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OB stars towards NGC 6357 and NGC 6334

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Abstract. The star forming regions NGC6334 and NGC6357 are amid the most active star-forming complexes of our Galaxy where massive star formation is occuring. Both complexes gather several HII regions but they exhibit different aspects: NGC6334 is characterised by a dense molecular ridge where recent massive star formation is obvious while NGC6357 is dominated by the action of the stellar cluster Pismis 24 which have shaped a large cavity. To understand and compare the formation of massive stars in these two regions requires to precise the distance and characterise the proper motions of the O to B3 stellar population in these regions.

Keywords. stars: distances, stars: early-type, ISM: HII regions

1. Overview and GAIA perspectives

The NGC6334 and NGC6357 (Fig. 1a) are two active star-forming complexes for which it is possible to study the formation and the evolution of massive stars from their earliest phase to their impact on the environment due to their HII regions. From the OB stars distribution, mainly distributed between 1 and 3 kpc (Russeil *et al.* 2012), a distance of 1.75 kpc for both regions is usualy adopted. From the GAIA-DR1 catalogue (e.g. Arenou *et al.* 2017, Lindegren *et al.* 2016) one can underline (Fig. 1b and c) a stellar layer around 1.12 kpc (main peak of the histogram Fig. 1c at ∼0.89 mas) while few O-B3 stars towards NGC 6334 and NGC 6357 have a measured parallactic distance (see Table 1) in the GAIA DR1 catalogue (Astraatmadja *et al.* 2016). Despite our small sample the mean distance obtained is 2.23 kpc or 1.23 kpc depending on the prior. The Milky-way prior gives better agreement with Wu *et al.* 2014 and Chibueze *et al.* 2014 who gives for NGC 6334 a maser parallax distance between 1.25 and 1.35 kpc.

In parallel, WISE-22μm and HERSCHEL-70μm data were used to identify (Russeil *et al.* 2016) bow shocks features (Fig. 1d) which are usualy related to run-away stars (e.g. Gvaramadze *et al.* 2011). The identified features are either seen in Hα or radio continuum suggesting that run-away stars can be massive.

In addition, an age estimate of O-B3 stars (Russeil *et al.*, in preparation) suggest that young (log(age) < 7) stars are found at the periphery of NGC 6357. They can have been formed in Pismis 24 but quickly expelled.

Table 1. O-B3 stars with parallax distance in NGC 6334 and NGC 6357.

HII region	Star Ident.	Spectral type	Dist.[1] kpc	GAIA dist.[2] kpc	GAIA dist.[3] kpc
NGC 6334 - GUM64C	CD-3511482	B0.5e	1.41	2.71±2.20	1.21±0.43
NGC 6334 - GUM64b	HD319702	O8III	2.11	1.66±1.82	1.17±0.36
NGC 6334 - GUM64b	CD-3511484	B1V	1.10	2.10±1.93	1.25±0.38
NGC 6334 - G351.2+0.5	HD156738	O6.6III(f)	1.58	2.67±2.06	1.31±0.40
NGC 6357	HD157504	WN5b	–	2.75±2.13	1.26±0.39
NGC 6357	HD319881	O6Vn	1.66	1.49±1.73	1.19±0.50

Notes: [1] Spectro-photometric distance (Russeil *et al.* 2012). [2] Distances from Gaia DR1 catalogue parallaxes computed by Astraatmadja *et al.* 2016 with the exponential decreasing space density prior with L = 1.35 kpc (systematics uncertainties of 0.3mas included). [3] Same as [2] but using the Milky-Way prior.

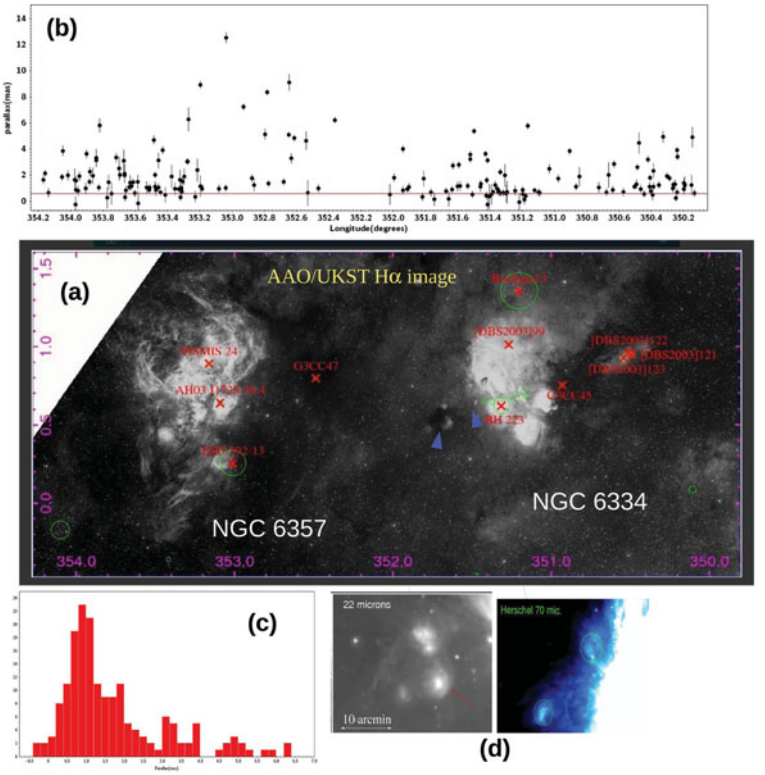

Figure 1. (a) Hα image of NGC 6334 and NGC 6357. (b) GAIA DR1 sources (0.5° < b < 1.5°) parallaxes (histogram in (c)) versus longitude (the horizontal line underlines the 1.75 kpc parallax). (d) Candidate run-away stars identified by Russeil *et al.* 2016.

To summarise, the next GAIA release will be used to 1) determine/precise statistically the distance of the OB stars and the different stellar layers present along the line of sight of NGC 6334 and NGC 6357, 2) identify and precise the proper motion of the run-away stars in order to clarify their origin and their possible star-formation impact.

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