

1 Derivation

$$\begin{aligned}\frac{\partial \eta}{\partial t} + \frac{\partial(\eta u)}{\partial x} + \frac{\partial(\eta v)}{\partial y} &= 0 \\ \frac{\partial(\eta u)}{\partial t} + \frac{\partial}{\partial x} \left(\eta u^2 + \frac{1}{2} g \eta^2 \right) + \frac{\partial(\eta uv)}{\partial y} &= 0 \\ \frac{\partial(\eta v)}{\partial t} + \frac{\partial(\eta uv)}{\partial x} + \frac{\partial}{\partial y} \left(\eta v^2 + \frac{1}{2} g \eta^2 \right) &= 0.\end{aligned}$$