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Interactive comment on "Effects of lateral processes on the seasonal water stratification of the Gulf of Finland: 3-D NEMO-based model study" *by* R. E. Vankevich et al.

Anonymous Referee #2

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General

The paper addresses the study of the processes relevant to the stratification in the Gulf of Finland by means of a sophisticated 3D model (NEMO). The question is relevant and completely fits to the Ocean Science scope. The novelty of the paper lies, to my mind, in the use of NEMO to assess the relevance of submesoscale lateral advection processes in the stratification of the GOF. Two setups with different horizontal resolutions and several convective mixing parameterizations are used in the analysis. The objectives, methodology and assumptions are clearly exposed, and the numerical experiments are described in detail. Authors honestly recognize the lack of data, and the

limitation it imposes to the study. The results are properly supporting the conclusions. Overall the quality of the manuscript is good. This study is worth to be published and is going to be of interest to the wide OS community. However, there are a number of issues that need to be fixed/improved before publication. I think that a moderate review will make the necessary improvements, to a big extent cosmetic.

The paper narrative is somehow obscured by the English writing, which needs a substantial improvement. The discussion falls quite in the short side. The role of horizontal resolution in submesoscale processes is not discussed (rather it is discussed the impact of submesoscale processes (upwelling/downwelling) in the UML structure). Being the lack of field data a problem, a deeper discussion on model results is required. One of the paper's conerstone is the use of MODIS SST data to evaluate the performance of the different runs in reproducing the stratification. However, it is not enough justified in my oppinion. This interesting approach demands more argumentation.

Some other minor comments/remarks:

I suggest adding a figure (the first one) with the geographical setting.

P2396 L6 "were" instead of "where" L17 add "water" after "fresh"

P2397 L3 delete "the" before "three" L15 difficult to assess "best existing", I would suggest "most advanced" L15 delete "scientific" L16 which mean temperatures are you referring to? Daily mean, monthly mean,...?

P2398 L11 add "the" before "thermohaline" L13 "believe" does not sound scientific, I suggest "hypothesize" L15 add "that" before "submesoscale" L17 "contribute" instead of "act" L17 delete "ocean" L21 Which studies are you referring to? Cite, please. If they are Sokolov and Zhurbas change the place of the reference.

P2399 L2 "estimating the contribution" instead of "learning how"..."contribute" L7 "The traditional" instead of "Traditional" L15 delete "a" before "many" L17 "for" instead of "on"

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P2400 L17 horizontal resolution better in degrees L22 "...salinity fields from the..." L23 "...the entire GOF with the open..."

P2401 L10 Reword the sentence as "Convective mixing can be parameterized in NEMO by (1)..." L11 Expand the meaning of TKE (first appearance) L13 Expand the meaning of GLS L15 "for" instead of "to a model of" L24 and Eq (1) Is it the same lc than l_ε?

P2402 L4 "specified" instead of "designed" L14 "additional condition" better than "extra assumption" L19 "displace" instead of "travel" Eq (7) "," before ldwn Eq (7) Is it e3= 1 m for all k-levels?

P2403 Eq (9) "," before ldwn L8 delete "its" L11 Not very clear what authors pretend to say. Could it be better "...arbrtrarily increases..."?

P2404 L14 "was" instead of "were"; 1st and 31st L15 add "surface" before "heating"

P2405 L4 delete "stated" L6 Do you mean hypothetical? Fig.1 Show the N-S or indicate Estonian and Finnish coasts.

P2406 L25 "difference" instead of "gradient"

P2407 L9 In page 2395 it was University, not Institute. L13-L14 I guess there are longitudes, not latitudes

P2408 L25 "pattern" instead of "paten"

P2409 L10-L11 "turbocline" a few times L12 Fig 6 captions indicate different dates

P2410 L3 add "is" before "manifested" L16 Is it true annual cycle?

P2412 L4 units for viscosity and diffusivity values?

P2415 Umlauf and Burchard (2005) is likely to be Cont. Shelf Res.

Interactive comment on Ocean Sci. Discuss., 12, 2395, 2015.