

$$a) \quad \frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + u \frac{\partial u}{\partial y} = \nu \left[ \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right]$$

Discretizando

$$\frac{u_{i,j}^{l+1} - u_{i,j}^l}{\Delta t} + u_{i,j}^l \left[ \frac{u_{i+1,j}^l - u_{i-1,j}^l}{2\Delta x} + \frac{u_{i,j+1}^l - u_{i,j-1}^l}{2\Delta y} \right]$$

$$= \nu \left[ \frac{u_{i+1,j}^l - 2u_{i,j}^l + u_{i-1,j}^l}{\Delta x^2} + \frac{u_{i,j+1}^l - 2u_{i,j}^l + u_{i,j-1}^l}{\Delta y^2} \right]$$

con  $\Delta x = \Delta y$  se llega a:

$$u_{i,j}^{l+1} = u_{i,j}^l + \nu \frac{\Delta t}{\Delta x^2} \left[ u_{i+1,j}^l + u_{i-1,j}^l + u_{i,j+1}^l + u_{i,j-1}^l - 4u_{i,j}^l \right]$$

$$- u_{i,j}^l \frac{\Delta t}{2\Delta x} \left[ u_{i+1,j}^l - u_{i-1,j}^l + u_{i,j+1}^l - u_{i,j-1}^l \right]$$