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Biogeosciences Discussions

Interactive comment on "Reconstructing the Nd oceanic cycle using a coupled dynamical – biogeochemical model" *by* T. Arsouze et al.

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Review of Arsouze et al. by Mark Siddall

This is a nice paper and I think it represents an important step forward in Nd modelling.

I feel the results are somewhat overstated – figure 6 reveals some very significant weaknesses in the modeling of concentrations when compared to data and there are no sensitivity tests as yet.

I think we need to sort something out early on as we improve Nd modelling. I suggest that BE best represents genuine exchange (i.e. no net input or output). This is how this term has been used in the past and it is my understanding that this is how most of the community understands this term. Boundary Input/Output or similar should be

used to represent Input and Output. Using BE will certainly be confusing to the broader community

General Comments

The English in this paper needs quite some work. Although the overall structure of the English is generally good there are many peculiar ways of saying things that make it hard to read in places and in other places the tone of the comments seems out of place. Please consult with a collaborator who is a native speaker to help sort this out.

MISSING – most of the figures are given for both EpsNd and Nd concentration except the horizontal maps in Figs. 7 and 8. These must be shown.

MISSING – characteristic profiles for each basin. The vertical signal hard to detect in the coloured contour plots. I think you need to follow the example of Jones et al and Siddall et al and show specific depth profiles for each of the ocean basins.

Specific Comments

P5551, L14 – Nd is not widely sampled compared to other tracers and there are special deficiencies such as the particulate component.

P5552, L19 - The Siddall et al study already showed that the water-mass effect does not exclude vertical cycling

P5552, L28 - I suggest that BE best represents genuine exchange (i.e. no net input, see P5553, L11) and the Boundary Input/Output or similar is used to represent Input and Output. Using BE will certainly be confusing to the broader community

P5553, L29 – maybe add ', as these authors acknowledge,' - I would just state that these authors acknowledge the need for further work and tone down some of this criticism. Perhaps this is just a subtle question of tone that needs to be sorted out by a native speaker.

P5554, L5 - I disagree - one could imagine a number of sensitivity experiments to

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explore paleo scenarios with these models. I would remove this statement or modify it to read 'limiting any potential paleo-applications'. Note the advantage was that we were able to do vital sensitivity experiments (which you are prohibited from doing because of your cumbersome model).

Section 3 – I think you need to explain how you justify these choices of scavenging coefficients

Section 5.2 and elsewhere – if particle size is so important then why do the Siddall et al simulations do a better job than your simulations? The Siddall et al simulations do not include the particle size effect explicitly.

P5569, L17 and elsewhere – you need to state that this number is highly tentative in the absence of any sensitivity tests. Your other simulations show a residence time between 125 and 760 years – why are you suddenly so confident to state 360 years in the light of this information?

Table 1 – include the K values and res time for the Siddall et al simulations for comparison.

All figures - bigger font needed in the figures and on the axes

Fig2 – too low res and axes/text too feint

Fig 6 and in text – you need to discuss why these comparisons are so poor ? It is hard to believe you are really making a big step forward when the concentrations are so poorly modeled. Why are the Siddall et al simulations getting this correct when yours are not?

Fig. 8 and text – it makes no sense to integrate over all of the interesting water masses and lose a lot of the signal. I suggest to integrate say 3000 to 4000 m

Fig. 9 – very nice but you could discuss the implications of this more. What if the sink were to increase or change size during sea-level fluctuations?

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Interactive comment on Biogeosciences Discuss., 6, 5549, 2009.