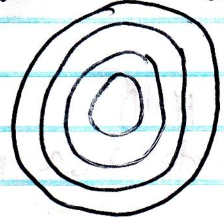
Bulk Transport

March 9th

Chapt 6 to 6.4

→ G+L (web) Chapter 13 → applications of fluids-



$\int j_\perp \, dA$ = total leakage

$$\rho_j (V_j \cdot \nabla) V_j + \frac{dV_i}{dt} = \rho_j t + \rho_j (V_j \times B \cdot \nabla p_j \quad (6.25)$$

$p_j = C\rho_j^{\gamma}$

3 Conservation Equations
1. Continuality
2. Energy
3. Momentum

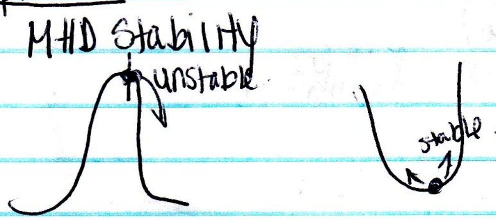
+ Maxwells equations

} MHD description of the plasma (highly used because it is very accurate)

We want high collisions rate.

Chapter 13

MHD Stability



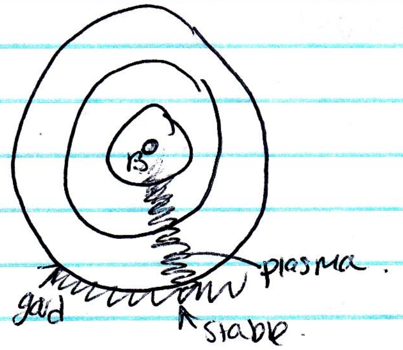
Fick's Law

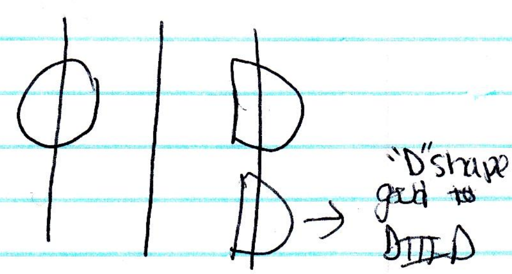
$J = -D \nabla n(r,t)$

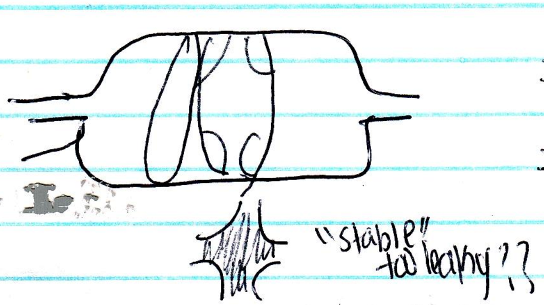
diff coeff

$D_{\parallel} \sim \frac{\lambda^2}{\tau} \rightarrow \lambda \sim T^{1/2}$

$D_\perp \sim \frac{r_L^2}{\tau} \sim \frac{1}{BT}$







If it curves into the plasma it is good

If it curves out of the plasma it is bad.

$$\rho \frac{dv}{dt} = -\nabla p + 1/c\,(j \times B)$$

MHD → if $\sigma \to \infty$ it is an ideal MHD

if σ doesnot equal to ∞ it is a resistive MHD

$$E + 1/c\,(v * B) = 0$$

$$\nabla \times E = -1/c \cdot \frac{dB}{dt}$$

$$\frac{dB}{dt} = \nabla \times (v \times B)$$

$$\nabla \times B = \frac{4\pi}{c} j$$

$$\nabla \cdot E = 4\pi\sigma$$

$$\nabla \cdot B = 0.$$

$$0 = -\nabla p_0 + 1/c\,(j_0 \times B_0)$$

counters $\nabla \cdot B$ force at equilibrium.

$$P = \frac{B_{exp}^2}{2\mu}$$ at equilibrium.