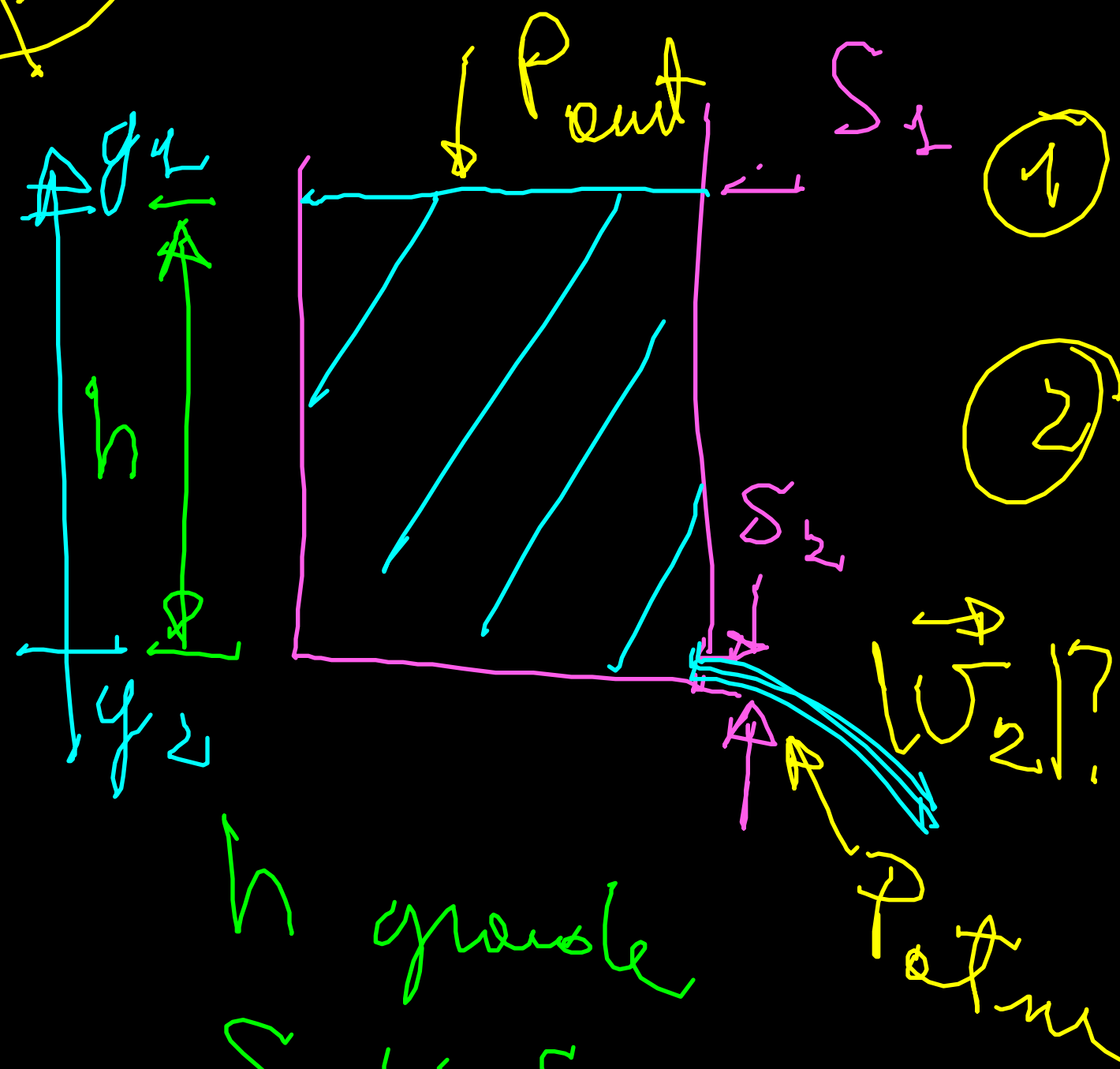


EQ. (1) BERNOULLI



$$P_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = P_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2$$



① $P_1 = P_{atm}$, $y_1 = h$, v_1

② $P_2 = P_{atm}$, $y_2 = 0$

v_2 ?

$$\frac{1}{2} \rho v_1^2 + \rho g h = \frac{1}{2} \rho v_2^2$$

$$v_1 S_1 = v_2 S_2 \Rightarrow v_1 = v_2 \frac{S_2}{S_1}$$

h grande

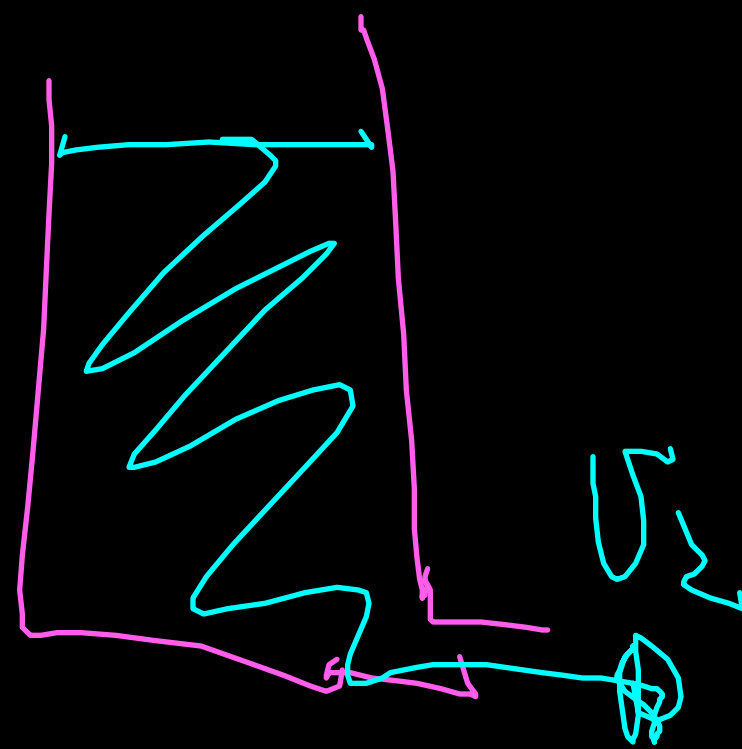
$S_1 \gg S_2$

\Rightarrow flusso stazionario

$$\frac{1}{2} \rho v_1^2 + \rho g h = \frac{1}{2} \rho v_2^2$$

$$v_1 S_1 = v_2 S_2 \Rightarrow v_1 = v_2 \frac{S_2}{S_1}$$

$$\frac{S_2}{S_1} < 1$$

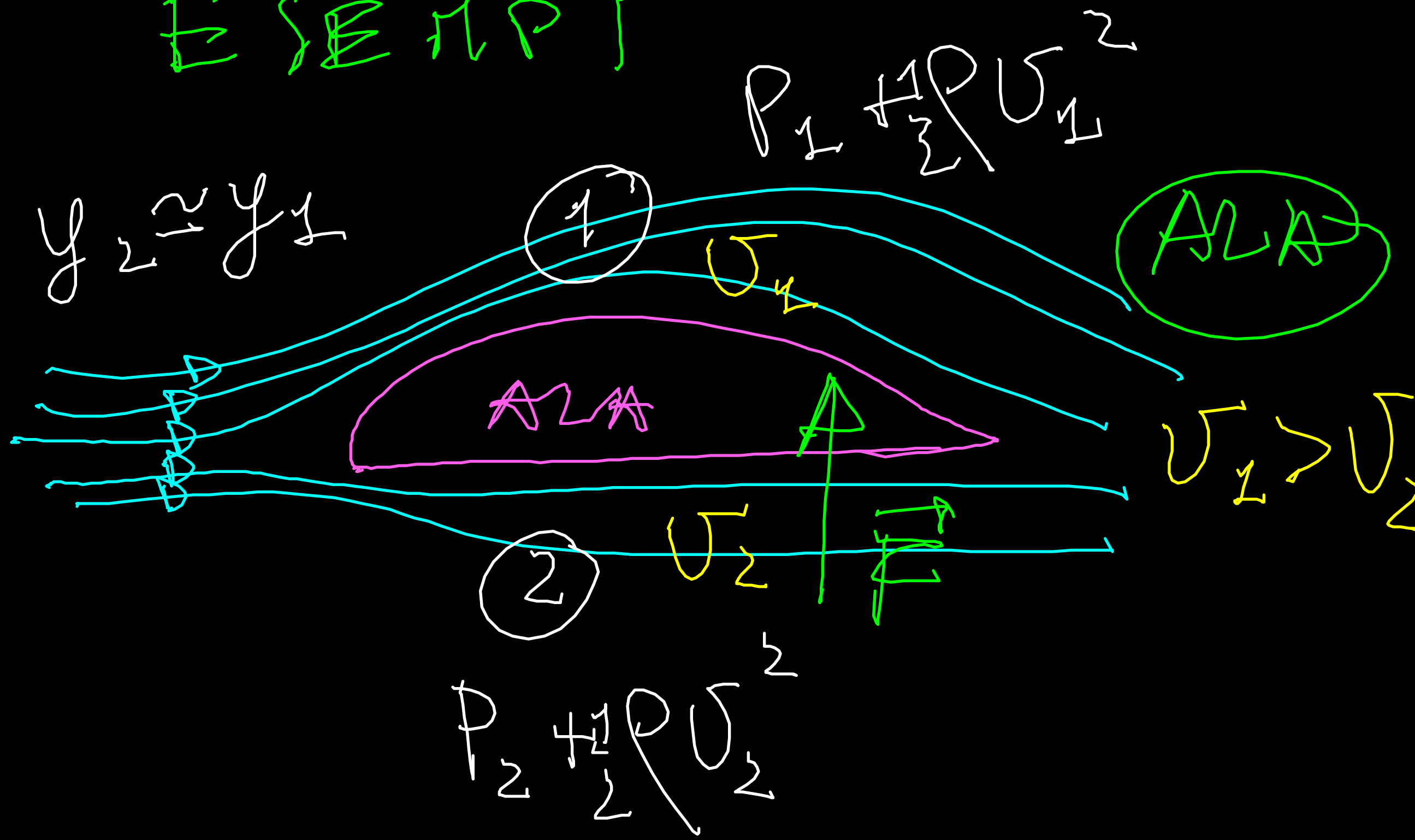


$$\Rightarrow \frac{1}{2} v_2^2 \left(\frac{S_2}{S_1} \right)^2 + g h = \frac{v_2^2}{2}$$

$$2gh = v_2^2 \left(1 - \left(\frac{S_2}{S_1} \right)^2 \right)$$

$$v_2 = \sqrt{\frac{2gh}{1 - \left(\frac{S_2}{S_1} \right)^2}}$$

ESEMPIO



$$P_1 + \frac{1}{2} \rho U_1^2 = P_2 + \frac{1}{2} \rho U_2^2$$

$$\rightarrow P_2 - P_1 = \frac{1}{2} \rho (U_1^2 - U_2^2) > 0$$

TUBO DI VENTURI



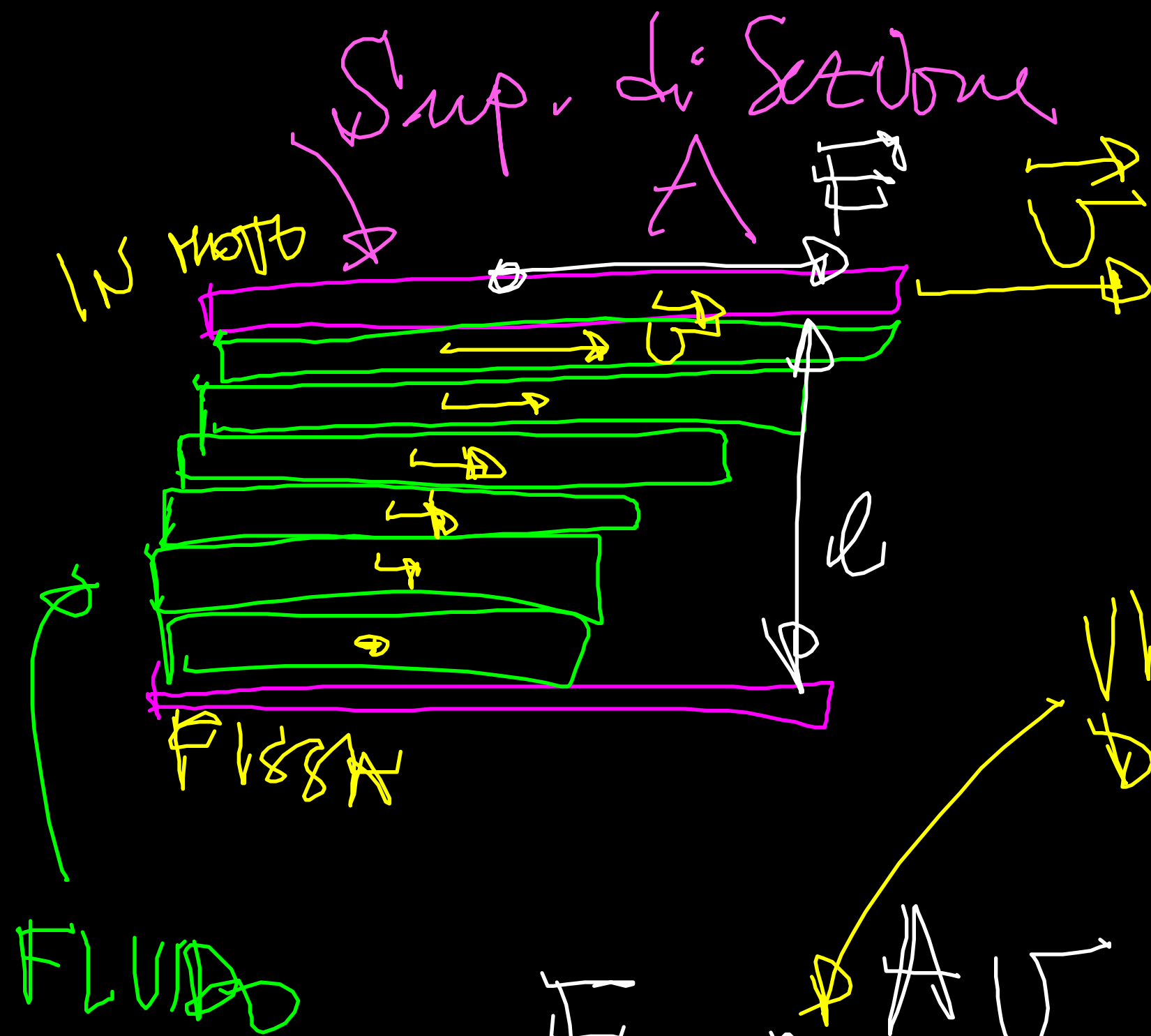
$$S_1 > S_2 \Rightarrow U_2 > U_1$$

$$\frac{1}{2} \rho U_1^2 + P_0 = \frac{1}{2} \rho U_2^2 + P_2$$

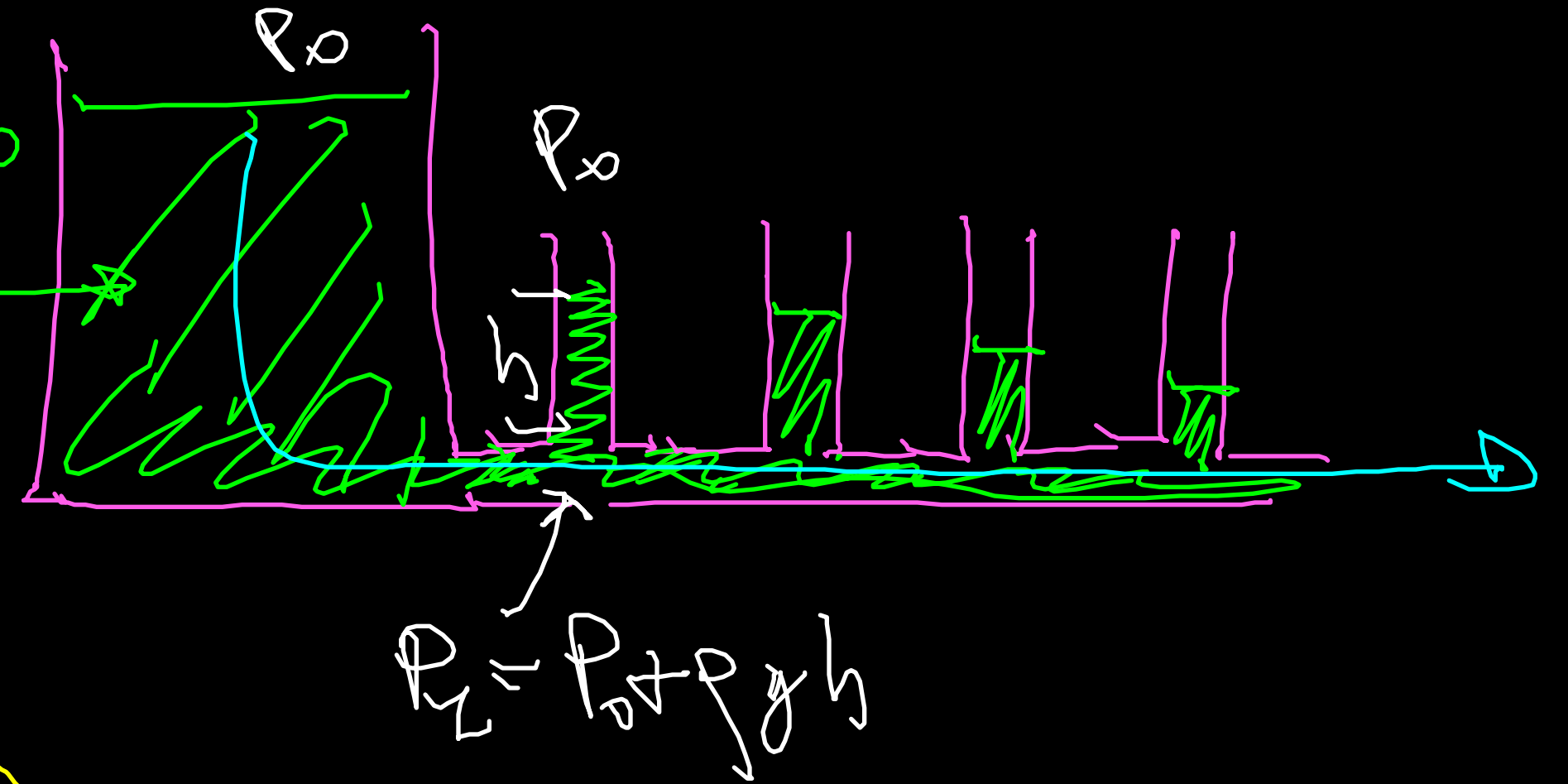
$$P_2 < P_0 + \frac{1}{2} \rho (U_1^2 - U_2^2) < 0$$

VISCOSITÀ

Forze interne al fluido non conservative



FLUIDO
VISCOSO



VISCOSITÀ
DEL FLUIDO

$$F = \eta \frac{A U}{l e}$$