Firstly, the authors would like to thank the two reviewers for their thorough readings of our manuscript and feel that our revised draft manuscript represents a significant improvement to the original. We have tried to answer every point in as much detail as space allows and indeed there is only one point which we feel falls outside the scope of this short paper (point five from referee one).

We now address each of the referee’s reports in turn, addressing specific points in the order given.

**First referee’s report**

Major Comments:

1. The authors agree with this point and have added more points to the abstract in a revised draft manuscript.

2. We have added further references, variable dimensionalities and information as requested in this point, including the precise origin of the value of 138/106 as indicated by the referee. Also, to align our paper with OCMIP protocols (and the referee’s suggestion), we have relabelled salt as *S* and Schmidt number as *Sc*.

3. All changes and additions from the recommendations in this bullet point have been taken into account and amendments made to the manuscript. Section 2 of the manuscript is now called ‘Theory and model description’ rather than simply ‘Theory’ in the original.

4. The reason for using the spatially-incomplete dataset (Helm et al. 2011) in the original manuscript was that a recent paper (Andrews et al. 2013) used it in studying deoxygenation over the last few decades both in observations and in the HadGEM2 model. It was the intent of the authors to keep the model development process fully traceable by using the same target dataset. We have added some text to make this point more explicit although we feel that the original pretext for using the Helm et al (2011) dataset remains valid. We have already begun preparing a revised manuscript and have found that when the oxygen concentrations are studied on the basin scale, using spatially complete oxygen dataset (from the World Ocean Atlas) is necessary because the dataset of Helm et al. does not give high enough quality figures due to the paucity of its coverage. We have noted however (in text and in a new figure in the draft manuscript) that although the World Ocean Atlas does indeed provide a complete latitude-longitude dataset, the constituent observations are far from complete, particularly in the southern hemisphere.

5. The points raised in this bullet point are certainly pertinent and apt but we feel that they lie outside the scope of this paper, particularly when discussing both past and future climate change. To do justice to these point would require a large additional section to be added, which, we feel, would take the paper outside its original remit of a model description paper.

For the *Specific Comments* section, we will address each point in turn using Word’s ‘track changes’ facility, that is, commenting on quoted text from the first referee’s report.

*Specific comments: p. 1454: l.11-12: This sentence is not relevant f­­­or the abstract and*

*can be deleted. p. 1455: l.1: Does the model include an interactive land and/or ocean*

*carbon cycle? Please specify. p. 1455: l. 7: What do the authors mean with “up to date”*

*models? Please specify. p. 1455: l. 12: There are several recent studies that have*

*looked at changes in oceanic oxygen under future climate change. The authors may*

*add some of the studies: e.g. Bopp et al. 2002 or Frölicher et al. 2009. p. 1456: l. 21:*

*What are the units for T? p. 1457: l. 12: Unclear what ‘simulator label’ means. p. 1457:*

*l. 8-13: This paragraph is unclear to me. Doesn’t the HadCM3 represent relatively*

*well observations? What was the reason to compare earlier FAMOUS versions with*

*HadCM3 and not with observations? Please specify. p. 1458: l. 18-20: Why do the*

*authors take an 1870-1880 SST pattern from Rayner et al. 2003 with low coverage*

*instead of a present-day SST data-set? The overall zonal and meridional gradients are*

*similar between present-day and preindustrial and differences between present-day*

*and preindustrial SST shouldn’t be an issue for this kind of comparison. p. 1459: l. 16:*

*What’s the motivation behind the use of a 2\_C threshold? Please specify. p. 1460: l.*

*4-6: You may add AOU patterns here. AOU may help to further explain the simulated*

*oxygen biases. p. 1461: l. 12-18: What’s the reason for the large NPP overestimation*

*in the equatorial Pacific and Atlantic? Please explain. Table 1 caption: Abbreviation*

*for Atlantic Meridional Overturning is usually AMOC. Table 1 caption: Change to ‘Note*

*the lack of an error estimate for Talley et al. (2003)’ Table 1: What is the difference*

*between the two Atlantic MOC estimates? Please also specify in the Table caption.*

*Figure 3: Narrow the x-axis range. Reduce it to 150 to 400 umol/l or so, to highlight*

*the important part of the oxygen range. Figure 4: Interestingly, both the HadGEM-ES*

*and FAMOUS largely overestimate O2 concentrations from 0\_ and 20\_N and between*

*100m and 1500m depth. Any ideas why this might be the case? Figure 8: This figure*

*can be deleted.*

*References: Anderson et al., 1994: Redfield ratios of remineralization determined by*

*nutrient data analysis, Global Biogeochem. Cycles, 13, 337-349. Bopp et al., 2002:*

*Climate-induced oceanic oxygen fluxes: Implications for the contemporary carbon budget,*

*Global Biogeochem. Cycles, 16(2), 1022. Frölicher et al. 2009, Natural variability*

*and anthropogenic trends in oceanic oxygen in a coupled carbon cycle-climate model,*

*Global Biogeochem. Cycles, 23, GB1003. Garcia, et al., 2010, Dissolved Oxygen, Apparent*

*Oxygen Utilization, and Oxygen Saturation, Government Printing Office, Washington,*

*DC, 344pp.*

**Second referee’s report**

*SST observations from 1870-1880 are used but the time period that represent the*

*oxygen observations is not mentioned. Please make sure that consistent time periods*

*are used since a relation between SST bias and oxygen bias is invoked. I think it would*

*be better to use more recent data where the coverage is better.*

*On page 1462 lines 5-7 the authors find “agreement” between FAMOUS and*

*HadGEM2-ES circulations “encouraging” but I don’t see much agreement. Also I think*

*that the FAMOUS circulation is clearly inconsistent with observations. E.g. it does not*

*display an Antarctic Bottom Water Cell, which is a fundamental property of the modern*

*ocean circulation. I think this should be stated clearly and the comparison to observations*

*should be extended to include AABW and flow of circumpolar deep water into the*

*Indian and Pacific oceans.*

*I also recommend to show oxygen separately in the Atlantic*

*and Indian/Pacific oceans since deep waters have large differences.*

*I’m not convinced by the author’s attribution of low oxygen in the Southern Hemisphere*

*to equatorial productivity bias. Why would this not affect the Northen Hemisphere*

*equally?*

*Another useful comparison would be horizontally averaged (in different basins) vertical*

*profiles from the model(s) and observations. This could be done by using only model*

*grid points where observations exist and would better show differences.*

*Apparent oxygen utilization (AOU) is another useful diagnostic that removes biases due to SST and*

*solubility.*

*I think the paper lacks in citing previous oxygen modeling work.*