

$$\frac{\mathrm{d}P}{\mathrm{d}\ln r} = \frac{\rho_g}{\mu m_{\mathrm{p}}} k_{\mathrm{B}} T_g \left(\frac{\mathrm{d}\ln \rho_g}{\mathrm{d}\ln r} + \frac{\mathrm{d}\ln T_g}{\mathrm{d}\ln r} \right)$$

$$M_{\mathrm{tot}}(< r) = - \frac{\langle r \rangle}{G_{\mathrm{N}} \rho_g} \frac{\mathrm{d}P}{\mathrm{d}\ln r}$$