

## ***Interactive comment on “Numerical simulations of oceanic oxygen cycling in the FAMOUS Earth-System model: FAMOUS-ES, version 1.0” by J. H. T. Williams et al.***

**Anonymous Referee #2**

Received and published: 10 April 2014

This is a short manuscript that diagnoses oxygen simulations in a model (FAMOUS) and compares it to another model and to observations. It also documents major flaws in the deep ocean circulation in FAMOUS. Such documentation is useful and I think the manuscript is suitable for GMD. Below a few suggestions for improvements.

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

C340

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 Northern 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.

---

Interactive comment on Geosci. Model Dev. Discuss., 7, 1453, 2014.