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LETTER

Letter to the Editor

ESO 280–SC06: a new globular cluster in the Galaxy⋆

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Abstract. By means of VI CCD photometry we identify a new globular cluster in the Galaxy: ESO 280−SC06. The images and Colour Magnitude Diagrams indicate that we are dealing with a sparsely populated globular cluster, showing a compact core. The cluster is located in Ara, projected at only 12.6° from the plane, and appears to be metal poor ($[\mathrm{Fe/H}] \approx -1.8$). We derive a reddening E(B−V) = 0.07 and a distance from the Sun $d_\odot$ = 21.9 kpc. It is a halo globular cluster on the opposite side of the Galaxy.

Key words: stars: Hertzsprung–Russel (HR) and C-M diagrams – Galaxy: globular clusters: individual: ESO 280–SC06

1. Introduction

Globular clusters in the Galaxy are relatively rare objects as compared to the population of open clusters. In recent years the list of globular clusters had new additions such as Lyngå 7 (Ortolani et al. 1993, Tavarez & Friel 1995), Pyxis (e.g. Weinberger 1995; Da Costa 1995; Irwin et al. 1995; Sarajedini & Geisler 1996) and IC 1257 (Harris et al. 1997). Harris' (1996) website on globular clusters (http://physun.physics.mcmaster.ca/Globular.html) contains 147 objects. Recently the 2MASS near infrared survey (Skrutskie et al. 1997) has provided two new highly obscured candidates (Hurt et al. 2000).

In a systematic inspection of southern cluster images, ESO 280−SC06 called our attention since on the second generation Digitized Sky Survey (XDSS), a dense core appeared to be present, suggesting it to be a globular cluster.

ESO 280-SC06 was found during the elaboration of the ESO/Uppsala Survey of the ESO (B) Atlas (Lauberts 1982), specifically in the list number IV (Holmberg et al. 1977). They classified ESO 280−SC06 as a very obscured open cluster, and provided an angular size of $1.5'$. No subsequent study was given in the literature.

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Table 1. Log of observations

Target	Filter	Exp. (sec)	Seeing (")
ESO 280-SC06	V	60	1.1
	I	20	1.1
	V	900	1.1
	I	600	1.1

The cluster is located at J2000 α = $18^{\mathrm{h}}09^{\mathrm{m}}06^{\mathrm{s}}$, δ = $-46^{\circ}25'23''$ and Galactic coordinates l = 346.90°, b = −12.57°.

In the present study we show that ESO 280−SC06 appears to be the 150^{th} globular cluster in the Galaxy.

In Sects. 2 and 3 the observations and Colour Magnitude Diagrams (CMD) are presented. In Sect. 4 the cluster parameters are derived and its properties are discussed. Concluding remarks are given in Sect. 5.

2. Observations and colour-magnitude diagrams

ESO 280−SC06 was observed on 2000 March 5, with the 1.5m Danish telescope at ESO (La Silla). A Loral/Lesser CCD detector C1W7 with 2052×2052 pixels, of pixel size 15 μm was used. It corresponds to $0.39''$ on the sky, which provides a full field of $13' \times 13'$.

The log of observations is provided in Table 1.

In Fig. 1 is shown a 15 min V exposure of ESO 280−SC06 for a field extraction of 3.3'×3.3' (510×510 pixels). The cluster has a very compact core. A loose halo of stars can be seen, with a diameter of about $1.5'$, confirming the size estimate by Holmberg et al. (1977). The overall morphology is similar to that of the globular cluster NGC 6540 (Bica et al. 1994).

Daophot II was used to extract the instrumental magnitudes. For calibrations we used Landolt (1983, 1992) standard stars. Reduction procedures of compact clusters in crowded fields were described in a study of Liller 1 (Ortolani et al. 1996) and in the recent work on NGC 6401 (Barbuy et al. 1999).

The calibration equations are:

$$V = 26.46 + 0.01(B - V) + v$$

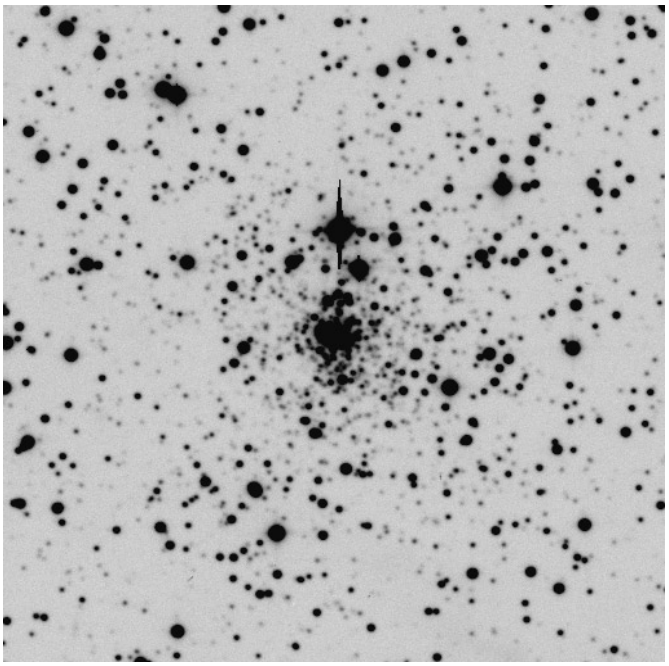

Fig. 1. V image of ESO 280−SC06 for 15 min exposure with an extraction of $3.3' \times 3.3'$ (510×510 pixels). East is to the left and North to the top.

$$B \;=\; 26.35 + 0.1(B-V) + b$$

for 10 sec. and 15 sec. respectively, at 1.25 airmasses. The errors in the zero point calibration are largely dominated by the crowding in the transfer from aperture to convolved magnitudes, estimated to be about ±0.03 mag in each colour. The CCD shutter time uncertainties (0.3 sec) related to short exposures done for standard stars, lead to an additional 3% error, which is propagated to the calibrations of the long exposure cluster frames. The final magnitude zero point uncertainty is estimated to be ±0.05. The atmospheric extinction was corrected with the La Silla coefficients (C_V = 0.13, C_I = 0.1 mag/airmass).

3. Colour magnitude diagrams

Fig. 2 shows the V vs. $V-I$ CMD of the whole field ($13' \times 13'$), where the cluster sequences are barely seen. Fig. 3 presents the V vs. $V-I$ CMD for an extraction of $r < 1'$ centred on the dense core, where stars from a more central extraction ($r < 0.5'$) are overplotted.

The whole field CMD is dominated by a disk Main Sequence (MS). In the extractions the cluster sequences become clear, especially in the innermost extraction. The cluster shows a rather steep Red Giant Branch (RGB) and evidence of 4 Horizontal Branch (HB) stars. Small numbers of HB stars happen to occur in sparsely populated globular clusters, such as E3 (McClure et al. 1985; Gratton & Ortolani 1987), or AM-4 (Inman & Carney 1987), where no HB stars are detected.

In Fig. 4 a CMD combining the deep and short exposures (Table 1) is presented, for an extraction of $r < 37''$ ($r < 94$ pixels). The deep exposures allowed to reach $V \approx 22$, below

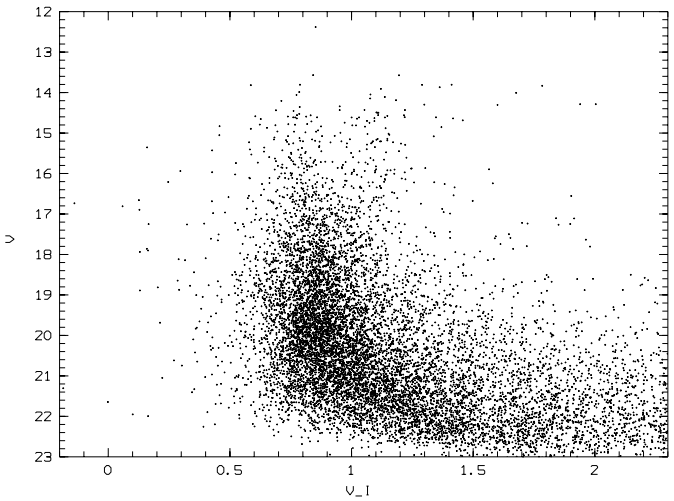

Fig. 2. V vs. $V-I$ CMD of the full field short exposures.

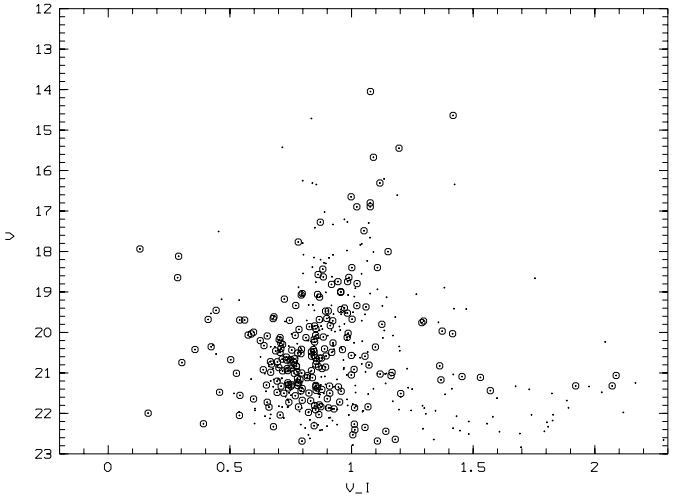

Fig. 3. V vs. $V-I$ CMD of an extraction of radius $r < 1'$ centred on the cluster. An inner extraction of $r < 0.5'$ is also shown as circles.

the turnoff point. The mean locus of the metal-poor cluster M55 (NGC 6809) of $[\mathrm{Fe/H}] = -1.81$ (Harris 1996) is overplotted on the cluster CMD, using the CMD of M55 from Desidera & Ortolani (1997). ESO 280−SC06 sequences are well fitted by this mean locus, in particular the confirmation of a low turn-off, indicating that we are dealing with a globular cluster. Note that the mean locus of M5 gives a suitable fit as well, very similar to that with M55. The steep RGB and the blue HB (BHB) suggest that the metallicity is close to that of M55, around $[\mathrm{Fe/H}] \approx -1.8$.

4. Cluster reddening and distance

The overall fit of Fig. 4 provides V_{HB} = 17.4±0.2 for the upper part of the BHB. The colour of the RGB at the HB level is $V-I$ = 1.0±0.1. The difference with respect to the fit with M55 is Δ(V-I)$_{(\mathrm{ESO280-SC06-M55})}$ = 0.0; so that the reddening of ESO 280-SC06 is the same as that of M55, E(B−V) = 0.07 (Harris 1996).

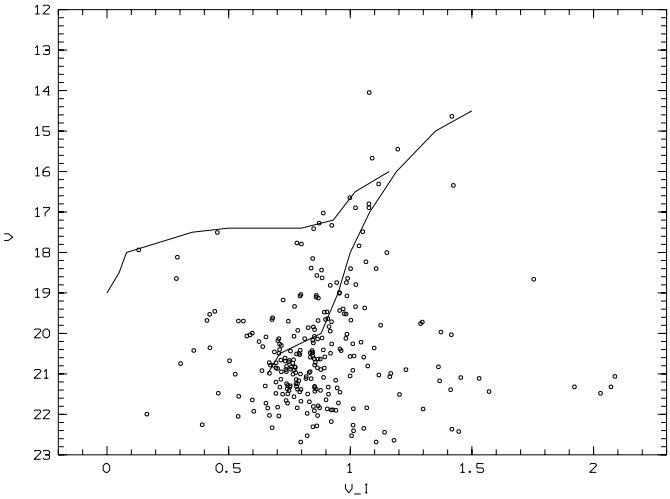

Fig. 4. V vs. $V-I$ CMD of an extraction of radius $r < 37''$ ($r < 94$ pixels) centred on the cluster, combining the short and deep exposures. The mean locus of M55 is superimposed on the cluster sequences (solid line).

This reddening value is compatible with those of clusters projected nearby ESO 280−SC06, such as NGC 6681 (l = 2.85°, b = −12.51°) with E(B−V) = 0.07 and NGC 6541 (l = 349.29°, b = −11.18°) with E(B−V) = 0.14 (Harris 1996).

Adopting R = 3.1 we get A_V = 0.22, and using M_V^{HB} = 0.5 suitable for the cluster metallicity (Buonanno et al. 1989), there results $(m\text{-}M)_o$ = 16.7, and the distance to the Sun $d_\odot$ = 21.9±2.0 kpc for ESO 280−SC06.

Assuming the distance of the Sun to the Galaxy center to be $R_\odot$ = 8.0 kpc (Reid 1993), the Galactocentric coordinates are X = 12.8 kpc (X > 0 is on the other side of the Galaxy), Y = −4.8 kpc and Z = −4.8 kpc. The distance from the Galactic center is R_{GC} = 14.5 kpc, thus the cluster is located in the halo on the opposite side of the Galaxy.

5. Conclusions

ESO 280−SC06 has been identified as a new globular cluster in the Galaxy. The cluster is poorly populated and contains a compact core. The cluster turnoff is attained and the overall CMD morphology indicates a metal poor globular cluster, with a blue Horizontal Branch. The cluster has a low reddening and is located in the halo on the opposite side of the Galaxy. Its angular location in the Galaxy is compatible with loci where new globular clusters are expected, i.e. projected not far from the plane near the central parts.

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