

$$\frac{\partial \Delta \rho}{\partial x} = -\Delta \rho \frac{w_e}{uh}$$

$$\frac{\partial W}{\partial x} = 2Fr^{-1}$$

$$\frac{\partial u}{\partial x} = \frac{u}{(1 - Fr^{-2})} \left[ \frac{\Delta \rho_x}{\Delta \rho} + Fr^{-2} \frac{W_x}{W} \right]$$

$$\frac{\partial h}{\partial x} = -h \left[ \frac{\Delta \rho_x}{\Delta \rho} + \frac{W_x}{W} + \frac{u_x}{u} \right]$$