

## ***Interactive comment on “The Flexible Ocean and Climate Infrastructure Version 1 (FOCI1): Mean State and Variability” by Katja Matthes et al.***

**Anonymous Referee #1**

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The authors document a new earth-system modelling framework developed from the Kiel Climate Model. A novel capability of the new system is the ability to refine the ocean model resolution in specific regions of interest in the context of the full coupled model. The authors present a quite comprehensive baseline assessment of the new system run in a variety of configurations including some assessment of the impact of the local grid refinement in the ocean.

I thought the paper was well written and structured, the figures are clear and the results well presented. I am therefore recommending that it is accepted subject to a few minor revisions, mainly to do with clarity.

p.3 l.16 : Should define/reference MPI-ESM the first time it is mentioned.

C1

p.10 l.5 : "eventually" is an odd word here. Maybe you mean "lastly"?

p.10 l.5 : "This choice depends on the validation of the simulated boundary currents". I'm interested in the criteria used. Is it possible to expand on this in 2 or 3 sentences? (Or reference other work?).

p.12 l.8 : "...as well as the dip in global mean temperature during the first part of the 1990s is captured very well by the ensemble means and might be related to the Pinatubo eruption." A bit garbled - better to split the sentence: "...as well as the dip in global mean temperature during the first part of the 1990s is captured very well by the ensemble means. The dip in the early 1990s is related to the eruption of Mount Pinatubo."

p.23 l.3 : "Under pre-industrial forcing, the AMOC shall not show any long-term trend" : I think you mean "the AMOC \*should\* not show any long-term trend".

p.23 l.9 : I found it difficult to understand the sentence beginning "While the southward flow...". Maybe something like this would be better: "While the southward return flow reaches down to the depth of classical upper NADW, the depth of classical lower NADW is not connected to the southward flow any more. This is a typical deficit seen in coarse-resolution OGCMs..."

p.27 l.31 : "inevitable" is a strange word in this context. Maybe you mean "required" or "necessary"?

p. 36 l. 7 : "While FOCI produces a realistic simulation of NH sea-ice distribution and evolution, sea ice on the SH is significantly underestimated. The latter bias is subject to ongoing work and likely related to mixing in the upper ocean." This doesn't tie in with what you said in Section 3.3 where you talk about the warm SST bias and the open-ocean deep convection in the Weddell Sea. If you think upper-ocean mixing is also important in the story of the Southern Ocean sea ice biases you should mention this in Section 3.3 rather than just introducing it in the Conclusions.

C2

p. 38 l. 5 : "Therefor" should be "Therefore".

Fig 3 : The caption needs some work. In particular the description of panels (c) and (d) is wrong/incomplete. Both panels include FOCI-hist and FOCI-chem and should state that (c) is SAT and (d) is 10hPa temperature.

Fig 18 : Still have a question mark in the caption.

Fig A5 : Should probably expand "SW" as shortwave and "LW" as longwave in the caption.

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