ASSESSing evolved massive stars in NGC 6822 and IC10

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Abstract: The role of mass loss from massive stars, especially episodic mass loss in evolved massive stars, is one of the outstanding open questions facing stellar evolution theory. Multiple lines of evidence are pointing to violent, episodic mass-loss events being responsible for removing a large part of the massive stellar envelope, especially in low-metallicity galaxies. Episodic mass loss, however, is not understood theoretically, neither accounted for in state-of-the-art models of stellar evolution, which has far-reaching consequences for many areas of astronomy. The ERC «ASSESS» project aims to determine whether episodic mass loss is a dominant process in the evolution of the most massive stars by conducting the first extensive, multi-wavelength survey of evolved massive stars in the nearby Universe. The project hinges on the fact that mass-losing stars form dust and are bright in the mid-infrared. In my thesis I have undertaken to investigate the properties of evolved targets, selected by mid-infrared archival photometry from Spitzer, in ~25 nearby galaxies and estimate the amount of ejected mass, which will constrain evolutionary models. In this work we present some of our first results from the galaxies NGC 6822 and IC 10.

The observations took place on August 2020 with OSIRIS (GTC) using the grism 1000R in the multi-slit mode. We observed NGC 6822 and IC10 with two and one pointing respectively with a total of 90 minutes (1350s x 4 exposures) per field. So far, we have completed the data reduction and spectral classification (by visual inspection), while we intent to work on the derivation of the main propertis using MARC models for the cool stars and CMFGEN for the hot ones.

NGC 6822

Dwarf galaxy   RV = -57 km/s [1]

Distance: 0.5 Mpc [2]   [Fe/H]= -0.32 [3]

We selected 40 targets to be observed *(Fig. 1)* but instead a total of 66 objects were extracted because of crowded slits. Between the most interesting results we find RSGs *(Fig. 2)*, C-stars and OB star+H II region.

ID	Prio	$m_{3.6\,\mu m}$	$m_{4.5\,\mu m}$	RV [km/s]
55	5	12.25	12.13	-67
66	1	13.59	12.30	-67
70	2	12.64	12.35	-19
103	1	13.36	12.62	115
175	5	13.30	13.09	-5
248	5	13.70	13.36	7
346	5	13.83	13.63	-20

Table 2: Properties of RSGs candidates in NGC 6822. The RV was measured using Ca II lines
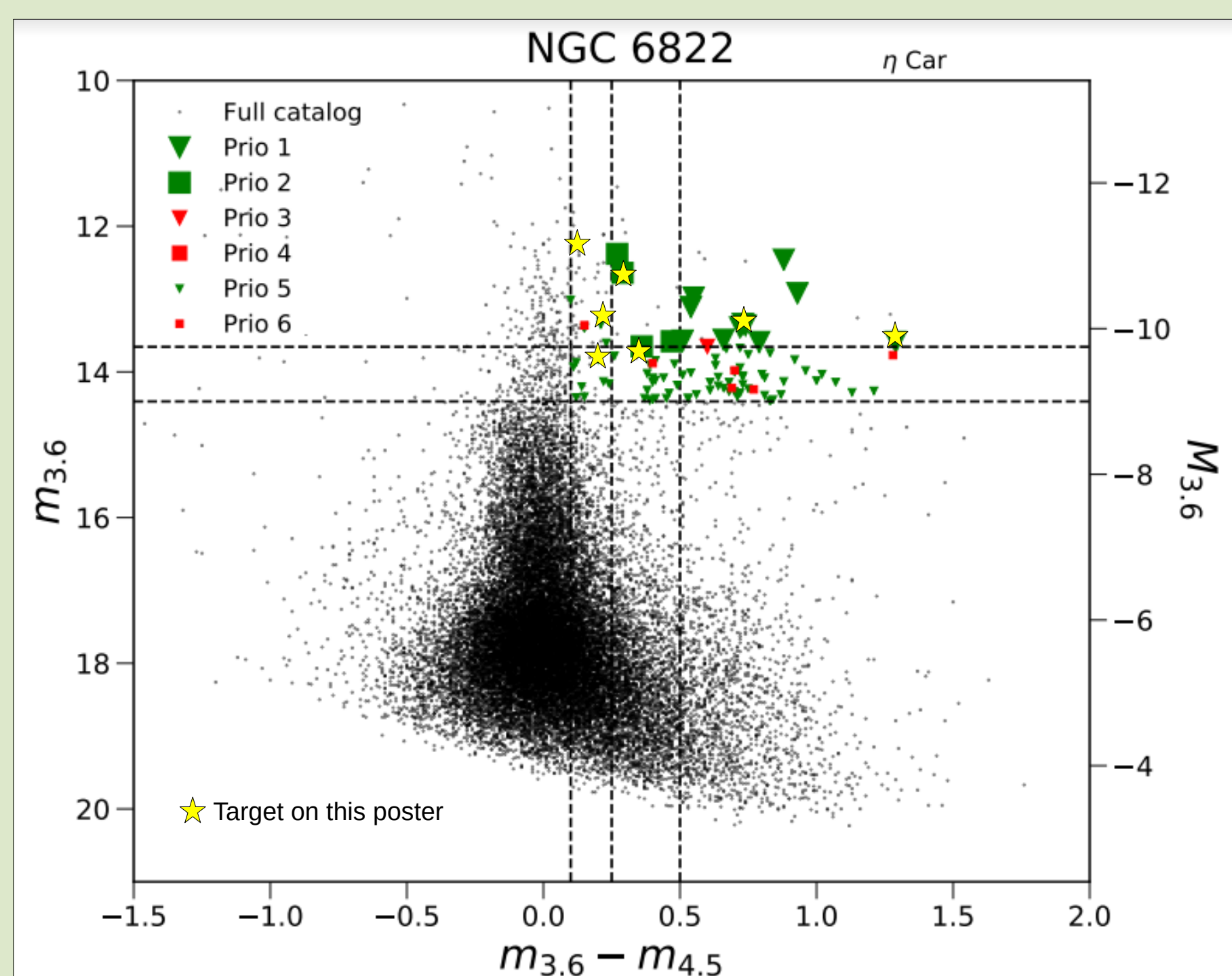

Figure 1: CMD of NGC 6822 indicating the targets selected and the priotiry

The targets were seleceted with a priority system based on their magnitudes at 3.6 and 4.5 μm and if optical or NIR photometry is availabale in any band *(Table 1)*

	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6
$m_{3.6\,\mu m} - m_{4.5\,\mu m}$	≥ 0.5	≥ 0.25	≥ 0.5	≥ 0.25	N/A	N/A
$M_{3.6\,\mu m}$	≤ -9.75	≤ -9.75	≤ -9.75	≤ -9.75	N/A	N/A
Optical / NIR	Yes	Yes	No	No	Yes	No
NGC 6822	5 (7)	3 (3)	0 (1)	-	22 (28)	1 (1)
IC10	1 (1)	2 (2)	1 (2)	-	11 (14)	7 (15)

Table 1: Priority system indicating the cuts on the classification and the targets detected and pre-selected (in brackets)
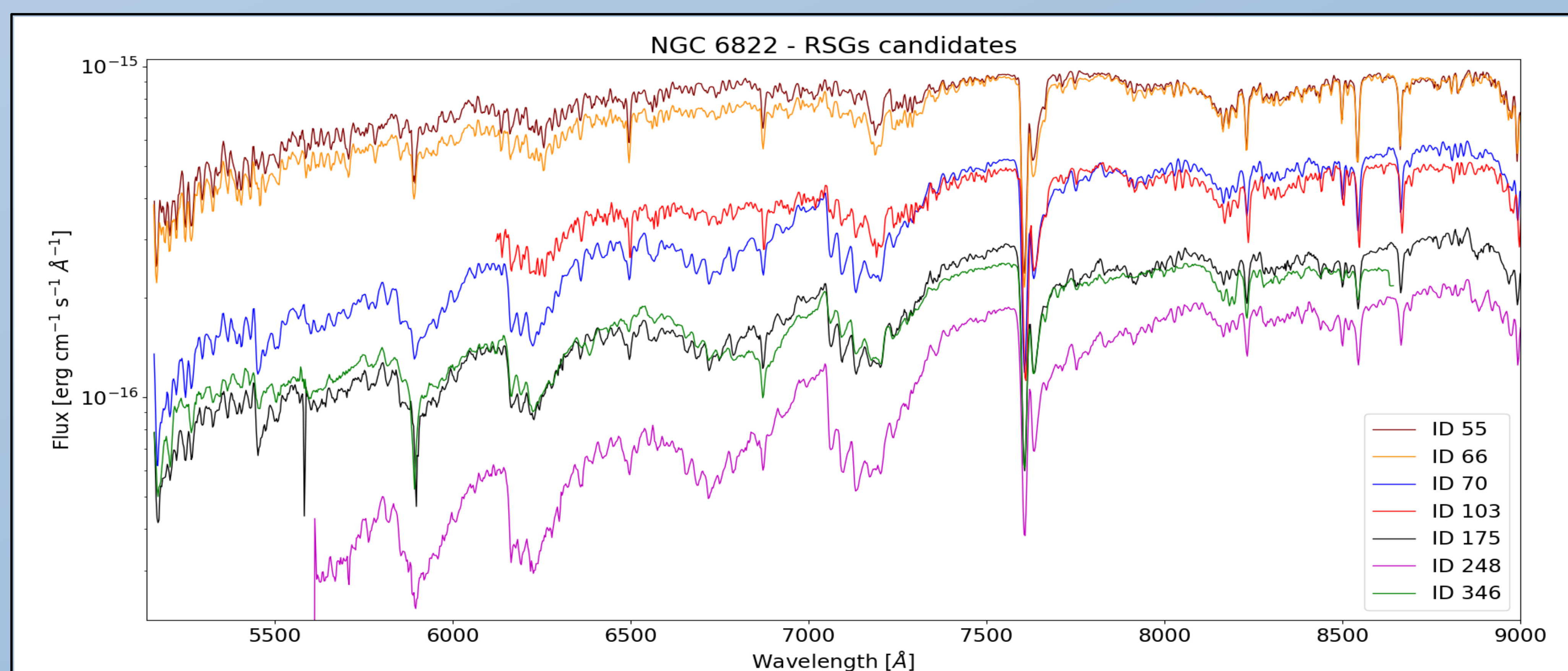

Figure 2: RSGs candidates in NGC 6822. See Table 2 for some properties of these objects.

Figure 4: RSGs candidates in IC10. See Table 3 for some properties of these objects.

IC 10

Dwarf galaxy   RV= -348 km/s [4]

Distance: 0.79 Mpc [4]   [Fe/H]= -1.28 [5]

We selected 35 targets to be observed *(Fig. 3)* but instead a total of 48 objects were extracted bcause of crowded slits. Between the most interesting results we find RSGs *(Fig. 4)*, C-stars and a WR star.

ID	Prio	$m_{3.6\,\mu m}$	$m_{4.5\,\mu m}$	RV [km/s]
5660	5	13.22	13.11	-180
9165	5	12.90	12.72	-167
26089	1	13.09	12.59	-280
26929	2	13.16	12.85	-250
-	Filler star	-	-	-172

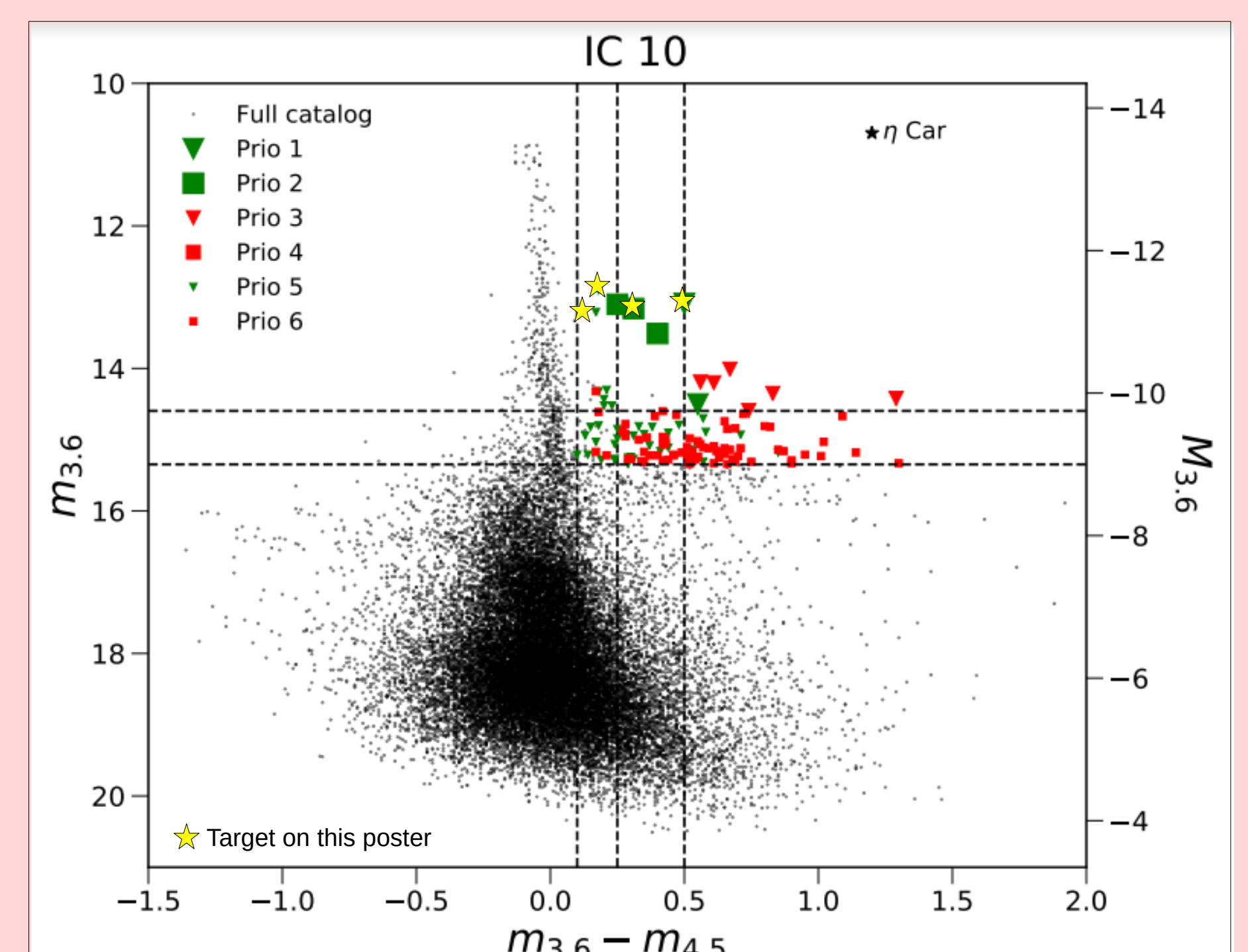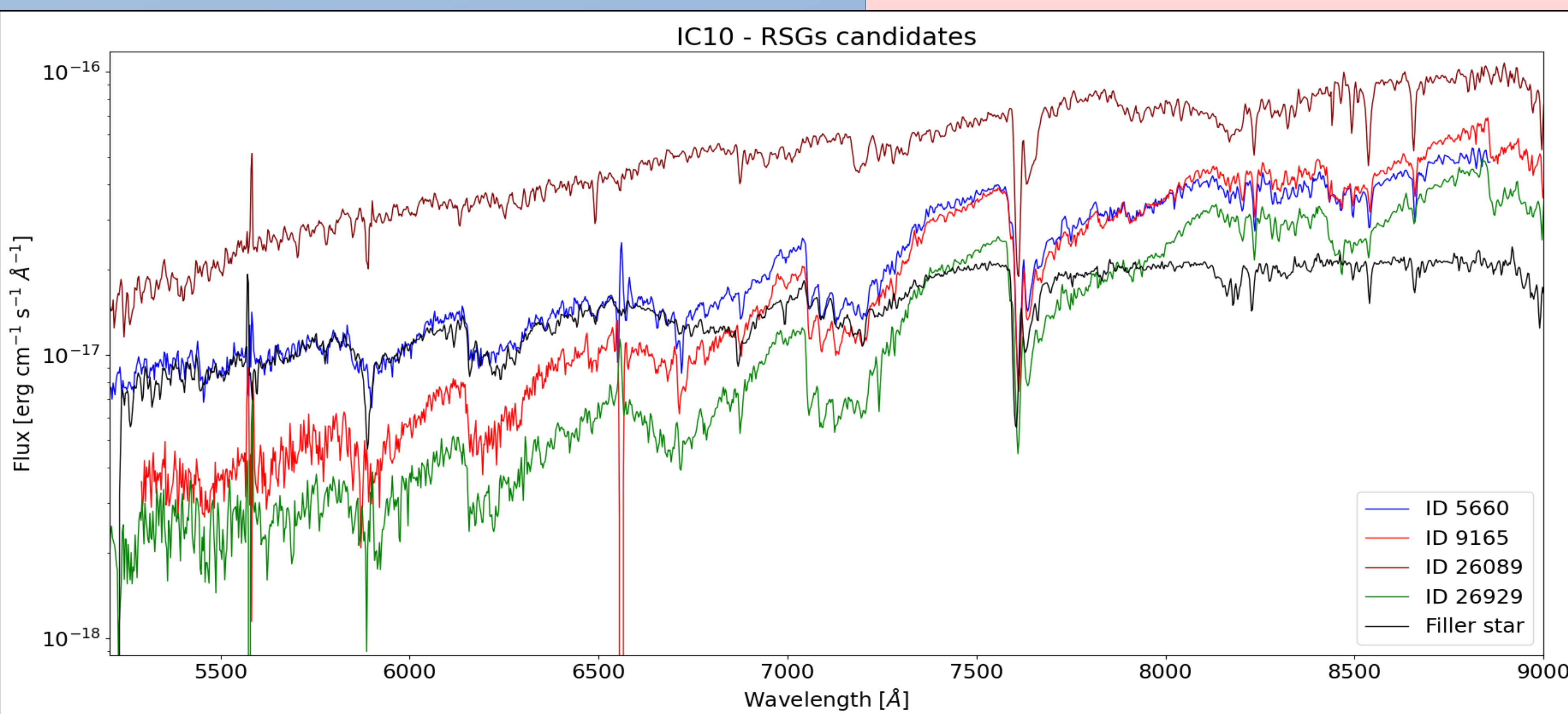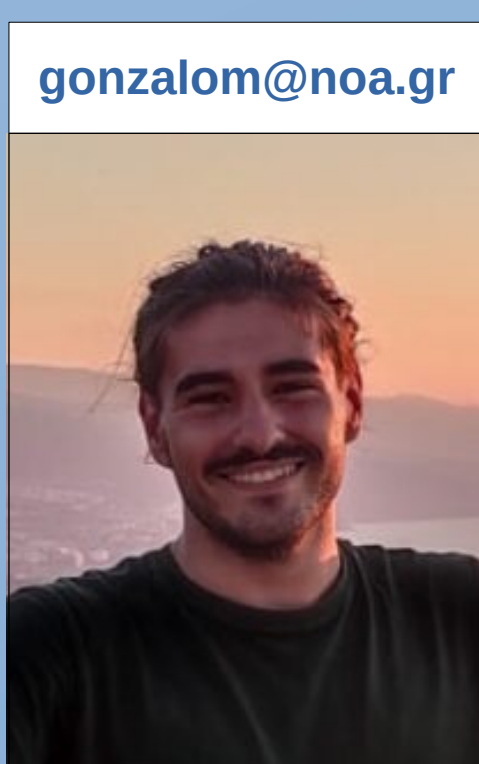*Table 3: Properties of RSGs candidates in IC10. The RV was measured using Ca II lines*

Figure 3: CMD of IC10 indicating the targets selected and the priotiry

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