The manuscript presents original research on siliciclastic sediment compositions in core KL23 from the northern Red Sea. The dataset is valuable as it extends the authors' previous work on paleoclimate trends through isotopic values and clay minerals. This study provides exceptionally high-resolution mineralogical and geochemical data supporting hypothesis on wind transport circulation between the Lower-Nile valley and the northern Read Sea over ~220 ka.
The discussion effectively integrates literature and establishes connections between northern Red Sea climate variability and glacial-interglacial cycles in high-latitude ice caps, contrasting with equatorial insolation-driven changes further south. The authors argue that during glacial periods and low sea levels, the exposed Nile River delta was a key source of eolian sediments, as indicated by increased smectite content, Ti counts and high εNd values.
However, some discrepancies exist between the data and the presented hypothesis. These discrepancies are not adequately explained, nor do the authors open the discussion to alternative hypotheses that deserve consideration. The following sections—GENERAL QUESTIONS, GENERAL COMMENTS, DETAILED COMMENTS, and FIGURE COMMENTS—highlight these issues.

GENERAL QUESTIONS

1) If, as hypothesized by the authors, the smectite fraction originates from the radiogenic Nile Delta sediments (average εNd ≈ -3) exposed during low sea level periods, why do high smectite and Ti concentrations during the Last Glacial Maximum (LGM) correspond to extremely low εNd (~ -8), which are characteristic of non-Nilotic sources, closer to the Saharan Shield?

2) If smectite is associated with radiogenic Nile Delta sediments, as the authors suggest, why do low smectite values during the S5 period correspond to high εNd values (-1)? The authors interpret this period as one dominated by increased local sediment supply (chlorite). Does this imply that the northern Red Sea is also influenced by highly radiogenic local (non-aeolian) sources?
It is worth noting that the eastern margin of the northern Red Sea consists of recent (Oligocene to Quaternary) volcanic headwaters, which can serve as sources of smectite and high εNd radiogenic values (see:

Antoine Delaunay, Guillaume Baby, Evelyn Garcia Paredes, Jakub Fedorik, Abdulkader M. Afifi, Evolution of the Eastern Red Sea Rifted Margin: Morphology, Uplift Processes, and Source-to-Sink Dynamics, Earth-Science Reviews, Volume 250, 2024, 104698, ISSN 0012-8252, https://doi.org/10.1016/j.earscirev.2024.104698).

3) If major and perennial fluvial sediment supply to KL23 is excluded, as proposed by the authors, the observed sedimentation rates appear disproportionately high compared to accumulation rates in the Nile Delta. This is particularly striking if KL23 sediments are assumed to be exclusively of aeolian origin.

How do the authors explain that aeolian sedimentation rates in the Red Sea are equal to or even higher than many fluvial sedimentation rates?

These discrepancies remain unresolved. To address these issues, I encourage the authors to expand the discussion by considering additional hypotheses based on the data (see GENERAL COMMENTS below).

GENERAL COMMENTS

A) The Gulf of Suez as a Sediment Source

Based on source proxies (smectite and εNd), the authors suggest that most of the KL23 sediment originates from Aeolian-reworked dust from the exposed Nile Delta during low sea level periods. However, none of the presented data directly confirm an eolian origin (e.g., grain surface analysis via exoscopy or grain-size distribution analysis).

The Gulf of Suez serves as a sediment repository for particles transported by marine currents from the Nile River. Therefore, high-smectite, radiogenic εNd sediments could simply originate from the erosion of the Gulf of Suez continental shelf during low sea level periods. The hypothesis that the Gulf of Suez serves as a temporary, non-linear reservoir for high-smectite and radiogenic εNd sediments could provide a plausible explanation for Questions 1 and 2.

B) The Role of Shallow and Deep-Water Circulation in the Red Sea

The manuscript by Ehrmann et al. thoroughly discusses wind circulation around the study area, treating it as the main transport mechanism for clay particles at the KL23 site. However, it does not consider shallow or deep-water Red Sea circulation as a potential transport mode for smectites and radiogenic εNd sediments from the central/southern Red Sea.

As shown by Yao et al. (2014), shallow waters originating from the central/southern Red Sea reach the KL23 site (~25°N). These waters carry hydro-sedimentary inputs from the Eritrean/Ethiopian Basaltic Traps headwaters. Around 24°–25°N, sinking processes induce downwelling, potentially transporting sediment plumes rich in smectites and radiogenic εNd particles from the Barka River and other sources in Eritrea.

Please consider and develop this hypothesis in the discussion.

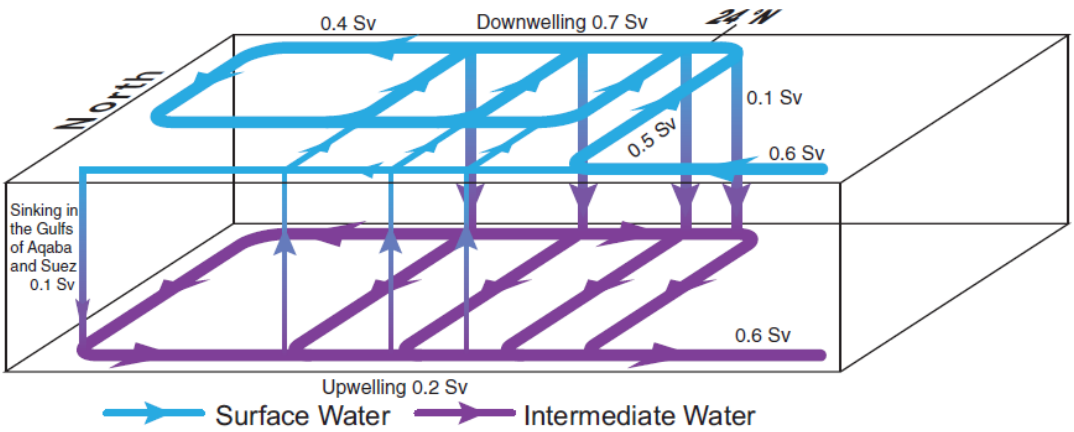

Figure 14. Schematic for the three-dimensional overturning circulation in the northern Red Sea. Most (0.5 Sv) of the surface western boundary current (0.6 Sv) crosses the basin at around 24°N, and then either sinks along the eastern boundary at the crossing latitude (0.1 Sv) or switches to an eastern boundary current (0.4 Sv) and sinks along the eastern boundary through a cyclonic recirculation. The downwelled water at the intermediate depth is transported to the western boundary either through direct cross-basin flows or a rim current along the boundary. Meanwhile, the sinking along the eastern boundary is enhanced by a weaker cross-basin overturning circulation produced by the upwelling along the western boundary (0.2 Sv). A small portion of the western boundary current (0.1 Sv) sinks in the Gulf of Aqaba and Gulf of Suez and contributes to the intermediate and deep water.

Reference:

Yao, F., Hoteit, I., Pratt, L. J., Bower, A. S., Kohl, A., Gopalakrishnan, G., & Rivas, D. (2014). Seasonal Overturning Circulation in the Red Sea: 2. Winter Circulation. J. Geophys. Res. Oceans, 119*, 2263–2289. doi:10.1002/2013JC009331.*

C) Sedimentation Rates and εNd Variability between the Nile Delta and KL23

Sedimentation rates at KL23 are notably high compared to those in the Nile Delta. Similarly, the average εNd values often overlap with those from Nile Delta coring sites. Additional data supporting and discussing source correlations with the study site would be beneficial. For example, a 100-ka-long dataset of εNd , smectite, and sedimentation rates from the Nile Deep Delta Fan is available in:

Luc Bastian & Carlo Mologni, Nathalie Vigier, Germain Bayon, Henry Lamb, Delphine Bosch, Marie-Emmanuelle Kerros, Christophe Colin, Marie Revel, Co-variations of Climate and Silicate Weathering in the Nile Basin during the Late Pleistocene, Quaternary Science Reviews, Volume 264, 2021, 107012, ISSN 0277-3791, https://doi.org/10.1016/j.quascirev.2021.107012.

DETAILED COMMENTS

Line 26: Specify which grain size fraction is being analyzed.

Line 80: Provide a synthetic figure of the age model as a review of all ages given in previous works. The manuscript also needs a presentation of sedimentation rates in the sequence.

Line 91: Include a detailed protocol in the supplementary materials.

Line 102: Explain why these elements are representative of the terrigenous sediment fraction, with mineralogical justification or bibliographic support.

Line 141: "Modest maxima of up to 20%"—20% of what? Please specify.

Line 215: There are multiple volcanic sources on the Arabian headwaters of the Red Sea; consider citing:

Antoine Delaunay, Guillaume Baby, Evelyn Garcia Paredes, Jakub Fedorik, Abdulkader M. Afifi, Evolution of the Eastern Red Sea Rifted margin: morphology, uplift processes and source-to-sink dynamics, Earth-Science Reviews, Volume 250, 2024, 104698, ISSN 0012-8252, https://doi.org/10.1016/j.earscirev.2024.104698.

Line 216: The Barka River, originating in the Eritrean Highlands over a basaltic trap context, flows northward into the Red Sea (~640 km in length). Given the northward shallow water circulation in the Red Sea (see GENERAL COMMENT B), its potential recent volcanic sediment contributions to the northern Red Sea should be considered.

Line 379: Specify what "fine grain size" refers to.

FIGURE COMMENTS

Figure 1a: Please add εNd values to the map, corresponding to geological regions in Africa and the Arabian Peninsula.

Figures 4 & 5: Add precession and eccentricity curves to support hypotheses discussed in the main text. Correlating εNd, smectite, and sedimentation rates with Nile Delta sequences is strongly recommended.

This review would enhance the text's clarity and introduces additional plausible hypotheses that should be considered in this article.

Carlo Mologni