

Ocean Sci. Discuss., referee comment RC1
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Comment on os-2021-41

Anonymous Referee #1

Referee comment on "Rectified tidal transport in Lofoten–Vesterålen, northern Norway" by
Eli Børve et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-41-RC1>, 2021

Review comments to Rectified tidal transport in Lofoten-Verstalen, Northern Norway by Eli Borve et al.

In this work the authors examine tracer dispersal due to tidal processes around the Lofoton-Vesteralen with the motivation of determining the importance of tides modulating the dispersal of cod eggs and larvae from spawning to nursery areas. They focus on two non-linear tidal processes, namely tidal pumping and tidal rectification. FVCOM is run with an unstructured grid 2D setup for tides only and subsequent tracer releases are analysed. The authors then analyse the relative importance of each process in driving the exchange of waters in and out of Vestfjorden through a number of different straits.

The paper is well written, clear and nicely presented. My comments are generally related to the presentation of the results and how they could be made more easily to understand.

Introduction:

L.18 – 21: could do with a few additional references

L 50-65: It would be nice to have a diagram to illustrate this process. You could move

Figure 9 to the intro and refer to it here as it greatly adds to the intuitive understanding of the process.

L 68-83: Again, it would be nice to have the diagram for this in the intro.

Methods:

L 118: Why do you use TPXO7.2? The latest version is 9 and is available as a higher resolution dataset. This is likely to affect your results. By how much do open boundary forcing values differ between the two datasets?

Model validation:

It would be nice to see some numerical values so that the reader can assess the performance of the model in absolute terms. Could you add a table with the amplitudes, phases, and amplitude and phase errors for each station for M2 and K1? You could also report mean errors for each constituent analysed.

Tidally driven tracer transport:

L.177: Why do you show results only for 3 and 4.5 hours? It would be good to see the process through the tidal cycle at e.g. hourly intervals.

Rectified tilde currents:

L.335: I'm not sure this sentence fully makes sense? Which mechanism dominates and is responsible for the net flux or how does each process contribute?

- 343: How will your choice of linear bottom friction impact your results? Is this the same bottom friction used in the tide model? It may be an issue if they are not consistent?
- 375: How does the choice of filter impact the curves? It would be nice to see 1 tidal cycle values as well.
- 440: I'm not sure I understand how you define the topographic length scale
- 445: Where do you define L_B and what is it? How does it differ from L ?

Summary and conclusion:

L.492L 'But not all straits are created equal' – reword to something more specific.

General: Given that your introduction talks about cod quite a lot, the reader feels a little let down in the conclusions. How important are these tidal processes for the dispersal of the Arctic cod?

How do the observed processes compare to other regions in the world and different observations? It would be nice to see this work be put into context of other previous work in this section.

Figures:

Figure 2: It would be nice to have more information with this figure: e.g. (a) how do the two figures differ? (I guess it's the phase of the tide); (b) the velocity front is identified – why is this relevant and what does it mean for this study?

Figure 4: how about plotting observed values on top as shaded circles on top of the model results? Also, plot against latitude and longitude rather than distance.

Figure 6, l.5: do = does

Figure 7: Could you take your panels a bit further south? At 10.5 hours you are missing part of the incoming waters

Figure 9: Panel b: Why is us Ae in the sink region? Should it not be in the jet? It would be nice to illustrate all of the length scales on this plot (as far as possible)

Figure 10: Not all marker labels are visible. Also, you could increase the intuitiveness of the plot by adding labels such as an arrow with 'more asymmetric' along the axis y axis and doing the same for the x-axis.

Figure 11: Mention what each non-dimensional parameter is in words either on the axis or in the legend.

Figure 13: What do you mean by 'sets of closed contours'? Could you show these on a map?

Figure 14: It would be nice to add the positive/negative vorticity gains in the diagram – it would make it even more intuitive. You could also explicitly include the words squeezing and stretching in the diagram.

Minor comments:

Generally, watch out for the use of commas. E.g. Here, ... In this study,...

l.16: rises = raises

l.54: is = are

- 59: what = which
- 102: no comma needed
- 425: 'is down the' = is down to the
- 520: appears = appear