

Response to reviewer 2 comments

We sincerely appreciate your constructive comments. Please find below our responses and the revisions we have made to the manuscript in accordance with your suggestions.

Major concern:

COMMENT: Sediment compositions: I check the revision. I understand that the authors exclude pure biogenic sediments from their analysis. However, the biogenic materials are also included in the “mixed” sediments, which compose of siliciclastic and bioclastic materials. Based on classical IODP classification, ratio of siliciclastic and bioclastic ranges from 4:6 to 6:4. I understand that most of sediments used in this study may be siliciclastic sediments. But even content of bioclastic is low, changing trend of sediment grain-size may be influenced by sediment compositions. Furthermore, even for the siliciclastic sediments, heavy mineral grains may have different mode on sediment transport from light mineral grains. Therefore, the authors should add some explanations on the influence or limitation of sediment compositions for this methodology. This addition may increase scientific value of this paper.

RESPONSE: The limitations you refer to are absolutely reasonable. For this reason, a very extended analysis of the statistical significance of the results is presented in the manuscript (lines 300-352, 473-491). The statistical test answers to a simple question: is the calculated vector significant or it cannot be recognized among the noise that all of the parameters that you refer to may contribute (mineral composition, biogenic clast showing a different hydraulic behavior etc). The statistical tests try to overcome the limitation introduced by the various types of grain heterogeneities you refer to, and to provide a degree of confidence for further application of the methodology. Additionally, it is also important to understand that the grain size parameters used for the analysis reflect between other factors (hydrodynamic conditions for example) the variability on sediment compositions. This is the advantage of the specific method and this is why it is widely applied in similar studies.

McLaren (1981) who was of the first to introduce the analysis of grain size trends, identified that the grain size characteristics of a sedimentary deposit are dependent on sedimentary processes as defined by i) winnowing, ii) selective deposition from sediment in transport, and iii) total deposition of sediment in transport; and the characteristics of its source deposit. This implies that as described before grain size properties including grain-size parameters reflect many of the factors like hydrodynamic conditions and variations in grain size composition. He has also addressed exceptions that have to be considered like clay particles flocculation of involvement of various sediment sources.

Gao and Collins (1992) applied their methodology in a mixed system where sediment supply is derived from coastal erosion, river inputs, while unknown amount a detrital grain is derived from reworking of the inner continental shelf sediments. Additionally, coral reefs provided about 20% of grains in the study.

The same approach is followed in many other studies various settings (e.g.: Gao and Collins, 1994; Pedreros et al., 1996; Asselman, 1999; Duman et al., 2006; Poizot et al., 2008; Carriquiry and Sánchez, 1999; Carriquiry et al., 2001; Liang et al., 2019).

In order to explicitly address the issues that you have pointed out, a paragraph has been added to the manuscript stating the following:

The value of the method is that grain-size parameters reflect the various factors that control the transport patterns of sediments. Such factor is the grain-size composition, the presence of single or multiple sediment sources, the hydrodynamic conditions, the trend of finer material to flocculate. It is characteristic that the area where Gao and Collins (1992) applied the method was a mixed system where sediment supply is derived from coastal erosion, river inputs, while unknown amount a detrital grain is derived from re-working of the inner continental shelf sediments. Additionally, coral reefs provided about 20% of grains in the study. The limitation of the method in very complex settings where multiple sediment sources may occur and hydrodynamic behavior of the grains is affected by the nature of sediment sources (e.g. the settling velocity of skeletal carbonate grains is shape – dependent, Slooman et al., 2023) is partially smoothed by the application of statistical significance tests where net transport vectors that are distinguished from the potential noise that all the uncertainties can introduce.

COMMENT: Description of the analytical methodology: I still feel that description of the analytical methodology is insufficient. Methodology described by Folk (1980) is one of the standard methods for sediment grain-size analysis but is not an international protocol. There are so many methods for grain-size analysis of sediment, some of which are new and the others are traditional. But without the detailed description of methodology, it is difficult to expand this methodology in future.

RESPONSE: The term protocol should not be confused with the term standard. The procedure regarding grain size analysis as described by Folk is definitely a scientific protocol (A detailed plan of a scientific or medical experiment, treatment, or procedure). It is not of course a testing standard, but it has been the base for standard test methods (BS.1377 part 2, 9.2 Wet sieving method and 9.4 Sedimentation by the pipette method). In order to avoid this misunderstanding, the term protocol has been removed and a brief analysis of the test method has been provided.

The granulometric analysis is conducted using the method of Folk (1974, 1980). According to this method, the sediment is divided into fractions (parts) based on grain diameter per Φ , and the weight of each fraction is then determined. Initially, any pebbles or shells with dimensions significantly different from the rest of the sediment are removed to prevent distortion of the granulometric analysis results. Subsequently, the fractions are separated: coarse materials (gravels and sands) are processed using the sieving method, while fine-grained materials (silts and clays) are processed using the pipette method, as follows: First, a small representative quantity of the sample (20–30 g) is taken and dissolved in 50–100 cm³ of distilled water. Gradually, 20–30 cm³ of H₂O₂ (50% hydrogen peroxide) is added to oxidize any organic matter present in the sediment. After 24 hours, particularly for samples containing the finer fractions (silts and clays), approximately 15–20 ml of NH₃ (10% ammonia) is added as a dispersing agent to prevent clay flocculation. After thorough stirring, the suspension is poured through a sieve with a mesh opening diameter of 4 Φ (0.063 mm). This value represents the boundary between sand and fine-grained materials (silts and clays). The sediment retained in this sieve, comprising the total coarse materials, is washed with distilled water, placed in a crucible, and dried at 80°C. After drying, the total sand fraction is further separated into sub-fractions using a shaker and a series of sieves with mesh opening diameters of: -1 Φ (2 mm), 0 Φ (1 mm), 1 Φ (0.500 mm), 2 Φ (0.250 mm), 3 Φ (0.125 mm), and 4 Φ (0.063 mm). All weight measurements are performed with an accuracy of four decimal places. The suspension that passes through the 4 Φ sieve is placed in a 1-liter graduated cylinder, which is then filled with distilled water to a total volume of one liter. The contents of the cylinder are homogenized

with vigorous stirring, and immediately after, 20 cm³ samples of the suspension are taken at regular time intervals and from specific depths relative to the zero mark of the graduated cylinder, as follows: At 20 seconds from a depth of 20 cm, at 1 minute 45 seconds, 6 minutes 58 seconds, 28 minutes, 1 hour 51 minutes from a depth of 10 cm, and at 3 hours 42 minutes from a depth of 5 cm.

The temperature of the solution during sampling is maintained at 25°C by placing the graduated cylinders in a constant-temperature water bath. The sampled material is then placed in crucibles, dried at 80°C, and weighed with an accuracy of four decimal places.

COMMENT: Descriptions on water circulations, wave and tides and discharges from major rivers: I understand that most of these are described in sections 4.1, 4.2 and 4.3 in “Discussion”. However, all descriptions in sections 4.1 and 4.2 are NOT the results from this study, but a summary of the previous studies. This means that these are NOT “Discussion”. These contents with some descriptions on discharges from rivers in section 4.3 (e.g., L. 436, 442-443, 446-447) should be moved to the descriptions of the study area (section 2.1). Also, water circulations in Figures 11 and 12 and major rivers in Figure 12 should be moved to Figure 1 or new Figure 2. Without this movement, some interpretations on the influences of these mentioned in “Results” (e.g., L. 222-223, the others are shown in minor comments) are difficult to follow.

The manuscript has been reformed by moving the water circulation information in section 2.1. Figure 11 has also been removed in section 2.1 and referred as figure 2 following your suggestion where the general circulation pattern of the Aegean is presented, while a new figure (Figure 3 in the revised manuscript) shows the water circulation patterns in the study area.

Minor comments:

COMMENT: L. 110: Where is “Cyclades Archipelago”? Please indicate in Figure 1.

RESPONSE: Has been rewritten in consistency with figure 1: To the south, the Cyclades area in the central Aegean forms an isolated plateau (Cyclades plateau, Fig. 1) with numerous islands

COMMENT: L. 112: Where is “Saroic Gulf”? Please indicate in Figure 1.

RESPONSE:

COMMENT: L. 112-113: Need citation of “glacial sea levels of this area”

RESPONSE: The reference has been added

COMMENT: L. 116: Where is “Cavo Doro Strait” and “Andros”? Please indicate in Figure 1.

RESPONSE: Cavo Doro strait and Andros were indicated in figure 1. We have increased the text size to be legible.

COMMENT: L. 128: Where is “North Evoikos Gulf”? Please indicate in Figure 1.

RESPONSE: See previous comment.

COMMENT: L.130-132: This sentence is NOT related to “Sampling”. Please delete.

REPSONSE: Lines 130-132 have been deleted.

COMMENT: L. 139-141: Thank you for your addition of this sentence. However, I think more clear indication that all sediments used for this study are composed of siliciclastic grains are needed.

REPSONSE: See the reply on the first major comment

COMMENT: L. 180, 226: “sediment composition” should be “grain-size composition”.

REPSONSE: It has been corrected in both lines

COMMENT: 187-189: This statement a bit contradicts that on L. 139-141.

REPSONSE: It is referred to reworked clasts of skeletal grains. The case in lines 139-141 refers to large sized (more than 2mm) well preserved shells. The text has been so that there is no misunderstanding: “Here, the sediment becomes predominantly composed of sandy calcareous skeletal fragments and clasts, primarily consisting from reworked remnants of benthic and planktonic organisms, which contribute to a more heterogeneous texture as sand fractions diminish.”

Sections 3.2 and 3.3: Distributions on some parameters are NOT described adequately as follows.

COMMENT: L. 216-223: Why there is no description on two locations with better sorting values (<1), which find in the Aegean Sea of Figure 6?

REPSONSE: The text has been revised as following: It two cases as shown in figure 8 moderately sorted samples occur, suggesting probably local hydrodynamic conditions that favor extended sediment reworking.

COMMENT: L. 220-221: I can’t find area of the better sorting around Chalkis in Figure 5b.

REPSONSE: The text has been revised as following: “Better sorting (1-2 ϕ) is observed in a restricted area on the southeastern margin of South Evoikos, as well as in the area between south Evia and Skyros island.”

COMMENT: L. 224-231: Why there is no description on locations with low skewness values (<-0.3), which find in both areas of Figure 6?

REPSONSE: The text has been revised as following: “Locally, in both areas samples with skewness <-0.3 occur (Fig. 8) located mainly near the coasts, indicating probably high energy conditions.” It has to mentioned here that where samples showing a specific character are isolated cannot consist a mappable entity like those presented in the updated figs. 6 and 7.

COMMENT: L. 268-269: I can’t find bidirectional transport at the central part of South Evoikos Gulf. Vectors in this part are small and directions are NOT bidirectional but multidirectional and no preferred direction.

REPSONSE: Has been replaced by multidirectional.

COMMENT: L. 271: “northwest” is “north”?

REPSONSE: Has been corrected to “north”

Sections 3.2 and 3.3: There are many interpretations in this section as shown below. This is “Results” chapter. To avoid making confusions or misunderstanding for the readers, these interpretations should be deleted.

COMMENT: L. 222-223: “which could be..... waves or currents” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Lines 222-223 have been deleted.

COMMENT: L. 231: “likely due to..... in these areas” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Line 231 has been deleted.

COMMENT: L. 237-238: “indicating a tendency..... coastal inputs” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Lines 237-238 have been deleted

COMMENT: L. 282-283: “This eastward flow..... away from the shore” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Lines 282-283 have been deleted

COMMENT: L. 285-286: “and probably..... of this region” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Lines 285-286 have been deleted

COMMENT: L. 291-293: “Overall,..... Aegean regions” is interpretation without any evidence and discussion and NOT result.

RESPONSE: Lines 291-293 have been deleted

COMMENT: L. 274: Where is “Attica Peninsula”? Please indicate in Figure 1.

RESPONSE: Indicated

COMMENT: L. 279: Please consider to delete “indicating that materials are being carried southward”

RESPONSE: Deleted

COMMENT: L. 301: Where is “Evoikos Sea”? Please indicate in Figure 1.

RESPONSE: The text has been revised as following: (Evoikos sea consisting of North, South Evoikos and Petalioi Gulfs and Aegean sea)

COMMENT: L. 319, 320, 329, 338, 342, 347: Where is “Evoikos Gulf”? Is this combination of North and South Evoilos gulfs? If so, please change “Evoikos gulf” to “North and South Evoikos gulfs”.

RESPONSE: North, South Evoikos and Petalioi gulfs have been rewritten in accordance with the correction following your previous comment as Evoikos Sea.

COMMENT: L. 406: Where is “Euripus Strait”? Please indicate in Figure 1.

RESPONSE: Corrected.

COMMENT: L. 438-439: Amounts of water discharge are different from those of sediment discharge. These have no simple linear relationship. Statement of this sentence is too simplified. Please rewrite.

RESPONSE: The text has been modified as following: This riverine input could be potentially marked by the prevalence of finer sediments in these specific areas, though data regarding the amount of sediment discharge are not available.

COMMENT: L. 467: Where is “Euripus channel”? Please indicate in Figure 1. Is this the same as “Euripus Strait” in L. 406? If so, please use a single term.

RESPONSE: Has been rewritten as Euripus strait to be consistent with the rest of the text.

COMMENT: Table 1: I still can’t understand what is X and Y. Need explanation in Table caption.

RESPONSE: Table caption has been updated to have a clear reference in the applied X and Y coordinates represent sampling locations in UTM34N projection system.

COMMENT: Figure 1: It is difficult to read some local place names in Figure 1. This should be corrected.

RESPONSE: Text size has been increased in Figure 1 so that local names are more legible.

COMMENT: Figure 6 b: What is a gray dot in Figure 6b?

RESPONSE: The gray dot represents samples that do not constitute a mappable entity. Figure caption has been revised to address the issue.