

GEOCHEMISTRY AND X - RAY MINERALOGY OF THE RECENT SHELF
SEDIMENTS OFF ALEXANDRIA, SOUTHEAST MEDITERRANEAN

by

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Abstract:

Three mineralogical provinces are distinguished along the shelf off Alexandria: I Aragonite/calcite, II Calcite/aragonite/quartz, III Quartz/calcite/aragonite. These provinces are arranged according to the dominant mineral occurrence. The average values of geochemical data in this area are as follows: SiO_2 19.46%, Al_2O_3 11.76%, Fe_2O_3 1.12%, TiO_2 0.14%, CaO 31.03%, MgO 5.72%, Na_2O 0.53%, K_2O 0.14%, MnO 0.03%, Cu 66 ppm and Ni 52 ppm.

Resume:

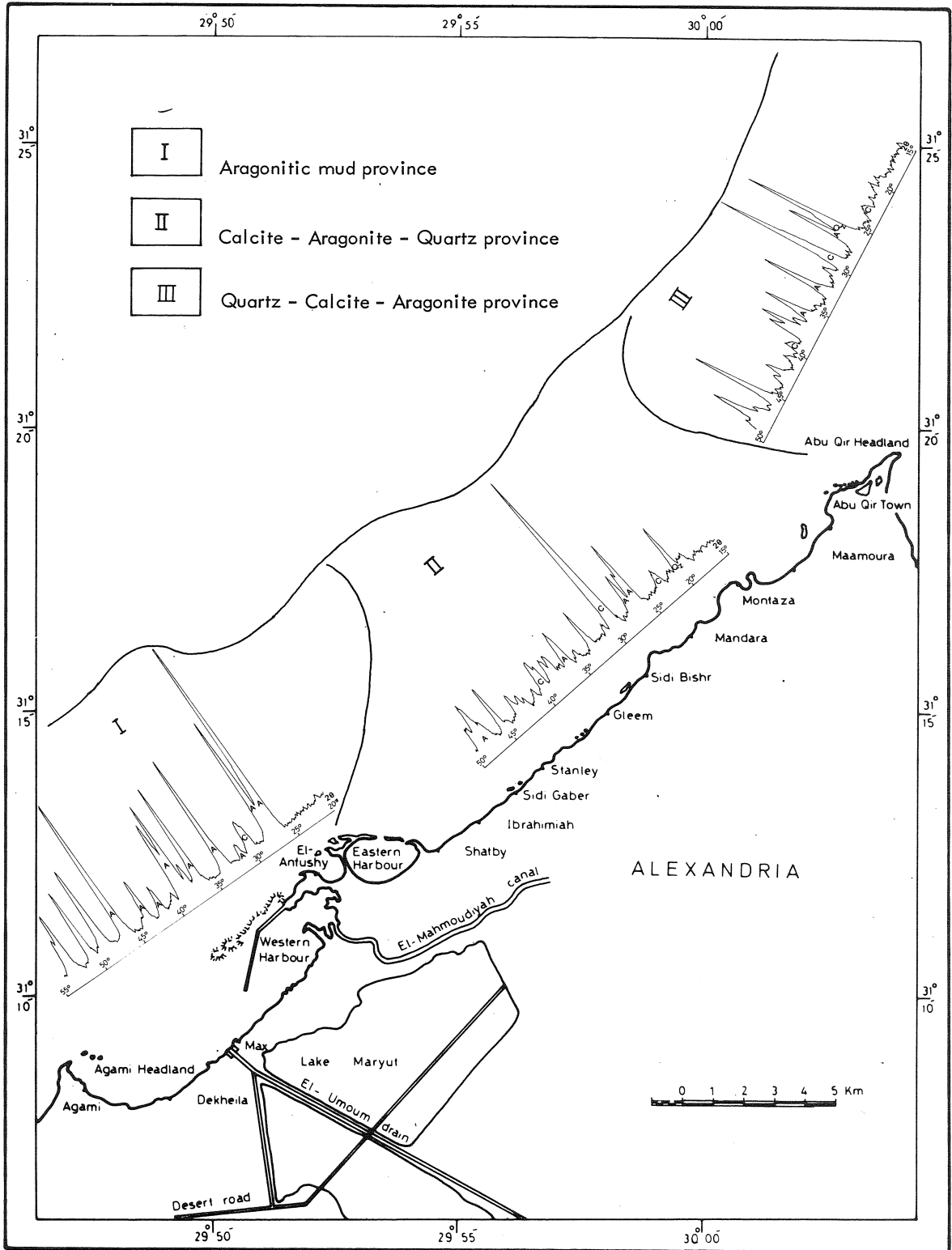
On presente les resultas des analyses geochimiques et X-R mineralogiques. Ce sont les analyses de 40 echantillons sedimentaires des surfaces, prises sur le plateau continental d'Alexandrie. On peut distinguer trois domaines mineralogiques: I Aragonite/calcite, II Calcite/aragonite/quartz, III Quartz/calcite/aragonite. On distingue ces domaines conformement aux depots des mineraux dominants. Les valeurs mesurees des analyses geochimiques sont: SiO_2 19.46 %, Al_2O_3 11.76%, Fe_2O_3 1.12% , TiO_2 0.14%, CaO 31.03%, MgO 5.72%, Na_2O 0.53% , K_2O 0.14%, MnO 0.03 % , Cu 66 ppm et Ni 52 ppm.

Introduction:

The shelf of Alexandria is covered with carbonate-rich sediments of biogenic clastics and reworked ooids. Terrestrial fresh-water deposits cover the eastern part of the shelf through the Rosetta branch of the Nile. Sands occur in the nearshore area, and merge seaward into fine silt and clay. The subject of this paper is to study the mineralogical and geochemical characteristics of Alexandria shelf sediments in order to distinguish their different sedimentary provinces.

Material and methods:

Forty bottom samples were examined for their mineralogy and geochemistry. The bulk mineralogy of the powdered samples was studied by X-ray diffractometer. The chemical analyses were carried out in an atomic absorption spectrophotometer after a total digestion of samples by a HF/HNO_3 mixture.



Results and discussion:

The carbonate minerals are by far the major mineral constituents in Alexandria shelf sediments. The minerals are grouped into three assemblages reflecting their characteristic provinces and their dominant occurrence (Fig. 1):

- I The Aragonite/calcite province (Aragonitic mud province) ,
- II The Calcite/aragonite/quartz province and III The Quartz/calcite/aragonite province.

The average concentrations of SiO_2 and Al_2O_3 in the shelf sediments are 19.46% and 11.76 % respectively. Their occurrence indicate their terrestrial origin through Nile , aeolian deposits , eroded beach materials and relict sands. A high correlation value ($r=0.73$) is found between silica and alumina confirming their common origin.

CaO and MgO averaging 31.03% and 5.72% respectively, and they are positively correlated ($r=0.45$). Their origin are the bioclastics and the reworked oolitic limestone.

The average Fe_2O_3 is 1.12% . However, sediments of the eastern area are exceptionally rich in iron (2-4 %). This high level is enhanced by the influx of Nile deposits rich in iron.

TiO_2 averaging 0.14% with distinctly relatively higher values in sediments covering the eastern area. Titanium is highly correlated with iron ($r=0.66$).

Manganese, copper and nickel vary widely in their distribution in the shelf area. A significant correlation coefficient value is found between copper and nickel ($r=0.45$).

Three chemical provinces are also distinguished along the shelf area and coincide with the mineralogical ones.

Conclusion:

Three mineralogical provinces and three other chemical provinces were recognised along the shelf off Alexandria. These provinces have definite mineralogical and chemical compositions and coincide respectively reflecting three major provinces of deposition. The first is found in the western part of the area characterized by relict ooids and biogenic clastic sediments rich in aragonitic carbonate and poor in metallic elements. The second represents the central shelf area covered with relict quartzose sands and biogenic clastics. This province is of calcitic carbonates and shows moderate concentrations of chemical compositions. The third is covered with modern Nile deposits and located in the eastern part of the shelf. This province is characterized by its high quartz content and clay mineral as well as very high levels of metallic elements.
