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RESOLVING STELLAR CLUSTER ENIGMAS THROUGH N-BODY SIMULATIONS

H. Dottori[1], A. Fausti[1], M.R. de Oliveira[2] and R. de Carvalho [3]

N-body simulations, by de Oliveira, Dottori & Bica (1998) are used to explain morphological and brightness distribution peculiarities, recently discovered in the globular clusters M92 and NGC5824.

In M92, Testa et al. (A&A 356,127,2000) have found faint extensions up to three tidal radii of the cluster center. We simulate the evolution of a relaxed Plummer model in the Galaxy gravitational field during the last two Gyr, which roughly correspond to 16 perigalactic transits. The dynamical initial conditions have been obtained by letting a particle evolve in the galactic potential from its present position by inverting the spacial velocity vector of the cluster. The Plummer model has 16384 particles, covering a mass range from $0.1-1.2$ solar masses and the half mass radius of 1.5 pc, and a equivalent King radius of 10 pc. The simulations show the appeareance of several hundreds of parsecs long tidal tails, which tend to align with the cluster orbit.

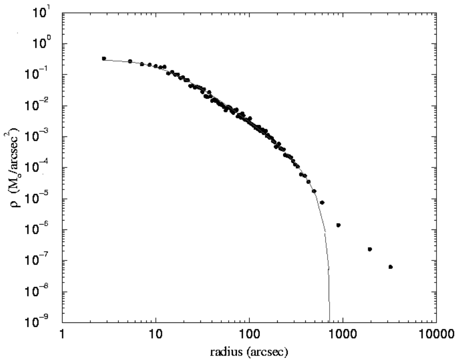

Fig. 1. M92. Dots, counts from our model showing the extra-tidal structure. Solid line, isotropic King model.

The evolved cluster model reproduce quite well the observed density profile and surface density map, including the on-the-sky isodensities orientation. The models point to an upper mass loss rate of $\approx$ 6%

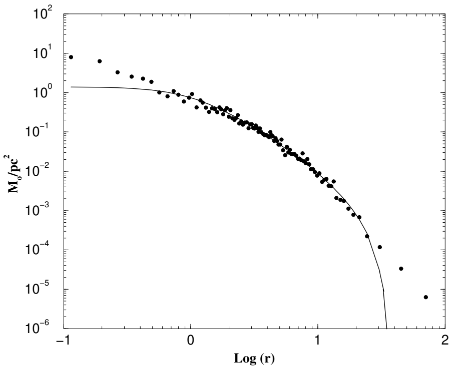

Fig. 2. NGC5824. Dots, counts from our model at 500 Myr when the core enhancement appears. Solid line, isotropic King model.

per Gyr, which linearly extrapolated indicate a time of evaporation of about 40 Gyr. Over the two Gyr covered by the simulation the cluster halo tends to swell and the core to shrink.

NGC 5824 presents a power law brightness distribution, with enhanced core brightness and an extended halo, with strong departures from the classical King's model, Grillmair et al. (AJ,109,2553,1995). Our simulations shows than the observed features can be reproduced by the capture and merger of a small stellar cluster by a larger one. The observed cluster properties are better reproduced after 500 Myr of simulation time. At simulations time of the order of 400 Myr the core enhancement does not yet appears, and after 1.2 Gyr the cluster model recovers a central density similar to the King's profile. Nevertheless, the halo remains larger than the tidal radius.

REFERENCES

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[1]Instituto de Física, UFRGS, CP 15051, CEP 91501-970, Porto Alegre, RS, Brasil; dottori@if.ufrgs.br; fausti@if.ufrgs.br

[2]Observatoire de Paris, DEMIRM, 61 Av. de l'Observatoire, F-75014 Paris, France; marcio.oliveira@obspm.fr

[3]Instituto Astronômico e Geofísico, USP, Avenida Miguel Stefano, 4200, 04301-904 São Paulo, Brasil; reinaldo@iagusp.usp.br