Shedding Light on the Isolation of Luminous Blue Variables

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In the standard view of massive star evolution, luminous blue variables (LBVs) are transitional objects between the most massive O-type stars and Wolf-Rayet (WR) stars. With short lifetimes, these stars should all be found near one another. A recent study of LBVs in the Large Magellanic Cloud (LMC) found instead that LBVs are considerably more isolated than either O-type stars or WRs, with a distribution intermediate between that of the WRs and red supergiants (RSGs). A similar study, using a more restricted sample of LBVs, reached the opposite conclusion. Both studies relied upon the distance to the nearest spectroscopically identified O-type star to define the degree of isolation. However, our knowledge of the spectroscopic content of the LMC is quite spotty. Here we re-examine the issue using carefully defined photometric criteria to select the highest mass unevolved stars ("bright blue stars," or BBSs), using spatially complete photometric catalogs of the LMC, M31, and M33. Our study finds that the LBVs are no more isolated than BBSs or WRs. This result holds no matter which sample of LBVs we employ. A statistical test shows that we can rule out the LBVs having the same distribution as the RSGs, which are about 2x more isolated. We demonstrate the robustness of our results using the second-closest neighbor. Furthermore, the majority of LBVs in the LMC are found in or near OB associations as are the BBS and WRs; the RSGs are not. We conclude that the spatial distribution of LBVs therefore is consistent with the standard picture of massive star evolution.

Reference: Accepted by AJ
Status: Manuscript has been accepted

Weblink: https://arxiv.org/abs/1810.11169

Comments:

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