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Biogeosciences Discussions

Interactive comment on "Can whales mix the ocean?" *by* T. J. Lavery et al.

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We thank the referee for her/his rigorous evaluation of the manuscript. In response to her/his comments we have made a suite of modifications that have improved the quality of the manuscript. Below we have included our response to every specific comment of the referee as well as a description of the proposed changes to the final manuscript (the original referee comments are included in italics for reference).

1. "I would prefer that the introduction and abstract tone down the global significance talk and focus more on the importance of nutrient transport". The section of the introduction that discussed global significance has been removed and the title, abstract and introduction altered to better reflect a focus on nutrient transport.

2. "My impression is that Equation 2 describes the volume in which whale induced turbulence could occur, but I think that the real volume of the turbulent wake is smaller.

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Interactive Discussion

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I would like to see the authors slow down in this section and spend more time on the details of this part of the calculation" Further details have been added to better explain the novel methodology we present. We have altered our terminology to better reflect that we are estimating Darwinian mixing, which is the amount of water entrained by the whale moving through the water. Our model is thus a behavioural model. We have added a paragraph into Section 2.2 to explain Darwinian mixing and have highlighted that nutrient stratification is not considered in Eqn 1 but rather is considered in Eqn 6 in Section 2.4. Further information has been added to explain the various parameters that contribute to our model.

We have added a classical fluid dynamics model by D'Asaro to estimate diapycnal diffusivity in order to provide a comparison for our novel methodology of estimating Darwinian mixing, which is the diapycnal diffusion caused by a swimming animal. As the models return the same estimation we can be confident that the new methodology adequately estimates Darwinian mixing.

Interactive comment on Biogeosciences Discuss., 9, 8387, 2012.