Geoscientific
Model Development
Discussions

Interactive comment on "Assessment of the Finite VolumE Sea Ice Ocean Model (FESOM2.0), Part I: Description of selected key model elements and comparison to its predecessor version" *by* Patrick Scholz et al.

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The paper by Scholz and co-authors is a careful description of FESOM2.0, including the vertical coordinate, free surface formulation, parameterizations, and comparisons to FESOM 1.4. These details are very useful to fellow ocean modelers, like me, because it provides both documentation of the model and, more importantly, the developers' reasoning behind those choices. The scientific significance, quality, reproducibility, and presentation are all high, so I am recommending publication by GMD. English writing is good, but I've included some corrections below. Plots are well done and nicely

labelled.

I am very impressed with the performance improvements in FESOM 2.0, and excited to see an unstructured-mesh model that has throughput that is comparable to structured models. Thank you for the explanation of the reduced scalability of FESOM 2.0. This can typically be described by a certain minimum 'vertices per core', below which communication dominates computation. For your Fig 19, it looks like the full model has good scaling to 0.64M/2304cores = 270 vertices/core. Please comment in the text if that rule of thumb holds across meshes, i.e. we expect that meshes with more vertices can scale well to a higher number of cores.

Fig 19: This figure can be greatly improved. I much prefer simulated years per day on the left, which is a simple calculation, but allows for comparison across models at a glance. Your current unit does not tell me the throughput. Number labels on left should be standard log intervals (0.1, 1, 10) and not 5 digits long. I prefer to have light grid lines behind to follow data points across. It's also very useful to put a dashed line behind all of the data lines to show perfect scaling.

Line 424: A diagram of the tetrahedral elements and prismatic elements would be very helpful, and show at a glance what you are explaining with text here. You could show the array indexing for each version below the sketch.

Fig 20 is very nice, and an artistic representation of your mesh development. I know this is diagrammatic, but the dark colors make the text impossible to read. I would lighten up the colors. Simplify the text in your circles – remove the tilde, and use 2 sig digits only, like 87K, 910K, 3.1M, 16M etc. Put only a few words below, like "1 km Arctic".

Small items: line and text correction

27 have been -> were

28 taking the -> requiring

35 development of new generation ocean -> development of this new generation of ocean

45 In the recent -> In recent

45 came to the focus -> came to be the focus

65 ALE; Ringer -> Please change to Petersen 2015, which is where ALE coordinate is presented

67 allows to utilize plenty of -> allows a choice of

67 like -> such as. (or including)

73 part of the progress made so far. -> the progress to date

80 medium-sized (add hyphen)

105 a medium-sized

138 Peterson -> Petersen (-en is correct)

154 Since in -> With the

154 than in zstar case it -> than in the zstar case, so it

157 onto -> on

165 linfs both, -> linfs, both

181 stronger -> strongly

254 'gradually switched off': Please specify if you use a ramp or tanh, what lower resolution is where GM is effectively off, and if Bolus/Redi are treated the same way.

265 within same -> within the same

269 especially seen -> particularly visible

C3

306 Align -> The behavior aligns

371 ref is bold

433 configurations -> configuration

510 Part of ... -> These differences result in part from

559 in an own -> in a separate

559 can be -> may include

C4