

ESSPP – Discretização no ALG

Equação do momentum (horizontal):

$$\frac{\partial}{\partial t}(\rho u) + \frac{\partial}{\partial x}(\rho u^2 + p - \tau_{xx}) + \frac{\partial}{\partial y}(\rho uv - \tau_{xy}) = 0$$

Reescrevendo as derivadas parciais, temos:

$$\begin{aligned} & \frac{\partial \rho}{\partial t} u + \frac{\partial u}{\partial t} \rho \\ & + \frac{\partial \rho}{\partial x} u^2 + \frac{\partial u}{\partial x} 2u\rho + \frac{\partial p}{\partial x} - \frac{\partial \tau_{xx}}{\partial x} \\ & + \frac{\partial \rho}{\partial y} uv + \left(\frac{\partial u}{\partial y} v + \frac{\partial v}{\partial y} u \right) \rho - \frac{\partial \tau_{xy}}{\partial y} = 0 \end{aligned}$$

Discretizado:

$$\begin{aligned} & \frac{[\rho^{(n+1)} - \rho^{(n)}]}{\Delta t} u^{(n+1)} + \frac{[u^{(n+1)} - u^{(n)}]}{\Delta t} \rho^{(n+1)} \\ & + \frac{[\rho_e^{(n+1)} - \rho_w^{(n+1)}]}{\Delta x} (u^{(n+1)})^2 + \frac{[u_e^{(n+1)} - u_w^{(n+1)}]}{\Delta x} 2u^{(n+1)} \rho^{(n+1)} \\ & + \frac{[p_e^{(n+1)} - p_w^{(n+1)}]}{\Delta x} - \frac{[(\tau_{xx})_e^{(n+1)} - (\tau_{xx})_w^{(n+1)}]}{\Delta x} \\ & + \frac{[p_n^{(n+1)} - p_s^{(n+1)}]}{\Delta y} u^{(n+1)} v^{(n+1)} + \left(\frac{[u_n^{(n+1)} - u_s^{(n+1)}]}{\Delta y} v^{(n+1)} + \frac{[v_n^{(n+1)} - v_s^{(n+1)}]}{\Delta y} u^{(n+1)} \right) \rho^{(n+1)} \\ & - \frac{[(\tau_{xy})_n^{(n+1)} - (\tau_{xy})_s^{(n+1)}]}{\Delta y} = 0 \end{aligned}$$

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