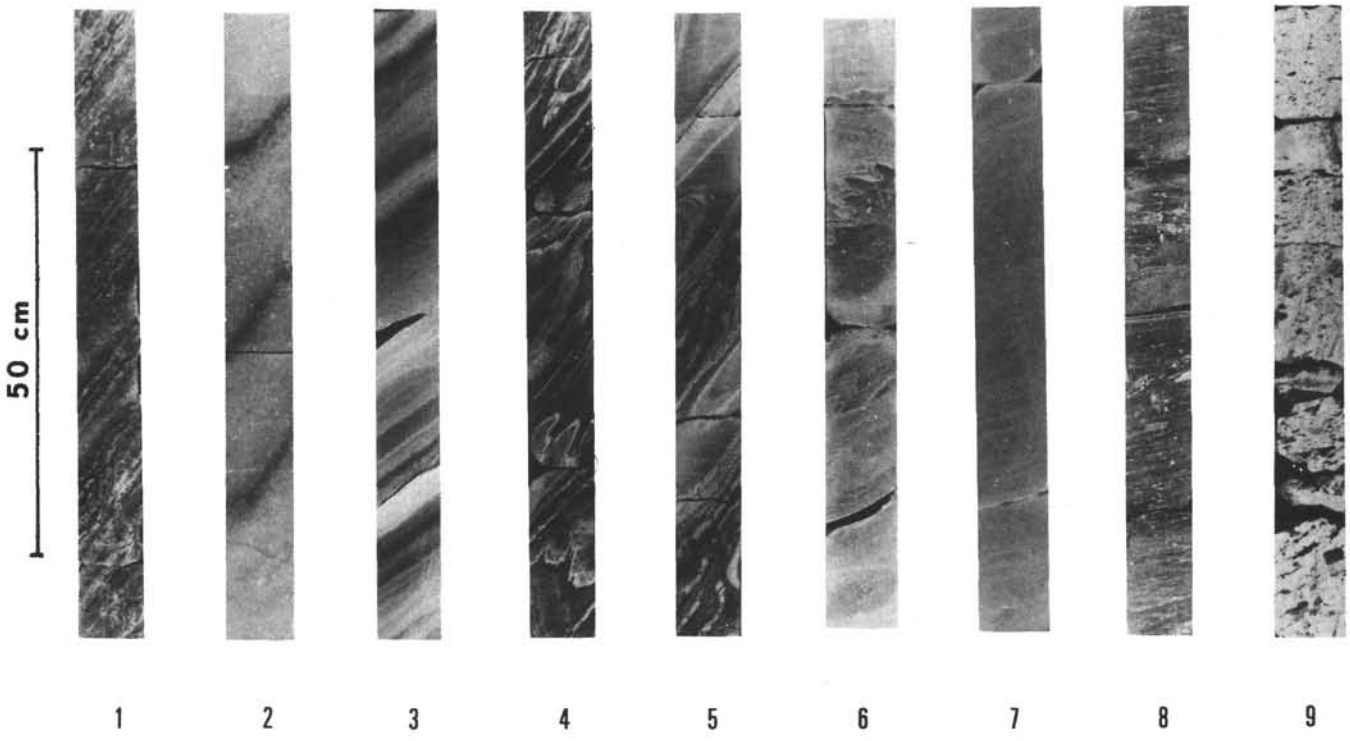

Figure 4. *Core specimens of the Solfifera Series showing some typical saline facies: (1) halite with anhydritic laminae of "Zone D"; (2) halite of "Zone C"; (3) halite of the upper part of "Zone B"; (4) folded kainite beds of "Zone B"; (5) folded kainite beds intercalated in the halite ("Zone B"); (6) halite with anhydritic laminae (basal part of "Zone B"); (7) pure and dense halite of the upper part of "Zone A"; (8) halite with laminated and nodular anhydrite of lower part of "Zone A"; (9) the marly-anhydritic basal breccia.*

44.2. GEOLOGICAL HISTORY OF THE MEDITERRANEAN AT THE END OF THE MIOCENE–THE BEGINNING OF THE PLIOCENE ACCORDING TO NEW DATA

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As a result of the extensive geological and oceanographic research conducted in the Mediterranean by West European and Soviet scientists mostly after the second World War, it seems possible now to give a fuller background of the processes that determined the main features in the geological history of the Mediterranean at the end of the Miocene and the beginning of the Pliocene.

The situation of a shrinking of the area occupied by the Mediterranean, the tendency for which became manifest during the middle Miocene, and its connection with the Atlantic ocean having been reduced to two straits (Northern or Bettian and Southern or Riphian) ended during the upper Miocene with a complete break in this connection and a general regression of the closed basin. The traces of this regression are reflected by; a pronounced shrinking of the development area of upper Miocene deposits, their lithological peculiarities (evaporite series of Messinian suite, the specific nature of the fauna (permanent presence of distrophic forms), as well as by a general incision of the entire river network to a new, very low, base level of erosion. It seems that the reason for the break in communication between the Atlantic Ocean and the Mediterranean was a drop in the ocean level during the upper Miocene. An uplift of the area of the straits (the south of Spain and the north of Morocco) only served to consolidate this break. The regression of the Mediterranean was caused by a deficit in humidity in this area and reflects its desiccation and disintegration into a number of isolated

seas-lakes. In each such sea or lake there could, naturally, have existed both extremes of salinity, as well as intermediary conditions of normal salinity. Correspondingly, the fauna of these basins includes elements typical of salinity regimes in their different parts. In addition to the already known facies of the Messinian suite, there should be present here still unestablished deposite of big river deltas– The Rhône, Nile, Oront (Nahr-El-Asi). The extent of overdeepening of these rivers and the structure of some of the underground canyons studied, warrant an assumption of a drop in the level of the upper Miocene Mediterranean (as compared with the present) of about 1-1.5 km.

The next, lower Pliocene, transgression indicated by Plaisancian suite deposits (Tabianiano, Piacenziano, Astian) took place as the result of communication being established between the Atlantic ocean and the Mediterranean through the Gibraltar strait along a deep fault. Owing to a great difference in levels of the sea and the ocean this transgression was instantaneous (in the geological meaning of this word). That is why Gibraltar proved to be only slightly affected by abyssal erosion, and the sea waters that penetrated along the overdeepened river valleys of both continents (the Rhône–for 240 km from the present mouth, the Nile–over 1200 km, Oront–about 150 km) transformed them into deep estuaries.

Under such conditions, the accumulation of a thick mass of Pliocene sediments began with clays and marls having an absence of facies characteristic of the usual transgressive series. All the events mentioned affected the character of the Pliocene and Pleistocene fauna of this sea: the abyssal fauna is very poor and non-typical, endemism is poorly expressed, and littoral and sublittoral forms are predominantly of Lusitanian origin.

44.3. PLIOCENE AND PLEISTOCENE DEPOSITS OF THE NILE VALLEY IN NUBIA AND UPPER EGYPT

Abstracted from Chumakov (1967)

Marine deposits of Pliocene age have been discovered in the Nile Valley at a considerable depth below sea-level. These deposits have not only been detected in lower Egypt where the base of the upper Pliocene near Cairo has been established at −300 meters, but more recently in the High Dam area at Aswan. During the course of geological investigation in this area, lower Pliocene marine and estuarian sediments were encountered at −170 (and maybe −200) meters in a narrow incision into the bed of the paleo-Nile River. The overdeepening of this riverbed involved extensive erosion into a crystalline basement of gneiss and granite.

The gradient of the bedrock floor of the buried valley of the Nile above Aswan indicates that the Pliocene sea formed a deep estuary in the Nile Valley, which penetrated upstream of Wadi Halfa, in the Sudan, some 1250 miles from the present seacoast.

Cross-sections reconstructed from boreholes south of the Aswan Dam are illustrated in Figure 1. The lower part of the Pliocene sequence (N_2^1m) was deposited in a salt water estuary revealing the maximum extent of the Pliocene transgression, which in the Mediterranean region is usually expressed by the Plaisancian. The middle transitional layer (N_2^2), dated as Astian, shows a gradual change from oceanic conditions of sedimentation to continental. This series has only been found near the mouths of the east bank wadis. The Upper Series (Villafranchian) is represented by coarse alluvium in isolated patches on both banks of the Nile on the highest erosional surfaces at +160 to 200 meters elevation above the valley bottom of the paleo-Nile.

The Quaternary fill (Q_1 to Q_4) is exclusively alluvial and records the encroachment of semi-arid conditions.

REFERENCE

Chumakov, I. S., 1967. Pliocene and Pleistocene deposits of the Nile Valley in Nubia and Upper Egypt (in Russian). Acad. Science, U.S.S.R., *Geol. Institute Trans.*, Moscow. **170**, 5.

[1]Summary of a paper read by the author on December 29, 1970 at the Moscow Society of Naturalists. Translated into English by T. A. Sofiano.