ANOTHER SOURCE OF LOCAL MISSING MASS

O.YU. MALKOV
Institute of Astronomy, 48 Pyatnitskaya St., Moscow 109017, Russia

It is well-known that the velocities and distributions of stars perpendicular to the Galactic plane indicate the presence of unseen or missing mass in the local disk of the Milky Way. In spite of an abundance of papers on this subject, no consensus seems to have been reached on not only the amount of dark matter, but even on a "correct" method of analysis.

Photometrically unresolved binary systems can contain at least a part of the missing mass. The mechanism of the effect is as follows: assume we are observing a binary system that represents a single star with magnitude V. Also assume that the magnitudes of the components are V_1 and V_2. Observing this star, we estimate its mass from the integral light, and this fictitious mass is always found to be less than the sum of the components' masses. The so called "mass defect", δm, is expressed as follows: $\delta m = [m_1(V_1) + m_2(V_2) - m(V)] / m(V)$, where m_1 and m_2 are the components' masses and m is the fictitious mass. It can be shown that δm is higher when the components' masses are nearer to each other, and it reaches a maximum when the mass ratio $q = 1$. Besides that, its exact value depends on the integral light of a system, V (strictly saying, on its integral absolute magnitude) and the adopted mass-luminosity relation.

Investigating the influence of unresolved binaries on the stellar luminosity function, we can estimate the value of δm for the solar neighbourhood to be as high as about 0.7. It is necessary to note that we assume that all stars are unresolved binaries with components of equal mass (so we can give an upper bound for our estimate). On the other hand, we consider only stars brighter than 17^m. Keeping in mind that the poorer known M- and brown dwarves populations may contain a considerable part of total mass of the solar neighbourhood, we have to allow that this portion may be more than expected due to du- and multiplicity. Naturally, it is not really "unseen" mass, but rather an underestimated one.

https://doi.org/10.1017/S0074180900109003 Published online by Cambridge University Press