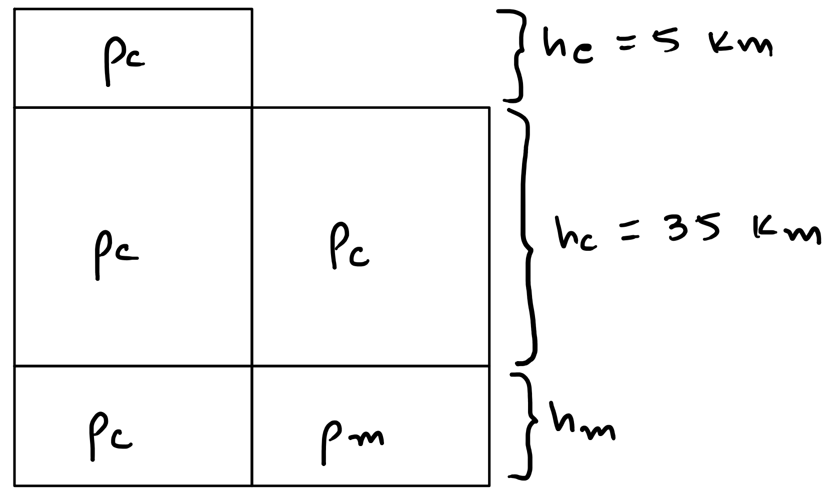
Gabarito Lista 1

1



$$\rho_c h_e + \cancel{\rho_c h_c} + \rho_c h_m = \cancel{\rho_c h_c} + \rho_m h_m$$

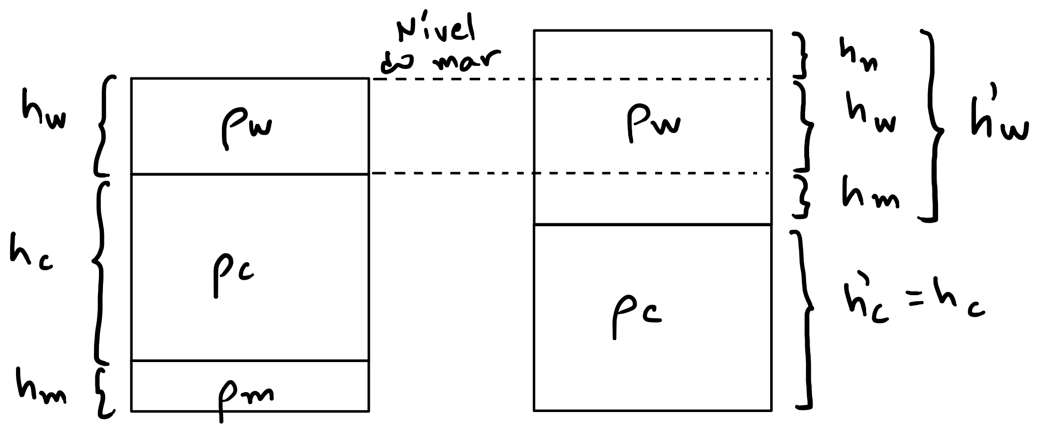
$$\rho_c h_e = (\rho_m - \rho_c) h_m$$

$$\frac{\rho_c h_e}{\rho_m - \rho_c} = h_m = \frac{2800 \cdot 5}{3300 - 2800} = 28 \text{ Km}$$

∴ A espessura da crosta na região da cordilheira é $L = h_e + h_c + h_m = 68$ Km.

2

Atual Cretáceo



Onde $h_n = 200$ m

$$\cancel{\rho_w h_w} + \cancel{\rho_c h_c} + \rho_m h_m = \cancel{\rho_w h_w} + \rho_w h_m + \rho_w h_n + \cancel{\rho_c h_c}$$

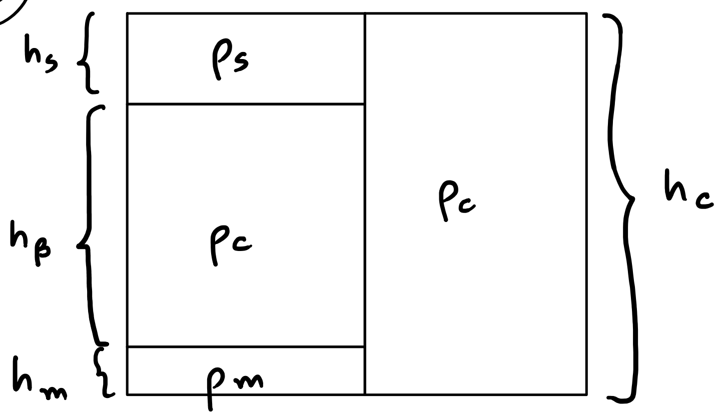
$$\rho_m h_m = \rho_w h_m + \rho_w h_n$$

$$(\rho_m - \rho_w) h_m = \rho_w h_n$$

$$h_m = \frac{\rho_w h_n}{\rho_m - \rho_w} = \frac{1000 \cdot 200}{3300 - 1000} \cong 87 \text{ m}$$

$\therefore$ O aumento real da profundidade da lâmina d'água foi de $H = h_n + h_m = 287$ m.

③



$$\rho_s h_s + \rho_c h_\beta + \rho_m h_m = \rho_c h_c$$

Como $h_m = h_c - h_\beta - h_s$

$$\rho_s h_s + \rho_c h_\beta + \rho_m h_c - \rho_m h_\beta - \rho_m h_s = \rho_c h_c$$

$$(\rho_c - \rho_m) h_\beta = \rho_c h_c - \rho_s h_s - \rho_m h_c + \rho_m h_s$$

$$h_\beta = \frac{\rho_c h_c - \rho_s h_s + \rho_m (h_s - h_c)}{\rho_c - \rho_m} =$$

$$= \frac{2750 \cdot 35 - 2450 \cdot 4 + 3300(4-35)}{2750 - 3300} =$$

$$\cong 28{,}82 \text{ Km}$$

Como $\beta = \dfrac{h_c}{h_\beta} \Rightarrow \beta = \dfrac{35}{28{,}82} \cong 1{,}21$

④ Dada a pressão P_1 na base da coluna não estirada:

$$P_1 = \rho_c \left(1 - \frac{\alpha T_1 T_c}{2a}\right) g\, T_c + \rho_L \left(1 - \alpha T_1 \left(\frac{T_c - a}{2}\right)\right) g\, (a + T_c)$$

e a pressão P_2 na base da coluna estirada e com subsidencia inicial S

$$P_2 = \rho_c \left(1 - \alpha \frac{T_1 T_c}{2a}\right) g \frac{T_c}{\beta} + \rho_L \left(1 - \alpha T_1 \left(\frac{T_c - a}{2}\right)\right) g \frac{(a + T_c)}{\beta}$$

$$+ S \rho_w g + \rho_L (1 - \alpha T_1) g \left(a - S - \frac{a}{\beta}\right)$$

Igualando $P_1 = P_2$, temos:

$$\rho_c \left(1 - \alpha \frac{T_1 T_c}{2a}\right) g\, T_c + \rho_L \left(1 - \alpha \frac{T_1 (T_c - a)}{2a}\right) g\, (a + T_c) =$$

$$\rho_c \left(1 - \alpha \frac{T_1 T_c}{2a}\right) g \frac{T_c}{\beta} + \rho_L \left(1 - \alpha \frac{T_1 (T_c - a)}{2a}\right) g \left(\frac{a + T_c}{\beta}\right) +$$

$$\rho_w S g + \rho_L (1 - \alpha T_1) g \left(a - S - \frac{a}{\beta}\right)$$

O termo $\left(1 - \frac{\alpha T_1 (T_c + a)}{2a}\right)$ pode ser reescrito como

$$\left(1 - \frac{\alpha T_1 (T_c + a)}{2a}\right) = \left(1 - \frac{\alpha T_1 T_c}{2a}\right) - \frac{\alpha T_1}{2} = \varphi - \frac{\alpha T_1}{2}$$

$$\therefore \rho_c \varphi g T_c + \rho_L \left(\varphi - \frac{\alpha T_1}{2}\right) g (a - T_c) = \rho_c \varphi g \frac{T_c}{\beta} +$$

$$\rho_L \left(\varphi - \frac{\alpha T_1}{2}\right) g \frac{(a - T_c)}{\beta} - S \left(\rho_L (1 - \alpha T_1) g - \rho_w g\right)$$

$$+ \rho_L (1 - \alpha T_1) g \left(1 - \frac{1}{\beta}\right) a \qquad (I)$$

Dividindo a expressão (I) por g

$$\rho_c \varphi T_c + \rho_L \left(\varphi - \frac{\alpha T_1}{2}\right)(a - T_c) = \rho_c \varphi \frac{T_c}{\beta} + \rho_L \left(\varphi - \frac{\alpha T_1}{2}\right)\frac{(a - T_c)}{\beta}$$
$$- s\left(\rho_L (1 - \alpha T_1) - \rho_w\right)$$
$$+ \rho_L (1 - \alpha T_1)\left(1 - \frac{1}{\beta}\right) a$$

$$\therefore s\left(\rho_L(1 - \alpha T_1) - \rho_w\right) = \left(1 - \frac{1}{\beta}\right)\left(-\rho_c \varphi T_c - \rho_L \left(\varphi - \frac{\alpha T_1}{2}\right)(a - T_c)\right.$$
$$\left. + \rho_L (1 - \alpha T_1) a\right)$$

$$= \left(1 - \frac{1}{\beta}\right)\left(-\rho_c \varphi T_c - \rho_L \varphi a + \rho_L \varphi T_c\right.$$
$$\left. + \rho_L \frac{\alpha T_1}{2} a - \rho_L \frac{\alpha T_1}{2} T_c + \rho_L (1 - \alpha T_1) a\right)$$

$$= \left(1 - \frac{1}{\beta}\right)\left((\rho_L - \rho_c)\varphi T_c - \rho_L \varphi a + \rho_L \frac{\alpha T_1}{2} a\right.$$
$$\left. - \rho_L \alpha \frac{T_1 T_c}{2} + \rho_L a - \rho_L \alpha T_1 a\right)$$
$$= \left(1 - \frac{1}{\beta}\right)\left((\rho_L - \rho_c)\varphi T_c - \frac{\rho_L \alpha T_1 a}{2}\right)$$

Substituindo φ e isolando s

$$s = \frac{\left((\rho_L - \rho_c)\left(1 - \frac{\alpha T_1 T_c}{2a}\right) T_c - \frac{\rho_L \alpha T_1}{2} a\right)\left(1 - \frac{1}{\beta}\right)}{\rho_L (1 - \alpha T_1) - \rho_w}$$