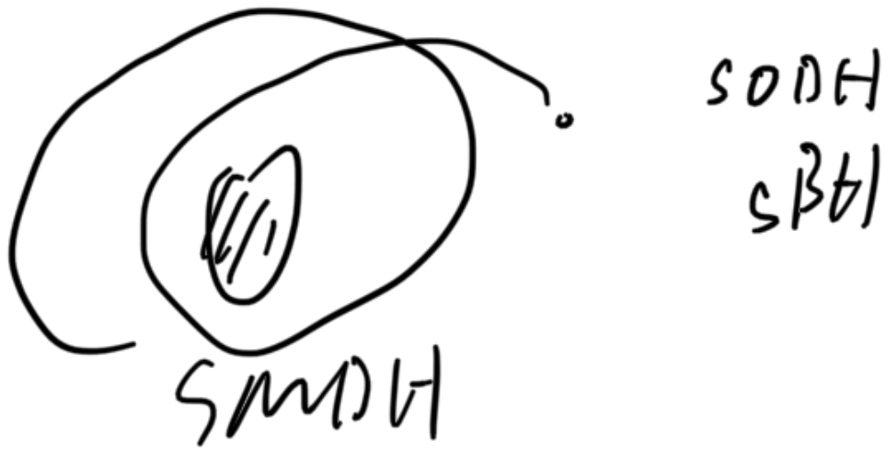


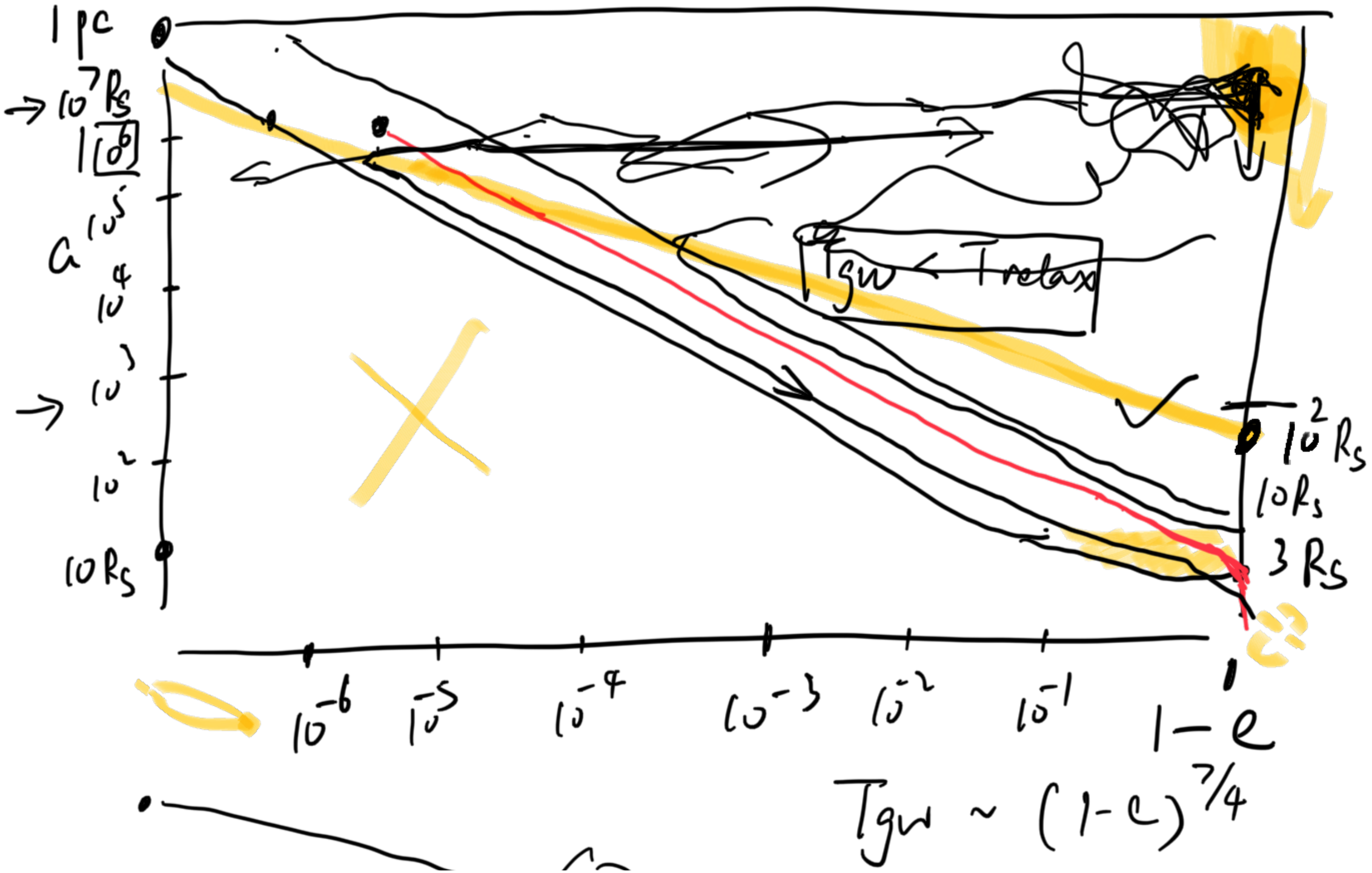
$$R_S = 3\times10^6\,\mathrm{km}\,\frac{M}{10^6 M_\odot} \sim 10^{-7}\,\mathrm{pc}\,\frac{M}{10^6 M_\odot}$$

$$R_{NSC} \sim 1\,\mathrm{pc}$$

$$f_{GW} = \frac{1}{\pi}\sqrt{\frac{GM}{a^3}} = 2\,\mathrm{mHz}\left(\frac{M}{10^6 M_\odot}\right)^{-1}\left(\frac{a}{10R_S}\right)^{-\frac{3}{2}}$$

$$M \sim 10^5 M_\odot$$

Phase space of stars around SMBH



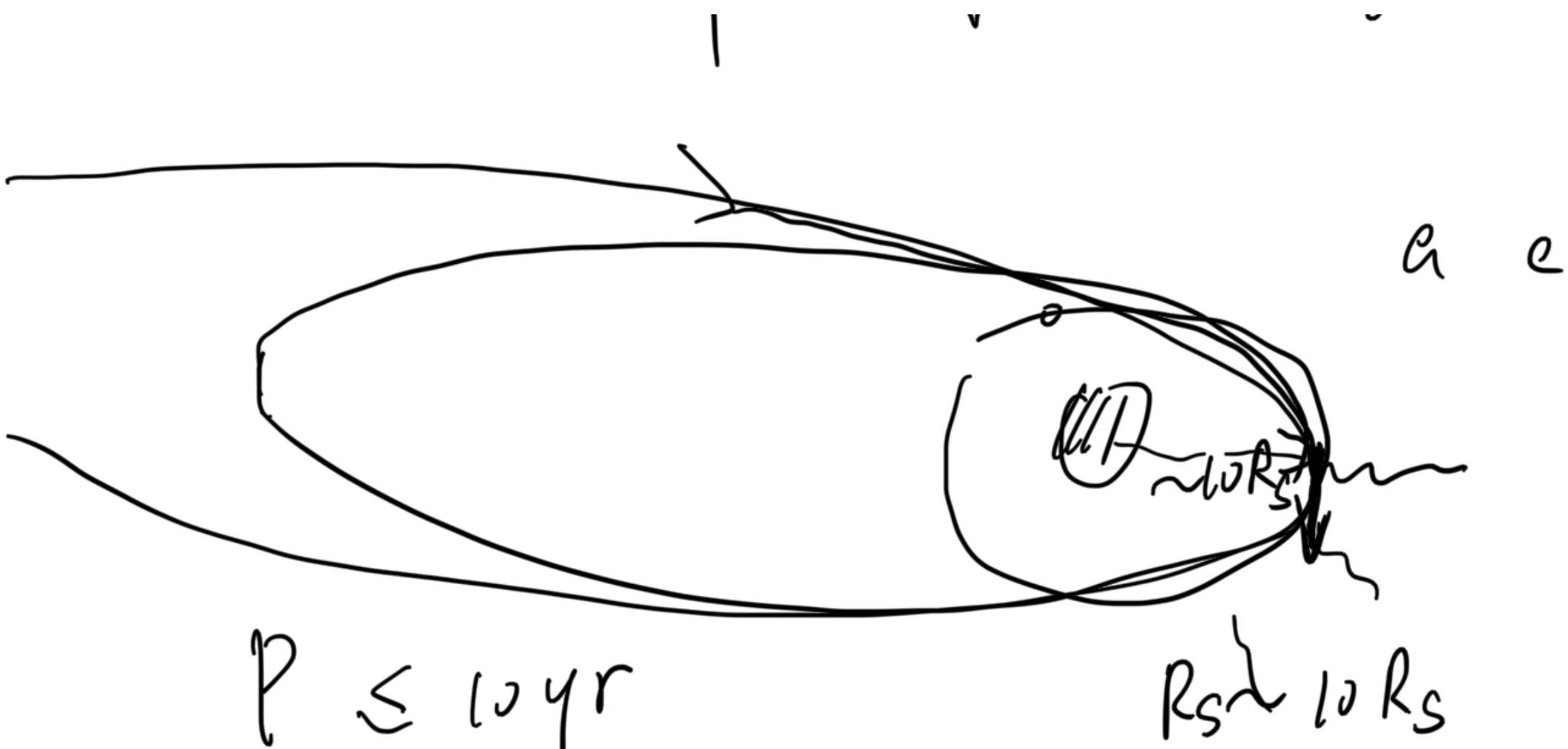
$R_p \sim a(1-e) \sim 10 R_s$

$a(1-e) \sim R_p < 2R_s$

$1-e \sim 1$

$3R_s$

EMRI Inspiral



$$R_p = a(1-e) \lesssim 10 R_s$$

$$=$$

Where are the SOBHs?

$$\rho \sim a^{-\frac{7}{4}}$$

$$\frac{dN}{da} \sim 4\pi a^2 \rho \sim a^{\frac{1}{4}}$$

$$\frac{dN}{d\ln a} \sim a^{5/4}$$

$1\,pc$ $10^7 R_S$ $10^6 M_\odot$ stars

$10^5 M_\odot$ sBHs

10^4 sBHs

$10^3 R_S$ 0.1 sBHs

$$\frac{dN}{d\ln a} \sim \text{const}$$

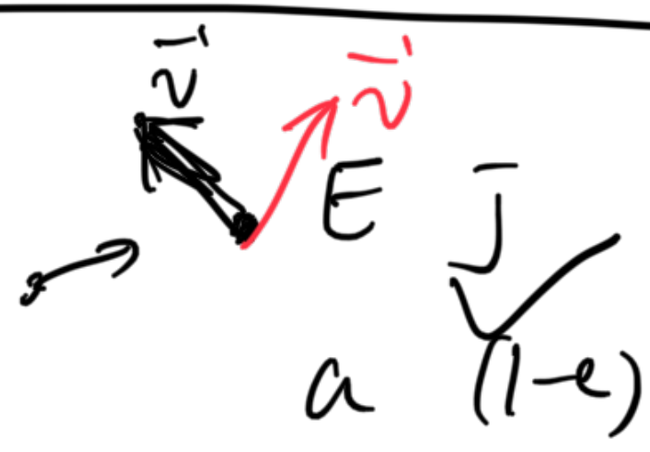
$d(1-e)$ $\qquad$ $d(1-e^2)$

$$\frac{dN}{d(1-e)} \sim C \quad \text{when} \quad e \sim 1 \quad (1+e=2)$$

$$\frac{dN}{d\ln(1-e)} \sim 1-e \qquad 1$$

10^{-6}

Relaxation



Clean EMRIs ?

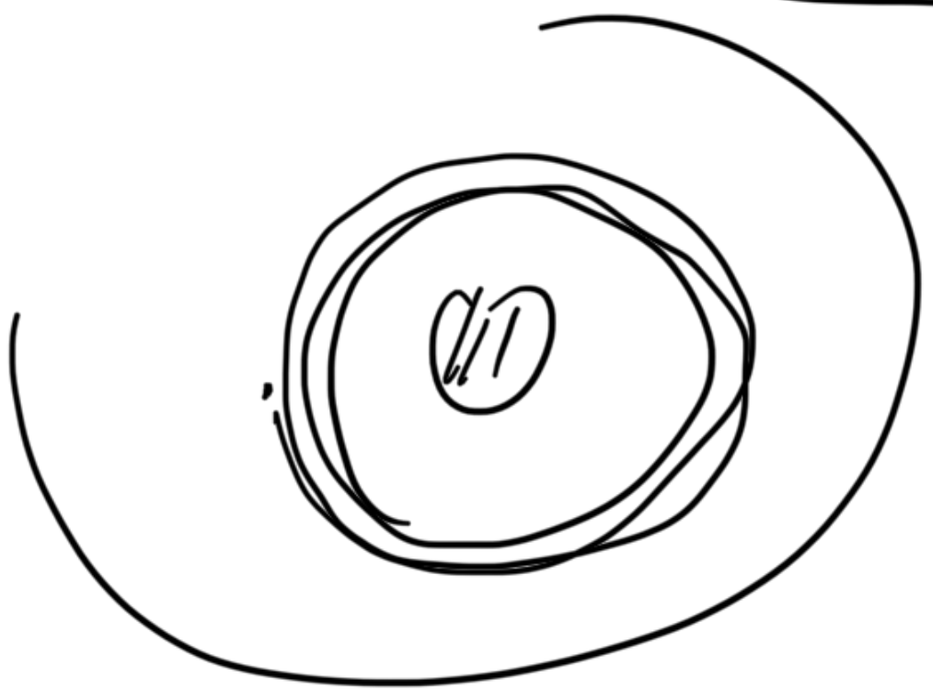
$T_{relax} < T_{gw}$

Near-circular EMRI

$p \sim a^2$

$\Rightarrow$ 10yr

$R_p \sim R_T \gg a(10 R_S)$



① EMRI high ecc.

(2) near-circular EMRIs

(3) AGN circular EMRIs

{ Resonant Relaxation
  Schwarzschild Barrier

① $\mathcal{D}$ event rate $\propto a^2$.

② ece.

S - stars.