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Interactive comment on "Development of a 2-way coupled ocean-wave model: assessment on a global NEMO(v3.6)-WW3(v6.02) coupled configuration" *by* Xavier Couvelard et al.

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This paper describes a two-year experiment with a coupled WW3-NEMO setup. The experiment builds on earlier experiments by Breivik et al (2015) and others who investigated the impact of waves on the mixed layer. The paper is well written and clear.

First, the change from a Dirichlet to a Neumann condition for the TKE flux should be discussed in more detail. It is not clear to me that comparing against an uncoupled run with a Dirichlet conditon is clean. A separate experiment should be run where the uncoupled model ingests a flux in the Neumann form, or alternatively a coupled run where the Dirichlet condition is used to communicate the TKE flux from WW3.

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The integration period is rather short. I think the authors should investigate whether there is sufficient convergence after just two years.

The Langmuir experiment is very interesting as it promises a way forward from the ETAU hack. I would like to see a quantification of how much changing from parameterized Stokes drift (1.6% of the wind speed) to a Stokes drift taken from WW3 gives you. I suspect the most important thing you've done is to chance the factor from 0.15 to 0.30.

Further on the Langmuir experiment, you don't seem to improve the

The Stokes drift discussion is interesting. I suggest you read the appendix of Li et al (2017) where there is a description of the finite volume form of the profile by Breivik et al (2016). Also, the recent paper by Wu et al (2019) discusses the combined impact (quite small!) of the Coriolis-Stokes force and the Stokes drift on tracer advection.

Finally, a quantitative assessment of the relative impact of the various wave-induced processes is needed in order to give the reader an idea of their importance. This applies to the description in Sec 4.2.3 as mentioned below.

Cost: You have run WW3 on half the resolution of NEMO at 20% added cost. Have you considered the added benefit of running the models on similar resolution? I presume this would cost more than twice the standalone NEMO run, so I sympathize with your decision, though.

All told, I would say that after major revision (rerunning the experiments with Dirichlet or Neumann to make a clean comparison) and assessment of the relative importance of the wave-induced effects, this paper should be acceptable for publication in GMD.

Detailed comments:

Fig 2 is a mess. Please explain in detail what is shown in the different panels and refer to those panels in the text. The figure headings are illegible. I am also surprised by the huge difference in average wave height and would like to see a more in-depth

discussion of why this is so.

4.2.2 It is interesting that you have rewritten the Dirichlet conditon to a Neumann condition for the TKE flux. However, I think you should also investigate how this affects the results as you compare against an uncoupled run with a Dirichlet condition.

4.2.3 The impact on MLD and SST does not separate between Langmuir, TKE flux and stress. This needs to be done.

References:

Wu, L, J Staneva, O Breivik, A Rutgersson, A G Nurser, E Clementi, G Madec (2019). Wave effects on coastal upwelling and water level, Ocean Model, 140, p 101405, doi:10.1016/j.ocemod.2019.101405

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