Authors' response
EGUSPHERE-2023-2690

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February 27, 2025

Contents

1 Editor's remarks

The authors are thankful to the editor (Ludovic Räss) for his comments, thus allowing an improved version of the paper. We have addressed all points raised by the editor:

- Highlight where the high-resolution is mandatory to converge some model configurations (showing, e.g., that physical quantity of interest converges to a steady value upon reducing grid size)
  - A new Appendix B has been described where Nix model convergence is detailed, reaching resolutions of 60 metres. Fig. 1 in this document (Fig. B1 in the manuscript) depicts a number of physical variables are plotted as a function of grid size. Results are then compared to the analytical solution presented by Schoof (2007).
- Further development on the pros and cons of the (parallel) implementation.
  - We have entirely written a new section (Section 7: Model scalability and performance) to report the computational speed (Fig. 8 in the manuscript) and the details regarding the parallel implementation.
- Additional performance experiments such as, e.g., effect of using multiple core via OpenMP, weak and/or strong scaling.
  - In Section 7, there are two new figures (Figs. 2 and 3 in this document, and Figs. 9 and 10 in the revised manuscript) where both strong and weak scalability of Nix are tested, respectively. Several parameter permutations of the linear solver are considered: the total number of iterations N and the optimization level level during compilation with OpenMP flag (i.e., -O1, -O2 and -O3).
- Updated GitHub and Zenodo repositories. Link: `https://github.com/d-morenop/nix`.
- Removed typos.

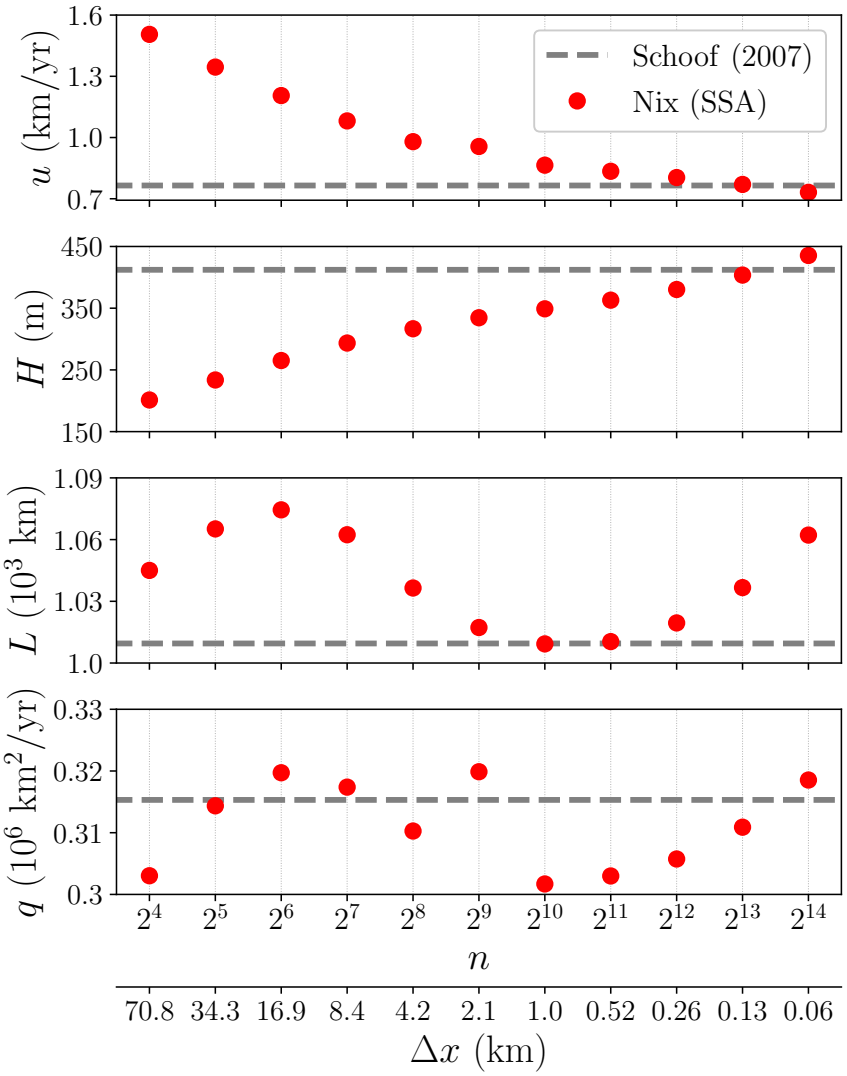

Figure 1: Convergence study with Nix model. From top to bottom: ice velocity, terminus position, ice thickness and ice flux. All variables are evaluated at the grounding line. The double x-axis denotes the total number of horizontal grid points n and the corresponding spatial resolution Δx given the stretched coordinate transformation.

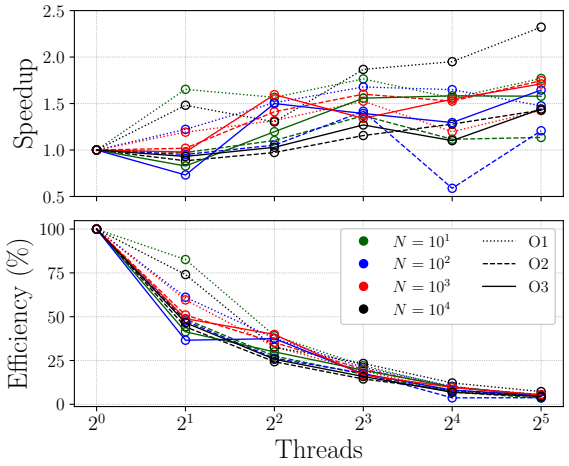

Figure 2: Acceleration and efficiency for strong scalability experiments. The maximum number of iterations N in the sparse linear problem is given as a colour legend. Line styles denote the three levels of optimization provided by OpenMP during compilation (O1, O2 and O3, in increasing order).

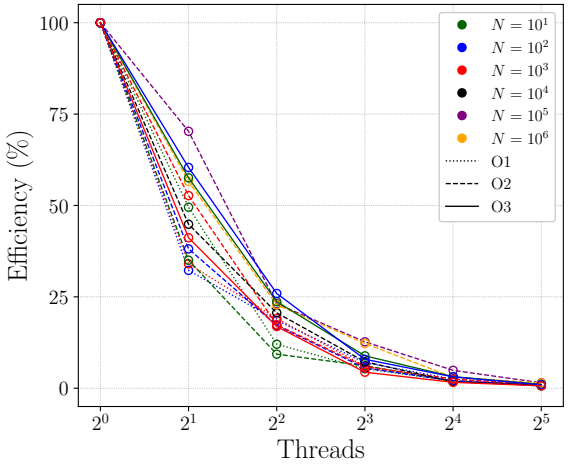

Figure 3: Efficiency for weak scalability experiments. The maximum number of iterations N in the sparse linear problem is given as a colour legend, ranging from 10 to 10^6. Line styles denote the three levels of optimization provided by OpenMP during compilation (O1, O2 and O3, in increasing order).

References

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