research highlights

MILKY WAY GALAXY

Statistical weigh-in

Astrophys. J. (in the press); preprint at https://arxiv.org/abs/1609.06304 (2017)

The mass of the Milky Way is tricky to estimate, as all the stars, planets, gases and dust — not to mention dark matter — need to be included. Gwendolyn Eadie and co-workers use globular star clusters to address this problem. Specifically, they analyse the positions and velocities of globular clusters, whose orbits are governed by the Milky Way's gravity, even when the data are incomplete. Now they incorporate the measurement uncertainties as well, and the resulting hierarchical Bayesian analysis gives a mass range of $(4.96–5.76) \times 10^{11}\ M_{\odot}$ out to 125 kiloparsecs.

Two of their previous papers report on this Bayesian statistical approach, but the measurement uncertainties were not accounted for. By including the uncertainties, the positions and velocities of the clusters become measurements instead of true values; the true values are treated as parameters. The authors can now increase the number of globular clusters studied from 89 to 143, but the proportion of galaxies for which they have complete proper motion data has dropped from 80% down to 50%. Although the result is more strongly constrained, the mass is low compared with other methods, which come in at $(5.8–8.5) \times 10^{11}\ M_{\odot}$. Larger data sets — from Gaia, for instance — will be important to improve the mass estimate of our Galaxy.

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