



# On the Orbital Decay of Globular Clusters in NGC 1052-DF2: Testing a Baryon-Only Mass Model

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## NGC 1052-DF2

UDG with a cored stellar profile

GC luminosity function shifted to higher luminosities

Best fit GC velocity dispersion consistent with a dark matter mass of zero

Specific Question: Are the dynamics of the GCs in DF2 consistent with a baryon-only mass model?

(Dutta Chowdhury et al. 2019)

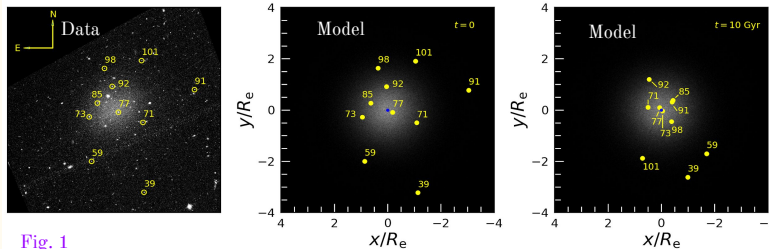


Fig. 1

Figure 1: Evolution of the GC system in DF2 for a baryon-only model (1 out of 50 realizations)

## Simulation Setup

Spherically symmetric N-body model constructed for DF2 using the observed surface brightness profile as constraint

Velocity isotropy and dynamical equilibrium assumed for the stellar system

50 random realizations made for the GC system consistent with observed projected positions and los velocities of the GCs

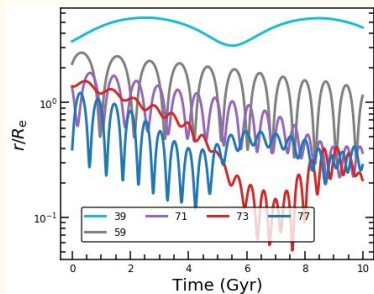


Figure 2: Evolution of the 3D radii of individual GCs for the realization shown in Figure 1

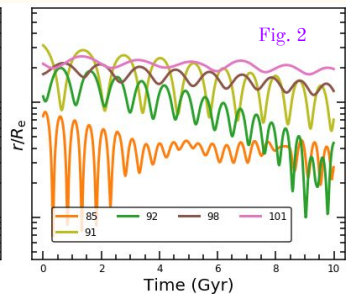


Figure 3: Realization-to-realization variance in the evolution of the projected GC half-number radius

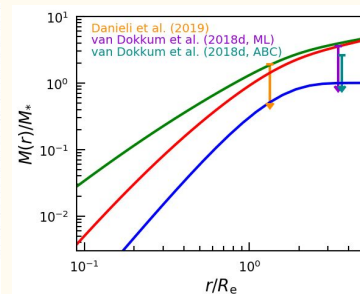
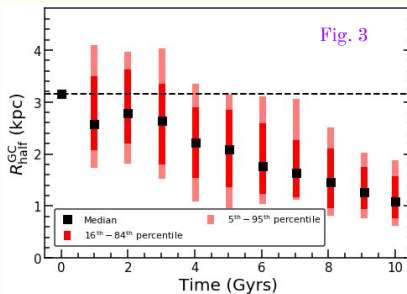


Figure 4: Enclosed mass profiles (left) and orbital decay timescales (right) in presence and absence of dark matter. A dark matter cusp (green curve) results in significantly shorter inspiral timescales for  $r < 0.5 R_e$ .

**Conclusion:** While orbital decay due to dynamical friction causes the GC system to become more compact over 10 Gyr, reduced dynamical friction in the galaxy core (core-stalling) and GC-GC scattering prevent the GCs from sinking all the way to the galaxy center. Therefore, a baryon-only mass model is perfectly viable as long as the GC system was (somewhat) more extended in the past.