$$\frac{\partial p}{\partial t} = \underbrace{\frac{k}{\mu \phi c_t}}_{\alpha} \frac{\partial^2 p}{\partial x^2}$$

$$\ell = (j-1)NX + i$$

$$\frac{\phi c_t}{B_w} \frac{\partial p}{\partial t} + q_{sc} = \frac{\partial}{\partial x}\left(\frac{k_x}{\mu B_w} \frac{\partial p}{\partial x}\right)$$

$$\frac{\phi c_t}{B_w} \frac{\partial p}{\partial t} + q_{sc} = \frac{\partial}{\partial x}\left(\frac{k_x}{\mu B_w} \frac{\partial p}{\partial x}\right) + \frac{\partial}{\partial y}\left(\frac{k_y}{\mu B_w} \frac{\partial p}{\partial y}\right)$$

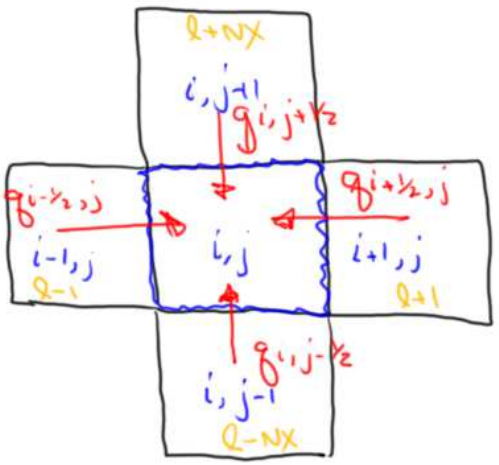
"Areal view"

$$\left(\overline{\overline{T}} + \frac{1}{\Delta t} \overline{\overline{B}}\right) \vec{p}^{\,n+1} = \left(\frac{1}{\Delta t} \overline{\overline{B}}\, \vec{p}^{\,n} + \vec{q}\right)$$

$j=4$	$\ell=10$	$\ell=11$	$\ell=12$
$j=3$	$\ell=7$	$\ell=8$	$\ell=9$
$j=2$	$\ell=4$	$\ell=5$	$\ell=6$
$j=1$	$\ell=1$	$\ell=2$	$\ell=3$
	$i=1$	$i=2$	$i=3$

$NY = 4$

$NX = 3$



Flux in/out

$$q_{i-1/2,j} = TX_{i-1/2,j}\left(P_{i-1,j} - P_{i,j}\right) = TX_{i-1/2,j}\left(P_{l-1} - P_l\right)$$

$$q_{i+1/2,j} = TX_{i+1/2,j}\left(P_{i+1,j} - P_{i,j}\right) = TX_{i+1/2,j}\left(P_{l+1} - P_l\right)$$

$$q_{i,j-1/2} = TY_{i,j-1/2}\left(P_{i,j-1} - P_{i,j}\right) = TY_{i,j-1/2}\left(P_{l-NX} - P_l\right)$$

$$q_{i,j+1/2} = TY_{i,j+1/2}\left(P_{i,j+1} - P_{i,j}\right) = TY_{i,j-1/2}\left(P_{l+NX} - P_l\right)$$

Accumulation

$$\frac{V_{i,j}\, c_t\, \phi_{i,j}}{B_w\, \Delta t}\left(P_{i,j}^{n+1} - P_{i,j}^{n}\right) = \frac{V_l\, c_t\, \phi_l}{B_w\, \Delta t}\left(P_l^{n+1} - P_l^{n}\right)$$

Mass Balance on "i,j" or "l"

$$\underbrace{TX_{i-1/2,j}\left(P_{l-1} - P_l\right)}_{\text{left}} + \underbrace{TX_{i+1/2,j}\left(P_{l+1} - P_l\right)}_{\text{right}} + \underbrace{TY_{i,j-1/2}\left(P_{l-NX} - P_l\right)}_{\text{bottom}} + \underbrace{TY_{i,j+1/2}\left(P_{l+NX} - P_l\right)}_{\text{top}}$$

$$= \underbrace{\frac{V_l\, c_t\, \phi_l}{B_w\, \Delta t}\left(P_l^{n+1} - P_l^{n}\right)}_{\text{accum.}} - \underbrace{Q_l}_{\text{source / sinks}}$$