King models

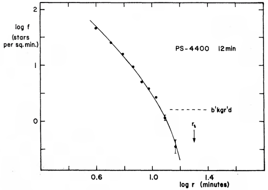


Fig. 1. Star counts in M15. Maximum-exposure 48-inch Schmidt plate. Mean errors are indicated above and below last two points. Arrow indicates value of r_t; dotted line indicates backgrount count.

(King 1962)

- At the centre of globular star clusters,

$$\Sigma = \frac{\Sigma_0}{1 + (r/r_c)^2},$$

which is different from the Plummer model ($\Sigma \propto r^{-4}$).

- At outer regions ($r \gg r_c$),

$$\Sigma \propto (1/r - 1/r_t)^2,$$

which is also different from the Plummer model.

King models

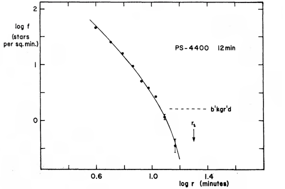


FIG. 1. Star counts in M15. Maximum-exposure 48-inch Schmidt plate. Mean errors are indicated above and below last two points. Arrow indicates value of r_t; dotted line indicates backgrount count.

(King 1962)

- The density of the Plummer model never drops to zero.
- King 1962 suggested the following function to fit observed profiles of globular star clusters

$$\Sigma \propto \left\{ \frac{1}{1+(r/r_c)^2} - \frac{1}{1+(r_t/r_c)^2} \right\}^2 .$$

King models

- What can be the distribution function of these models?
- Consider a distribution function in the form of

$$f = G(e^{\mathcal{E}/\sigma^2} - 1)$$

  for $\mathcal{E} > 0$ and $f = 0$ otherwise.
- Note that the constant σ is not the velocity dispersion; the velocity dispersion decreases with r and reaches zero at r_{t}.
- There is a radius r_{t}, where the density drops to 0 $\rightarrow$ tidal radius.

King models

- Concentration is defined by

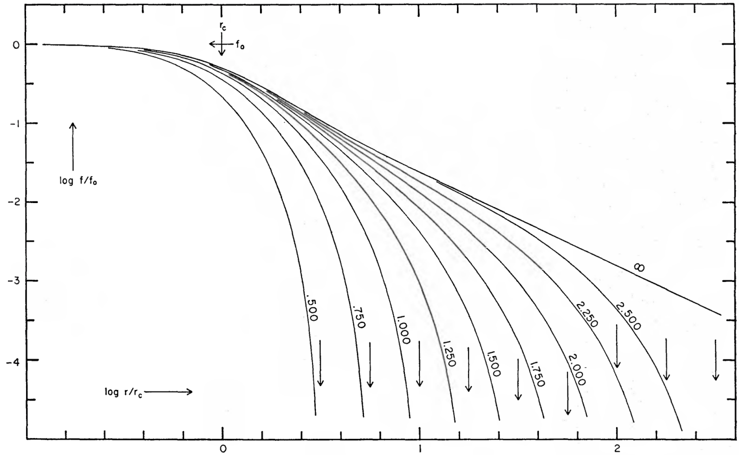
$$c \equiv \log_{10}(\mathrm{r_t}/\mathrm{r_0}).$$

- where the King radius r_0 is given by

$$r_0 = \sqrt{\frac{9\sigma^2}{4\pi G\rho_0}}.$$

- Concentration c is the only parameter of the King models.

King models



(King 1966). Note that f here is not a distribution function, but Σ. The curves are parametrised by the concentration c.

King models

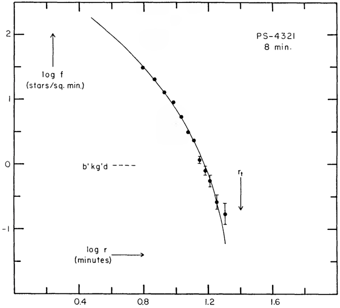


FIG. 2. Comparison of star counts in M13 with theoretical curve for $\log(r_t/r_c)=1.50$. Maximum-exposure 48-in. Schmidt plate.

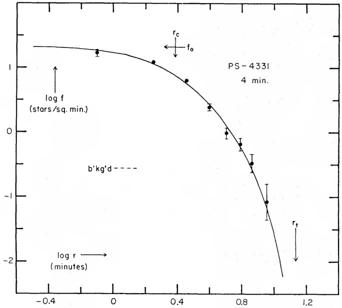


FIG. 3. Comparison of star counts in NGC 5053 with theoretical curve for $\log(r_t/r_c)=0.75$. Medium-exposure 48-in. Schmidt plate.

(King 1966). King model can fit well both concentrated (left panel) and low concentration star clusters (right panel).