Supplement of

Comparison of ice dynamics using full-Stokes and Blatter–Pattyn approximation: application to the Northeast Greenland Ice Stream

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Figure S1. Surface and basal area-averaged velocity for different numbers of vertical layers. Velocity is presented relative to simulation results obtained with 15 vertical layers. Results are shown for FS, $E = 1$, $m = 1$, P1P1GLS-strong applied to the ice stream region with a horizontal resolution of $l = 400\text{m}$. 
Figure S2. Results of ISMIP-HOM benchmark Exp. A. Surface velocity component $v_x$ (m a$^{-1}$) across the bump at $y = L/4$ for different length scales, with $L$ ranging from 160 to 5 km. Values computed in the study for FS and BP-like with P1P1GLS-strong are compared to results by simpler models (nFS) and FS from the ISMIP-HOM benchmark (Pattyn et al., 2008).
Figure S3. Results of ISMIP-HOM benchmark Exp. C. Surface velocity component $v_x$ (m a$^{-1}$) across the bump at $y = L/4$ for different length scales, with L ranging from 160 to 5 km. Values computed in the study for FS and BP-like with P1P1GLS-strong are compared to results by simpler models (nFS) and FS from the ISMIP-HOM benchmark (Pattyn et al., 2008).
Figure S4. Line plots of the absolute surface velocity difference between FS and BP-like ($|\Delta v_{s}^{FS-BP-like}|$) with P1P1GLS-strong versus the surface slope for a resolution of $l = 6400$ m (a), a resolution of $l = 1600$ m (b), a resolution of $l = 400$ m (c), and a resolution of $l = 100$ m (d). A moving mean with a window of 2500 data points is applied.
Figure S5. Line plots of the absolute surface velocity difference between FS and BP-like ($|\Delta v_{FS-BP-like}|$) with P1P1GLS-strong versus the bed slope for a resolution of $l = 6400$ m (a), a resolution of $l = 1600$ m (b), a resolution of $l = 400$ m (c), and a resolution of $l = 100$ m (d). A moving mean with a window of 2500 data points is applied.
Figure S6. Line plots of the absolute surface velocity difference between FS and BP-like (|Δv_{FS-BP-like}^s|) with P1P1GLS-strong versus the local aspect ratio for a resolution of \( l = 6400 \) m (a), a resolution of \( l = 1600 \) m (b), a resolution of \( l = 400 \) m (c), and a resolution of \( l = 100 \) m (d). A moving mean with a window of 2500 data points is applied.
Figure S7. Line plots of the absolute surface velocity difference between FS and BP-like ($|\Delta v_{FS-BP-like}|$) with P1P1GLS-strong versus the FS slip ratio ($v_b/v_s$) for a resolution of $l = 6400$ m (a), a resolution of $l = 1600$ m (b), a resolution of $l = 400$ m (c), and a resolution of $l = 100$ m (d). A moving mean with a window of 2500 data points is applied.
Figure S8. Relative surface velocity differences of spatially averaged surface velocities from FS and BP-like stress regimes for m=3 and P1P1GLS-strong. The coloured lines indicate the number of vertical layers.
Figure S9. Relative surface velocity differences of spatially averaged surface velocities from FS and BP-like stress regimes for $m=3$ and P1P1GLS-strong. The coloured lines indicate the inferred friction coefficient with ISSM used as input for COMSOL.
References