MASGOMAS PROJECT,
New automatic-tool for cluster search on IR photometric surveys

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ABSTRACT

New tools are needed to analyze the huge amount of data in the era of ongoing IR surveys. In this poster we present a new Automatic-Tool to search for Massive Cluster Candidates in the disk/bulge areas covered by 2MASS and VVV surveys.

Introduction: The phases of the MASGOMAS project (MAssive Stars in Galactic Obscured MAssive clusterS)

- Ph1 : Visual inspection of existing catalog in 2MASS. We have constantly improved our selection tools.
- Ph2a : Automatic tool to select objects with colors and reddening-free parameter Qir optimized for OB stars. Visual inspection of selected targets distribution to identify overdensities.
- Ph2b : Masgomas Automatic Search (MAS) to identify overdensities using a friend-of-friends algorithm (AUTOPOP, Garcia et al. 2011).
- Ph3 : Use of individual line-of-sight extinction law and extension to the South (VVV survey).

Ph2 Selection of OB cluster candidates on MASGOMAS

We select overdensities of OB star candidates with $Q_{ir} \in [-0.2, 0.2]$, $Q_{ir} = (J - H) - 1.7 * (H - K)$, Negueruela & Schurch 2007, construct the color and pseudo-color magnitude diagrams of the over dense zone and their surroundings, (see fig. 1).
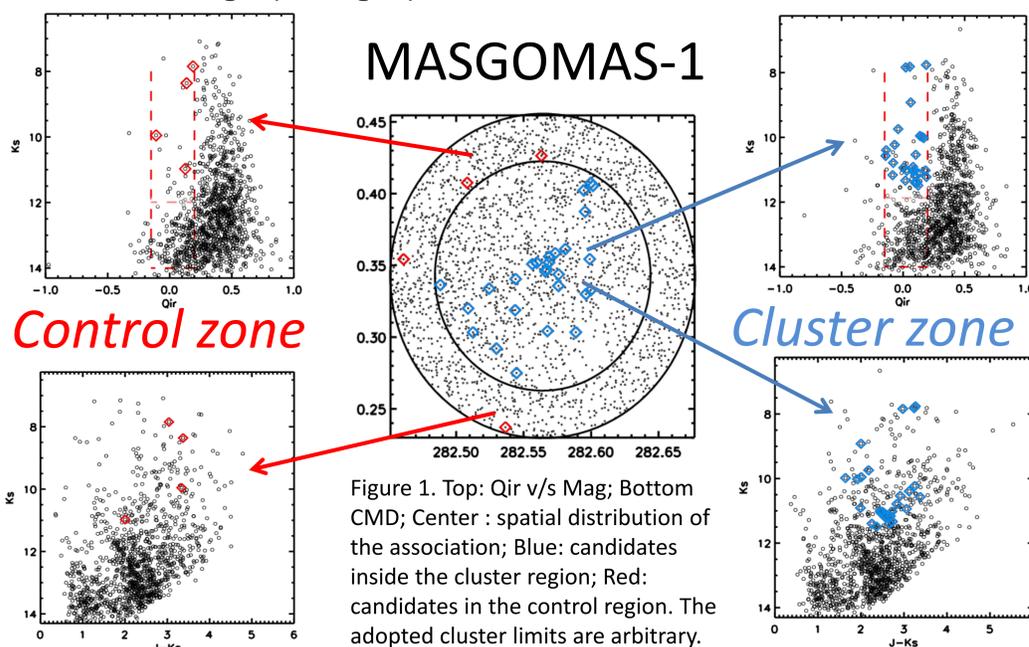
MASGOMAS-1

Control zone

Cluster zone

Figure 1. Top: Qir v/s Mag; Bottom CMD; Center : spatial distribution of the association; Blue: candidates inside the cluster region; Red: candidates in the control region. The adopted cluster limits are arbitrary.
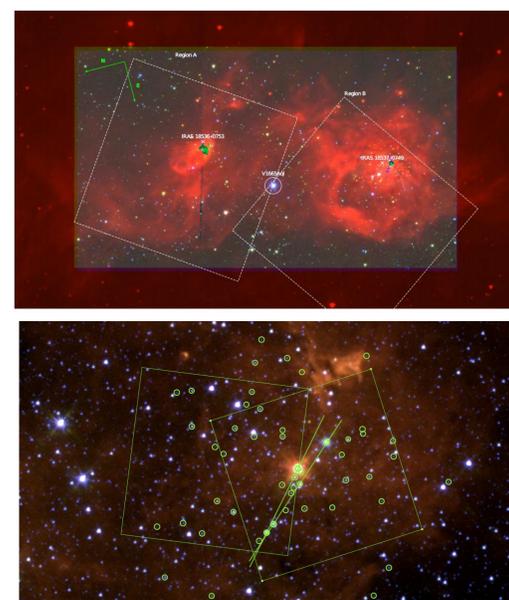

Figure 2:
Top: MASGOMAS 4, found in Ph2a, spectroscopically confirmed as a young stellar cluster.
Bottom: MASGOMAS 6, first result in Ph2b, using the complete algorithm automatization MAS on 2MASS. The preliminary spectroscopic results confirm the young stellar population.

MASGOMAS Clusters

Masgomas 1	Ramirez Alegria et al. 2012	Total mass ~10^4 $M_\odot$
Masgomas 4	Ramirez Alegria et al. 2014	Total mass ~$2*10^3$ $M_\odot$
Masgomas 6	Ramirez Alegria et al. (in prep)	Under analysis
Masgomas 9	Rubke et al. (in prep)	Pending confirmation

Ph3: Extinction optimization and expansion to VVV

We used the extinction law from Rieke & Lebofsky (1985) to predict the extinction of a O9V star using its intrinsic color . We select the stars above this line plus 0.5 mag, to consider differential extinction (green points, fig. 3).
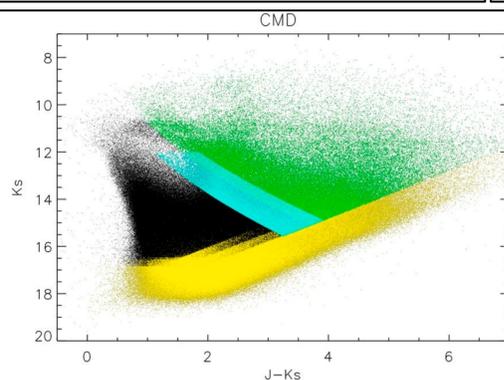

Figure 3: CMD of stars in a sky region from the VVV catalog; Light blue: red clump zone; yellow: points with error over 0.1mag; green: selected OB candidates

We determined the Red-Clump zone, (light blue dots in the Fig. 3), and use it as a reference to calculate the extinction to improve the Qir range determination. We calculate the mean slope (black line) and repeat the process using the data within ± 2 sigma from the first slope (red points Fig. 4).
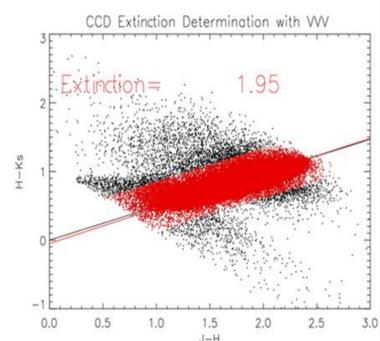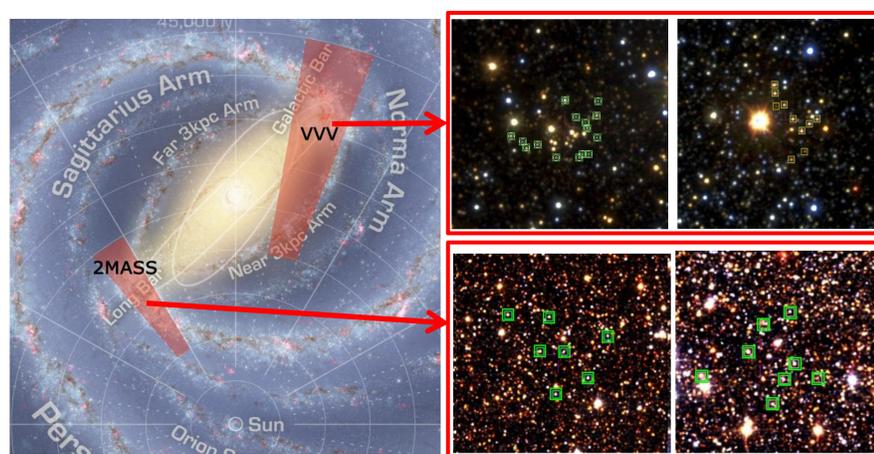

Extinction = 1.95

Figure 4: Extinction Determination.

Results

We show some preliminary results from the AUTOPOP output of the two search areas. Search zones are defined by the magnitude cuts.

Green squares show stellar candidates. A catalog of new OB clusters/association candidates is in preparation.

Conclusions and future work

MAS is a powerful tool to detect OB cluster/associations candidates. We are planning a spectroscopic follow-up for the new most promising candidates.

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