

MASGOMAS project: building a bona-fide catalog of massive star cluster candidates

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MASGOMAS (MAssive Stars in Galactic Obscured MAssive clusterS) is a project aiming at discovering OB stars in Galactic, dust enshrouded, star-forming massive clusters (Marín-Franch *et al.* 2009, A&A 502, 559). The project has gone through different phases of increasing automatization, that have allowed us to discover massive clusters like MASGOMAS-1 (Ramírez Alegría *et al.* 2012, A&A 541, A75) (with $M \approx 20,000 M_{\odot}$).

Currently the search is carried out through MASA: MASGOMAS Automatic Search Algorithm. MASA consists of three IDL modules: (a) a module that carries out photometric cuts to select massive OB star candidates; (b) a friends-of-friends algorithm based on AUTOPOP (García *et al.*, 2009, A&A 502, 1015) that requires two free parameters: the maximum distance D_s to consider two stars as belonging to the same cluster and N_{\min} , the minimum number of members for a cluster; and (c) an output module giving the list of candidates and color-color and color-magnitude diagrams for inspection.

However, automatic methods may introduce many contaminants due both to the high stellar densities in the Galactic Plane and to our inability to set a priori the search parameters in the friends-of-friends algorithm, for which we have no physical constraints. For this reason we have run a series of simulations on synthetic fields of various surface densities with randomly distributed targets. This way we have been able to determine an optimum search distance D_s for a given N_s and stellar density. For these optimum D_s values, no cluster candidates were found in the simulations. Thus, candidates found in real stellar fields have a high chance to be a real cluster or association of massive stars.

We have tested our method in a $6^{\circ} \times 6^{\circ}$ region around $l = 33^{\circ}$ and $b = 0^{\circ}$. This region contains MASGOMAS-1, used as a test. A new promising candidate was found, that we call MASGOMAS-10. Follow-up spectroscopy at $R = 2500$ with LIRIS@WHT of MASGOMAS-10 resulted in 5 OB stars plus one Wolf-Rayet out of 7 observed stars.

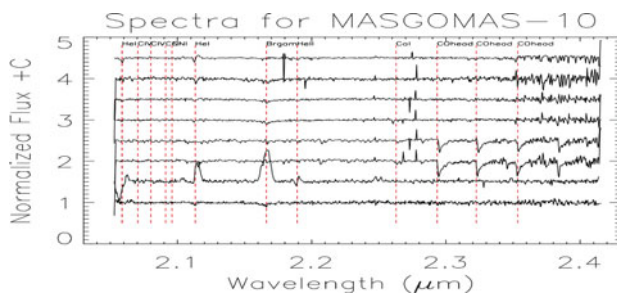


Figure 1. K-band spectra of MASGOMAS-10 with LIRIS@WHT. The top four stars are OB stars, as well as the bottom one. Together with the WR, they clearly characterize it as a massive cluster candidate. The two late-type stars were marked as low probability candidates because their (J-Ks) color was bluer than that of the other stars