# Appendix

| Variable/ constant | Description | Value | Dimensionality |
|---|---|---|---|
| $A$ | Flow-law rate factor | | Pa $^{-n}$ a $^{-1}$ |
| $b$ | Glacier width along a flow line | | m |
| $F$ | Smoothing functional | | |
| $g$ | Gravitational acceleration | 9.8 | m s$^{-2}$ |
| $h_s$ | Ice cap surface elevation | | m |
| $h_b$ | Bed elevation | | m |
| $H$ | Ice thickness | | m |
| $K_{fr}$ | Friction coefficient | | Pa m$^{-1}$ a |
| $L$ | Length of a glacier flow line domain | | m |
| $m$ | Exponent in the friction law | 1: linear friction law; 3: non-linear friction law | |
| $n$ | Exponent in Glen's flow law | 3 | |
| $T$ | Ice temperature | | K |
| $t$ | Time | | a |
| $u$ | Horizontal ice flow velocity | | m a$^{-1}$ |
| $w$ | Vertical ice flow velocity | | m a$^{-1}$ |
| $x$ | Horizontal axis along a flow line | | m |
| $z$ | Vertical axis pointing upward ($z = 0$ at sea level) | | m |
| $\beta$ | Regularization parameter | | |

| | | | |
|---|---|---|---|
| $\gamma$ | Parameter of the gradient minimization procedure | | |
| $\dot{\varepsilon}_{ik}$ | Strain-rate tensor components | | a$^{-1}$ |
| $\dot{\varepsilon}$ | Second strain-rate tensor invariant | | a$^{-1}$ |
| $\eta$ | Ice effective viscosity | | Pa a |
| $\rho$ | Ice density | 900 | kg m$^{-3}$ |
| $\sigma_{ik}$ | Stress tensor components | | Pa |
| $\sigma'_{ik}$ | Stress deviator components | | Pa |
| $\Phi$ | Squared discrepancy functional | | |
| $\Omega$ | Stabilizing functional | | |