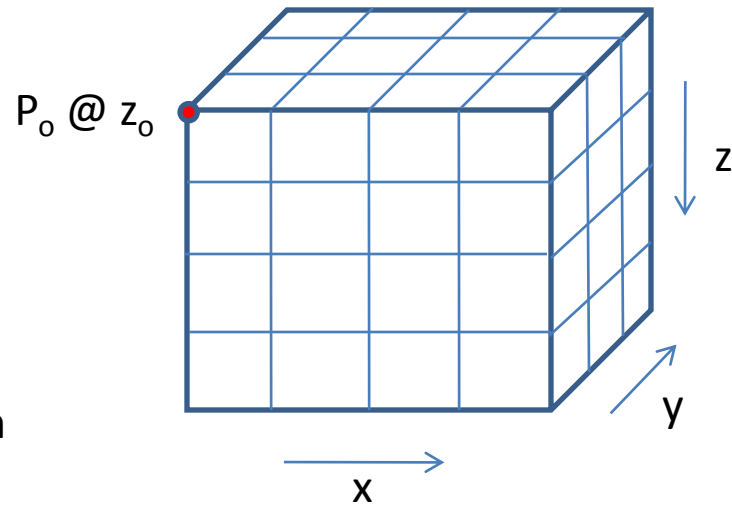


Initial Condition

$$P(x,0) = P_i \xrightarrow{\text{For simulation}} p_{i,j,k}^n = p_o + \gamma(z_{i,j,k} - z_o)$$

Z_o – datum depth
 P_o – initial pressure at datum depth



Initial Condition

Initialization in Simulator

1. Direct input into each gridblock

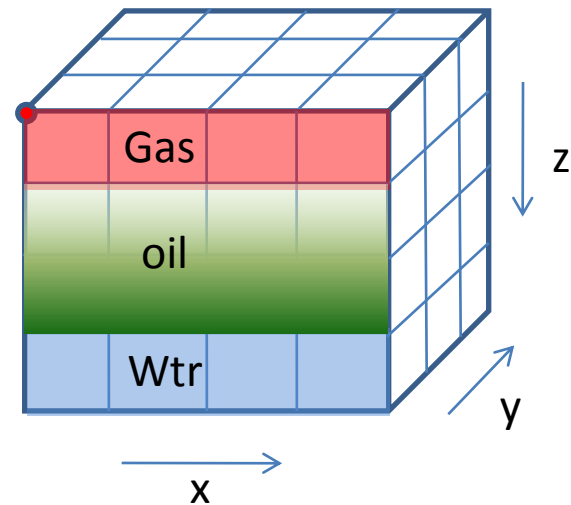
Use keywords (for black oil):

PRESSURE

SWAT

SGAS

RS or PBUB



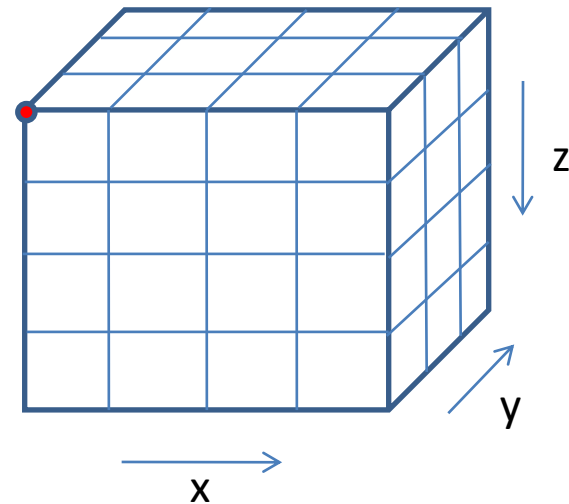
Initial Condition

Initialization in Simulator

2. Calculated by equilibration - initial conditions determined on the basis of hydrostatic equilibrium (EQUIL)

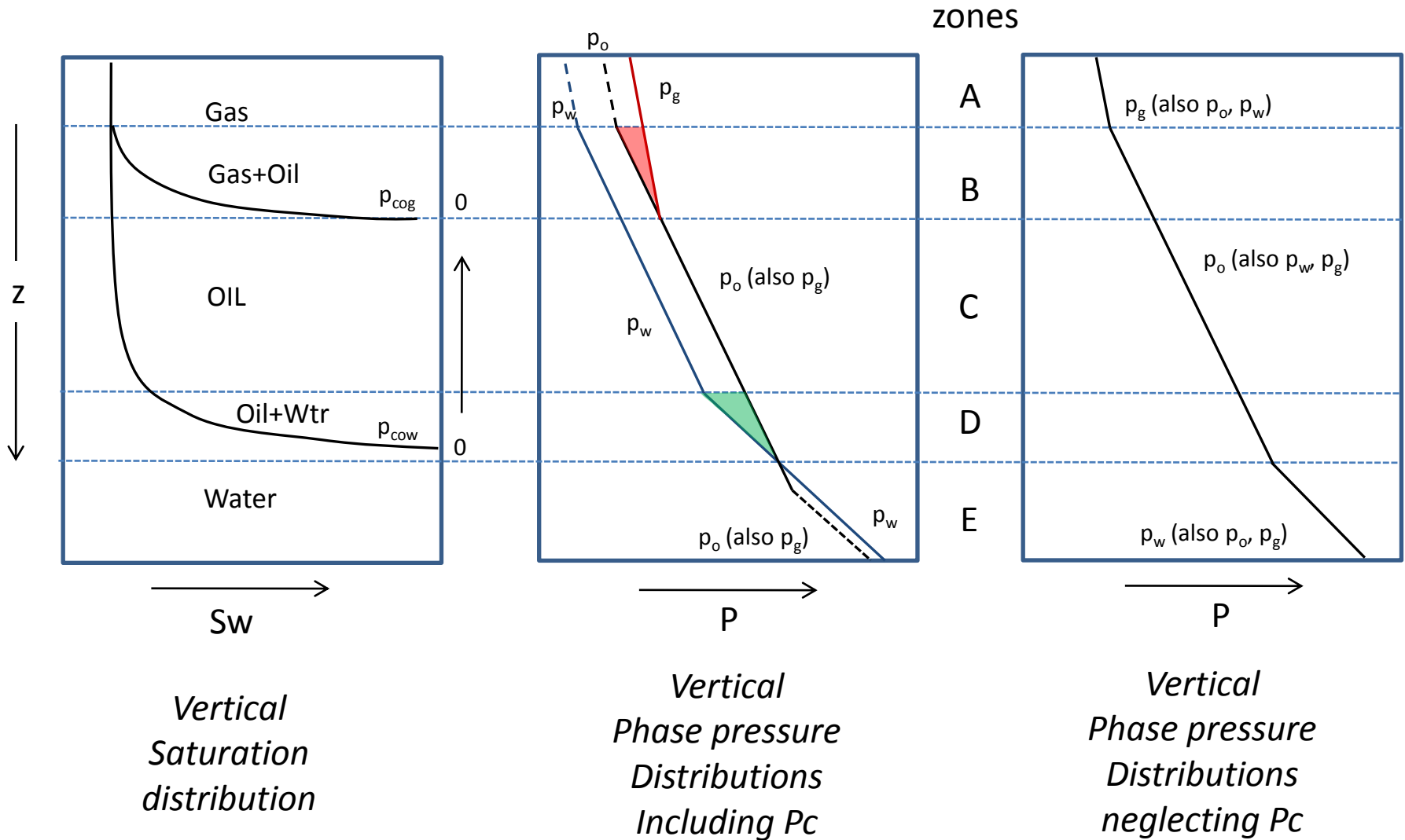
Data requirements

- a. Pressure at datum depth
- b. Gas-oil and water-oil contacts
- c. Capillary pressure at each contact
- d. R_s or P_b optional as $f(D)$



How initialize phase pressures and saturations; i.e., oil, gas, water?

Initial Condition



Initial Condition

- Zone A – Gas Cap

- Gas phase is only continuous phase, thus

$$\frac{dp_g}{dz} = \gamma_g$$

- With $S_o = 0$, we can find,

$$p_o = p_g - p_{cog} \left(S_{g_{\max}} \right)$$

- Also $S_w = S_{wi}$, thus

$$p_w = p_o - p_{cow} (S_{wi})$$

- And last, $S_g = 1 - S_o - S_w$

Initial Condition

- Zone B – Oil/Gas Transition

- Both oil and gas phases are continuous, thus

$$\frac{dp_g}{dz} = \gamma_g \quad \text{and} \quad \frac{dp_o}{dz} = \gamma_o$$

- From the oil and gas pressures, find P_c

$$p_{cog}(S_g) = p_g - p_o$$

- Which allows the determination of gas saturation distribution
- Also $S_w = S_{wi}$, thus

$$p_w = p_o - p_{cow}(S_{wi})$$

- And last, $S_o = 1 - S_g - S_w$

Initial Condition

- Zone C – Oil Zone

- oil phase is only continuous phase, thus

$$\frac{dp_o}{dz} = \gamma_o$$

- With $S_g = 0$, we can find,

$$p_g = p_o + p_{cog}(0)$$

- Also $S_w = S_{wi}$, thus

$$p_w = p_o - p_{cow}(S_{wi})$$

- And last, $S_o = 1 - S_g - S_w$

Initial Condition

- Zone D – Oil/water Transition

- Both oil and water phases are continuous, thus

$$\frac{dp_w}{dz} = \gamma_w \quad \text{and} \quad \frac{dp_o}{dz} = \gamma_o$$

- From the oil and water pressures, find P_c

$$p_{cow}(S_w) = p_o - p_w$$

- Which allows the determination of water saturation distribution
- Also $S_g = 0$, thus

$$p_g = p_o + p_{cog}(0)$$

- And last, $S_o = 1 - S_g - S_w$

Initial Condition

- Zone E – water Zone

- water phase is only continuous phase, thus

$$\frac{dp_w}{dz} = \gamma_w$$

- With $S_o = 0$, we can find,

$$p_o = p_w + p_{cow}(S_{w,max})$$

- Also $S_g = 0$, thus

$$p_g = p_o - p_{cog}(0)$$

- And last, $S_w = 1$

Initial Condition

Example: Initialization of Tutorial 2

