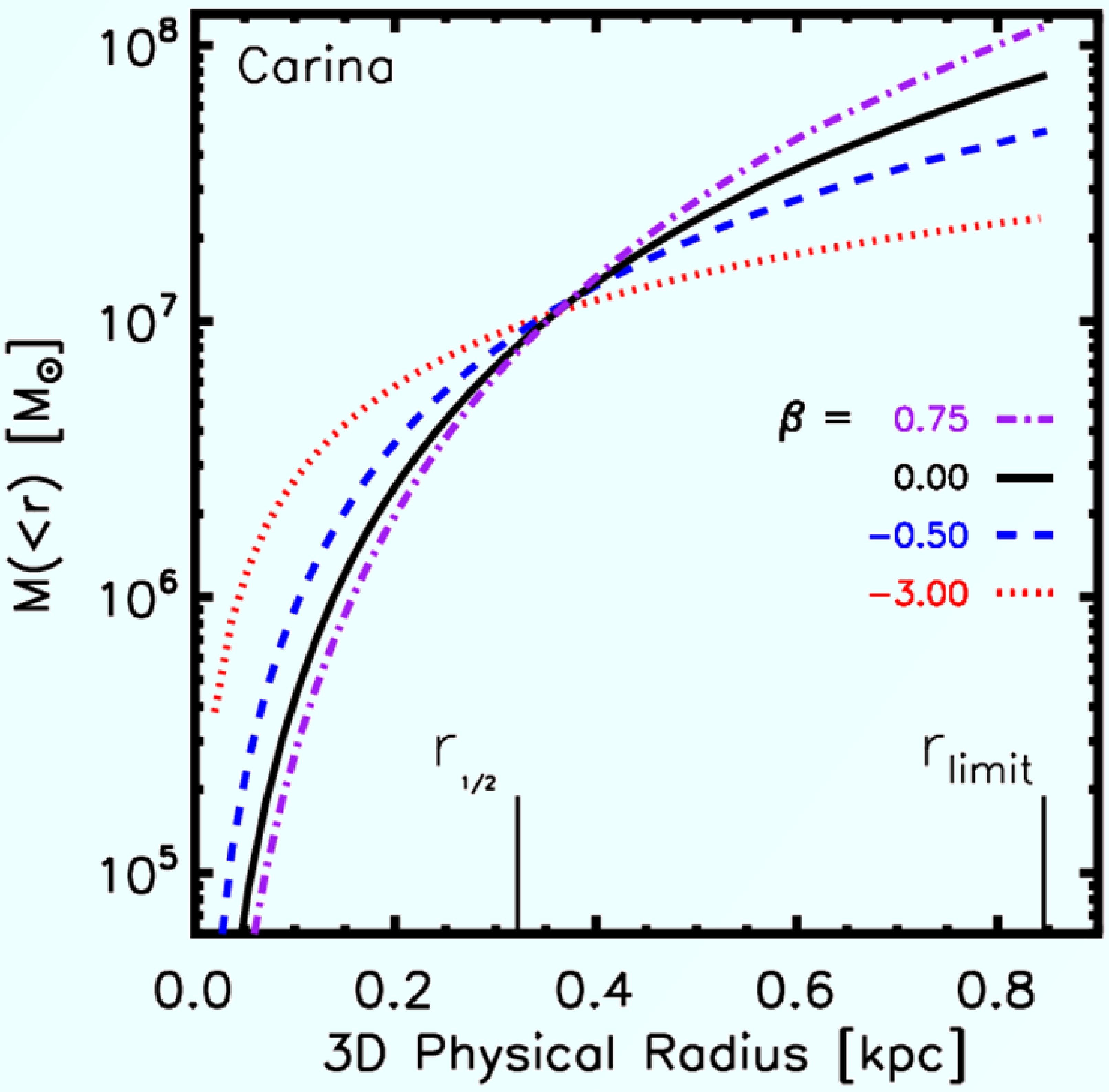
Anisotropy-Independent Mass Modeling

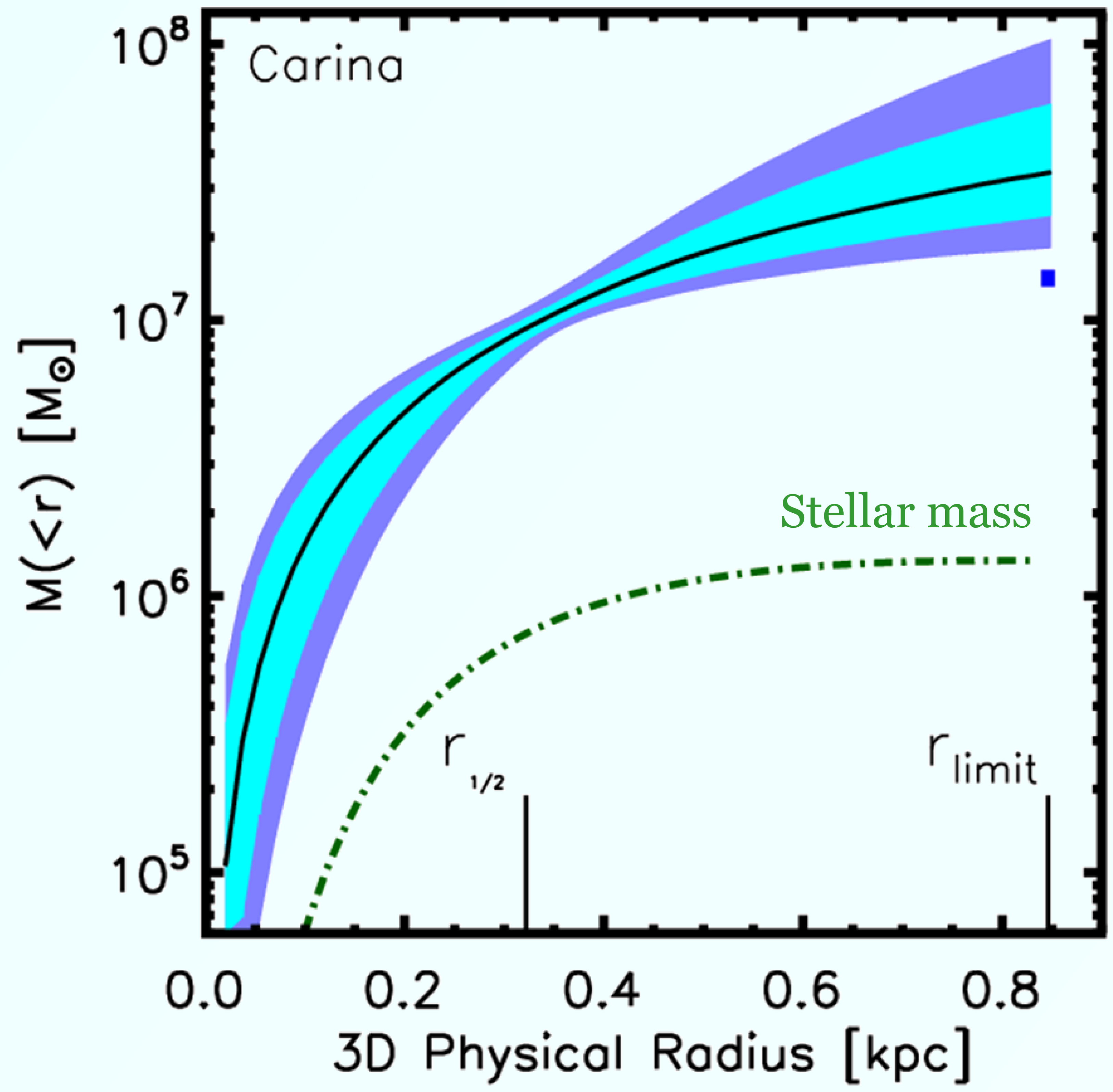
Joe Wolf, G. Martinez, J. Bullock, M. Kaplinghat, F. Avedo *(CfC, UC Irvine)*
L. Strigari *(Stanford)* M. Geha, R. Munoz *(Yale)* J. Simon *(OCIW)* B. Willman *(Haverford)*

Abstract: We demonstrate both analytically and with available kinematic data that the mass-anisotropy degeneracy is effectively eliminated near the 3D deprojected half-light radius of spheroidal galaxies.

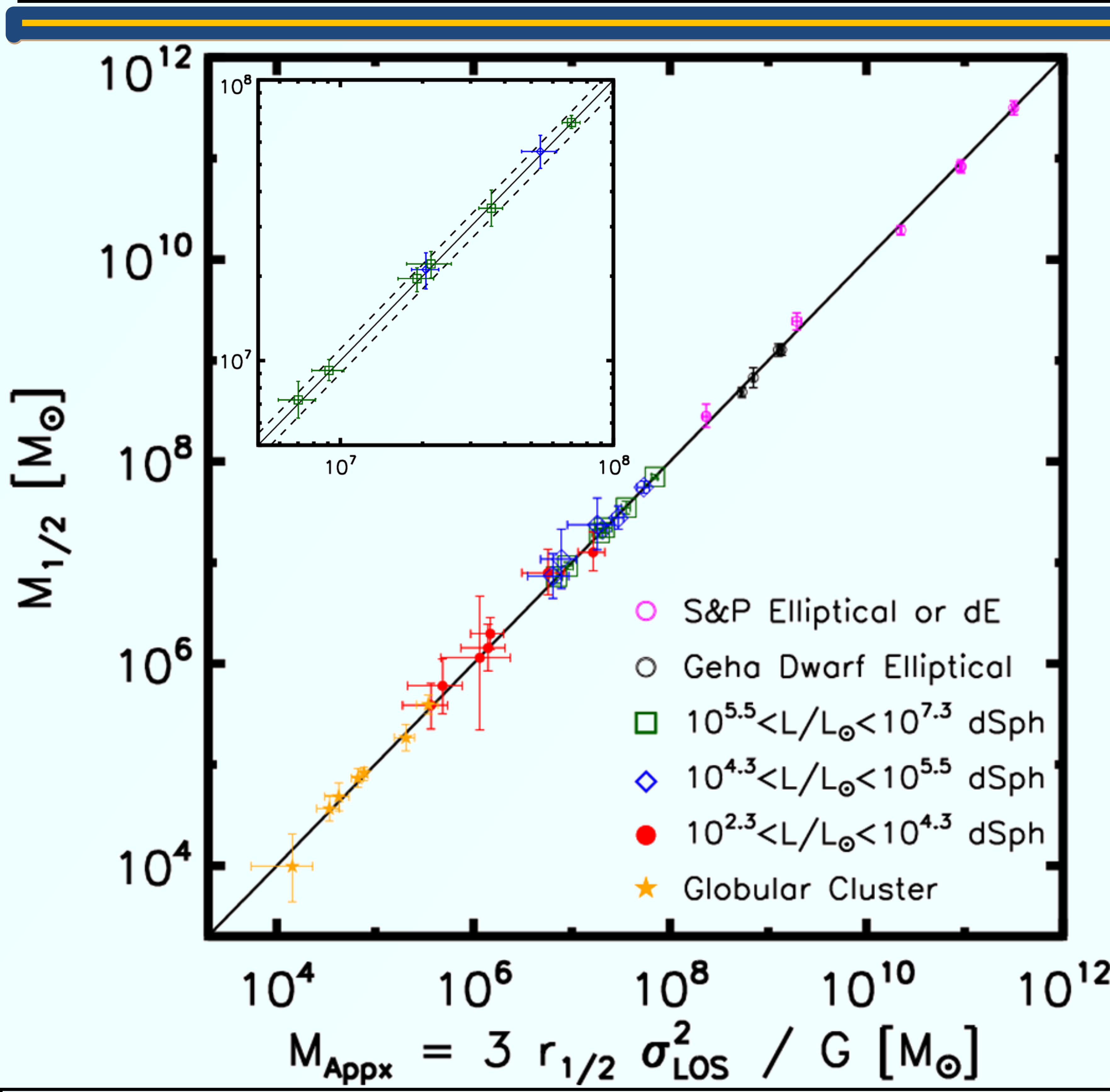


$$M(<r;0) - M(<r;\beta) = \frac{\beta(r)\, r\, \sigma_r^2(r)}{G}\left(\frac{d\ln\rho_\star}{d\ln r} + \frac{d\ln\sigma_r^2}{d\ln r} + \frac{d\ln\beta}{d\ln r} + 3\right)$$

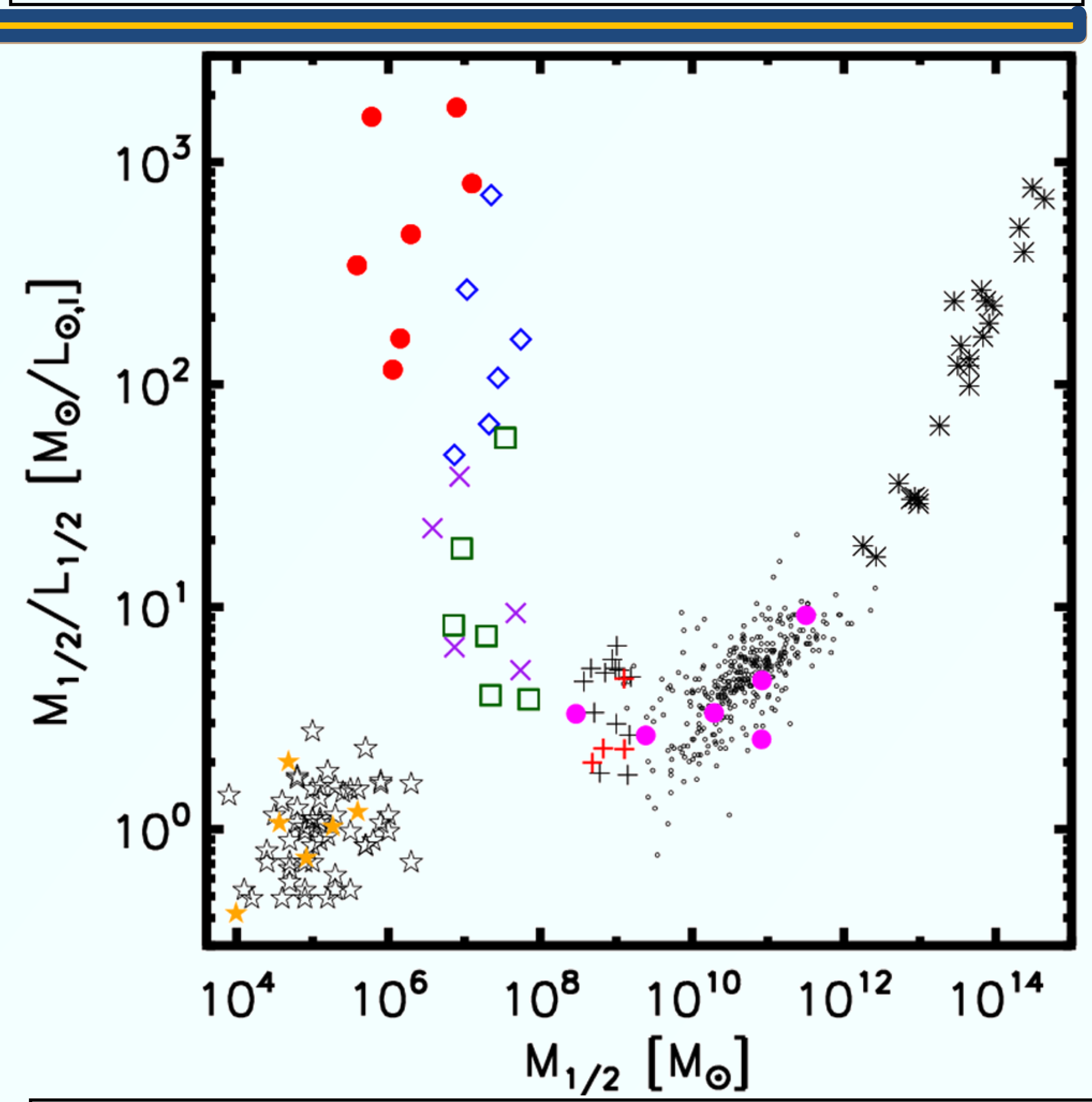
The above equation explains the plotted behavior that the effect of anisotropy on determining mass is minimized near the 3D deprojected half-light radius ($r_{1/2}$).



We derive the above mass errors by marginalizing over solutions to the spherical Jeans equation. We allow for non-constant anisotropy profiles, varying density profiles, and we incorporate the photometric errors. A pinch occurs in the same region as demonstrated in the left plot.



Approximation formula to determine dynamical mass within $r_{1/2}$ tested for almost eight decades in mass. The insert shows that the formula is accurate to better than 10%.



M/L within $r_{1/2}$ vs. $M_{1/2}$. Systems on the curve lie in DM halos. The stars are GCs. Different feedback mechanisms cause differing slopes at each end.