

Interactive comment on “Advanced parallel implementation of the coupled ocean-ice model FEMA0 with load balancing” by Pavel Perezhogin et al.

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The authors present an interesting approach to partitioning the regular grid ocean model, that allows to implement code parallelization in an efficient way by distributing the load between CPU cores in a balanced way. The approach has an advantage of relatively simple implementation, that requires small amount modifications to the original non-parallelised code.

The paper is an interesting contribution to the field and can be published after minor revision.

C1

Major comments:

The two step procedure of first dividing the model domain into small blocks and then redistributing those blocks between cores was not really clear to me at first and should be better communicated. It would be helpful for uninitiated readers if you can mention earlier on that the requirement is to preserve the structured nature of the code. So your partitions can't be of arbitrary shape, like in unstructured mesh models, but should be constructed out of small rectangles. I would suggest creating a schematic that shows all the steps of the procedure - splitting into so called blocks, fitting the Hilbert curve, distributing the blocks among CPU cores and finally allocating "shared" arrays. Of course it's not possible to demonstrate with 128x128 blocks you use for a realistic model, but something like a 10x10 schematic representation would do the job.

A bit more details on how the partitioning handled in the model setup would be appreciated. Does the partitioning created by the library and then read by the model? Or it's computed each time. If the latter is the case - do you guarantee that the partitioning will be the same each time the model is run?

Minor comments:

Line 23: "adjusted to the White Sea Chernov (2013), Chernov et al. (2018)"

- You forgot parenthesis.

Line 28:"(i.e., not sigma coordinate and so on)."

- Just delete it, you don't need this clarification.

Line 28:"In case of significantly variable depth, this "integer depth" may also vary, see figure 1."

- I think I understand what you are trying to say here, the number of levels vary with depth, but it's not clear why depth should be "significantly variable". Please rewrite to make it clearer.

C2

Line 30

- what balancing (I assume you mean balancing of model computation)?

Line 39: "distributed using the METIS Karypis (1998)"

- you need parentheses around citation in this case. Please double check all your citations.

Line 40: "to make the code library-independent"

- my understanding is that you create a separate library for partitioning, so at the end it depends on the library, it's just your library? :)

Line 57:"initial distributions"

- of what? Please be more precise.

Line 59:"demonstrate any important features"

- please rephrase, maybe give some examples.

Line 66

- Please provide details on the type of advection you use.

Lines 68-73.

- Please provide references for sea ice dynamics and thermodynamics.

Line 77:"more shallow than it really is"

- any references to that?

Line 102

- What do you mean by subdomain? Number of blocks that belong to one core? sub-domain in computational domain, like a bay? Please define.

C3

Line 129:"Let us introduce two baseline partitions:"

- change to "We have implemented two baseline partitions"

Fig. 2:"Black rectangle corresponds to a "shared" array"

- change to "Black rectangle on figure for hilbert3d partition corresponds to ..."

Line 151:"The shared array size is shown..."

- Change to "An example of the shared array size..."

Line 189:"Simulations were performed for three model days"

** and then in Line 192

"launched on 993 CPU cores for 30 days"

- Please clarify.

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C4