The authors have made considerable efforts to implement the requested changes from the first round of reviews. I believe that the clarity of the message is better conveyed by the restructuring of the manuscript and the overall English improvements. The introduction is now complete with a well written state of the art, and the place and originality of the present study -in particular, with respect to previous publications by Beyer et al. 2018, has been more explicitly emphasized throughout. The additional figures are helpful, and the occasional rework of existing ones appropriate. Section 3 is also much easier to follow, with a clearer description of the chosen test cases backed up with proper references.

I believe the quality of this preprint is very close to being suitable for publication; however, I would still recommend a couple of "major" improvements beforehand.

First, I find that Section 2.2 still suffers from vagueness; and contains superfluous information that would be better merged with the Appendix "workflow": from l. 154 to line 168, not a lot is said that is going to help in the understanding of the rest of the paper. Instead, and in preparation for the discussion of Section 4.3, I think this would be a good place to provide more details about the model's implementation. For instance, the sentence starting l.150 "We designed the grids and kernels of CUAS-MPI…" should be elaborated upon. Can you provide more details about these "grids" that you design ? Is it an original storage feature or does it rely entirely on PETSc? In the same fashion, the paragraph starting l. 177 could be more descriptive. You could also be more technical about what "CUAS-MPI system kernels" versus "CUAS-MPI system matrix" contain, and what PETSc feature they rely upon/use.

Indeed, being more descriptive in what you coded versus what PETSc is eventually in charge of would help make the analysis of Section 4.3 less generic: while I appreciate that CUAS-MPI is "an entirely different model simulating another compartment of the Earth system (than what is presented in Fischler et al., 2022)", I strongly disagree when the authors state that conclusions drawn from this previous paper do not apply here –unless they can provide a more detailed analysis of the culprit behind the observed throughput and scalability limits. An analysis culminating with the three paragraphs starting l. 347, incriminating the loss of performance "to the increasing communication overhead between MPI processes and decreasing computation performed on each MPI process" has to, at the very least, acknowledge similitudes with that previous work (Fischler et al., 2022) - which most likely also employed the same PETSc features and matrix/vector formatting. If anything else, to reinforce the statement made in Section 5 about how much improvements to the external libraries that you rely upon would improve your throughput in a multi-code environment (ie, ice sheet+hydrology) !

There are also a few small typos/"questions" which require the authors' attention before publication:
- Overall, the equations, citations and sections referencing are messy (lots of misplaced parenthesis, sometimes it is "Eq." sometimes "equation", sometimes "section" sometimes "Sec." …) . Hopefully this is something that the editor will correct prior to publication ? But it would be worth checking the Latex source file.

- The first sentence in the abstract is still a bit difficult to follow. I suggest rewriting it ("due to sliding …" → "through sliding and the location of lakes at the ice margin" ? "as well as the ocean circulation" → "it also impacts the ocean circulation …" ?)
- l.4 "on the ice sheet scale" → "**at** the ice sheet scale"
- l.7 "...the scaling behavior of…" → "the **strong** scaling"
- l.8 I would suggest completing the sentence with the type of supercomputers that you use
- In l. 31 the "inefficient system" is mentioned prior to introducing it. Perhaps you can add a descriptive term in parenthesis ?
- l. 39 missing "the" before head ?
- l. 44 "..., advanced for seasonal evolution of the hydrological system" is awkward, perhaps the sentence could be rephrased
- l. 46 "... both systems: Sommers et al evolves …" → "... both systems. Sommers et al. solve for the water …" (splitting the sentence)
- l. 49 "lead" → "led"
- l. 50/51 "as in Smith-Johnsen et al. …" → "such as in Smith-Johnsen et al. …, for example."
- I would suggest referring the reader to Section 2 for a definition of the greek symbols in the legend of Fig. 1
- l. 69 "... will benefit if simulations of the subglacial system are available for the same time period." → "... will benefit from simulations of the subglacial system for the same time period."
- l. 71 perhaps provide a number for "fine resolution" (100-500m ?)
- l. 72 "... software that uses parallel computers …" → "... softwares capable of using parallel computers …"
- The title 2.1 is still too short, please be more descriptive
- l. 107 why not use the acronym CUAS that you have introduced ?
- The numbers in Fig. 2, which will be very useful for Section 4, should be acknowledged in the caption of the figure
- l. 148 sub-glacial → subglacial
- the sentence starting l. 156 could be dropped altogether
- l. 177 "We" → "we" (no capital letter)
- l. 186 please provide a ref for MUMPS
- Fig 5: the exact meaning of "difference" should be given. Is it an absolute error ?
- The sentence starting l. 243 "To be able to compare performance …" is awkward and should be rewritten
- l. 245 "As linear solver, we use GMRES with a Jacobi preconditioner" → "We use the GMRES linear solver with a Jacobi preconditioner"
- l. 257 you talk about GXX runs prior to introducing the notation
- The first sentence of Section 4.1 is awkward, consider rephrasing
- l. 294 "sufficiently realistic" → "sufficiently realistically"
- l. 331 "The CUAS-MPI system kernels category, which, like the code categories discussed in the following, is also identified in Fig. 2, includes all kernels running on CUAS-MPI grids.The CUAS-MPI system kernels category contains the characteristics of the EPM, such as the confined-unconfined scheme, transmissivity change and flux, as two dimensional fields." → "**The four remaining functional parts are identified in Fig. 2.** In particular, the CUAS-MPI system kernels category

includes all kernels running on CUAS-MPI grids (see the blue box in Fig. 2)". This is just a rewrite suggestion

- l. 337 "the **preconditioned** GMRES implementation"
- l. 337 "Finally, NetCDF output includes …" → "Finally, the NetCDF output category includes …"
- l. 370 "fix" → "fixed"
- Figure 10a should feature the same x-axis legend as Figure 9: 96, 192, 384 etc. It is very confusing otherwise. Consider enlarging the police for both axis also, it looks like there is the space to do so.
- The paragraph of l. 375 is redundant and could be dropped
- l. 383: "98" → "96"
- Can you elaborate more on the sentence starting l. 389 ? What is the cause of needing more iterations and how does that number grow with resolution ? That is an interesting issue for further code improvement !
- When discussing potential runtime improvements (l. 446-459), it would be interesting to say a word about what you, within your code implementation, could be able to improve: perhaps communication overhead could be avoided by recomputing ghost cells less often ? Or could a different linear solver be potentially investigated - still within the PETSc framework ? It would bring much to the discussion.
- l. 479 I would be careful in saying this