Advection of heat and salt balanced by diffusion and solidification.

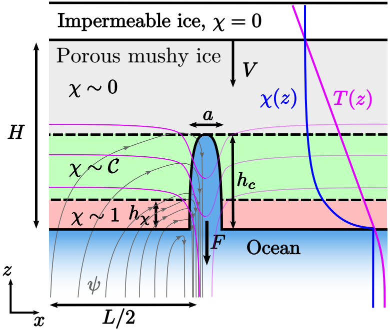
$$\mathbf{U}\cdot\nabla T \sim \frac{\partial^2 T}{\partial x^2} \qquad \mathbf{U}\cdot\nabla S_l \sim V\frac{\partial S}{\partial z}$$

Baroclinic torque drives flow in the porous layer.

$$Rm\frac{\partial S_l}{\partial x} \sim \frac{\partial^2 \psi}{\partial x^2}$$

Empirical scaling to close argument.

$$\frac{h_c}{h_\chi} \sim \sqrt{Rm}$$



Mushy layer height and vertical temperature profile well approximated by diffusive solution (as flow is weak).

$$S_l = -T \approx z/H \qquad \mathcal{S}\frac{\partial \chi}{\partial z} \sim \frac{\partial^2 T}{\partial z^2}$$

Flow in the narrow channels is driven by buoyancy. Salt advection is balanced by horizontal diffusion.

$$Rm\frac{\partial S_l}{\partial x} \sim \frac{\partial^2 \psi_c}{\partial x^2} \qquad \mathbf{U}\cdot\nabla S_l \sim \frac{1}{Le}\frac{\partial^2 S_l}{\partial x^2}$$

$$L \sim Rm_s^{-1/4},\ a \sim Rm^{-3/4},\ \psi \sim \mathcal{C}\,Rm^{1/2},\ \psi_c \sim \mathcal{C}\,Rm^{1/2},\ h_c \sim \mathcal{C}\,Rm^{1/4},\ h_\chi \sim \mathcal{C}\,Rm^{-1/4} \qquad F \sim \frac{\psi_c}{L} \sim \mathcal{C}Rm^{3/4}$$