

Review of the manuscript entitled « Dynamical reconstruction of the upper-ocean state in the Central Arctic during the winter period of the MOSAiC expedition” by Kuznetsov et al..

The authors present a reconstruction of the dynamics based on the nudging of the MOSAiC data in a high-resolution model (FESOM-C). The goal of the paper is to demonstrate the usefulness of this modeling tool to analyze the MOSAiC data and to give a better description of the mesoscale and sub-mesoscale dynamics in the central Arctic.

The authors have developed an interesting tool to interpret the MOSAiC dataset, however, the analysis of the model simulation is limited and could be more detailed. The authors point to the bimodal vertical distribution of the EKE. As mentioned by the authors this bimodal distribution was already described in previous studies, the authors should specify the novelty of their result. For example, the origin of the north-south distribution of the EKE could be detailed. The authors describe the properties (size, depth, ...) of an anticyclonic eddy and a cyclonic eddy and their interaction. The authors might extend this analysis to all the eddies of the area to give a broad view of the distribution of the properties of the eddies and discuss how it compares with previous studies. Furthermore, the interaction of the eddies remains quite qualitative and might be more detailed (implications for the evolution of the properties, ...).

Specific comments.

L 162. The initialization of the coarse resolution model could be specified in this paragraph.

L. 219-220: I do not really understand this sentence. Could the authors clarify?

L. 248: distance along the vertical?

L. 251-252. What do the authors mean by similar manner? According to the authors response to reviewers, I thought that the C_2 was constant with depth. Is it correct?

L.253: The model is nudged to ITP profiles in the same way as the PS and OC-CTD profiles?

L 256. Add a reference to fig 2e.

Fig 2. 2b: d_i is the inverse of the distance?

L. 289: The duration of the free run is mentioned in Fig 3, but it should also be specified in this paragraph.

Figure 5. fig 5b and 5c have been inverted? Check the legend: Blue line is salinity and orange line temperature.

Section 3.2. This section has to be checked carefully. North and East have been inverted.

L.314-315: “a decrease in ML salinity spatial variability”? This sentence is unclear to me, could the authors clarify?

L.317: Could the authors indicate the halocline depth.

L.318: “ML depth increases”. I would rather say that the ML decreases. Is it correct?

Figure 6: Check the legend (East and north inverted).

L. 319 “Increase”. Change in decrease?

L. 323. “Low salinity (high density)”?

L. 343-344. Could the authors discuss the origin of the difference of the EKE distribution between the northern and southern parts of the domain?

Figure 7: The figures are not easy to read. Larger plots might help.

Figure 8 What do the figure 5, 10, 15, 20 mean? Could the authors label the anticyclonic and cyclonic eddies that are discussed?

L. 370: "obseervations" : observations.

L. 371. Could the authors correct the sentence?