

Biogeosciences Discuss., author comment AC3
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Reply on CC1

Mohamed Ayache et al.

Author comment on "Neodymium budget in the Mediterranean Sea: evaluating the role of atmospheric dusts using a high-resolution dynamical-biogeochemical model" by Mohamed Ayache et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-107-AC3>, 2022

Dear Ashwini Kumar,

We warmly thank you for your overall encouraging comment concerning the utility of our study for the Bio-geoscience community. We sincerely appreciate all valuable comments and suggestions, which helped us to improve the quality of the manuscript. We have now revised our manuscript, and we have restructured and rewritten it to give a clear general overview of the model and our modelling approach.

Minor comments:

Line 63: can be reworded

We agree with the referee; this sentence was not very clear. Text was changed in the revised ms for clarification.

Ayache et al. (2021) explores the impact of drastic changes in Mediterranean thermohaline circulation on the North Atlantic Circulation, using the simplified version of the ϵ Nd modelling approach (Arsouze et al. 2007) with idealized hosing experiments implemented in the IPSL-CM5 model."

Line 98: "...too-radiogenic..." not clear

We meant that the simplified approach (including only the boundary exchange between sea water and continental margin, publish in Ayache et al., 2016) simulated a too-radiogenic isotopic composition of ϵ Nd, *i.e.*, this approach overestimates the observed Nd isotopic composition.

Clarified in the revised ms

"Nevertheless, this simplified approach yields too high (too radiogenic) ϵ Nd values compared to the modern Mediterranean Sea waters."

Line 138: C:N:P ratio is 122:16:1.. is it correct"?

Agreed. This was changed in the revised manuscript.

"PISCES is a Redfieldian model where the C:N:P ratio used for plankton growth is fixed to 122:16:1"

Line 141-143: Does smaller particle include Aeolian dust? It will be particularly important for open oceanic region as there is an enrichment of fine (clay) fraction in atmospheric deposition.

We totally agree with the referee about the role of Aeolian dust for open oceanic region. However, the small particle pool in the currents version of the biogeochemical model PISCES includes only particulate organic carbon (POCs, between 2 and 100 μm in size)

Our work highlights the need to consider more carefully the representation of the various particle fields in the biogeochemical model, and could be investigated in future studies.

Line 185: Typo "the"

Corrected