

# ***Interactive comment on “Experimental and diagnostic protocol for the physical component of the CMIP6 Ocean Model Intercomparison Project (OMIP)” by Stephen M. Griffies et al.***

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We sincerely thank Wilbert Weijer for his comments and for his encouragement. Here are our responses.

## **Reviewer comment:**

This paper documents the experimental protocol for the CMIP6 Ocean Model Intercomparison Project (OMIP); as well as a recommended suite of diagnostics to analyze the ocean component of OMIP and other CMIP6 simulations. This is a very thorough paper that provides excellent guidance for modeling centers participating in the CMIP6 experiments, as well as a reference for analysts. I found the paper very well-written

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and well-documented. I have only trivial comments and a few corrections, see below, and so I recommend the paper be accepted with only minor modifications.

**Author response:** Many thanks for your encouraging comments.

### **Reviewer comments and author responses**

p. 21, footnote 10: Should g not be added as part of the archive?

→We will consider doing so in the future. The issue concerns the role of static equilibrium sea level and tides, each of which are a consideration for future CMIPs. So adding gravitational acceleration to the CF diagnostic suite is not as trivial as one may think/hope.

p. 29, ll. 24-25, “. . .the first year. . .”: Do you mean initial state instead?

→We mean the first year of the simulation, which is generally taken at the end of a spin up. This point has been clarified in the revised draft.

Section 5.24: I often find the maximum mixed layer depth over a given averaging interval quite useful as well.

→We agree, and have added these two fields (max and min MLD for a month) to the diagnostic request.

Section 6.7: So hfx and hfy will reflect total heat transport, not broken up in individual contributions?

→Correct, as detailed in this section.

Section 6.8: In the hfbasin diagnostics I don't see the contribution by the resolved flow called out. Is the idea that this can be calculated from the difference between the total and parameterized contributions?

→correct.

p. 44, l. 12: . . .should ALSO (?) compute. . .

→agree and corrected

p. 49, l. 6: componeNts

→corrected

p. 51, l. 29: Goldsbrough

→corrected

p. 68, l. 24: remove there

→corrected

p. 79, l. 15: It is my understanding that Dukowicz Smith's a free-surface formulation /does/ allow for changing surface layer thickness.

→From equations (6) and (7) of Dukowicz and Smith (1994), their algorithm assumes a linearized free surface formulation, in which the top grid cell has an upper surface strictly at  $z=0$  rather than at  $z=\eta$ . Therefore, POP cannot conservatively incorporate real water fluxes; it must instead use virtual salt fluxes.

Appendix E: It's probably good to capitalize Kelvin and Celsius.

→According to <http://www.nist.gov/pml/wmd/metric/writing-metric.cfm> we should write Celsius in capital, but Kelvin is lowercse.

p. 105, l. 34: Leeuwen

→corrected

p. 106, l. 8: Carson

→Thanks for identifying the typo. We corrected the reference.

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