Isothermal Anisotropic Osipkov-Merrit model

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Finding Jean-Pierre Petit like density distribution

$$\Psi(R) := -\phi(R).$$
$$\nabla^2\Psi(R) = -4\pi G\rho(R).$$

Consider Osipkov-Merrit type anisotropic distribution function in isothermal exp() function:

$$Q = \Psi(R) - \frac{v_R^2}{2} - \frac{v_\theta^2}{2}\left(1 + \frac{R^2}{r_a^2}\right).$$

$$f(Q) = f_0 \exp\left(\frac{mQ}{kT}\right),$$

$$\rho(R) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(Q)\, dv_R\, dv_\theta.$$

we find the same distribution as in: https://www.jp-petit.org/science/f300/f3900/f3904.htm

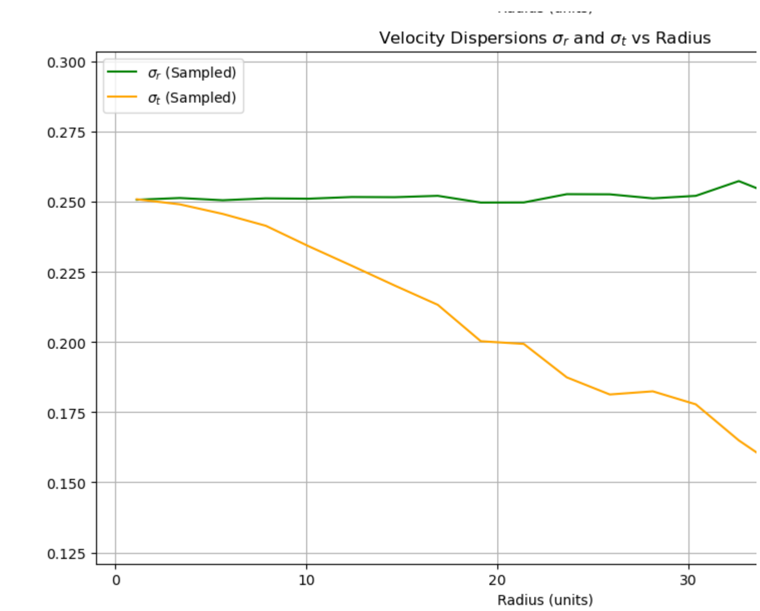
$$\boxed{\rho(R) = \frac{2\pi f_0 kT}{m}\frac{e^{-\frac{m}{kT}\phi(R)}}{\sqrt{1 + \frac{R^2}{r_a^2}}}.}$$

Taking :

$$f(Q) = \begin{cases} f_0 \exp\left(\frac{mQ}{kT}\right) & \text{if } Q \geq 0, \\ 0 & \text{if } Q < 0. \end{cases}$$

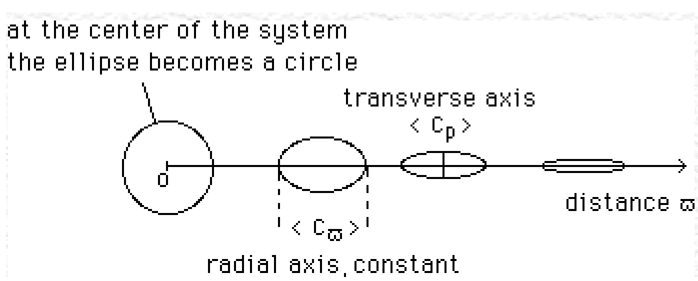
to have a truncated version with finite extend , we can find after some calculations :

$$\boxed{\rho(R) = \frac{2\pi f_0 kT}{m}\frac{e^{-\frac{m}{kT}\phi(R)} - 1}{\sqrt{1 + \frac{R^2}{r_a^2}}}}.$$

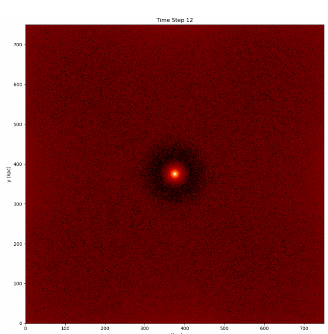


solving with self consistency and ”Backwarded” negative fluids environment and ”2D axi symmetric version”

Like in Jpp WebSite :

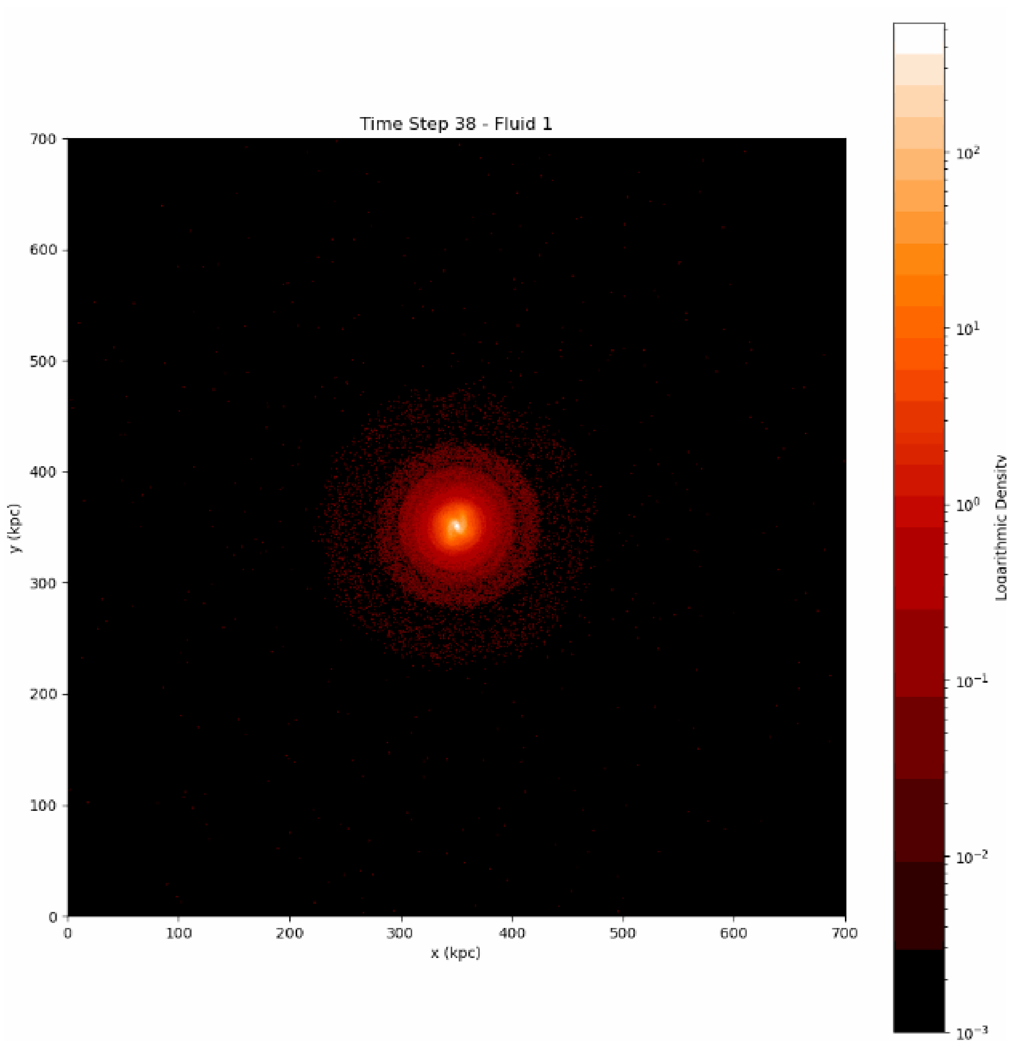


We can find some steady state without Rotation :



Now given a curve rotation like J.Petit - F.Lhanseat from :
https://www.jp-petit.org/science/f300/f3900/f3906.htm : " r. exp(-r / R0) "

we find some spiral structure too :



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