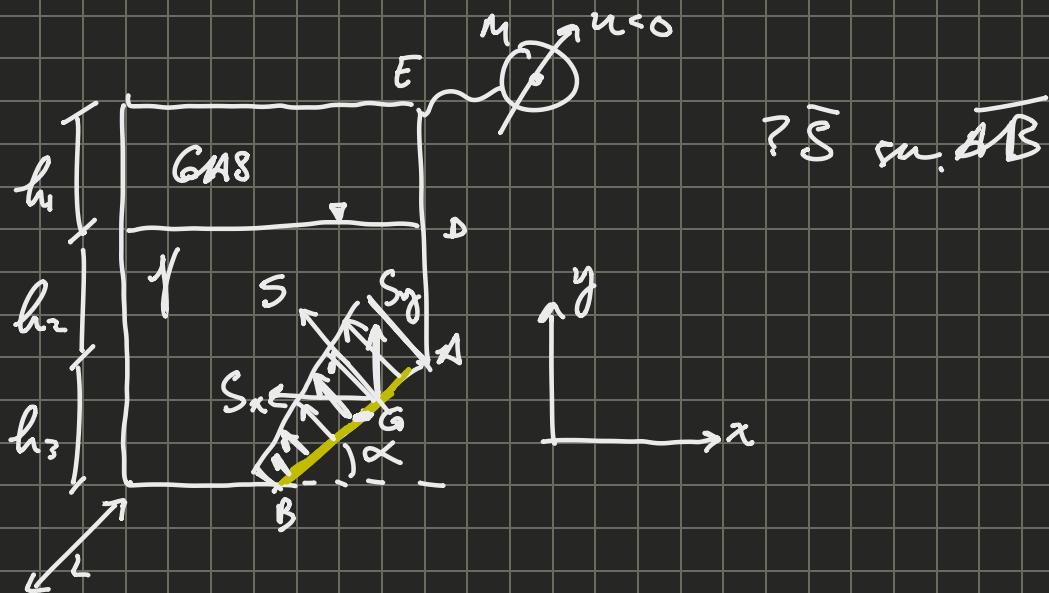


## Esercizio 2

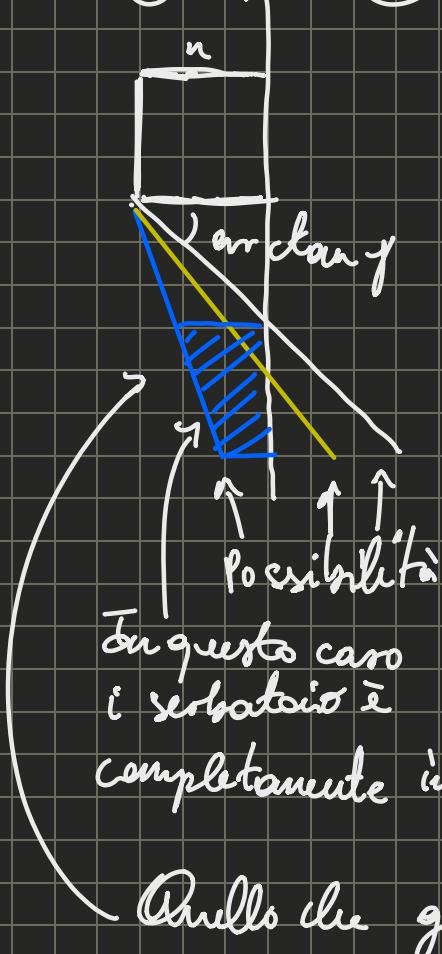
### Esercizio 3 - Dispersione Superficie Piana



?  $\bar{S}$  su  $\overline{AB}$

### 3 Prebase e diagramma

○  $P=0$  ○  $+$



$$\begin{aligned} P_m &= n \\ P_E &= n \\ P_0 &= n \end{aligned} \quad \left. \begin{array}{l} P_{\text{gas}} = \text{cost} \\ P_0 = P_0 + \gamma h_2 \\ P_0 = P_0 + \gamma h_3 = n + \gamma (h_2 + h_3) \end{array} \right.$$

Tanto non cambiano.

In questo caso il serbatoio è completamente in depressione

Quello che guardiamo

- Modulo di  $\bar{S}$

$$|\bar{S}| = |P_G| \cdot A_{AB}$$

$$\begin{aligned} |P_G| &= \left| P_A + \frac{h_3}{2} \gamma \right| \\ &= |u + y h_2 + \frac{h_3}{2} \gamma| \end{aligned}$$

$$\begin{aligned} A_{AB} &= \overline{AB} \cdot L \\ \overline{AB} &= \frac{h_2}{\sin \alpha} \end{aligned}$$

(3) Direzione e verso di  $\bar{S}$

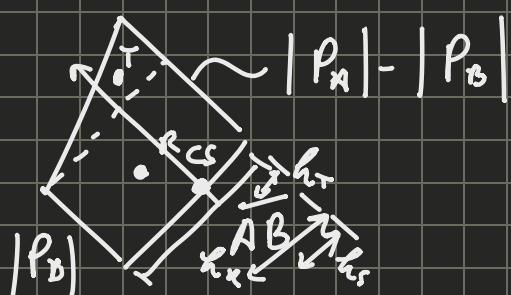
$$\begin{aligned} \bar{S} &= S_x \hat{i} + S_y \hat{j} \\ &\quad \left. \begin{array}{l} <0 \quad >0 \end{array} \right\} \\ S_x &= - |\bar{S}| \cdot \sin \alpha \\ S_y &= |\bar{S}| \cdot \cos \alpha \end{aligned}$$

=  $- |\bar{S}| \sin \alpha \hat{i} + |\bar{S}| \cos \alpha \hat{j}$

Verso

Direzione  $\perp \overline{AB}$

Centro di Spinta (Metodo Geometrico)



$$h_s = \frac{A_t h_T + A_R h_R}{A_t + A_R}$$

$$A_T = \frac{1}{2} (|P_A| - |P_B|) \cdot \bar{AB}$$

$$A_R = |P_3| \cdot \bar{AB}$$

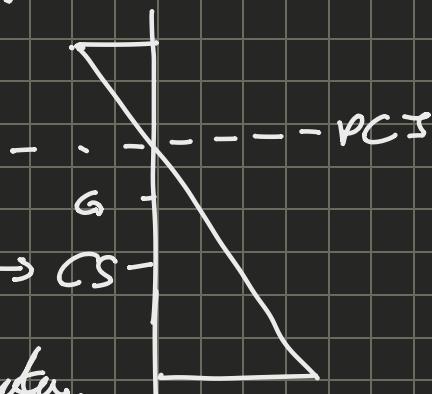
$$h_T = \frac{1}{3} \bar{AB}$$

$$h_R = \frac{1}{2} \bar{AB}$$



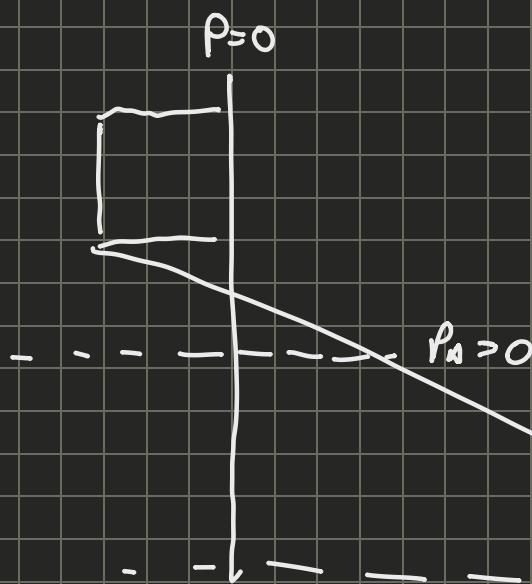
CS  $\leftarrow$  Punto lontano  
dal PCS

Cos



Anche qui il CS è più lontano

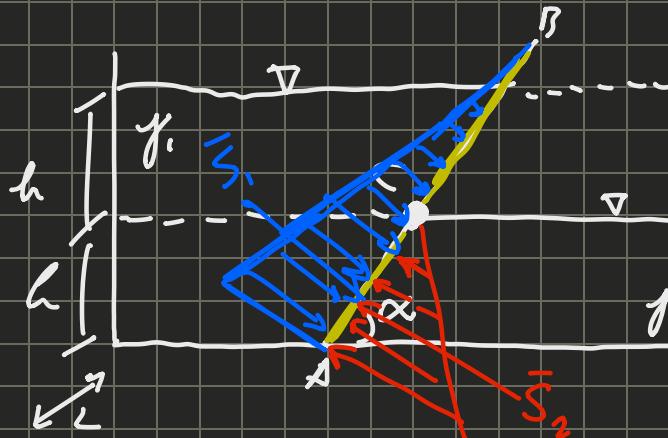
dal PCS rispetto al G.  $\rightarrow$  È sempre vero



È possibile anche che la superficie sia in pressione,  
 $P_3 > 0$

slowing  
aberration  
grande

## Esercizio 5 - Dispense



Seconda tipologia di problemi idraulici

Dati:

$y_1, h, L, \alpha$

?  $\rightarrow y_2$

C'è connivenza

A B è una paratia

Determinazione  $y_2$

① pressione e diagramma

$$P_B^{y_1} = 0$$

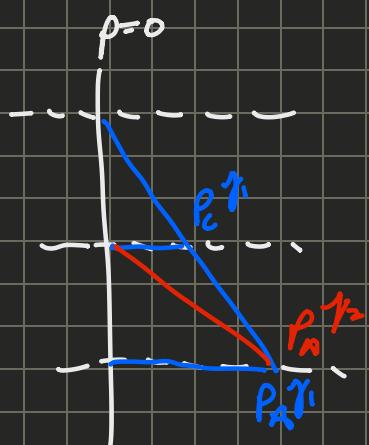
$$P_C^{y_1} = y_1 h$$

$$P_A^{y_1} = 2y_1 h$$

$$P_B^{y_2} =$$

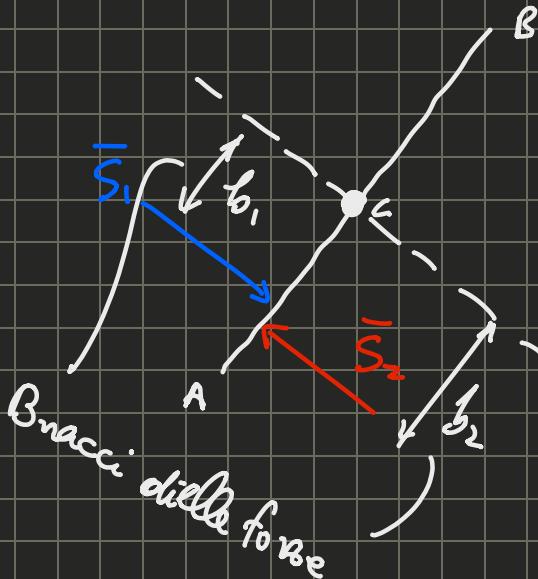
$$P_C^{y_2} = 0$$

$$P_A^{y_2} = y_2 h = 2y_1 h$$



— =  $y_1$   
— =  $y_2$

② Isolo la paratia  $\overline{AB}$  e disegna forze



Tipi di Forze

- Forze di volume (peso)

- Forze di superficie ( $\bar{S}$ )

- forze esterne

Uniche presenti in questo problema

③ Equilibrio alla rotazione di  $\bar{AB}$ , polo C

$$\textcircled{+} \quad |\bar{S}_1| \cdot b_1 - |\bar{S}_2| \cdot b_2 = 0$$

$$\textcircled{(S_1)} \quad |\bar{S}_1| = \rho_{G1} \cdot A_{\bar{AB}} = \rho_c^T \cdot A_{\bar{AB}} = \gamma_1 h \cdot \bar{AB} \cdot L$$

$$b_1 = \frac{2}{3} \bar{AB} - \bar{CB} = \frac{2}{3} \bar{AB} - \frac{1}{2} \bar{AB} = \frac{1}{6} \bar{AB} =$$

$$\textcircled{(S_2)} \quad |\bar{S}_2| = |\rho_{G2}| \cdot A_{\bar{CA}} =$$

$$\downarrow \quad \rho_{G2} = \textcircled{\gamma_2} \quad \frac{CA}{2} = \gamma_2 \cdot \frac{h}{2}$$

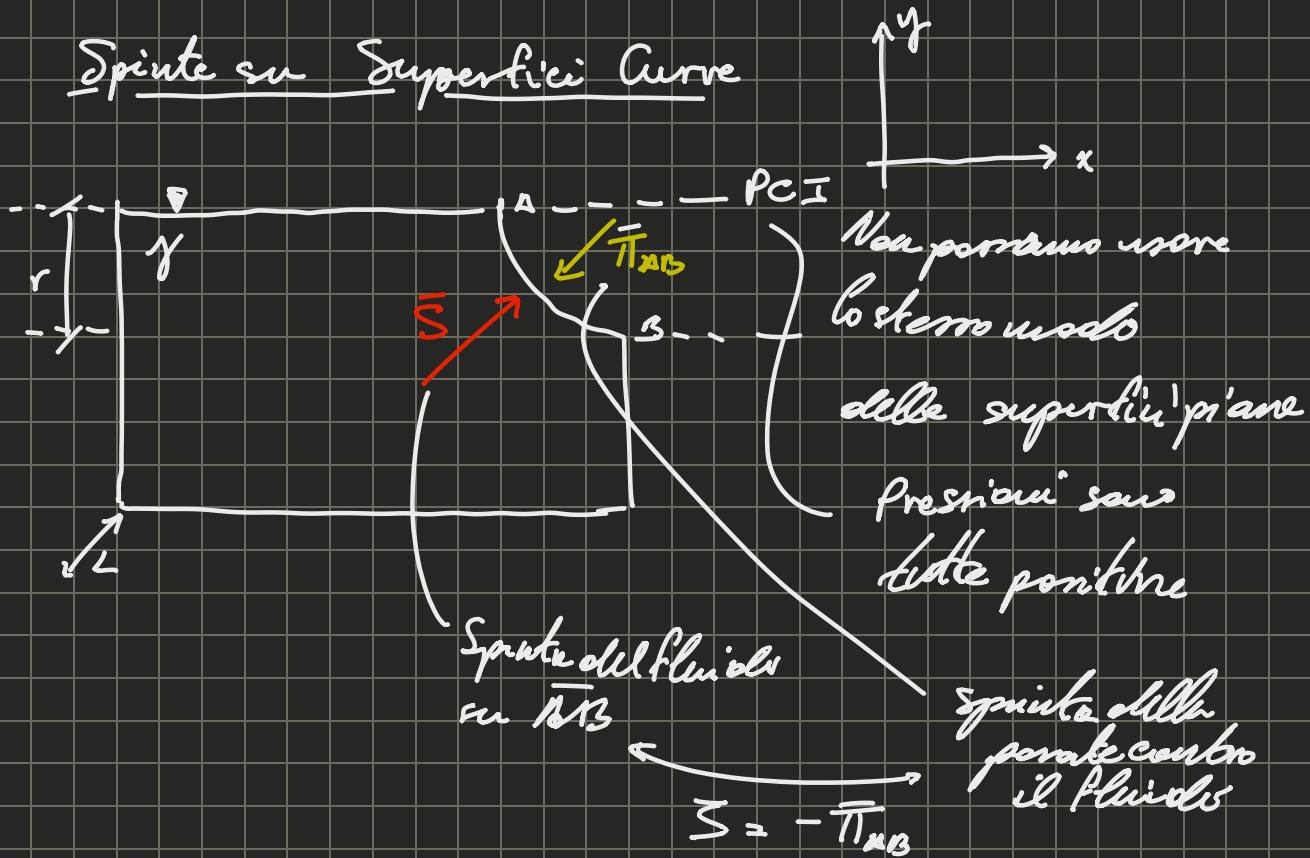
$$A_{\bar{CA}} = \frac{\bar{AB}}{2} \cdot L =$$

$$b_2 = \frac{2}{3} \bar{AC} = \frac{2}{3} \left( \frac{1}{2} \bar{AB} \right) = \frac{1}{3} \bar{AB}$$

$$\underbrace{\gamma_1 h \cdot \bar{AB} \cdot x \cdot \cancel{\bar{AB}}}_{S_1} - \underbrace{\gamma_2 \cancel{x} \cdot \frac{\bar{AB}}{2} \cdot x \cdot \cancel{\frac{1}{3} \bar{AB}}}_{S_2} = 0$$

$$f_1 = f_2/2 \rightarrow f_2 = 2f_1$$

## Spirte su Superficie Curve

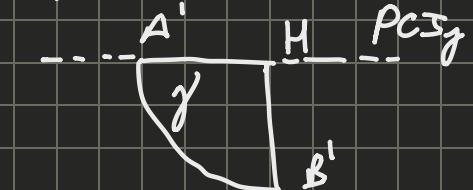


## Metodo dell'equilibrio globale

### 1) Cosa volume di controllo (V.d.c.)

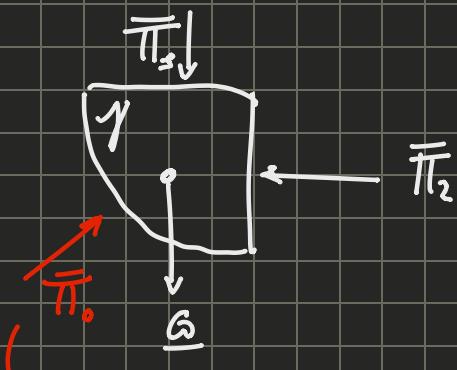
Condizioni:

- superficie curva unica e compresa
- chiusa con superficie piane (finite) in qualiasi modo
- riempio di  $\gamma$  il V.d.c.
- stesso diagramma delle pressioni  
se  $P_\infty = 0 \Rightarrow P_{\infty} = 0$



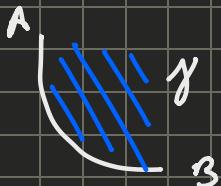
### 2) Forze del v.d.c.

- Forze di volume
- Forze di superficie
- no esterne

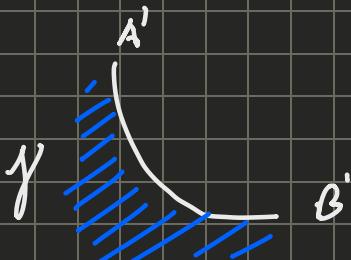


Di regola come per le  
conserviamo ancora  
i suoi componenti.

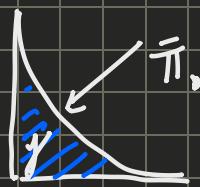
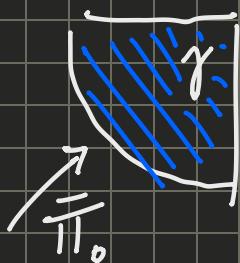
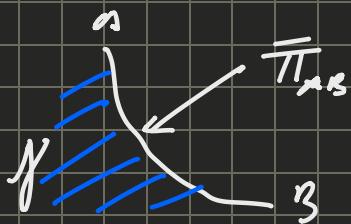
V.d.c. fittizio



V.d.c. reale



Sistema V.vv



$$\bar{\pi}_0 = -\bar{\pi}_{AB}$$

$$\bar{\pi}_0 = \bar{\pi}_{AB}$$

$$\bar{S} = -\bar{\pi}_{AB}$$

$$S = -\bar{\pi}_0$$

③ Equilibrio del V.d.c.

$$\left\{ \begin{array}{l} \bar{\pi}_0 + \bar{G} + \bar{\pi}_1 + \bar{\pi}_2 = 0 \end{array} \right.$$

$$\left\{ \begin{array}{l} \bar{\pi}_0 = \bar{S} \end{array} \right.$$

$$\rightarrow \bar{S} = \bar{\pi}_0 = -\bar{G} - \bar{\pi}_1 - \bar{\pi}_2$$

Componenti di S

$$\left\{ \begin{array}{l} S_x = -G_x - \cancel{\pi_{1,0}} - \cancel{\pi_{2,0}} \\ S_y = -G_y - \cancel{\pi_{1,y}} - \cancel{\pi_{2,y}} \end{array} \right.$$

$$\left\{ \begin{array}{l} S_x = -G_x - \cancel{\pi_{1,0}} - \cancel{\pi_{2,0}} \\ S_y = -G_y - \cancel{\pi_{1,y}} - \cancel{\pi_{2,y}} \end{array} \right. \quad \text{con 'altro}'$$

questo è vantaggio di aver preso  e non  ci toglierebbe una forza perché

Per come abbiamo preso il sistema di riferimento sfondiamo il PCI

$$G_y = -\gamma \cdot W_{Vdc} = -\gamma \cdot \frac{\pi}{4} r^2 \cdot L \quad \left. \begin{array}{l} \\ \end{array} \right\} S_x = -\left(-\gamma \frac{\pi r^2}{4} L\right) = \gamma \frac{r^2}{2} L$$

Sistema di Riferimento

$$\bar{\Pi}_{2x} = -p_{02} \cdot A_{45} = -\gamma \frac{\pi}{2} \cdot (r \cdot L) \quad \left. \begin{array}{l} \\ \end{array} \right\} S_y = -\left(-\gamma \frac{\pi}{4} r^2 L\right) = \gamma \frac{\pi}{4} r^2 L$$

$$\bar{S} = +\gamma \frac{r^2}{2} L \hat{i} + \gamma \frac{\pi r^2}{4} L \hat{j}$$

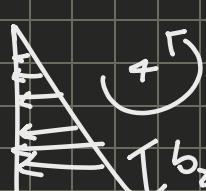
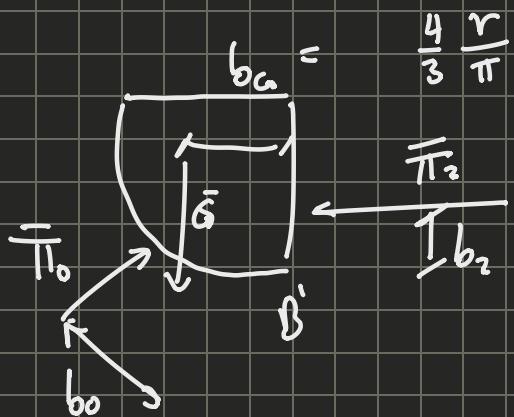
$\beta$

Direzione:  $\beta = \tan \left( \frac{|S_x|}{|S_y|} \right)$

$$|\bar{S}| = \sqrt{S_x^2 + S_y^2}$$

$$\boxed{I \cdot CS_i} \rightarrow Vdc$$

equilibrio alla rotazione del volume di controllo,  $b'$



$$|G| \cdot b_G + |\Pi_2| \cdot b_2 - |\Pi_0| \cdot b_0 = 0$$

$$b_2 = \frac{1}{3} r \quad b_0 = \frac{|G| \cdot b_G + |\Pi_2| \cdot b_2}{|\bar{S}|}$$

$$b_0 =$$

