The radial distribution of stellar populations in NGC 2808

Matteo Simioni[1,2,3,4], Antonino P. Milone[5], Luigi R. Bedin[4], Antonio Aparicio[2,1], Giampaolo Piotto[3,4]
Enrico Vesperini[6], Jongsuk Hong[6]

[1]Instituto de Astrofísica de Canarias, Spain, [2]Departamento de Astrofisica, Universidad de La Laguna, Spain,
[3]Dipartimento di Fisica e Astronomia 'Galileo Galilei', Università degli Studi di Padova, Italy, [4]INAF-Osservatorio Astronomico di Padova, Italy,
[5]Research School of Astronomy and Astrophysics, Australian National University, Australia, [6]Department of Astronomy, Indiana University, USA
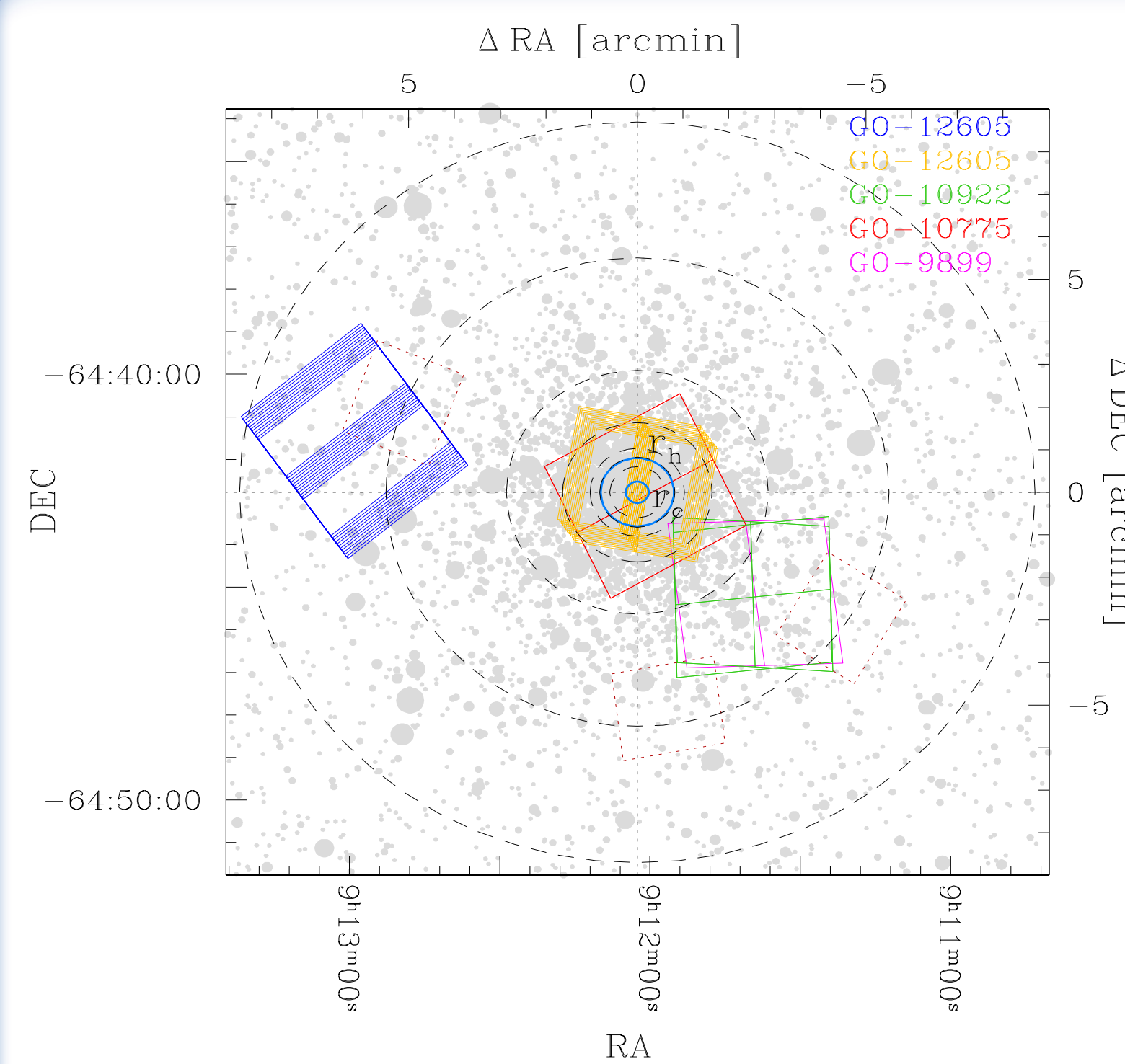
Introduction

We exploit *Hubble Space Telescope* photometry to investigate the radial distribution of the different stellar populations inside NGC 2808.
Combining proprietary and archival data from the Wide Field channel of the Advanced Camera for Surveys (WFC/ACS) and the Ultraviolet and Visual Channel of the Wide Field Camera III (UVIS/WFC3) we are able to sample the cluster from center out to radial distances of ~8.5 arcmin.
In all the analyzed fields, three distinct stellar populations can be identified in the Main Sequence (MS) region of the Colour Magnitude Diagrams (CMD). These corresponds to rMS, mMS and bMS sequences of Piotto et al., (2007).

The Data

GO	PI	Camera	Filter	Exposures	R	Epoch
9899	G. Piotto	WFC/ACS	F475W	6×340s	3'.34	05 May 2004
10775	A. Sarajedini	WFC/ACS	F814W	23s+5×370s		01 Jan 2006
10922	G. Piotto	WFC/ACS	F475W	2×350s	3'.40	09 Aug 2006
				2×360s	3'.38	01 Nov 2006
			F814W	3×350s	3'.40	09 Aug 2006
				3×360s	3'.38	01 Nov 2006
12605	G. Piotto	WFC/ACS	F475W	6×890s+6×982 s	6'.27	08 Sept 2013
			F814W	6×508s	6'.27	08-9 Sp 2013
12605	G. Piotto	UVIS/WFC3	F275W	12×985s		08-09 Esp 2013

The Observed CMDs

Three distinct MS can be observed in all analyzed fields. Exept for the outer field (in blue in the finding chart), CMDs were decontaminated from non-cluster-members through an analysis of stars proper motions. We correct all CMD for differential reddening using the technique presented in Milone et al.,(2012).
It is important to note that, while for the outer and intermediate fields F814W and F475W photometry (ACS data), for the inner/central field we used F275W and F814W photometry (WFC3 data).

Finding chart. Core and half-light radii of NGC 2808 are indicated by blue circles; Dashed circles represent the boundaries of the selected radial bins.
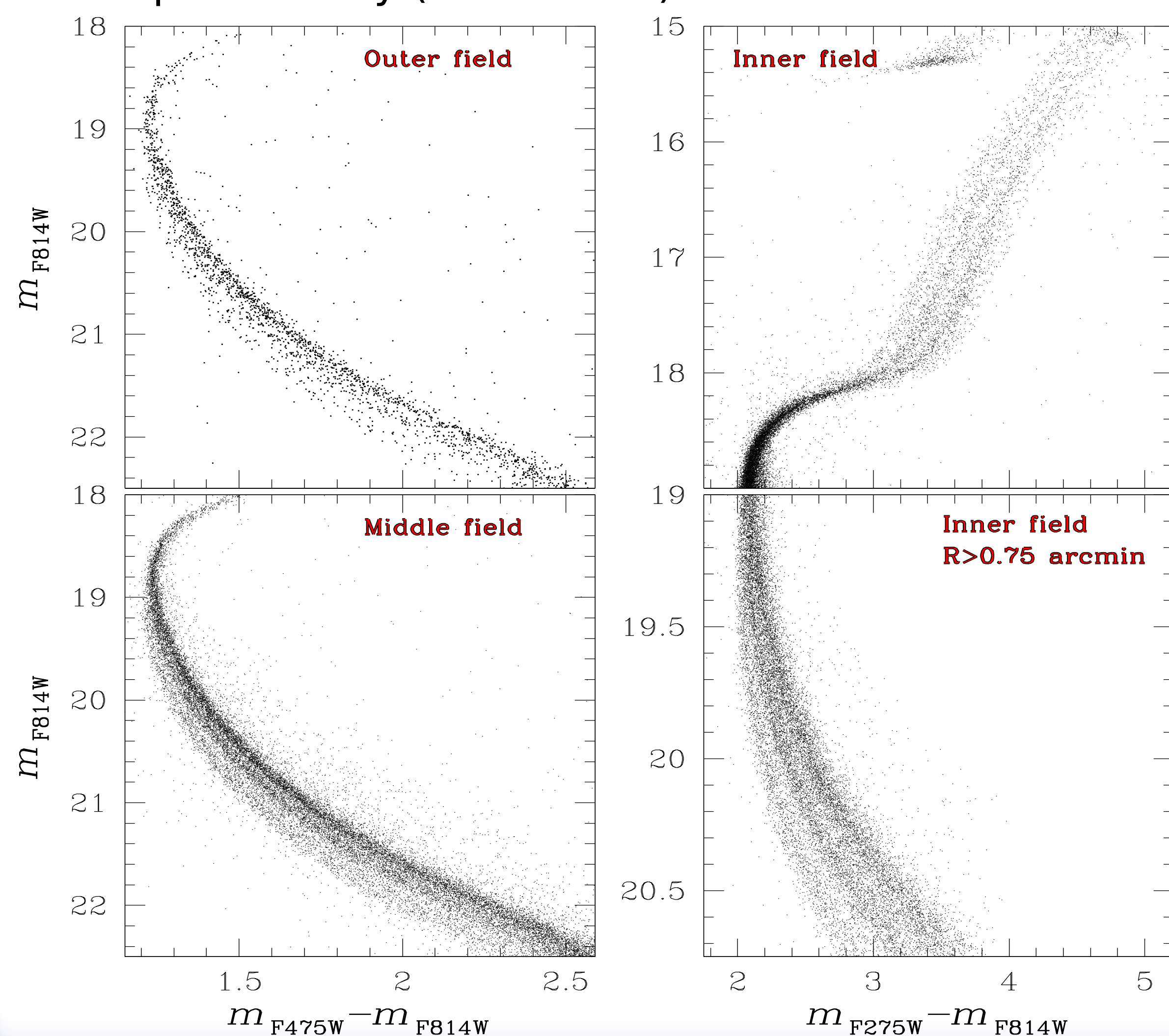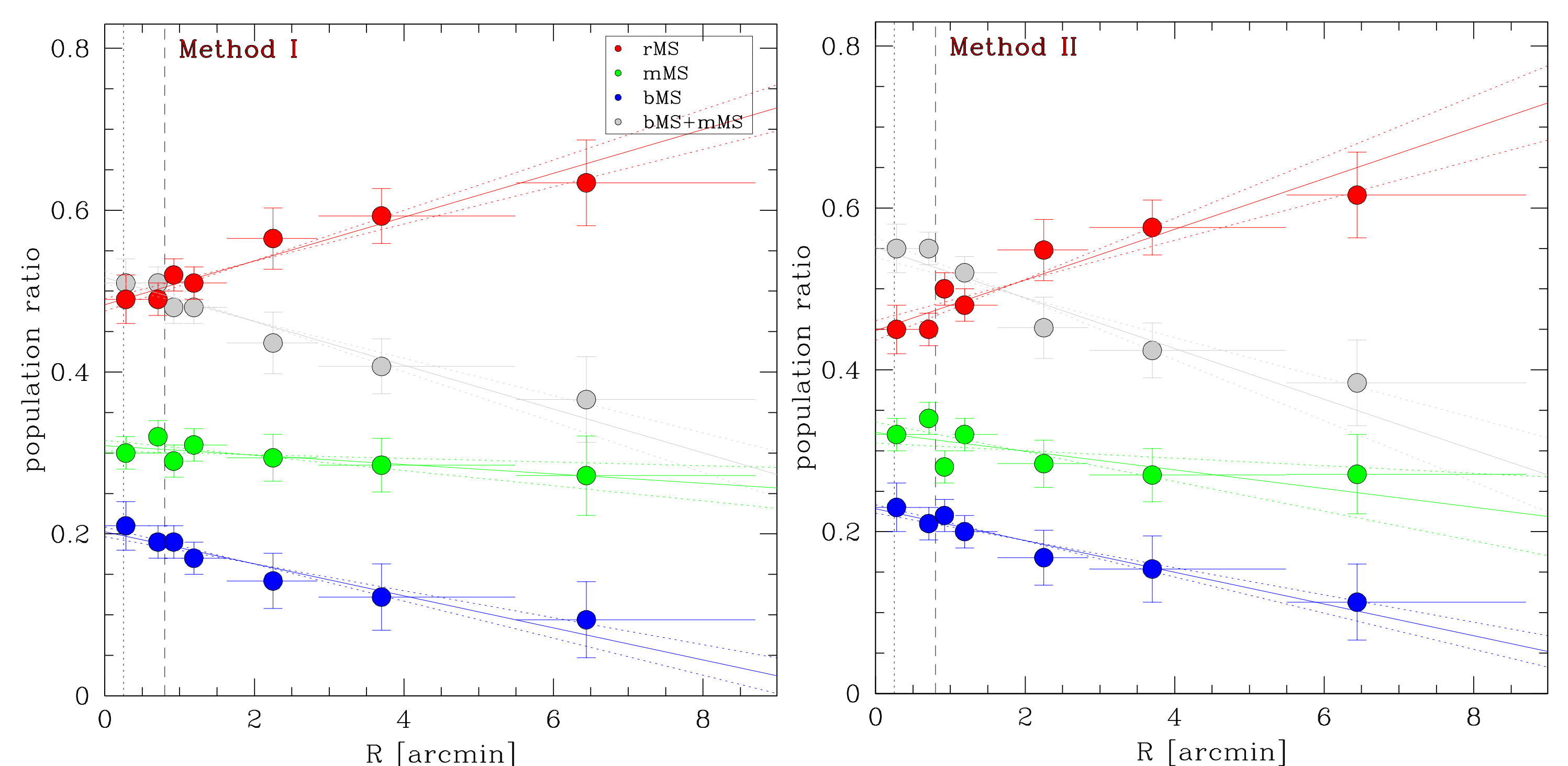Red dotted fields corresponds to WFC3 IR observation of GO-11665.

Methodology and Results

We have counted the number of stars belonging to each stellar population in different radial bins. In order to do so we have applied tha same iterative method used in Milone et al., (2012).
Since the photometric catalogs used in this work samples different magnitude intervals - which translates into different stellar masses intervals - we have performed at first a direct comparison in different radial bins (Method I), we have then normalized the counts for the sampled stellar mass interval (Method II).

Normalizing stellar counts obtained for each sequence for the total number of stars measured in the selected magnitude interval we have obtained the so called population ratio. Analyzing the radial dependence of the different populations we have detected a weak yet statistically significant gradient. We have observed that the red sequence of Piotto et al., (2007) is less concentrated than the other two while the blue one is the most concentrated. The significance level of this result is above 3σ.
A theoretical analysis have also been performed and indicate that the observed gradient is consistent with what is obtained by means of N-Body simulations of two interating stellar populations, for times larger than ~10 Gyrs.

References

Milone, A. P., Piotto, G., Bedin, L. R., et al. 2012, A&A, 537 A77
Piotto, G., Bedin, L. R., Anderson, J., et al. 2007, ApJ, 661, L53

Contacts

email: msimioni@iac.es