**[GMDD]**

Interactive
comment

# *Interactive comment on* "Representation of the Denmark Strait Overflow in a z-coordinate eddying configuration of the NEMO (v3.6) ocean model: Resolution and parameter impacts" *by* Pedro Colombo et al.

**Anonymous Referee #2**

Received and published: 6 February 2020

I think it is an interesting manuscript that deserves to be published after some editing.

The story, if summarized, is that one should be 'resolving' the topographic slope in the sense that the aspect ratio dz/dx of mesh cells is higher than the slope, and that vertical mesh resolution has to be sufficient to represent the plume (in this manuscript 150 layers provide several points (5-6) across the overflow plume in vertical direction).

1. My main problem with the manuscript in its current form is that this story is presented as something unexpected and not known. This starts from the abstract and is repeated

several times in the text. However, at least as concern the dz/dx ratio, the limitation on this ratio is well known (and authors themselves mention several papers). The second aspect is also general enough to be surprising, of course, the overflow plume has to be resolved vertically, there is no hope on representing the overflow otherwise. The statements like "Contrary to expectations ..." are strange in this context, it is, in contrast, in agreement with expectations.

The value of the manuscript is not in the fact that it finds something new and unexpected ("It is found that when the local slope of the grid is weaker than the slope of the topography the result is a more diluted vein" - Is not this known?), but in exploring and documenting precise limitations for the particular ocean circulation model, which will be appreciated by the NEMO community and very likely by other ocean modeling groups.

I would recommend that the authors look critically at their statements and adjust the manuscript accordingly (the Abstract, introduction, conclusions in the first turn). I do not think the present form is acceptable.

2. Even in higher resolution runs the bottom topography was kept from 1/12 degree case, and question arises as what will happen if the topography were adjusted according to the resolution. I would appreciate some discussion of the aspect of resolving the topography. For example, what would happen if 1/12 degree simulations were run on a smoother topography? This might add some useful insight.

3. The manuscript is well written, however it tends to overdefine and at too many places phrases could be more concise. Some editing would be good at this level, but it is up to authors.

Some small issues (not all)

page 2

line 7 check citation style

Interactive comment

23 'at that resolution' – which one? Can be removed

page 3

line 4 'yield to'???? The entire sentence can be written as:

The first complication arises from the the neglect of vertical acceleration in the hydrostatic approximation leading to misrepresentation ... (see 3 above)

line 30 remove , after (2009)

page 4

lines 8 and 12 'Despite' and then again 'despite'

29 'is presented in' – contains

page 5

line 24 citation style

page 6

line 4 citation style

Caption to Fig.2 an –> and; Surface (a,b) and bottom (c, d) current speed (year 75) in the global ORCA12 (a,c) and regional DSO12.L46 simulations. Only every fourth point is shown....

page 11

lines 4,5 Following the convention for DSO12.L46, the simulations ...

page 14

line 9 Is NEMO different from all others?

line 24 your formula does not express the ratio.

line 28 250 km wide

line 29 when?

page 18

line 1 over-resolving the slope vertically worsens the overflow representation

line 2 there exists or there is

line 7 Which rationale is meant?

page 20

line 13 acceleration? or speed-up (units are of velocity)

line 14 5 - 6 points

---

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2019-272, 2020.