Galaxy formation and evolution
PAP 318, 5 op, autumn 2020

on Zoom

Lecture 8: Formation and evolution of gaseous haloes– Additional notes, 30/10/2020

Lecture 8 additional notes I

- Page 4: Shock-heating: Initial Assumption

$$v_{\rm in}^2 >> \frac{k_B T_{\rm in}}{\mu m_p}$$

- Page 4: μ is the mean molecular weight and m_p the proton mass.

$$N = \frac{M_{\rm gas}}{\mu m_p}$$

- Page 5: Gas on free-fall:

$$\frac{1}{2}mv^2 - \Phi m = 0 \Rightarrow \; v_{\rm in} \simeq v_{\rm esc}(r_{\rm sh}) = \sqrt{2|\Phi(r_{\rm sh})|}$$

Lecture 8 additional notes II

- Page 5: Definition of the virial velocity:

$$v_{\rm vir}^2 = \frac{GM_{\rm vir}}{r_{\rm vir}}$$

- Page 6: Hydrostatic equilibrium:

$$\frac{k_b}{\mu m_p}\frac{d}{dr}\left(\rho T\right) = -\rho\frac{GM(r)}{r^2}$$

$$M(r) = -\frac{k_b r^2}{\mu m_p G\rho}\left(\frac{d\rho}{dr}\cdot T + \frac{dT}{dr}\cdot\rho\right)$$

Lecture 8 additional notes III

- Page 7: Correcting for non-thermal pressure, add the term:

$$\frac{P_{\rm nt}}{P_{\rm th}} \frac{d \ln P_{\rm nt}}{d \ln r}$$

- Page 8: The terms going into the virial temperature formula:

$$2K = 3 \frac{M_{\rm gas}}{\mu m_p} k_B T_{\rm vir} \qquad W = \zeta \frac{G M_{\rm gas} M_{\rm vir}}{r_{\rm vir}}$$

$$\Sigma = V \cdot P = \frac{4\pi}{3} r_{\rm cl}^3 \cdot 3 P_{\rm ext} = 4\pi r_{\rm cl}^3 P_{\rm ext}$$