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Interactive comment

Interactive comment on "The Flux-Anomaly-Forced Model Intercomparison Project (FAFMIP) contribution to CMIP6: Investigation of sea-level and ocean climate change in response to CO$_2$ forcing" *by* Jonathan M. Gregory et al.

Anonymous Referee #2

This manuscript outlines the formulation of the FAFMIP experiments – a model inter-comparison in which air-sea fluxes a forced by different scenarios. The goal of the experiments are to reveal the extent to which the ocean model controls the climate response to differing scenarios. This information can then be used to guide interpretation of standard CMIP simulations, and to attribute observed changes to individual forcing mechanisms.

This is a very well-written paper, and it's clear that a lot of thought has gone into the

design of FAFMIP. The method used to conduct the heat flux experiments are relatively convoluted due to unavoidable feedback effects, but both the issues faced and solutions proposed were clearly explained in the manuscript. In short, I am happy to recommend publication of this paper without alteration, and have only minor suggestions that the authors may want to consider.

1. Around line 180 the authors specify that momentum stress should be added only to the momentum balance, and should not alter mixed layer turbulence schemes. A little more information on how to do this (e.g. in the form of equations, separating the perturbation stress from the unperturbed stress, as is done for the far-heat experiments) would be helpful.

2. The "added heat" tracer was introduced rather suddenly on line 310, without a definition. It quickly became obvious what it is intended to represent, but a simple equation relating T_A to θ would have made this clearer.

3. In the last paragraph of p.16 there was a statement about heat being more influential on the AMOC than freshwater. It's worthwhile comparing the magnitude of buoyancy flux perturbations in each case – in particular, is this result purely because the buoyancy fluxes are greater in the heat case, or is the feedback on heat more significant?

4. Line 457 - This sentence didn't quite make sense; I think there may be a missing word.

5. My only significant criticism of this paper is that the "Preliminary Results" section is very hard to read, as it jumps back and forth between different figures, and doesn't seem to have a clear message. This may be partly because the results are indeed preliminary, but (for example) creating subsections covering the AMOC, OHC and SLR, and reformatting the figures accordingly, would help the readability of the paper.