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Erratum: "Bayesian Mass Estimates of the Milky Way: Including Measurement Uncertainties with Hierarchical Bayes" (2017, ApJ, 835, 167)

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In the analysis for the original manuscript Eadie et al. (2017), the Cartesian Galactocentric velocities (U_{gc}, V_{gc}, W_{gc}) of the globular clusters (GCs) were incorrectly transformed to the right-hand cylindrical velocities (Π, Θ, W) (Equation (17)). The angle θ in Equation (17) is measured in the xy-plane from the positive x-axis, such that $\cos\theta = \frac{X_{gc}}{r}$ and $\sin\theta = \frac{Y_{gc}}{r}$ where X_{gc} and Y_{gc} are the Galactocentric x and y coordinates of a GC in a right-hand Cartesian system, and where r is the projected distance of the GC onto the xy-plane. In the analysis, the incorrect r values were used to calculate $\cos\theta$ and $\sin\theta$. This mistake was partly due to the differences in notation between the Casseti and Harris online GC catalogs (in the former, R_{gc} is defined as the projected distance r, while in the latter R_{gc} is the three-dimensional distance). The Harris values of R_{gc} were used as the projected distance, and thus many of the GC spatial velocities were underestimated.

We have corrected this mistake, recalculated all posterior distributions, and performed the sensitivity analysis again. A summary of the new model parameter estimates is presented in the top half of Table 1. The estimates for the derived parameters $M_{125} = M(r < 125\ \mathrm{kpc})$, $M_{vir} = M(r < r_{vir})$, r_{vir}, and $M_{300} = M(r < 300\ \mathrm{kpc})$ are also calculated from the new posterior distributions of the model parameters and shown in the lower half of the table.

Of the four model parameters, only the Φ_o and β estimates changed significantly; Φ_0 and the derived mass estimates are higher because the velocities were previously underestimated, and β is lower because the tangential components of the velocities were the most affected. The shapes of the joint posterior distributions (Figure 7 in the original paper) did not change. The cumulative mass profile $M(r)$ is now in better agreement with previous studies (Figure 1). The estimated energy profile is similar in shape to the original Figure 8, but is shifted toward more negative energies (Figure 3). Our interpretation of the energy profile remains the same.

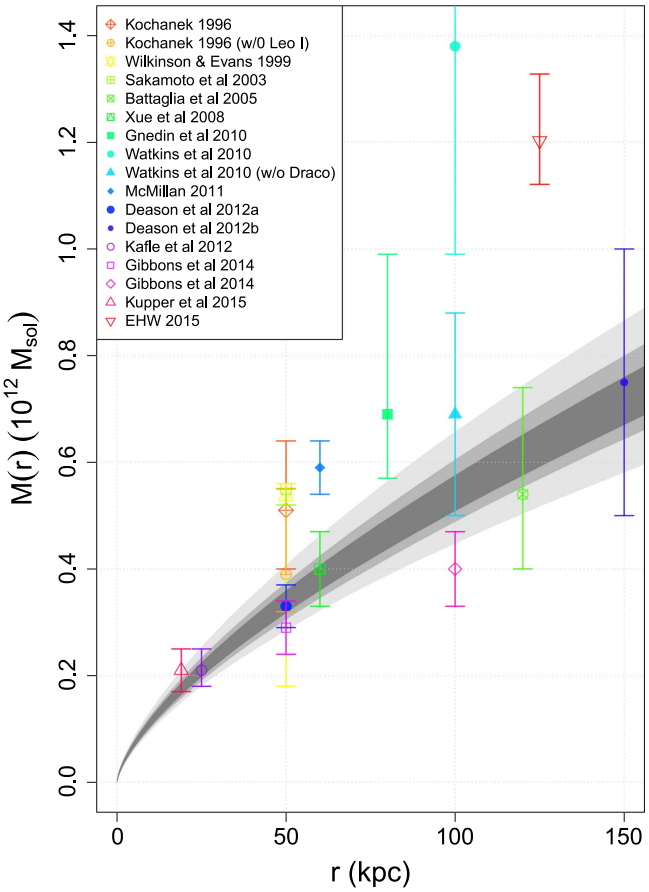

Figure 1. Cumulative mass profile for the Milky Way as estimated with the kinematic data of 143 GCs. The grey shaded areas show the 50%, 75%, and 95% Bayesian credible regions, and the points with error bars are results from other studies (this replaces Figures 3 and 4 in the original paper).

Table 1
Parameter and Derived Parameter Estimates with Bayesian Marginal Credible Regions

Parameter	Units	Mean	Median	50% Cred. Region	95% Cred. Region
Φ_o	$(10^4\ \mathrm{km^2\ s^{-2}})$	31.6	31.4	(29.7, 33.2)	(26.9, 37)
γ	—	0.32	0.31	(0.31, 0.33)	(0.30, 0.37)
α	—	3.05	3.05	(3.04, 3.06)	(3.03, 3.08)
β	—	0.14	0.14	(0.06, 0.21)	(−0.09, 0.34)
M_{125}	$10^{12}\ M_\odot$	0.63	0.63	(0.59, 0.66)	(0.52, 0.74)
M_{vir}	$10^{12}\ M_\odot$	0.87	0.86	(0.80, 0.94)	(0.67, 1.09)
r_{vir}	kpc	201	201	(195, 206)	(184, 217)
M_{300}	$10^{12}\ M_\odot$	1.14	1.14	(1.06, 1.21)	(0.92, 1.36)

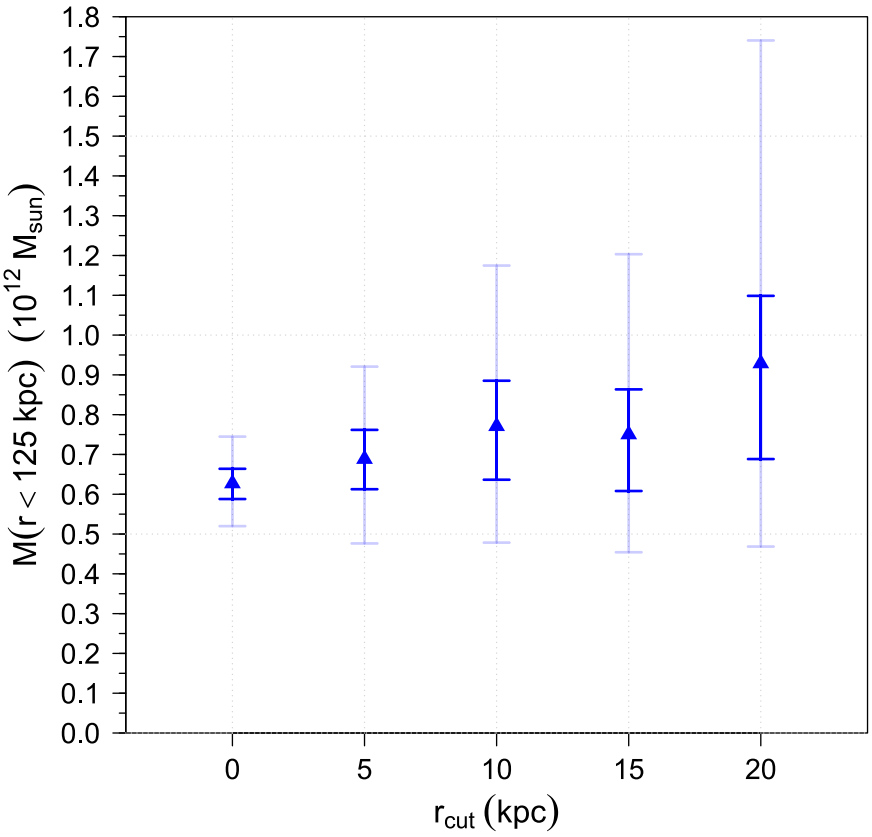

Figure 2. New M_{125} estimates from the sensitivity analysis. Bright and faint error bars correspond to 50% and 95% credible regions (this replaces Figure 5 in the original paper).

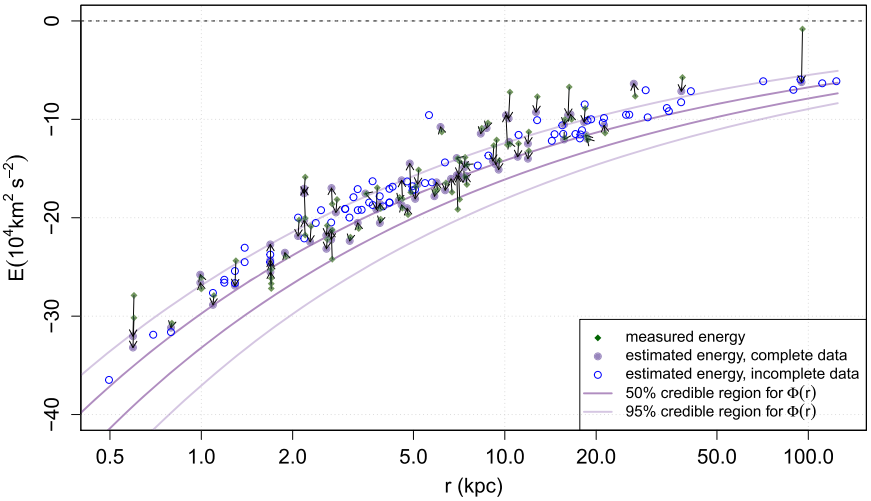

Figure 3. Specific energy profile for GCs (this replaces Figure 8 in the original paper).

The parameter trends found in the sensitivity analysis (Figure 6 in the paper) are unchanged, despite the different values of Φ_0 and β. The new estimates for β for different r_{cut} values are between 0.1 and 0.3, which still indicates a mild radial velocity anisotropy for the GC population. The trend in the M_{125} estimate is slightly stronger than that shown in Figure 5 of the original paper, albeit with large uncertainties (Figure 2).

Reference

Eadie, G. M., Springford, A., & Harris, W. E. 2017, ApJ, 835, 167