



## Data Article

# Datasets of trace elements in shallow marine sediments along the Egyptian shore of the Mediterranean and Red Seas



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## ABSTRACT

A comprehensive dataset concerning the geochemical composition of unconsolidated shallow marine sediments collected along coastal areas of Northern Nile Delta and Egyptian sector of Red Seas is presented. The sediment samples were analyzed using instrumental neutron activation analysis (INAA) in Frank Laboratory of Neutron Physics FLNP – Joint Institute for Nuclear Research JINR and inductively coupled plasma – mass spectrometer (ICP-MS) in Actlabs – Canada. Data thus collected supported the research published and published articles conducted to evaluate the geochemistry of shallow marine sediments covering mentioned areas [1–3]. The mass fractions of 43 and 39 trace elements and oxides were determined in the unconsolidated marine sediments

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of Northern Nile Delta and Egyptian sector of Red Sea, respectively. Final data were expressed in wt.% and mg/kg for major and trace elements, respectively. Different statistical tests such as Shapiro-Wilk, Anderson-Darling, Lilliefors and Jarque-Bera were used to check the normality of data. At the same time, distribution patterns of the rare earth elements (lanthanides) as well as Eu and Ce anomalies were investigated. Quality control of analytical measurements was carried out using certified reference materials. Different univariate and multivariate as well as graphic statistical analyses were performed. Presented data were used in identifying, by means of more pollution indices, the degree of local contamination. The present dataset could be further used in establishing geochemical background for the studied areas and tracking eventually changes posing significant threat to environment and humans.

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## Specifications Table

Subject	Environmental Sciences
Specific subject area	Neutron activation analysis in life science
Type of data	Table
How the data were acquired	The marine sediment samples were subjected to ICP-MS and INAA investigation.
Data format	Raw Analyzed
Description of data collection	A total of 131 sediment samples, e.g. 32 samples along the Northern Egyptian sector of Red Sea and 99 along the Northern shore of Nile Delta samples were collected using bottom grab samplers. After collecting, sediment samples were cleaned on-site, transported to the Cairo laboratories for preliminary processing and finally shipped to FLNP – JINR for INAA and to Actlabs – Canada for ICP-MS analysis.
Data source location	Sampling locations and their associated coordinates are shown in the data sheet are illustrated in Fig. 1.
Data accessibility	The dataset is hosted by: Repository name: Mendeley repository Data identification number (permanent identifier, i.e. DOI number): DOI: <a href="https://doi.org/10.17632/5ppm9ph565.1">10.17632/5ppm9ph565.1</a>
Related research articles	Direct link to the dataset: <a href="https://data.mendeley.com/datasets/5ppm9ph565/1">https://data.mendeley.com/datasets/5ppm9ph565/1</a> W. Badawy, A. Elsenbawy, A. Dmitriev, H. El Samman, A. Shcheglov, A. El-Gamal, N. H. M. Kamel, M. Mekewi. Characterization of major and trace elements in coastal sediments along the Egyptian Mediterranean Sea. Marine Pollution Bulletin. 177 (2022) - 113526. <a href="https://doi.org/10.1016/j.marpolbul.2022.113526">https://doi.org/10.1016/j.marpolbul.2022.113526</a>

## Value of the Data

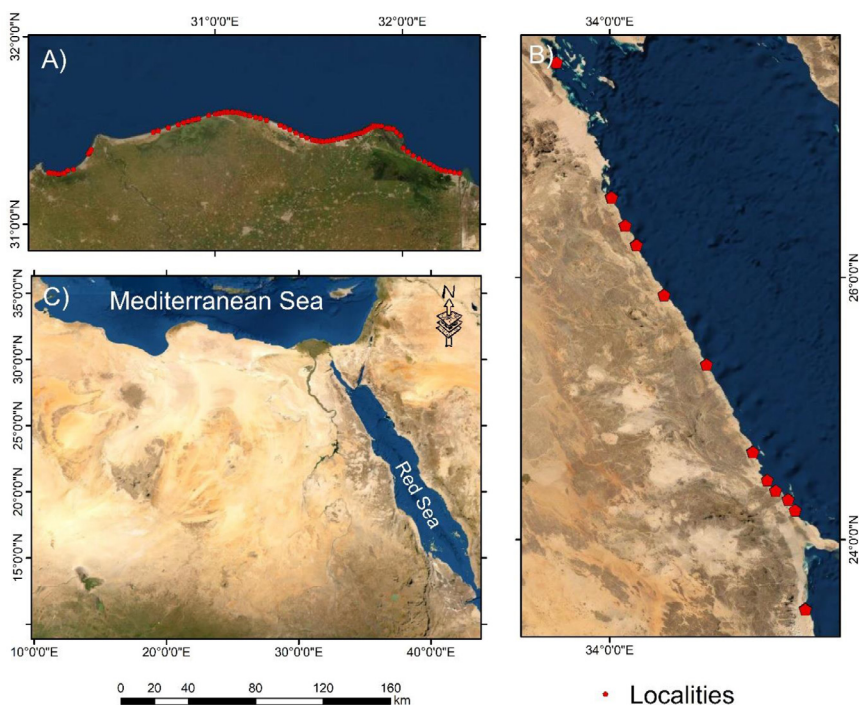
- The dataset provides the elemental analysis of marine sediments along the coastal areas of the Egyptian Mediterranean and the Red Sea. The dataset is of great importance for the explanation and a better understanding of the geochemical properties, recycling of the sediments, the origin of the elements, the quality of the sediments and give a better overview of the ecological situation in the studied environment.

- The dataset represents the first wide-scaled database which could serve as a background values of sediments in terms of elemental composition. It permits a better evaluation of both seas' environment in terms of the inorganic contamination loads and the marine life.
- The dataset is of interest and useful to researchers in various disciplines, physicists, chemists, statisticians, policy makers, engineers, agronomists, regulatory authorizations, fishery and oceanography, and Ministry of the Environment.
- The dataset can be used to monitor potential pollution dynamics in the elemental composition of coastal sediments (baseline data). Interpretation of the dataset will explain a particular phenomenon in different areas of scientific research and its applications.

## 1. Data Description

The elemental composition of a total of 131 marine surface sediments, e.g., 32 samples collected along Red Sea and 99 samples from Northern Nile Delta are presented in Table 1 and 2 of the attached Excel files [4]. Sampling points are shown on the maps reproduced in Fig. 1.

The samples were collected using the guidelines reported in IAEA [5]. All the obtained data for the Mediterranean Sea were prepared for one publication [3]. While the Red Sea data were presented in three publications., e.g., the first one was devoted to the geochemistry and pollution indices [2] while the second one dealt with the characterization of the rare earth elements and naturally occurring actinides Th and U [1]. While the third one outlined the main differences in terms of geochemistry, pollution, and associated hazards [6]. Univariate basic statistics



**Fig. 1.** The location of sampling point on Northern Nile Delta (99 samples) A), Egyptian sector of Red Sea (32 samples) B) as well as their position with respect to Egypt C). On (a) and (b) maps, collecting points are marked by red circles. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

and multivariate statistical data analysis such as hierarchical clustering and principal component analysis were used to process experimental data and identify the possible webs of metal pollution. Various pollution indices were calculated to estimate the ecological situation. For instance; enrichment factor, geoaccumulation factor, pollution load index, modified pollution index, and risk assessment [7].

## 2. Experimental Design, Materials and Methods

After field cleaning of impurities, the marine surface sediments were transported to the Egyptian laboratories which took part to this project. To avoid any cross contamination, only non-metallic instruments were used. The samples were air dried, sieved through a 100-mesh sieve, dried again to a constant weight at 104 °C for 24 h and finally cooled in a desiccator. Aliquots of 0.1 g of each sample and 0.1 g of certified reference materials (CRM) were packed in aluminum cups. Detailed description of the sample's preparation can be found in Frontasyeva and Pavlov [8]; Frontasyeva [9]. The prepared samples were subjected to instrumental neutron activation analysis INAA by the sector of neutron activation analysis and applied research, REGATA facility – IBR2 and the group of neutron activation analysis GNAA - IREN research facility (intense resonance neutron source) at FLNP, JINR for the determination of intermediate and long-lived isotopes, respectively. Detailed description of the irradiation mechanism was published elsewhere by Frontasyeva and Pavlov [8]; Frontasyeva [10]; Pavlov [11].

To get the induced activity, samples as well as corresponding CRM were exposed to thermal and resonance (epithermal) neutron fluxes for 14 days. After irradiation, samples were stored for 3 to 5 days cooling, and then the gamma spectra were recorded for 30 min and again, after two weeks, this time for 90 min. All gamma spectra measurements were performed using a liquid nitrogen cooled HPGe detector with an energy resolution of 2.1 keV for the 1332 keV  $^{60}\text{Co}$  gamma line. A Genie 2000 software was used to analyze the recorded spectra while the energy calibration elemental composition determination was done by using a proprietary software [10]. Under these conditions, the minimum measured mass fraction was of the order of magnitude of 0.1 mg/kg. The measurements precision and accuracy were monitored by using different CRM for calibration as well as for quality assurance.

In the case of ICP-MS determinations, about 0.25 mg of each sample as well as corresponding CRM, were digested in a mixture of hydrofluoric, nitric, and perchloric acids in a teflon bomb. The mixture was heated using a pre-established program which bring sample to dryness. After that, the dry residuum was again digested with hydrochloric acid and completed with high purity distilled water. Finally, all determinations were performed by a Perkin Elmer Sciex ICP-MS instrument. More details about the treatment of samples for measurement by means of ICP-MS can be found in [12]. As in the case of INAA, the precision and accuracy were carefully monitored by means of different CRM used for calibration as well as for quality control.

### CRedit Author Statement

**Wael Badawy:** Conceptualization, Methodology, Statistical analysis, Writing original draft, **Octavian Duliu:** Data curation, Mapping; **Atef El-Taher:** Sampling, Sample preparation; **Ahmed Elsenbawy:** Visualization, Investigation; **Andrey Yu. Dmitriev:** Methodology and reviewing; **Ayman El-Gamal:** Sampling, Sample preparation; **Wafaa Arafa:** Supervision and revision

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

## Data Availability

Trace elements dataset in marine sediments along Egyptian shores (Original data) (Mendeley Data).

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## Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.dib.2022.108217](https://doi.org/10.1016/j.dib.2022.108217).

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