

## ***Interactive comment on “The Louvain-la-Neuve sea ice model LIM3.5: global and regional capabilities” by C. Rousset et al.***

### **Anonymous Referee #2**

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The authors present the new version of the LIM sea ice model, document the improvements in this version and validate the model in a global a regional setting. The paper is well written and adequately documents the new version of the model. The English of the paper needs some minor improvements in places but I recommend the paper for publication subject to some minor revisions.

#### General Comments:

1) It would be useful if the authors, when describing the model, compared and contrasted its various aspects to the other state-of-the-art sea-ice models. This is especially true of the vertical halodynamics which differ significantly with other models and is one of the more advanced features of LIM.

C1161

2) The authors should describe the effect on the simulation results that moving from the 3.0 to 3.5 version of LIM has. Given these changes were mainly solver changes I would expect the effect to be small but it would be nice to have this discussed.

3) Some small discussion should be given on why this is v3.5 and not v4.0. Was left wondering what happened to 3.1, 3.2, 3.3, 3.4...

#### Specific comments:

Pg 3404, Ln 2: "novelty is" -> "novelty presented is"

Pg 3404, Ln 7: "enables to": incorrect English

Pg 3404, Ln 8: "online inspection ... of the code". I don't understand this sentence.

Pg 3404, Ln 14: "and is found ... done." -> "and is found to be reasonably realistic, although no specific tuning was performed."

Pg 3406, Ln 13: "moment-conserving scheme" -> "moment conserving advection scheme"

Pg 3406, Ln 14: "LIM2 as it was" -> "LIM2 when it was"

Pg 3408, Ln 3: "horizontal diffusion": Was confused by the addition here until it was revealed much later to only be numerical in nature.

Pg 3410, Ln 4: "usually 50%": When would it not be 50%?

Pg 3411, Ln 7: why is  $L=1m$ ? Whats the justification for exactly 1m?

Pg 3411, Ln 15: Don't start a sentence with "And".

Pg 3413, Ln 14: "Brine drainage ... ocean salinity.": There is no exchange of water mass in the model maybe but surely there is in reality. Be clear with the distinction.

Pg 3413, Ln 17: "neighbor" -> "neighbour": British English

Pg 3414: Seems section 3 should be renamed as something like "Changes in LIM3.5"

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since section 3.3 doesn't fit with the title to section 3.

Pg 3414, Ln 5: contributions to what?

Pg 3414, Ln 11: "however" -> ", however,"

Pg 3414: There is strange use of tense in section 3.2.

Pg 3414, Ln 24-25: It wasn't immediately clear that the authors were going to discuss how the scheme doesn't conserve momentum. Perhaps adding "As discussed next..."

Pg 3415, Section 3.2: The authors don't seem sure what CICE does in this situation in terms of conservation. A personal communication would seem to be in order if it isn't apparent in any CICE manuals or papers.

Pg 3415, Ln 15: "but is hardly adaptable": somewhat aggressive phrasing.

Pg 3416, Ln 1: "In and Outputs" -> "Inputs and Outputs"

Pg 3416, Ln 2: Remove "completely"

Pg 3416, Ln 7: "possibilities of variables manipulation" -> "possibilities for variable manipulation"

Pg 3416, Ln 9: "performance to output data" -> "performance when outputting data"

Pg 3416, Ln 10: "File system writing is totally overlapped by computation" -> "File system writing is performed concurrently with computation."

Pg 3417, Ln 6: "no direct observations" Don't know what this means given the existence of icesat, cryosat, submarine data etc.

Pg 3417, Ln 21: "to low an" -> "to too low an" (although this sounds clunky it is more correct English, you might want to change the whole sentence).

Pg 3417, Ln 21: "heat supply by" -> "heat supply in".

Pg 3418, Ln 5: "too strong a vertical ocean mixing" -> "too strong vertical ocean mixing"

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Pg 3418, Ln 6: "classic" -> "common"

Pg 3418, Ln 23: "allow to split" Not correct English

Pg 3419, Ln 10: "slightly up to ": Don't understand this

Pg 3419, section 3.4.3: Is there really that much snow-ice formation in the Arctic in reality?

Pg 3420, Ln 12: "way similar" -> "similar way"

Pg 3420, Ln 23: "The category filling ... was used." Clunky sentence - reword.

Pg 3421, Ln 7: "recorded": when?

Pg 3421, Ln 10: "role for climate" -> "role in climate"

Pg 3421, Ln 17: "uniform levels" -> "uniform ocean levels"

Pg 3421, Ln 24: "\kappa-\eta" -> "The \kappa-\eta"

Pg 3421, Ln 23: Why was this third order scheme used instead of FCT?

Pg 3422, Ln 10: "The opening of polynyas is generally well represented" In what sense?

Pg 3422, Ln 24: "globally": Strange use of word. Maybe: "while it is generally weak in the Arctic basin"

Pg 3423, Ln 9: "considerably evolved" -> "evolved considerably"

Pg 3423, Ln 10: "were developed" -> "have been developed"

Pg 3423, Ln 10: "coexist up to now" -> "have coexisted up until now"

Pg 3423, Ln 12: "LIM2 was the reference model so far" -> "LIM2 has been the reference model to date."

Pg 3423, Ln 20: "code is changed" -> "code was changed"

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Pg 3423, Section 5. As noted above tense is not used well in this section.

Pg 3423, Ln 21: "which enables to discriminate": not correct English

Pg 3424, Ln 7: "showed" -> "present"

Pg 3424, Ln 27: "is yet to achieve" -> "is yet to be achieved"

Figure 2: "CICE and used ... is represented" -> "CICE, which is used in the former version 3.0 of LIM, is represented"

Figure 3: If you use "delimits" the sentence should be something like "The white line delimits the 15% ice concentration region." Or "The white line signifies the 15% ice concentration contour".

Figure 5: "at the time of the maximum": -> "at the time of maximum"

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Interactive comment on Geosci. Model Dev. Discuss., 8, 3403, 2015.