



EGUsphere, referee comment RC1
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Comment on egusphere-2022-41

Anonymous Referee #1

Referee comment on "Moana Ocean Hindcast – a > 25-year simulation for New Zealand waters using the Regional Ocean Modeling System (ROMS) v3.9 model" by Joao Marcos Azevedo Correia de Souza et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-41-RC1>, 2022

General comment:

The manuscript entitled "Moana Ocean Hindcast – a 25+ years simulation for New Zealand Waters using the ROMS v3.9 model" by Souza et al. presents an extensive model-data comparison of a high-resolution ocean model for the New Zealand region. The comparisons highlight the improvements of the high-resolution simulation over the global data-assimilative model used for boundary conditions. The manuscript is well-structured, moving from the large-scale to the coastal ocean, however it is my opinion that minor changes are needed before this manuscript can be considered for publication.

I appreciated the manuscript for being well-structured and for trying to present a substantial amount of information in a succinct way. However, in doing so some of the results aren't explored in any detail and some of the model-data comparisons are glossed over (e.g. SST). The Conclusion sections is a bit disappointing. This section could be improved by a) highlighting the strengths and short-comings of the model and b) by including some of the ways in which the model can be improved on.

Specific comments:

Page 1, Line 20: The authors state that the New Zealand fishing industry is expanding to include coastal aquaculture. New Zealand already has extensive coastal aquaculture activities based around three marine species: salmon, mussels and oysters. However, the Government's Aquaculture Strategy aims to a) expand and improve the existing aquaculture activities, b) advance land-based aquaculture and c) extend aquaculture into the open ocean by 2035. The aquaculture industry in New Zealand are already exploring moving further offshore (so-called open ocean aquaculture) due to coastal warming and the impacts of marine heat waves.

Page 2, Line 46: The statement "revolutionize the understanding and prediction of ocean processes in New Zealand" seems to be a bit of a bold claim. Regional models like the one described here are well-used to understand ocean processes in a range of environments. I agree with the author's underlying view that this simulation will significantly contribute to improve our understanding and predictability of ocean processes but to claim that it will be revolutionary is an exaggeration.

Page 2, Lines 48-49: What do the authors mean by "7 days forecasts daily"? Were daily forecasts created for a period of 7 days?

Page 3, Line 74: Please clarify what you mean by mass structure

Page 6, Line 104: Please be more specific with respect to the local sources that were used for the model bathymetry.

Page 6, Line 107: The authors mention that PGE associated bottom velocities were used to determine which grid cells required bathymetric smoothing. Since this is not a commonly used method in ROMS, please provide more details about this method.

Page 6, Line 118: You use Souza et al. (2020) to justify using CFSR for the atmospheric forcing. However, Souza et al. (2020) only compared the ocean component of CFSR to other ocean models and did not look at the atmospheric component. Is there any evidence that the atmospheric component of CFSR out-competes other atmospheric reanalysis products such as JRA-55 in the New Zealand region?

Page 10, Lines 208-209: Please be more specific with regards to the location of the high and low SSH centres and the large-scale currents indicated by these SSH centres?

Page 12, Line 230: The authors note that it is interesting that the hindcast reproduced the 2018 temperature peak. This suggest that they didn't expect the model to reproduce this event. Please elaborate why this is particularly noteworthy.

Page 12, Line 234-235: The authors mention that the bias pattern is similar to that found for GLORYS in Figure 7 of Souza et al. (2020) but then don't give an explicit description of the biases in the Moana Ocean Hindcast shown in Figure 6.

Page 13, Lines 238-240: While (a) and (b) **are the result** of intrinsic limitations of the model. Also, the section number for the section addressing (c) is missing. Point (c) is listed as "issues related to the observations of SST from satellites close to the coast and in a region notorious for its high cloud coverage", yet Section 3.4.2. which I suspect is suppose to look at this limitation in more detail only looks at daily sea surface temperature at a number of coastal stations around New Zealand, and doesn't examine the limitations of satellite SST close to the coast.

Page 13, Table 3: RMSE and MAE are standard statistics used in model validation but are often calculated in different ways. Furthermore, maximum-absolute-error is not a commonly used statistic. I recommend that the equations for all the statistics presented in the manuscript are included.

Page 14, Line 251: Was the model output used for the comparison co-located in space and time with the temperature and salinity profiles or was the time-averaged model output extracted at the location of the profiles?

Page 14, Line 259-260: The phrasing makes this sentence hard to understand. I think the authors are trying to say something along the lines of "Despite the difficulty in asserting the reasons behind such differences, the differences seem to be in part related to the surface forcing from CFSR and in part due to the boundary conditions from GLORYS.

Page 17: The section on MLD really gives a nice description of what is observed in the observations and how the model differs from these observations. It would have been really good if this same approach was used throughout the manuscript.

Page 19, Lines 309-311: It is clear from the statement here that you are cognisant of the fact that volume transport calculation are sensitive to the horizontal and vertical extent over which it is calculated. Was any effort made to try and match the sections used here to the spatial extent over which transport has been calculated in the literature for a better comparison?

Figure 11: Can you provide any explanation for some of the large differences observed between the observations and the model (e.g. stations 10-15 in subplot G)?

Page 27, Line 425-426: "Satellite-derived annual cycles show coastal regions around New Zealand differ from..." This sentence is hard to understand due to the phrasing and requires some clarification.

Page 28, Line 431-432: Here you claim that additional analysis of the coastal SST time-

series are needed to understand the latitudinal decrease in SST and this might certainly be the case. However, one contributing factor to the latitudinal decrease would be a change in the background surface water masses as one moves from north to south with warm subtropical water in the north and cooler sub-Antarctic water in the south.

Page 28, Line 444: "The model results outperform the global models in the coastal region". This is a very generalised statement that can't really be backed up by any of the results presented in the manuscript. The results presented here only compares the temporal mean SSH and variance of SSH of the Moana Ocean Hindcast to that of one global model, GLORYS.

The above comments and recommendations along with some technical comments are provided in the attached pdf.

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-41/egusphere-2022-41-RC1-supplement.pdf>