

To the Editor of Ocean Science
Ref. 1st review of the manuscript
“New insights of the influence of ocean circulation on the sedimentary distribution in the Southwestern Atlantic margin (23°S to 55°S) based on Nd and Pb isotope fingerprinting”

Dear Sirs,

First of all, we would like to thank Reviewer 1 for his/her evaluation and comments about our manuscript. We will comment on each of the points presented by the Reviewer, but we must say that a revised version of the manuscript (with track changes) will be submitted after we receive the evaluation and comments from Reviewer 2.

1. Reviewer: I found the paper is difficult to follow because of the language. The authors need to polish the language in this paper.

Answer: The manuscript will be sent to a native speaker for a complete revision

2. In addition, I found most of the ideas in this paper has been discussed in the published paper of de Mahiques et al., 2008, Marine Geology. The authors need to highlight new insights about the sediment sources and ocean circulations.

Answer: We respectfully disagree. The paper of Mahiques et al. (2008) was mainly focused on sediment sources. Apart from a much higher number of samples, the present paper shows an improvement in ocean circulation, far better than the previous work. Nevertheless, we will emphasize these improvements along with the second version.

3. 21 Not true. There is latitudinal trend for Nd isotopes, but not for Pb isotopes

Answer: We respectfully disagree. We performed Correlation analyses for the Pb isotopes, and both $^{207}\text{Pb}/^{204}\text{Pb}$ vs. Latitude and $^{208}\text{Pb}/^{204}\text{Pb}$ vs. Latitude provided statistically significant ($p < 0.05$) correlations. The Reviewer is correct for $^{206}\text{Pb}/^{204}\text{Pb}$, which does not present any latitudinal correlation.

40 “Rare Earths” should be “Rare Earth Elements” or “REEs”

Answer: Corrected in the new version

4. 260-264 Pb/Pb? Please correct the ratios in this sentence and the following sentences through all manuscript

We acknowledge this comment. When preparing the Word document, we did not realize that all numbers were formatted as hidden. This mistake was corrected in the second version that will be sent after the evaluation by Reviewer 2

5. 347 The sediment samples from Punta del Este basin also have Nd and Pb isotope ratios between Antarctic sediments (a endmember) and Paraná Igneous Province (g endmember). How to exclude this provenances?

Answer: We did not exclude these provenances. On the contrary, we emphasized that sediments from the slope of the Punta del Este basin present an Antarctic source (lines 346-348), and sediments from the shelf have a Río de la Plata signature (lines 351-352)

6. 353-363 The authors try to attribute the Nd and Pb isotope data of Pelotas samples to the influence from Río de la Plate Plume water. But the Pelotas samples display larger range of Nd and Pb isotope compositions than Río de la Plate samples. It is evidence that the Pelotas samples were effected by other sediment provenances. However, the authors did not discuss this point. In addition, the Pelotas sediment samples are obviously located in the area of Brazil Current (Fig. 1), but the authors did not discuss the possible influence from Brazil Current.

Answer: Indeed, the Pelotas basin displays a more extensive range of Nd and Pb isotope values, and that is why we state in the manuscript that they represent a mixture of sediments from the Río de la Plata and Santos Basin. It must be emphasized that the Brazil Current acts only on the outer shelf and upper slope. In this sense, it is not true that all of the Pelotas sediments are located in the area of Brazil Current. All of the samples collected on the inner and middle shelf are outside of the influence of Brazil Current.

One of the main contributions of this paper is that we do not only look at the values of isotopes but also highlight the importance of ocean circulation in

their interpretation. We cannot propose models of transport of sediments flowing against the currents.

7. 363-370 It could not convince me that the Santos samples are related to Precambrian metamorphic rocks and granites of the Southeastern Brazilian coast. The Nd and Pb isotope data of the Santos sediments and Precambrian metamorphic rocks as well as granites of the Southeastern Brazilian coast (h, i and j end members) are obviously distinct. The following transport model of the Precambrian Brazilian cannot convince me as well.

Answer: We realized that Figure 7 caused much confusion, and we decided to remove it. The interpretation for a Pre-Cambrian source for the sediments of Santos Basin is based on the extensive work of Mantovanelli et al. (2018), who analyzed two sediment cores at 22.9°S (core 7620) and 25.06°S (core 7616). The authors also summarized data from 21 references of Pre-Cambrian rocks of southern and southeastern Brazil and suspended sediment samples from the Paraíba do Sul River (Roig et al., 2005) (mouth at 21.6°S). Sediments from core 7620 presented ϵ_{Nd} values (between -17.5 and -16.1) and Sm/Nd ages (between 1.7 and 1.9 Ga) similar to the suspended sediments of the Paraíba do Sul River, which drains mainly Pre-Cambrian rocks. This core shows a signature similar to the metasediments of the Paraíba do Sul Domain.

Concerning core 7616, it presented ϵ_{Nd} ranging from -11.0 and -9.6 and Sm-Nd age around 1.4 Ga, with similarity with the metasediments from the Coastal Domain. Worth noting that the values obtained in these cores are similar to the samples from Santos Basin that we used in this work. In this sense, we argue that the Pre-Cambrian origin for the sediments of Santos Basin is undoubted.

8. 418-419 It is not true. I observed that the Pelotas samples display mixture characteristics between Santos samples and Punta del Este samples, not Río de la Plate samples.

Answer: As shown in Figure 9 of the original version, the flow in the outer shelf and upper slope between 27°S to 35°S runs to the south. This aspect is due to the thickening of the Brazil Current after receiving intermediate waters from the Santos Bifurcation. In this sense, it is not plausible hydrodynamically that the

Punta del Este sediments can be transported towards the Pelotas Basin. The only northward flow is related to the Plata Plume Water, acting on the inner and middle shelf in that area.

9. 420-421 It is not true. The Santos samples did not have similar Nd and Pb isotope compositions compared to the Precambrian rocks (Fig. 7).

Answer: Please refer to our answer in Item 7.

10. What is the Nd and Pb isotope compositions of Two Argentina samples from Brazil-Malvinas confluence (BMC)? Did they inherit the isotope compositions from Malvinas Current or Brazil Current?

Sample 575 is located at 1097 mbsl and presents $\epsilon\text{Nd} = -2.0$, $^{206}\text{Pb}/^{204}\text{Pb} = 18.480$, $^{207}\text{Pb}/^{204}\text{Pb} = 15.609$, and $^{208}\text{Pb}/^{204}\text{Pb} = 38.366$. Its depth indicates that it is under the flow of the Antarctic Intermediate Water (AAIW), carried by the Malvinas Current.

Sample 630 is located at 3620 mbsl and presents ϵNd of -4.2. There are no values for Pb isotopes in that sample. Its depth indicates that it is under the Lower Circumpolar Deep Water (LCDW) or even the Antarctic Bottom Water (AABW). In this sense, it is not carried by the Malvinas Current nor the Brazil Current since it is affected by deep thermohaline circulation.

11. Fig. 1 what is thin red line which is basically parallel with thick red line in this figure?

Answer: The thin red line corresponds to the flow of the Tropical Water. It has been removed in the new version of Figure 1.

References cited

Mantovanelli, S. S., Tassinari, C. C. G., de Mahiques, M. M., Jovane, L., and Bongioiolo, E.: Characterization of Nd radiogenic isotope signatures in sediments from the southwestern Atlantic Margin, *Frontiers in Earth Science*, 6, 74, 10.3389/feart.2018.00074, 2018.

Roig, H. L., Moraes Rego, A. P., Dantas, E. L., Meneses, P. R., Walde, D. H. G., and Goia, S. M. L. C.: Assinatura isotópica Sm-Nd de sedimentos em suspensão: implicações na caracterização da proveniência dos sedimentos do Rio Paraíba do Sul - SP, *Revista Brasileira de Geociências*, 35, 503-514, 2005.