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Geometrically thin acrretion disk around quark stars

B. Mishra[1⋆], W. Kluźniak[1], B. Vaidya[2]
[1] *Copernicus Astronomical Center, Bartycka 18, Warsaw,00-716, Poland*
[2] *University of Leeds, Leeds LS2 9JT, United Kingdom*

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ABSTRACT
We studied semi-analytically and numerically the geometrically thin and optically thick accretion disk around rapidly rotating quark stars and white dwarfs using potential for Maclaurin spheroid. The main interest is to investigate the inner region of the so called α-disk. We found that the change in eccentricity of the compact object influence the spectra emitted from the accretion disk. This can be observational evidence for the existance of the quark stars. Analytical calculations are mainly done in the radiation pressure dominated region of the accretion disk. The numerical work has been carried out to see the time evolution of the accretion disk around quark stars and white dwarfs using the same potential for Maclaurin spheroids. We showed that if the eccentricity of the object is high the matter will diffuse slowly and advect rapidly during its evolution. This gives a clue that how spin up or spin down can change the time evolution of the accretion disk using a very simple Newtonian approach.

Key words: Maclaurin spheroids, white dwarfs, quark stars, accretion disk

1 INTRODUCTION

2 PHYSICAL MODEL

2.1 MacLaurian Spheroid

- Describe in very brief the basics and how Ω is obtained and re-draw the plot that is in your supervisor paper.

2.2 Analytical Approach

- List all the equations that you have used and what modification you have done for e.g., you have used Ω corresponding to MacLaurian spheroid.
- Say that formulae depends on M, Mdot, α, r and eccentricity and give the values of choices made for them. Explicit formulae and quantities shall be discussed in results section.

2.3 Numerical Evolution

- List formulae and refer the paper that we have been using for evolution of Surface density.

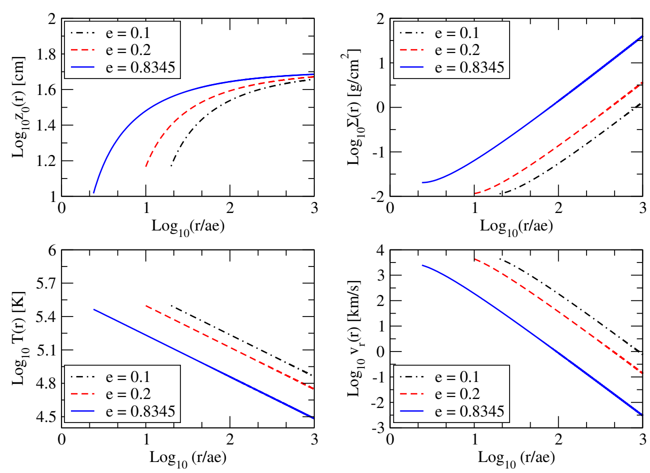

Figure 1. Multiplot of various quantities obtained from semi-analytical work

3 RESULTS

3.1 Steady state disk

- describe the multi plots (fig 1) for each quantity : its value, its profile and dependence on eccentricity.
- Make a table which gives quantitive values.

⋆ E-mail: mbhupe@camk.edu.pl

3.2 Disk thermodynamics and Spectra

- Show that values of T obtained above give Prad > Pgas.
- Also show that the disk is optically thick.
- Finally describe the spectra and state its dependence on eccentricity. (Explain the reason in discussion).

3.3 Evolution of surface density

- Show the plot of evolution of a ring of matter for a particular high eccentricity and describe it. Specially the skewed profile for higher eccentricity.
- Show that at low eccentricity it approaches the α-disk solution. Here also describe the plot which shows the evolution with different eccentricity.

4 DISCUSSION

4.1 Very thin and fast disk

- Why few cm sized disk?
- Is Newtonian gravity responsible for faster disk.
- how values change with change in α.

4.2 Dependence of Spectra on eccentricity

- Explain the reason for the dependence of spectra on e.
- Discuss its consequences in observations.

4.3 Angular Momentum transport in disks

- Explain the reason for skewness in sigma plot with high e values. Show plots of advection and diffusion.
- Also discuss the implication of e on Ang. momentum transport.

5 CONCLUSION

State your conclusions here.