THE NATURE OF THE RUNAWAYS: OLD DISK POPULATION OB STARS?

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We propose that most of the OB runaway stars are Old Disk Population objects in the same evolutionary phase as the hot UV-bright stars in globular clusters. Bimodal Gaussian fits to the peculiar radial velocity distribution are computed for 386 O-type and 1093 B-type stars. Both samples independently yield one Gaussian with $\sigma \simeq 13$ km s^{-1}, a value typical of extreme Population I objects, and a second one with $\sigma \simeq 28$ km s^{-1} which is characteristic of the Old Disk Population. The fraction of stars under the high velocity-dispersion distribution (HVD stars) is 47% of the O and 23% of the B stars. We analyze the kinematics of the sample of OB stars divided into low peculiar radial velocity, $|Vrp|<20$ km s^{-1}, and high-velocity stars, $|Vrp|>45$ km s^{-1}. The results for the solar motion and mean peculiar velocity of the groups are the expected ones for the extreme Population I objects in the case of the low-velocity group ($U_\odot = 9.1\pm0.1$; $V_\odot = 14.8\pm0.1$ km s^{-1}) and an asymmetric drift of approximately 20 km s^{-1} for the high velocity stars ($U_\odot = 2.7\pm1.4$; $V_\odot = 32.7\pm1.4$ km s^{-1}). This lag behind circular motion also corresponds to Old Disk Population objects.

We conclude then that there is good evidence supporting our interpretation for the runaway stars, and suggest the existence of an important number of old, low mass OB stars in the galactic disk without marked spectroscopic differences between them and the young OB stars. The estimated number density of HVD stars in the galactic plane indicates that these objects probably outnumber the planetary nebulae by about two orders of magnitude. A rough estimate for the lifetime of the HVD stars yields 10^5 yr, in agreement with the timescales resulting from evolutionary tracks calculated for the UV-bright stars.

An extended paper on this subject has been submitted to The Astrophysical Journal.

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