# Project Report — Ice-Ocean Interaction

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The given equation:

$$\frac{\partial C}{\partial t} = \nu \frac{\partial^2 C}{\partial x^2} - \frac{\partial u(x)C}{\partial x} = 0$$

$$\frac{\partial C}{\partial t} = 0 \quad \text{(We are in steady-state)}$$

Simplification:

$$\nu y'' - u'y - uy' = 0. \qquad (\star)$$

We use centered difference to approximate $y'$ and $y''$:

$$y_i' = \frac{y_{i+1} - y_{i-1}}{2h}$$

$$y_i'' = \frac{y_{i+1} - 2y_i + y_{i-1}}{h^2}$$

Thus:

$$(??) \implies \nu \frac{y_{i+1} - 2y_i + y_{i-1}}{h^2} - u_i'y - u_i \frac{y_{i+1} - y_{i-1}}{2h} =$$

$$\left( \frac{\nu}{h^2} + \frac{u_i}{2h} \right) y_{i-1} - \left( \frac{2\nu}{h^2} + u_i' \right) + \left( \frac{\nu}{h^2} - \frac{u_i}{2h} \right) y_{i+1} = 0$$