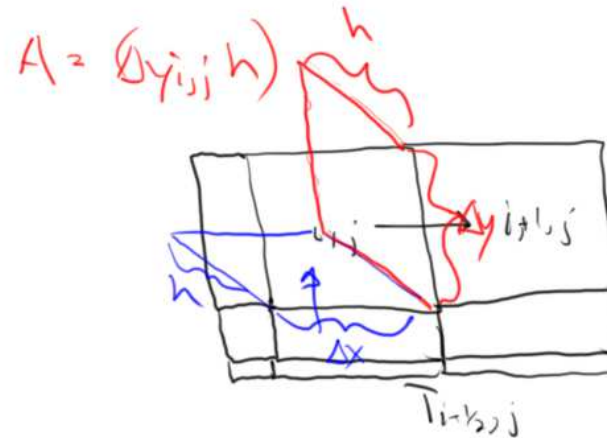


$$TX_{i+\frac{1}{2},j} = \frac{k_{x_{i+\frac{1}{2},j}} (\Delta y_{i,j} h)}{\mu B_w \Delta x_{i+\frac{1}{2},j}}$$

$$T = \frac{k A}{\mu B_w \Delta x}$$

$$k_{x_{i+\frac{1}{2},j}} = \frac{\Delta x_{i,j} + \Delta x_{i+1,j}}{\frac{\Delta x_{i,j}}{k_{x_{i,j}}} + \frac{\Delta x_{i+1,j}}{k_{x_{i+1,j}}}}$$



$$TY_{i,j+\frac{1}{2}} = \frac{k_{y_{i,j+\frac{1}{2}}} (\Delta x_{i,j} h)}{\mu B_w \Delta y_{i,j+\frac{1}{2}}}$$

$$\nabla \cdot \left(\frac{\bar{K}}{\mu B_w} \nabla p \right) = \frac{\partial p}{\partial t} \frac{G \phi}{B_w}$$

$$k_{y_{i,j+\frac{1}{2}}} = \frac{\Delta y_{i,j} + \Delta y_{i,j+1}}{\frac{\Delta y_{i,j}}{k_{y_{i,j}}} + \frac{\Delta y_{i,j+1}}{k_{y_{i,j+1}}}}$$

$$\bar{K} = \begin{bmatrix} k_x & k_{xy} \\ k_{xy} & k_y \end{bmatrix}$$

If reservoir is homogeneous, isotropic, uniform (square $\Delta y = \Delta x$)

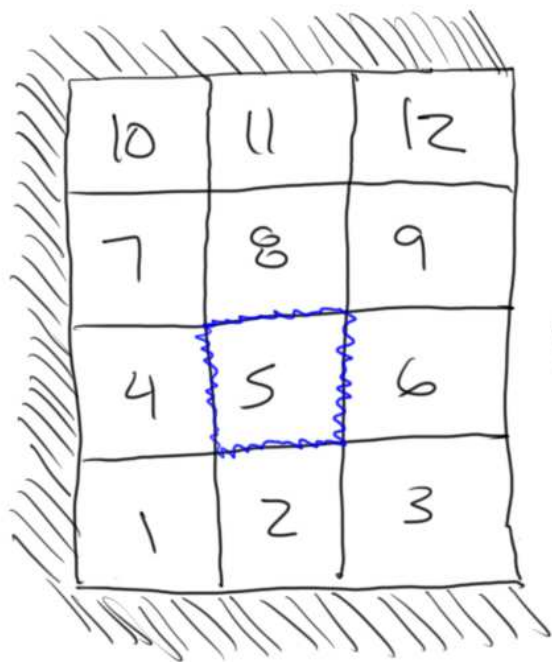
$$TX_{i+\frac{1}{2},j} = TX_{i-\frac{1}{2},j} = TY_{i,j+\frac{1}{2}} = TY_{i,j-\frac{1}{2}} = T = \frac{kA}{\mu B_w \Delta x}$$

Mass on grid #5

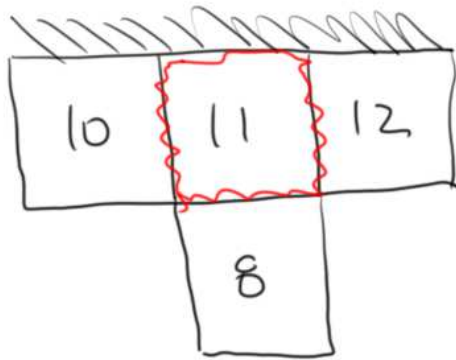
$$T(P_4 - P_5) + T(P_6 - P_5) + T(P_2 - P_5) + T(P_8 - P_5) =$$

$$\frac{V_5 C + \phi_5}{B_w \Delta t} (P_5^{n+1} - P_5^n) - Q_5$$

$P = P_B$



$$\begin{aligned} -TP_2^{n+1} - TP_4^{n+1} + \left(4T + \frac{V_5 C + \phi_5}{B_w \Delta t} \right) P_5^{n+1} - TP_6^{n+1} - TP_8^{n+1} \\ = \frac{V_5 C + \phi_5}{B_w \Delta t} P_5^n + Q_5 \end{aligned}$$

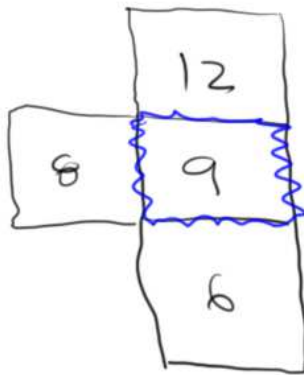


Mass balance on grid #11

$$T(P_{10} - P_{11}) + T(P_{12} - P_{11}) + T(\cancel{P_{TOP}} - P_{11}) + T(P_8 - P_{11}) =$$

$$\frac{V_{11} C_t \phi_{11}}{B_w \Delta t} (P_{11}^{n+1} - P_{11}^n) - Q_{11}$$

$$-T P_8^{n+1} - T P_{10}^{n+1} + \left(3T + \frac{V_{11} C_t \phi_{11}}{B_w \Delta t} \right) P_{11}^{n+1} - T P_{12}^{n+1} = \frac{V_{11} C_t \phi_{11}}{B_w \Delta t} P_{11}^n + Q_{11}$$



$P = P_D$ Mass balance on grid #9

$$T(P_8 - P_9) + 2T(P_B - P_9) + T(P_C - P_9) + T(P_{12} - P_9) = \frac{V_9 C_t \phi_9}{B_w \Delta t} (P_9^{n+1} - P_9^n) - Q_9$$

$$-T P_6^{n+1} - T P_8^{n+1} + \left(5T + \frac{V_9 C_t \phi_9}{B_w \Delta t} \right) P_9^{n+1} - T P_{12}^{n+1} = \frac{V_9 C_t \phi_9}{B_w \Delta t} P_9^n + Q_9 + 2T P_B$$