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Improved convergence and stability properties achieved in a three-dimensional higher-order ice sheet model

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We present a novel finite difference implementation of a three-dimensional LMLa ice sheet model. It performs well both in convergence rate and numerical stability. In order to achieve these benefits the governing force balance equation is discretised in its derivative form on a staggered grid. By that our realisation respects the elliptic form of this partial differential equation and guarantees good numerical stability. Moreover a new simple stable Picard relaxation scheme is used in the non-linear part of the model. This scheme accounts for both under- and overshooting of successive solutions to the linear model part during the iterative algorithm and therefore facilitates the rate of convergence. In this study we aim to verify the physical applicability of our new numerical implementation. For this purpose we will conduct the ISMIP-HOM benchmark experiments.