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Interactive comment on "Modulation of the North Atlantic Deoxygenation by The Slowdown of the Nutrient Stream" *by* Filippos Tagklis et al.

Anonymous Referee #2

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The study presents an analysis of phosphate, dissolved oxygen, temperature, apparent oxygen and velocity changes in the upper ocean for the northern hemisphere from 4 different CMIP5 Earth system model projections.

A plausible narrative is presented as to how changes in the dissolved oxygen in the northern basins are controlled in terms of overturning and temperature changes. There is a clear asymmetry between the North Atlantic and North Pacific with a weakening of the meridional overturning in the former basin. Taking that view forward, the narrative is engaging in terms of discussing the likely changes in terms of a weakening of the western boundary currents and the associated nutrient stream.

However, the study is lacking in providing supporting quantitative analysis to endorse the above interpretations as to how the dissolved oxygen and nutrient distributions are

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controlled. There are no estimates of the nitrate flux carried by the western boundary currents and no estimates of nitrate transports along sections running across the basin. There is no real proof that either the nutrient transport change or the temperature changes are controlling the dissolved oxygen changes. Thus, a very plausible set of interpretations are presented that need to be made more quantitative and so become more robust and convincing.

I recommend that the authors address the following points: 1. What is the northward transport of nutrients in the nutrient stream and by how much has that weakened? 2. The nutrient stream is providing a redistribution of nutrients, but it is unclear whether the changes in this redistribution is confined within the subtropical gyre/subpolar gyre of the North Atlantic? 3. Alternatively, the changes in the overturning drives a weakening in the change in nutrient transport across the equator from the South to the North Atlantic.

For points 2 & 3, see Palter and Lozier (2008) supporting a more confined basin view and Sarmiento et al. (2004) and Williams et al. (2006) supporting a cross basin view. Both processes could be occurring to different extents.

While I agree with the view that the horizontal transport and redistribution of nutrients is probably key to the response, there needs to be mention of the implied changes in the vertical transfer of nutrients and oxygen within the basins.

A minor point, there are a lot of abbreviations that could be removed to make the text more readable.

In summary, the manuscript presents an engaging view of how the nutrients and dissolved oxygen distributions are controlled in the Earth system model projections. However, the authors need to provide more quantitative evidence to support their interpretations, rather than rely on changes in property maps.

References Palter, J. B., and M. S. Lozier (2008), On the source of Gulf Stream

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