Origin and distribution of strontium in Recent shelf sediments off Alexandria, Egypt.

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Abstract

The strontium concentration and distribution in Recent shelf sediments off Alexandria are related to the origin of sediments and carbonate mineralogy. Sr^{+2} is rich in the pelletoidal aragonitic mud covering the western part of the shelf, while it decreases eastwards in the sediments of relict or terrigenous origin.Bioclastics have appreciable concentrations of strontium.

Introduction

Grain-size analysis and carbonate contents of Recent shelf sediments off Alexandria were previously studied by El-Wakeel & El-Sayed (1978) and El-Sayed (1981). These studies showed that the grain-size decreases away from the coast, and the carbonate content progressively decreases eastward nearby the Nile estuary. The carbonate contents in the sediments vary from 11% to 86% (El-Wakeel & El-Sayed,1978). El-Sayed (1979) pointed out that the shelf sediments off Alexandria are mainly dominated by marine bioclastics, relict and chemogenic deposits.

Regarding the various origin of Alexandria shelf sediments, the carbonate mineralogy is typical for the different depositional environments, where aragonite, aragonite- Mg calcite and aragonite-Mg calcite- calcite carbonate assemblages were recognized (El-Sayed, 1981).

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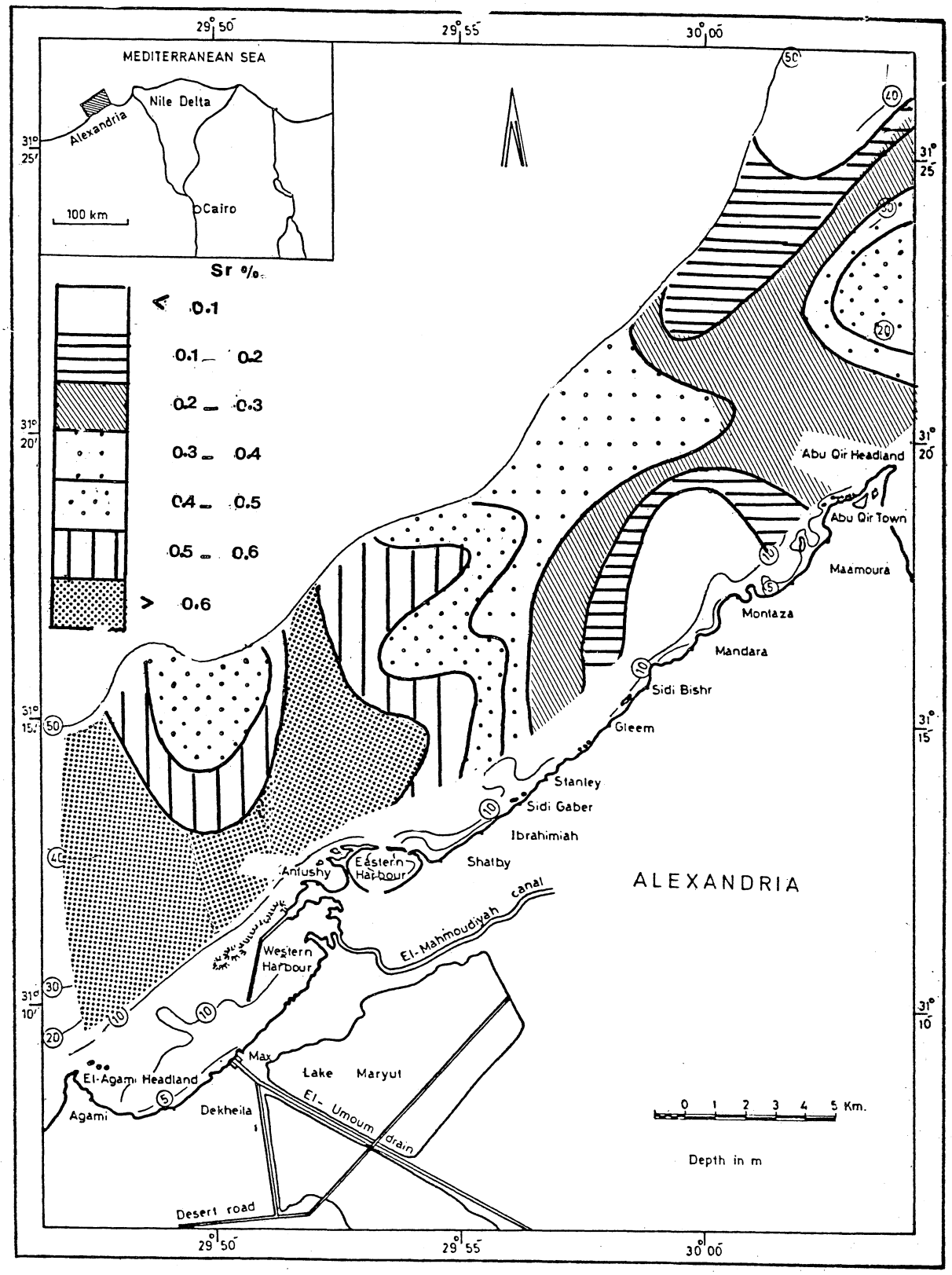
29° 50'
29° 55'
30° 00'
MEDITERRANEAN SEA
Nile Delta
Alexandria
Cairo
100 km
31° 25'
31° 20'
31° 15'
31° 10'
Sr ‰
< 0.1
0.1 – 0.2
0.2 – 0.3
0.3 – 0.4
0.4 – 0.5
0.5 – 0.6
> 0.6
Abu Qir Headland
Abu Qir Town
Maamoura
Montaza
Mandara
Sidi Bishr
Gleem
Stanley
Sidi Gaber
Ibrahimiah
Shatby
Eastern Harbour
Anfushy
Western Harbour
El-Mahmoudiyah canal
ALEXANDRIA
Max
Lake Maryut
El-Agami Headland
Agami
Dekheila
El-Umoum drain
Desert road
0 1 2 3 4 5 Km.
Depth in m

Figure 1

High strontium pelletoidal aragonitic mud covers the area west of Alexandria (Stoffers et al,1980). However, El-Sayed & Alexandersson (in preparation) suggest a poosible inorganic precipitation of aragonite through biological processes.

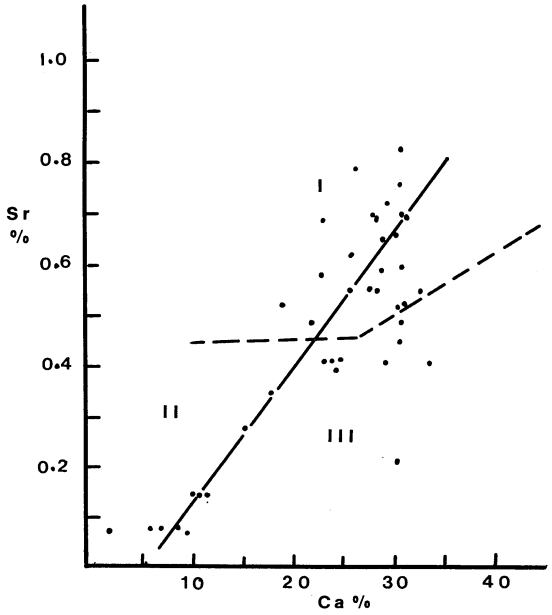

Figure 2

Figure 3

Discussion of Results

The strontium contents were determined in forty samples collected evenly from the inner shelf off Alexandria by means of AAS UNICAM SP 90 Series 2A. The sediment samples were digested and prepared for analysis following Robinson's method (1980).

Sr^{+2} varies between 0.07% and 0.82% and averaging 0.47%±0.2. The distribution of Sr^{+2} (Fig. 1) shows a general decreasing pattern from the west of Alexandria toward the east. The higher Sr^{+2} contents (0.6% - 0.8%) characterized the western flank of the area, mostly covered by aragonitic mud (Stoffers et al,1980: El-Sayed,1981); while the lowest concentrations ($<0.1\%$) coincide with the nearshore highly quartzitic relict sediments in front of the central part of the area, and with the eastern extremity of the area directly affected by Nile deposits. The carbonate mineralogical assemblages of these areas are different (El-Sayed, 1981).

The realtion between Ca^{+2} and Sr^{+2} in the sediments (Fig.2) shows a positively high correlation value (+ 0.76) and three fields were outlined. These fields demonstrate the High-strontium aragonitic mud (I), the terrigenous Nile deposits poor in strontium (II) and the bioclastics of moderate strontium values (III), and randomly distributed in the area.

The aragonitic mud is rich in strontium (> 0.8%) and might reaches values up to 0.9 % (Stoffers et al,1980). This high strontium values indicate that there origin are unlikely the products of shell desintegration. Stoffers et al (1980) suggest that pelletoids are the major contributor of aragonic mud in the western shelf of Alexandria, in addition, Halimeda might contribute appreciable amounts of aragonite rich in strontium (Milliman,1974).

Aragonite needles is dominant in the aragonitic mud west of Alexandria (Fig.3), this finding is in favour to the hypothesis of its formation from pelletoids or partially from Halimeda plates. However, the origin of Sr^{+2} in the area except its western extremity is mainly the product of shell desintegration. Aragonite of modern invertebrate skeletal material has much higher strontium concentration relative to the Mg-calcite (Bowen, 1956 ; Thompson &Chow,1956). Therefore, it is presumed that the admixture proportion of the various skeletal remains , originally having various strontium concentrations, controlling the relative abundance of strontium in the different sediment facies.

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