Thermo-mechanical ice-sheet model
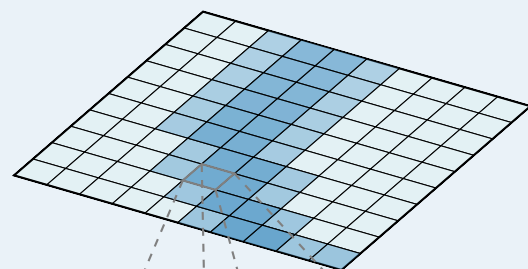(Pattyn (2017))

$h, \boldsymbol{v}$
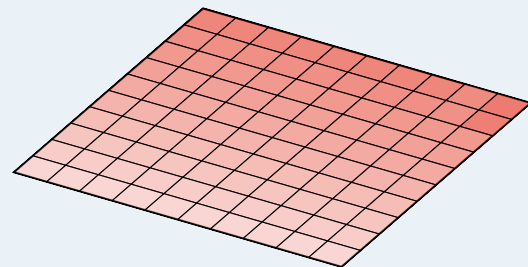
$\phi_0, \dot{m}$

(i) Subglacial water routing
$$\nabla \cdot \boldsymbol{q}_{\mathrm{w}} = \dot{m}/\rho_{\mathrm{w}}$$
(Le Brocq et al. (2009))

$\boldsymbol{q}_{\mathrm{w}}$

(ii) Global–local matching
$$Q_{\mathrm{w}} = \|\boldsymbol{q}_{\mathrm{w}}\| \, l_{\mathrm{c}}$$
(Gowan et al. (2023))

Q_{w}
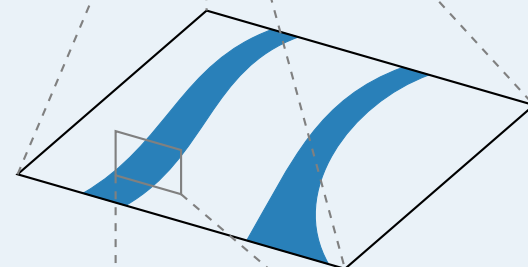
(iii) Effective-pressure param.
$$N = \underbrace{\mathcal{F}(\phi_0/N_\infty)}_{\text{effect of GL}} \underbrace{N_\infty}_{\text{far field}}$$

N

N