Reply on CC2

Daniel Caviedes-Voullième et al.

Author comment on "SERGHEI (SERGHEI-SWE) v1.0: a performance-portable high-performance parallel-computing shallow-water solver for hydrology and environmental hydraulics" by Daniel Caviedes-Voullième et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-208-AC3, 2022

- This is an interesting contribution that I think it would be a nice read if made shorter and more focused, by mainly:

Thanks for the kind words Georges.

- reorganising the methodology to ensure that the interesting parts appear first, or are at least introduced. For example, it would help to introduce the concept of SERGHEI here, and narrow down the scope to the SWE module.

Thanks for this comment. That was the original organisation of our manuscript, which we changed as it evolved. However, it does seem to work better by including the overall framework in the introduction.

- cutting the verification and validation section, significantly, to only focus on the analysis of performance and scaling for selected test cases. The 2D dam-break is a keeper because its symmetricity is important to ensure that the code re-implementation is valid (i.e., illustrating the 1D radial profile for the 2D dam-break test will provide stronger evidence of code validity). Many the test cases can either removed or put in an Appendix.

We have significantly reduced the section on verification and validation, essentially leaving only a single test of each type. We do think this is necessary to establish the accuracy, robustness and applicability of SERGHEI to multiple use cases.

- The abstract: It can be made more personalised to just reflect on the content of this contribution. For example, the first 10 lines can be cut to a sentence or two to just introduce the concept of SERGHEI and its relevance to portability.

Done. We have improved the abstract to better focus on the key points.

- The Introduction: What does ESM stand for? Earth System Modelling?

Yes, ESM stands for Earth System Modelling. This was defined already here, but we now include a list of abbreviations for clarity.

- Line 89-90. The trend to address "rainfall-runoff problems in both natural and urban environments, fluvial problems, and other flows" seems to be the case with many of existing models in Table 1. That may not be the novelty here, as also shown later by the type of test cases reported.

This is a fair point. We have reformulated to express which intentions and aims have shaped our design and implementation. More than a novelty, the point is that SERGHEI is conceived already as a framework for wider usage. This is now better conveyed.

- The organisation of the methodology: Section 2 and Section 3.1 seem to be overviewed from past published works. They are useful for completeness, but their presence at the start is confusing without any introductory text saying about what is where, and why, with reference to the novel aim and scope of this work. Could Section 3, or the methodology, be titled more specifically? For example, SERGHEI-SWE?

Some context was required at the beginning of both sections. We also take in the idea of providing somewhat more informative section titles. For section 2 we now explain that there is indeed no real novelty concerning the mathematical and numerical formulations. For section 3, we provide an introductory paragraph better explaining the levels of parallelism, and the technical novelties.

- Verification and validation: The mathematical and the numerical formulations are already valid on existing platform. From this stand, verification should be brief to just confirm that the new implementation, using kokkos, remains valid too. Therefore, there is no need to have the main body of the results for the detailed verification of accuracy and error convergence. This could go into an appendix for the basic test cases. This will keep room for the interesting part to be the center of the main discussion: that is, Section 7 of the performance and scaling.

The extensive verification strategy is important to establish the correctness and robustness of the implementation. As you point out, we are not really intending to verify the underlying numerical schemes. Therefore, and following your suggestion and that of the reviewers, we have significantly shortened the verification section, to keep basically one example of each type of problem. The rest has been moved to the appendix.

- Vision and future work: Couldn't this part be repositioned, re-edited higher up to be integrated at start the methodology to better scope this paper and set the expectation earlier/clearer on the novelty?
  Yes, we agree. This actually works better at the end of the introduction. We leave only the reference to potential future innovations as "Outlook" in the conclusions section (as they are not really part of the envisioned framework).