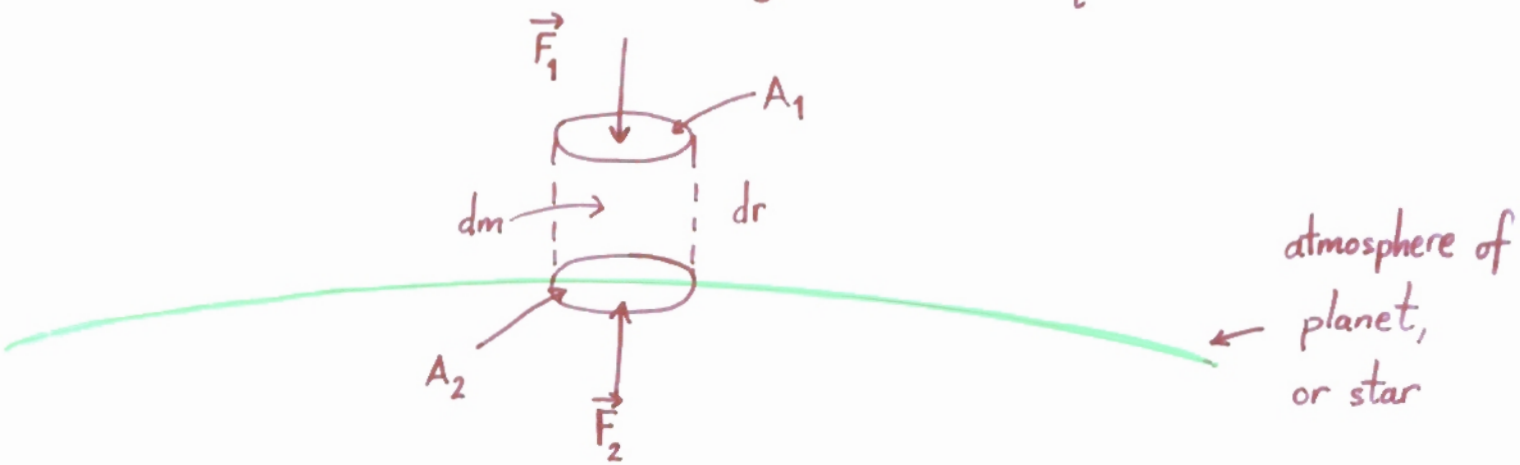
Hydrostatic equilibrium

The pressure (and hence density and temperature) is not constant throughout an atmosphere. A balance is maintained between the outward pressure force, and the inward gravitational force.

We call this balance hydrostatic equilibrium



Consider a cylinder of atmosphere, between r and $r + dr$ above the surface, containing mass dm and of cross-sectional area A

$$\text{Pressure} = \text{force} / \text{area}$$

Force on lower face of cylinder has magnitude :-

$$F_2 = P(r) . A + F_G$$

F_G : weight of gas in cylinder