

$$\partial_t \mathbf{q} + \partial_x \mathbf{F}_1(\mathbf{q}) + \partial_y \mathbf{F}_2(\mathbf{q}) + \partial_z \mathbf{F}_3(\mathbf{q}) = \mathbf{S} \quad (1)$$

where:

$$\mathbf{q} = \begin{bmatrix} \rho \\ \rho u \\ \rho h^2 \\ \rho w \\ \rho \theta \end{bmatrix}, \quad \mathbf{F}_1 = \begin{bmatrix} \rho u \\ \rho u^2 + p + \cos h \\ \rho uv \\ \rho uw \\ \rho u\theta \end{bmatrix}, \quad \mathbf{F}_2 = \begin{bmatrix} \rho v \\ \rho vu \\ \rho v^2 + p \\ \rho vw \\ \rho v\theta \end{bmatrix}, \quad \mathbf{F}_3 = \begin{bmatrix} \rho w \\ \rho wu \\ \rho wv \\ \rho w^2 + p \\ \rho w\theta \end{bmatrix}, \quad \mathbf{S} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ -\rho g \\ 0 \end{bmatrix} \quad (2)$$