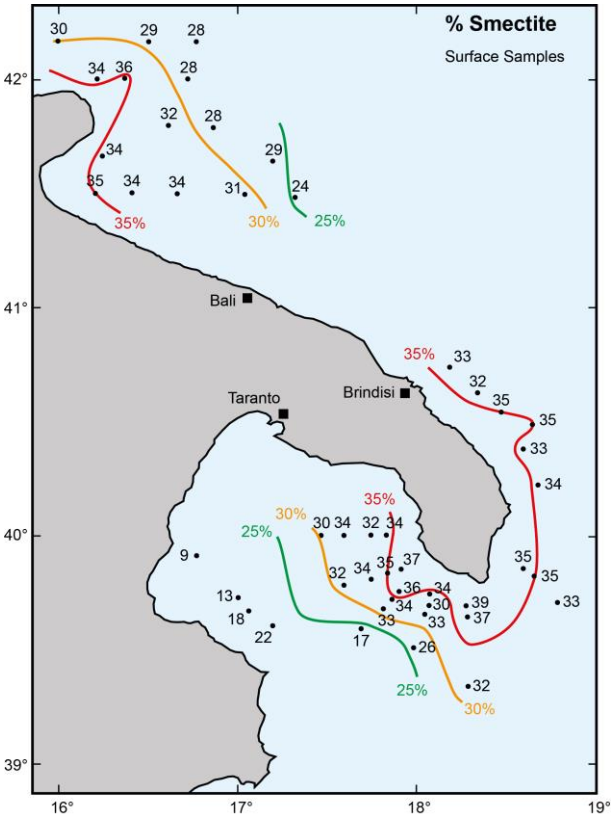
Response to Reviewer Comment 2

We would like to thank the anonymous referee 2 for the detailed comments and suggestions that will help to improve the manuscript substantially. Below we added our point to point reply to all comments. Referee comments are displayed in italic font, our response is written in normal font.

1) The Authors attempt to define the provenience of fine-sediment by looking at the relationship between illite and smectite. This methodology is based on earlier Tomadin's works which rely on old studies of sediment transport in the Adriatic basin. For instance, the Authors do not report new data on the source area of the Padane sector (i.e. the Padane sector is constituted by different catchments that are characterized by distinct sediment composition (see various papers by Eduardo Garzanti and Alessandro Amorosi in the Padane sector from '90s to now). In addition, the composition of the clay minerals does not reflect only the provenience of the sediment, especially in sediment that travelled such a long path. Finally, the key role of the interaction among different oceanic water masses has not been taken into account by Authors; this is true also for the different sediment facies that should reflect the depositional processes and may be examined in the available sediment cores. Moreover, recent documentation demonstrated that diagenesis play a crucial role even in modern sediment (e.g. see JHS Macquaker works on muddy deposits). Thus, the drivers of sediment transport and accumulation are different in nature and Authors seem to underestimating the role of each driver. Authors should study the sediment provenance by integrating different methods and by showing additional data.

We generated an additional dataset on the clay mineral distribution in the seafloor surface sediments of the Gulf of Taranto and the western Adriatic Sea to further assess the provenance of the different clay minerals and spatial gradients in clay mineral dispersal. Response to Reviewer Comment (RRC) 2 Figure 1 shows first results. We will present these new data in form of a new figure showing clay mineral ratios in the style of Figure 6 of the current manuscript. This will also allow us to further elaborate on the relation between different water masses and the clay mineral transport and distribution and on the integrated signal of the different sediment sources.
Diagenesis of clay minerals normally requires increased temperature and pressure and therefore is confined to deeper and older parts of marine sedimentary sequences (see also Brindley and Brown, 1980, Chamley, 1989, Meunier, 2005). Also our previous studies on modern, Holocene and Late Pleistocene clay minerals in various parts of the eastern Mediterranean Sea (e.g., Ehrmann et al., 2007 a,b; Hamann et al., 2009; Ehrmann et al., 2013, 2016, 2017) did not give any indication of a diagenetic alteration but suggest that the clay mineral distribution is mainly controlled by sediment provenance and dispersal.



RRC2 Figure 1: Map showing first results from the clay mineral analysis of surface samples from the Gulf of Taranto and the western Adriatic Sea. The data show an on-offshore gradient and trace the near-coastal transport of suspension from the Adriatic Sea into the Gulf of Taranto. In the revised manuscript, results will be presented in form of clay mineral ratios as also applied to the sediment core.

2) As the Western Adriatic Current (WAC) has been defined in different ways from different authors (e.g. Artegiani et al., 1999 vs Poulain, 2001), Authors should state the evidence that the WAC is bringing sediment from the Adriatic Sea to the Gulf of Taranto. Perhaps, Authors should consider that: - from Artegiani et al. 1999, the WAC corresponds to the coastal amplification of the southeastward current on the mini-shelf and flows at water depth 100 m). - Lipizer et al., 2014 suggest a sinking of the WAC along the slope of the western Adriatic margin and in the Otranto Strait (see their section 3.2.2) and they do not mention the Gulf of Taranto. The Authors should provide references to works that document the path of the WAC in their study area. This is a fundamental point to address. How the sediment of the Po river reached the Gulf of Taranto? Authors should argue this concept with robust paper references. What's the current that brings the sediment at the sites of the sediment cores sampled in the Gulf of Taranto? Indeed, as Authors reported in different sections the WAC flows along the Adriatic shelf. This is well documented from different works available from the bibliography. What remains unclear to the reader is the path of the WAC outside the Otranto Strait, based on previous works.

We agree with the reviewer that in the settings section we mostly cited publications on the oceanography of the water currents up to the Strait of Otranto. To improve this section and underline our argumentation we will for example include studies of: Goudeau et al. (2014) (finding evidence that the dominant provenance of Gallipoli Shelf sediments originates from the western Adriatic mud belt, transported by the WAC), Grauel et al. (2013 a, b) (finding evidence that relatively nutrient-rich and fresher waters of the WAC influence the isotopic composition of surface dwelling planktonic foraminifera on multi-decadal time scales) and Zonneveld et al. (2012) (finding a correlation between Po River discharge and the accumulation and relative abundance of dinoflagellate cysts in samples from the Gulf of Taranto and the Gulf of Manfredonia). Furthermore we generated a new clay mineral record of surface samples from the Gulf of Taranto and the Adriatic Sea (RRC2 Figure 1), which traces the near-coastal suspension transport from the Adriatic Sea into the Gulf of Taranto. We will add a corresponding figure (in the style of Figure 6 of the current manuscript version)

displaying clay mineral ratios to assess the modern clay mineral distribution. This will allow for a further elaboration on clay mineral dispersal pathways.

3) The concept that bands of sediment with Padane provenience and Apennine provenience travel in the Adriatic Sea on two "parallel highways" is an old concept based on earlier Tomadin's works. More recent works suggest a more complex oceanographic sediment dispersion pattern (under the influence of water gyres and cascading see Trincardi et al., 2014). Moreover, based on his dataset, Tomadin doesn't take into account the distribution of the modern sediments and sampled deposits older than 5ky BP.

We agree with the reviewer that our phrasing suggests a strict separation between the Padane and Apennine sediment flux and we did not emphasize the mixing between the different sources sufficiently. We will rephrase the corresponding section in the introduction and refer to relevant literature.
The cited study of Tomadin (2000) did not sample deposits older than 5 ky BP but investigated surface sediments as stated by the author: "More than 300 bottom samples, collected by van Veen grab samplers, box-corers and piston corers during numerous cruises, have been considered for the present investigation. To avoid the comparison of materials of different age, thin layers of sediments deposited on the sea floor were carefully sampled."
Even though local currents and gyres play an important role in sediment dispersal, the general concept of a spatial gradient in Po- and Apennine-generated material is convincing in our opinion. To further validate this, we generated a new clay mineral record of surface samples from the Gulf of Taranto and the western Adriatic Sea (RRC2 Figure 1 provides first results). We will add one or two additional figures and a corresponding paragraph to better assess the modern clay mineral distribution and dispersal pathways in the study area.

4) Readers would appreciate if Authors could add photos of the sediment cores (maybe in supplemental material?): any deformations of the cores due to gravity core sampling? If yes, how deformation has been taken into account? What is the recovery (%) of sediment cores?

The sediment cores display an undisturbed sediment surface and no signs of deformation or sediment loss are visible. A picture of the gravity core will be added in the supplementary material.

5) The Authors should remind that they did not sample the depocenter, because the figures provided for sediment accumulation rates are telling the opposite (e.g. 28.3 cm/kyr that means a sediment accumulation rate of ca. 0.028 cm/yr... see Cattaneo et al., 2007 for maps of the modern depocenters and for the sediment accumulation rates (>1,5 cm/yr).

The sedimentation rates at Site 06 are relatively high (approximately 1 mm/yr) considering the core location at 214m water depth in the Gulf of Taranto far away from a large river mouth or the main Apennine sediment sources. Mesotrophic to eutrophic conditions displayed by the abundance of SIIBF suggest high accumulation rates of organic material hence documenting a depocenter in the northeastern part of the Gulf of Taranto. We are aware of the fact that there are areas in the western Adriatic Sea closer to the Apennine and Po sediment sources with far higher sediment accumulation rates. Nevertheless, we would like to retain this wording considering our study area in the Gulf of Taranto. The sedimentation rates for Site 03 are lower when compared to Site 06 and we point out that this is most likely due to its location at the margin of the depocenter. In the revised manuscript, however, we will refer to the study of Cattaneo et al. (2007) in order to put the sediment accumulation in the Gulf of Taranto into a regional perspective.

6) Part of the result section should be moved to methods (see highlighted sentences in the pdf).

We will shift the definition of the microhabitat groups (e.i. SIIBF, EBF) and the related discussion into the methods chapter.

7) Authors should discuss the Apennines sediment contribution on the light of Milliman and Syvitski, 1992, and Syvitski and Kettner, 2007.

We agree with the reviewer that the manuscript would benefit from a more detailed description of the depositional environment. We will include the studies of, for example, Syvitski and Kettner (2007), Milliman and Syvitski (1992) and Amorosi et al. (2016) and elaborate more on the northern Apennine sediment contribution to the Po River sediment flux and the central Apennine sediment contribution to the total sediment load of the Adriatic Sea.

8) Authors should avoid non-scientific language in many parts of the text (see comments in the pdf).

The use of language will be checked throughout the whole manuscript and modified appropriately.

9) Some references are missing from the reference list.

All references will be double checked.

10) Fig. 1. I strongly suggest to avoid this very old concept of sediment transport, a lot of work has been done by different authors on the oceanographic regime and related sediment transport in the last decades. Authors should think about merging the two imagines in one maintaining the continental part from 1A and the marine part from 1B. Authors should provide references for the oceanographic regime in the Gulf of Taranto.

We agree with the reviewer and will combine Figure 1 A and B into one figure merging the terrestrial part of Figure 1 A with the marine part of Figure 1 B and will avoid illustration of a strict separation between a Padane and an Apennine flux. Furthermore, we suggest to modify the current division of the Apennines according to the different Apennine sediment contribution into the Adriatic Sea (eastern Apennine Rivers: 32.5×10^6 t yr^{-1}, Apennine Rivers south of Gargano: 1.5×10^6 t yr^{-1}).

11) Figs. 3 and 4. The resolution is good. Fig. 6. Authors should add isobaths values and a dotted line along the shelf-edge and should explicit that the endmembers of the color bars change from A to B to C. Figs. 9 and 10. I really like these figures! Maybe Authors can add lines to help the readers for correlation.

We will add information on the different color bars and display the values for the depth of the isobaths.

12) Here I am suggesting works on the Adriatic Sea dealing with the complexity of oceanographic mass water pathways and the sediment dispersal system:

We appreciate the recommended literature and will consider the publications in appropriate sections of the manuscript.

Cited References

Amorosi, A., Maselli, V., and Trincardi, F., 2016, Onshore to offshore anatomy of a late Quaternary source-to-sink system (Po Plain–Adriatic Sea, Italy): Earth-Science Reviews, v. 153, p. 212-237.

Brindley, G.W., Brown, G. (Editors), 1980. Crystal Structures of Clay Minerals and their X-Ray Identification. Mineral. Soc. Monogr., 5: 495 pp.

Chamley, H. (1989) Clay Sedimentology. Berlin, Heidelberg, New York: Springer, 623 pp.

Cattaneo, A., Trincardi, F., Asioli, A., and Correggiari, A., 2007, The Western Adriatic shelf clinoform: energy-limited bottomset: Continental Shelf Research, v. 27, no. 3-4, p. 506-525.

Ehrmann, W., Schmiedl, G., Hamann, Y., and Kuhnt, T., 2007a, Distribution of clay minerals in surface sediments of the Aegean Sea: a compilation: International Journal of Earth Sciences, v. 96, no. 4, p. 769.

Ehrmann, W., Schmiedl, G., Hamann, Y., Kuhnt, T., Hemleben, C., and Siebel, W., 2007b, Clay minerals in late glacial and Holocene sediments of the northern and southern Aegean Sea: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 249, no. 1, p. 36-57.

Ehrmann, W., Schmiedl, G., Beuscher, S., and Krüger, S., 2017, Intensity of African Humid Periods estimated from Saharan dust fluxes: PloS one, v. 12, no. 1, p. e0170989.

Ehrmann, W., Schmiedl, G., Seidel, M., Krüger, S., and Schulz, H., 2016, A distal 140 kyr sediment record of Nile discharge and East African monsoon variability: Climate of the Past, v. 12, no. 3, p. 713-727.

Ehrmann, W., Seidel, M., and Schmiedl, G., 2013, Dynamics of Late Quaternary North African humid periods documented in the clay mineral record of central Aegean Sea sediments: Global and planetary change, v. 107, p. 186-195.

Goudeau, M. L. S., Grauel, A. L., Tessarolo, C., Leider, A., Chen, L., Bernasconi, S. M., Versteegh, G. J. M., Zonneveld, K. A. F., Boer, W., Alonso-Hernandez, C. M., and De Lange, G. J., 2014, The Glacial-Interglacial transition and Holocene environmental changes in sediments from the Gulf of Taranto, central Mediterranean: Marine Geology, v. 348, p. 88-102.

Grauel, A.-L., Goudeau, M.-L. S., de Lange, G. J., and Bernasconi, S. M., 2013a, Climate of the past 2500 years in the Gulf of Taranto, central Mediterranean Sea: A high-resolution climate reconstruction based on δ18O and δ13C of Globigerinoides ruber (white): The Holocene, v. 23, no. 10, p. 1440-1446.

Grauel, A. L., Leider, A., Goudeau, M. L. S., Muller, I. A., Bernasconi, S. M., Hinrichs, K. U., de Lange, G. J., Zonneveld, K. A. F., and Versteegh, G. J. M., 2013b, What do SST proxies really tell us? A high-resolution multiproxy (U-37(K '), TEX86H and foraminifera delta O-18) study in the Gulf of Taranto, central Mediterranean Sea: Quaternary Science Reviews, v. 73, p. 115-131.

Hamann, Y., Ehrmann, W., Schmiedl, G., and Kuhnt, T., 2009, Modern and late Quaternary clay mineral distribution in the area of the SE Mediterranean Sea: Quaternary Research, v. 71, no. 3, p. 453-464.

Meunier, A., 2005. Clays. Springer, Berlin, Heidelberg, New York, 472 pp.

Milliman, J. D., and Syvitski, J. P., 1992, Geomorphic/tectonic control of sediment discharge to the ocean: the importance of small mountainous rivers: The Journal of Geology,

v. 100, no. 5, p. 525-544.
Syvitski, J., and Kettner, A. J., 2007, On the flux of water and sediment into the Northern Adriatic Sea: Continental Shelf Research, v. 27, no. 3-4, p. 296-308.