## On the existence of C-rich massive evolved stars

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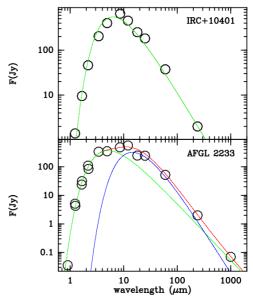
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We studied the properties of a particular type of evolved stars, the C-rich evolved stars with high expansion velocities (HVC stars). For this purpose we selected the two best studied objects within this group, IRC +10401 and AFGL 2233. We obtained an estimate of their luminosity by studying their spectral energy distribution. Also we have obtained single-dish line profiles and interferometric maps of the CO J=1-0 and J=2-1 emission lines for both objects, as well as a λ 3 and 1mm line survey toward IRC+10401 to study their molecular census. We have modeled the CO emission using a LVG radiative transfer code to determine the kinetic temperature and density profiles of the gas ejected by these stars. We have found that the luminosities obtained for these objects ( $log(L/L_{\odot}) = 4.1 \& 5.4$ ) locate them in the domain of the massive Asymptotic Giant Branch stars (AGBs) and the Red Supergiant stars (RSGs). In addition, the mass-loss rates obtained (1.5  $\times$  10  $^{-5}$  – 6  $\times$  10  $^{-3}$   $M_{\odot}$  yr  $^{-1}$  ) suggest that while IRC +10401 might be an AGB star, AFGL 2233 could be a RSG star. These results, together with those from previous works, suggest that both objects are massive objects, IRC +10401 a massive evolved star with  $M_{\rm init} \sim 5-9 M_{\odot}$  which could correspond to an AGB or a RSG, and AFGL 2233 a RSG with  $M_{\rm init} \sim 20 M_{\odot}$ . This would confirm the existence of massive C-rich evolved stars. Finally, two scenarios are proposed to form these types of objects. The existence of these objects has a direct effect on the nucleosynthesis models in the composition of the ejecta and therefore on the composition of the dust injected into the ISM.

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