

Interactive comment on “Inorganic and organic geochemical fingerprinting of sediment sources and ocean circulation on a complex continental margin (São Paulo Bight, Brazil)” by Michel Michaelovitch de Mahiques et al.

Anonymous Referee #2

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This manuscript focused on the source and chemistry of sediment delivered to a portion of the continental shelf and slope off the eastern coast of Brazil. The goal was to determine the provenance of sediment in an area of the coastal ocean impacted by complicated ocean currents. Inorganic and organic parameters were measured, including a range of trace metal concentrations, organic carbon and nitrogen content, stable carbon and nitrogen isotopes, and long-chain n-alkanes and pristane/phytane ratios.

The manuscript is well-written and conveys the main points of the results well. These

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data will likely be interesting to a range of readers of Ocean Sciences and I advocate for its eventual publication here. However, I do have some suggestions that the authors should address before the paper is published. I've organized those suggestions here by paper section.

Introduction In general, I found the introduction to be unsatisfactory. Except for the first paragraph, the section was simply an overview of the study site, replicated almost completely in Section 2 (Study Area). The authors should remove all of the summary of the oceanographic setting (all of the Introduction except for Paragraph 1) and ensure that all of that information is in Section 2.2. Then, there needs to be an introduction of the use of the parameters employed here in similar oceanographic studies with expanded information about the specific tracers, inorganic and organic, that are used here and the types of information that they can convey.

Study Area The study area description was very good, including both the geology and oceanography of the site. However, I would like Figure 1 (study area map) to be updated and improved to better match with these descriptions. Overall, I think including a larger area on Figure 1 would be useful, with things like Rio de la Plata, the South Atlantic Subtropical Gyre, and other currents that are mentioned in the Introduction section included. The inset with the study site descriptions was very good, but if these currents and water sources are important to interpreting the study data, it would be nice to see them laid out on the figure.

Materials and Methods Because many of the parameters used in this study were not described in the Introduction, the authors describe the use of these proxies in the Methods section. I'd like to see the descriptions of the purposes and use of these proxies moved to the Introduction section (where they can be expanded upon and described in greater detail) and just have laboratory and analytical methods included in this section.

Terrestrial n-alkanes Index: I am not sure of the utility of this index. Why include it when

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you are already including previously used indices like the TAR and ACL? The TAR has the benefit of accounting for relative changes in total n-alkane input and degradation, while the newly introduced TI does not. Why introduce it here? If it is used, the authors should clearly describe its benefits for this study area that the many other indices they employed do not have.

Results and Discussion In general, I thought this section included many more figures and data than was appropriate. I am more familiar with the organic geochemical parameters than the inorganic, but many of the parameters seemed redundant. I think in general the authors should pick only a few parameters to show on scatter plots, even if they still use all of the data for the PCA analyses.

Core 65: In the beginning of the Results section, this core is described as having a “young age,” which according to the radiocarbon data it does. However, for the rest of the manuscript it is described as containing mostly relict sediment. While this is what previous studies have shown, and what some of your inorganic parameters seem to support, the organic data and radiocarbon dates do not support this. I would like to see more of an explanation for this discrepancy in the data. It is possible that the mineral portion of the sediment has a different source than the organic (sorbing / desorbing processes, etc) but this should be explored by the authors in the Discussion.

ACL values (Fig 9): In the text describing this figure, it is mentioned that all samples range from 28.96 to 33.00, but in Figure 9, samples range to only 31.00 (33 would be off the plot axis).

AI description: the authors describe this as a proxy for C3 vs C4 plants, which is true. But, there is little attempt to use this information to help explain carbon source, aside from saying that the likely C3 source is the adjacent continent. Within the context of what is known about the ocean circulation here, where would the C4 signature be coming from? What is the vegetation like in the watersheds of nearby rivers? Explain where the C4 signature is coming from.

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Section 4.3, first paragraph: I think there should be more explanation for this sentence: “. . .considering the humid climatic conditions along the southeastern coast of South America, the coastal and shelf sediment values might reflect proximity to the source rock, in contrast to previous interpretation attempts linking element provenance patterns to limited chemical weathering on the adjacent continent.” Why do the authors make this assertion?

Section 4.3, third paragraph: The authors say, “In this sense, the picture that emerges from our analysis is different from that presented by Razik et al (2015).” How so? Please summarize the findings of that study and explain exactly how your findings are different in the text of your discussion?

Section 4.4, first sentence: “. . . we observe that our results are partially acceptable.” How was this evaluated? What exactly do you mean by “partially acceptable”? Please be specific and explain exactly how this was evaluated

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