

**General comment:**

I commend the authors for adequately addressing the major comments from the first round of reviews. However, it was a bit disappointing to note that none of the technical comments in the pdf were addressed. The amendments done thus far has definitely improved the manuscript, putting it one step closer to publication. It is my opinion that some minor changes and technical corrections are required before this manuscript can be considered for publication.

**Specific comments:**

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 the claim that it will be revolutionary at this stage lacks supportive evidence.

Page 2, Lines 48-49: Rephrase “7 days forecasts daily” to make it more obvious that daily forecasts are created for a period of 7 days.

Page 18, Lines 328-330: The phrasing of this sentence makes it very hard to understand. The description in Table 5’s caption makes much more sense. This sentence should be rephrased so that it is easier to understand how the transport was calculated along the sections.

Figure 10: Even though it is stated in the caption that section 8 can not be displayed on the Figure, I think more effort should be put towards indicating where the section is located. Without this information the reader has no idea of where the Cook Strait section is located.

Page 22, Line 360: The model volume transport calculated for the ECC south section is significantly higher than that reported by Fernandez et al. (2018). How does the model volume transport compare to that of Fernandez et al. (2018) if calculated along similar sections as those used by Fernandez et al. (2018)?

**Technical corrections:**

Page 2, Line 25-26: Move the second set of references (e.g. Chaput et al. 2022; Silva et al., 2019) to the end of the sentence.

Page 2, Line 29: **an** important source

Page 2, Lines 48-49: I suggest changing ‘please visit the project website for details’ to ‘details available on the project website’

Page 2, Line 55: replace bibliography with literature

Page 3, Line 58: Change Marine Heat Wave to marine heatwave as used throughout the rest of the manuscript.

Page 3, Line 59: Remove the quotation marks around “sea surface temperature”

Page 3, Line 60: **n**orth of the Subtropical Front

Page 3, Line 61: Please provide the name of this western boundary current

Page 3, Lines 75-78: Please provide references to substantiate these statements.

Page 3, Line 76: **Three** Kings Islands

Page 3, Line 76: Change mass structure to density structure

Page 3, Line 80: Change following publications to subsequent publications or future publications.

Page 4, Line 90: Replace semi-colon between references with a comma

Page 4, Line 94: Unbold 5km resolution

Page 4, Line 96: Chatham Islands

Page 4, Line 96: **three** New Zealand main islands. Single-digit numbers should preferably be spelled out.

Page 4, Line 97: **western** boundary

Figure 1: **Puysegur**

Page 6, Line 103: Unbold 50 vertical layers. Also, ideally a sentence should not start with numerical digits but if it does then the number should be written out.

Page 6, Line 1227 (Lellouche et al. 2021)

Page 6, Line 128: 1 day<sup>-1</sup>

Page 6, Line 128: Change warm-up period to spin-up period. Did the model reach a steady state after just 1 year's integration? I suspect that it did but it did.

Page 7, Line 137: **four** readily available global ocean **reanalyses**

Page 7, Line 139: **four** of the

Page 7, Line 145: SST was defined in the introduction so there is no need to do it again here.

Page 7, Line 149: **the** Mercator Ocean

Page 7, Line 150: can be determinant **factors** for the representation of the **the** sea surface height

Page 7, Line 155: representation of the **the**

Page 7, Line 165: The Moana Ocean Hindcast **hindeast**

Page 8, Line 175: Table 1, and a description **of each is** provided in **the** next subsections

Page 8, Line 184: SST has already been defined thus no need to define it again.

Page 8, Line 191: Change from to including

Page 8, Line 192: Replace the semi-colons with commas.

Page 8, Line 193: Change forward to onward

Page 9, Line 202: collected by **the** New Zealand's

Page 10, Line 209: (NZ-OOS; **O**'Callaghan et al., 2019)

Page 10, Line 217: Add the acronym for the East Auckland Current here.

Page 10, Line 220: **e**specially in the region

Page 10, Line 220: If the acronym EAUC is included in line 217 as suggested then you can just use the acronym here.

Page 11, Lines 226-227: Combine these two sentences: leading to stronger variability, **and** less is left

Page 11, Line 234: Unbold 40 days

Page 11, Line 235: altimetry maps **at** the equator

Page 11, Line 236: days **around** New Zealand

Page 11, Line 238: pattern is **the** similar

Page 11, Line 241: **inter-annual** variability

Page 11, Line 242: variability **at**

Figure 3, Caption: from the free-running Moana Ocean Hindcast (left), the data-assimilating

Figure 4: In Figure 3, the first panel was the Moana Backbone followed by GLORYS and then AVISO. It would make it easier to follow along if the order is kept the same between figures.

Figure 4 caption: GLORYS

Page 13, Line 244: events with duration **on** the order

Page 13, Line 253: While (a) and (b) **are**

Page 13, Line 256: These **two** regions

Page 13, Line 261: summarized in Table **4**

Page 13, Lines 262: Please rephrase this sentence so that it is clearer that SSH errors are similar to that from global simulations, while SST performs better. It will also help if the statistics for GLORYS is included in Table 4.

Figure 6, Caption: These relate to the fact **that**

Page 15, Lines 269-273: This seems a bit out of place here. I would suggest adding this information in a more succinct way (e.g. only the formulas) into the caption of Table 4.

Page 15, Line 281: with values **in** generally under 1°C

Page 15, Line 282: **below** the mixed layer. These compare well **to** with

Page 15, Line 284: As shown in the RMSE profile (**Figure 7**)

Page 15, Line 288: large scale water **mass** structure

Figure 7 caption: Moana Ocean Hindcast **simulation** in relation to... A zoom **in** of the

Page 16, Line 302: Indicate the location of the plateau and other features mentioned in the text on Figure 1.

Figure 8: At first glance it is a bit confusing to have the depth-ranges used to generate the subplots as the label on the y-axis when in fact the y-axis represents latitude.

Figure 8: Caption: The differences are divided **into** slabs... deep waters (1000-2000m – **bottom** row). A geographic distribution pattern is evident in the model **result** differences

Page 18, Line 310: model's

Page 18, Line 314: (Elzahaby et al. 2021)

Page 18, Line 317: Chiswell et al. (2015) **and** Stevens et al. (2019)

Page 18, Lines 336: **comparisons** with estimates presented in the literature. We limit **the** model assessment

Page 18, Line 336: Change relative to corresponding

Page 18, Line 337: carried **out** to date along the eastern margin of **the** NZ

Table 5: The offshore sections need to be labeled A-D to match the sections in Figure 10 and section 4 should be changed to **West** coast of North Island. Also, the Cook Strait section is not indicated on Figure 10.

Page 21, Line 344: Change Following to Below

Page 21, Line 345: "remote based" I suggest changing it so that it is clearer that it is volume transport calculated from remotely sensed data.

Page 21, Line 347: Include a cross-reference to Table 5 for the transports reported here.

Page 21, Line 351: using **a** significantly

Page 21, Line 353: along **the** same

Page 21, Line 353-354: This sentence is hard to comprehend. I suggest rephrasing it to something like "These values are also consistent with a volume transport of 8-15 Sv derived from Argo float trajectories in the same region (Bowen et al., 2014)."

Page 21, Line 357: Add a cross-reference to Table 5 for the transports reported here.

Page 22, Line 375: same location as **for** the section

Page 22, Line 376: CTD **surveys**

Page 22, Line 377: carried **out** between ~~years~~ 1993 and 2000

Page 22, Line 382: cross-sectional transports **through** the Cook Strait

Page 22, Line 384: Include a cross-reference to Table 4 for the transports reported here.

Page 23, Line 395: Everywhere else throughout the manuscript it is referred to as the Moana Ocean Hindcast. I suggest changing ROMS hindcast to Moana Ocean Hindcast to keep it consistent throughout the manuscript.

Page 23, Line 397: Results from **the** harmonic analysis

Page 23, Line 398: constituent; Figure 11)

Figure 11: The black and red markers are different sizes with the red markers larger than the black markers. Is there a reason for this? If not, then I suggest making the markers the same size.

Page 24, Line 407: Root-Mean-Square-Error (RMSE). Abbreviations should be written out at the first instance where they are used and not towards the end of the manuscript.

Page 24, Line 412: The RMSE of **the** phase ~~error~~

Page 24, Line 413: The **phase of the** semidiurnal (diurnal) constituent ~~error~~,  $K_2$  ( $P_1$ ) had an RMSE **phase** of

Page 25, Line 416: indicator of ~~such~~ oceanic processes **such** as

Page 25, Line 420: Everywhere else throughout the manuscript it is referred to as the Moana Ocean Hindcast. I suggest changing ROMS hindcast to Moana Ocean Hindcast to keep it consistent with your vocabulary.

Page 25, Line 420: time series from **three** locations

Page 25, Line 426: denoted **by** MSE

Page 25, Line 429: ~~for example~~, North Cape ( $SLA_{TG12}$ , not shown),

Page 26, Line 432: Was the modelled data extracted at the grid cell closest to the station locations? If so, this should be included in the manuscript for both the temperature and sea level stations.

Page 26, Line 439: Portobello; Figure 13 G, I)

Page 28, Line 451:452: I suggest rephrasing this sentence to make it clearer that the model under-estimate the seasonal cycle (i.e. cooler (warmer) temperatures in summer (winter) than observed) at these stations.

Page 28, Line 454-455: I suggest rephrasing the second part of this sentence e.g. is potentially unresolved in a regional-scale oceanic model of this resolution due to land-air-sea processes.

Table 7 caption: I recommend splitting the last sentence of the caption in two.

Page 28 (0), Line 468: unbold Moana Ocean Hindcast

Page 28 (0), Line 472: series of **analyses**

Page 28 (0), Line 473: Replace shore with coastal temperature and tidal

Page 29 (1), Line 482: **calibrated** for the New Zealand region

Page 29 (1), Line 482-483: I suggest rewriting this sentence to say that it could lead to improvements of the model solution on the continental shelf.

Page 29 (1), Line 485: Remove the dash at the start of the sentence.