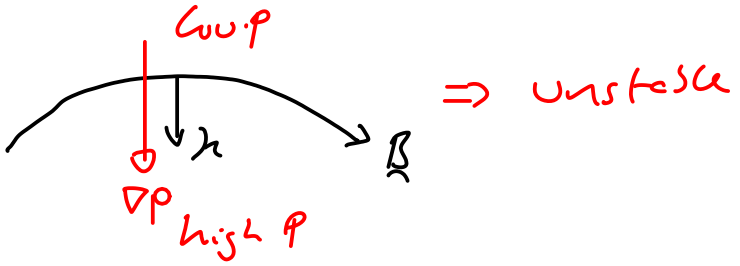
Pressure-driven modes

Contents

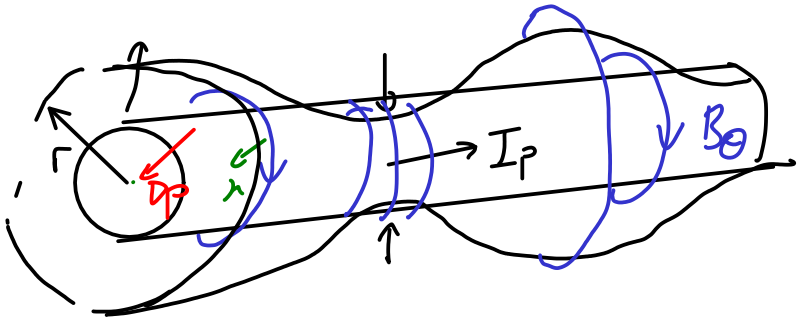
- Sausage instability
- MHD picture
- Single-particle picture

$$\delta W_p = \frac{1}{2}\int d\underset{\sim}{x}\left[-2(\underset{\sim}{\xi}_\perp \cdot \nabla p_0)(\underset{\sim}{\xi}_\perp \cdot \underset{\sim}{\kappa}) \right]$$

destabilising if $\nabla p_0 \cdot \underset{\sim}{\kappa} > 0$



⇒ unstable



$\underset{\sim}{\kappa} \cdot \nabla p_0 > 0$

① MHD

$$\oint \underset{\sim}{B} \cdot d\underset{\sim}{l} = \mu_0 I_p$$

$$B_\theta 2\pi r \qquad B_\theta = \frac{\mu_0 I_p}{2\pi r}$$

$$\frac{\partial}{\partial r}\left(p_0 + \frac{B_\theta^2}{2\mu_0}\right) + \frac{B_\theta^2}{r\mu_0} = 0$$

② Particle picture

$$v_\kappa = -\frac{v_\parallel^2}{\Omega}\,\underset{\sim}{\kappa}\times\underset{\sim}{b}$$

$$\Omega = \frac{qB}{m} \qquad \begin{matrix} + \text{ ions} \\ - \text{ electrons} \end{matrix}$$