Distributed Massive Stars and Possible Implications Star Formation and Clusters

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Over the last decade or so, many relatively young (a few mega-years) Wolf-Rayet stars have been discovered approximately tripling the number known in our Galaxy. It has also become apparent that a large fraction are to be found outside massive clusters and associated HII regions, and are apparently linked with more extended star formation in stellar associations. Similar results have been put forward for Luminous Blue Variables. Here we present three possible scenarios for a more extended distribution of massive stars and discuss, in particular the possibility of many of these stars being 'runaways' from stellar clusters. We present new GAIA results on Wolf-Rayet stars which, together with previous proper motion studies, illustrate that the very large majority have no significant proper motions relative to local stars and do not show any associated bow shocks, indicative of motion relative to the local interstellar medium. We briefly discuss remaining possibilities of i) dense but low mass stellar clusters - so far unobserved and, ii) induced star formation from feedback that can lead to a distributed formation of massive stars as high accretion rates are able to be induced in relatively low mass clouds.

Galactic Scale