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

T. J. Lavery et al.

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We thank Prof. D'Asaro for his rigorous evaluation of the manuscript. We are especially grateful for the classical fluid dynamics model which Prof. D'Asaro kindly took the time to provide in his comments. We have included D'Asaro's fluid dynamics model in the manuscript in order to provide a comparison to the behavioural model of Darwinian mixing we present. In response to 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 do not understand why Equation (1) estimates diapycnal diffusivity nor is there a reference to guide me. It contains nothing about stratification, energy or any of the

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usual things used in such estimates". 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.

2. "Some estimates of uncertainty might also be helpful". A sensitivity analysis has been added in Section 3.3 which investigates uncertainty.

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