$$\tau \quad \sim \quad k \left(\frac{P}{M^2} \right)$$

$$|GPE| \quad > \quad KE$$

$$\mathrm{r}_{\mathrm{strong}} \quad = \quad \frac{2GM}{(\Delta v)^2}$$

$$f \quad = \quad n \, \sigma \, \Delta v$$

$$\sigma \quad = \quad \pi(\mathrm{r}^2_{\mathrm{strong}}) \quad = \quad \pi \left(\frac{2GM}{(\Delta v)^2} \right)^2 \quad \propto \quad M^2$$

$$\Delta v \quad \sim \quad \frac{1}{2} \left(\frac{\Delta a}{a} \right) v \quad \propto \quad \left(\frac{v}{a} \right) \quad \propto \quad \frac{1}{P}$$

$$f \quad \propto \quad n \, (M^2) \, (\frac{1}{P}) \quad \propto \quad \frac{M^2}{P}$$