

## ***Interactive comment on “Modeling the Nd isotopic composition in the North Atlantic basin using an eddy-permitting model” by T. Arsouze et al.***

### **Anonymous Referee #2**

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#### General Comments:

This paper addresses an important issue underlying the use of Nd as a water mass tracer, i.e. boundary exchange (BE). Boundary exchange plays an important role in setting the Nd isotopic composition of a given water mass at the surface, and ultimately in the interior ocean.

This paper compares modeled data to modern observations. However, it also has important implications for paleoceanography. Determination of the rate of boundary exchange is critical in understanding the stability of a given water mass's isotopic composition through time in the case that sediment sources to ocean margins change (i.e. due to changing precipitation patterns etc.) The rate of exchange will influence whether Nd is a useful tracer in the interior ocean. If boundary conditions (based on the rate of

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BE) fluctuate rapidly, the interior ocean will respond to these changes as well as any change in water mass geometry/circulation making the interpretation of Nd as a proxy of paleoceanographic change difficult

#### Specific Comments:

My expertise is not in modeling so it is difficult for me to evaluate whether the modeling methodology is robust. The results from the  $\frac{1}{4}$  degree model are in better agreement with the observational data than from previous, coarser resolution models. This appears to be due to a more realistic modeling of the western boundary current and demonstrates the importance of ocean currents in distributing dissolved Nd.

Page 979 Lines 5-10. The authors "make the implicit hypothesis of constant Nd concentration." I find this unrealistic. The solubility of Nd in seawater is influenced by the redox chemistry of the water as well as its carbonate concentration. These conditions can change geographically (especially along continental margins) and temporally and likely play a role in the rate of BE at a given location. The discussion could be improved by addressing the extent that the above assumption is valid and whether or not a model could ever include geographical variations in Nd concentration.

Page 982 Lines 6-10. This is confusing. If BE provides >90% of oceanic Nd, how could river input dominate the isotopic composition?

Technical Corrections: Last sentence of the abstract is unclear.

Interactive comment on Ocean Sci. Discuss., 7, 973, 2010.

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