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Search for dwarf galaxy candidates in M 106

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Abstract. We present preliminary results of a search for dwarf galaxy candidates in the $24' \times 24'$ field of view around M 106 galaxy. Total of 107 images were taken in the V-band with the new 1.4 m Milanković telescope (Serbia, near Prokuplje) and 27 images in the L-band. We confirm presence of the satellites from previous studies and find new candidate galaxies.

Key words: galaxies – satellites – photometry

1. Introduction

Nearby galaxies offer unique possibility to study their local environment in unprecedented details. To address the "missing satellites" problem, a systematic study of the low surface brightness objects is needed. Observations carried out using amateur telescopes with hours-long exposures revealed a plethora of dwarf galaxies in the Local Volume (Karachentsev et al., 2015).

We believe that there are numerous low surface brightness galaxies surrounding nearby massive galaxies yet to be discovered using long exposures with modest-sized telescopes. To that end, we have imaged the nearby galaxy M 106, searching for the possible low surface brightness satellite candidates.

2. Observations

We carried out observations in two wavelength bands (V and L) on three nights (11, 20 and 23 April 2018) using the Apogee U42 camera attached to the 1.4 m Milanković telescope mounted at the Astronomical Station Vidojevica. With our small field-of-view (FOV, hereafter) of $8.3' \times 8.3'$, we created a mosaic of 3 $\times$ 3 images centered on the galaxy, to get $24' \times 24'$ area around M 106 galaxy. In each intrinsic FOV we took 10 images dithered slightly (by $0'.3$). And on the other nights, 27 images were taken again in V- and L-bands, respectively. Unfortunately, the number of 27 exposures of 180s across such a wide FOV wasn't enough to reduce the noise sufficiently. Finally, we have used 80 images in the V-band only, each of 180s exposure.

Data reduction was done in IRAF, following the standard procedure. Astrometric solution was obtained using Astrometry software (Lang et al., 2010). The mosaic creation was done using mscred package in IRAF, based on the astrometric solution. Objects were found and extracted using Sextractor (Bertin & Arnouts, 1996).

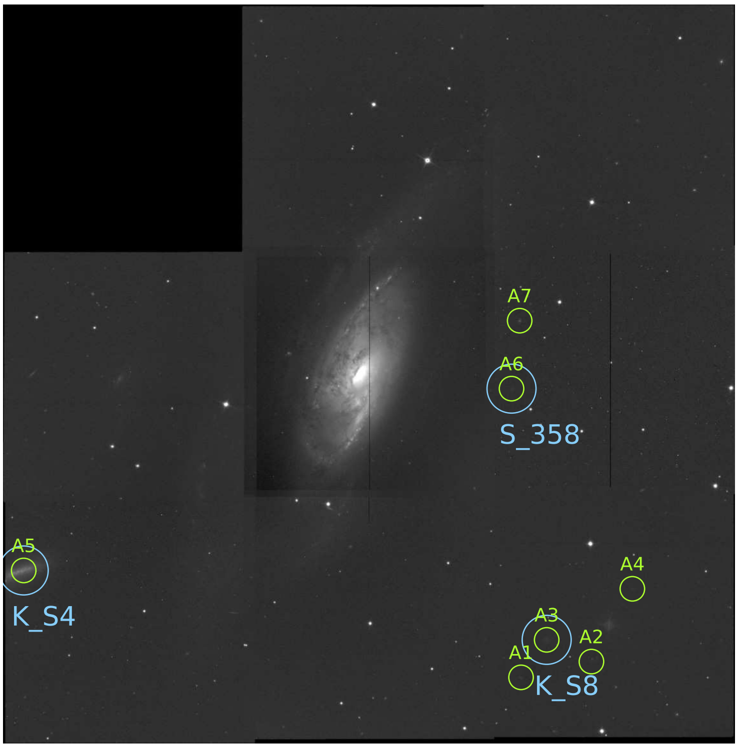

Figure 1. V-band image: Potential satellite galaxies are marked with smaller green circles. Larger blue circles correspond to the previously known satellites (see Table 1).

3. Results

Celestial coordinates of satellite candidates were cross-matched against the SDSS DR14 photometric catalog to get $g - r$ color. We had two requests for candidate galaxies: (1) color $g - r < 0.8$, to exclude possible background galaxies (Fukugita et al., 1995) and (2) a half-light Petrosian radius in the r-band $R_{50}{}^{r}$ $> 3''$, which corresponds to 150 pc. In this way, the potential list of candidates was downsized to 6 objects, yet another candidate galaxy was added with $R_{50}{}^{r}$ $= 2.5''$ (A7 object in Table 1), since it appears as an extended object and with the right color $g - r < 0.8$, it seems to be a plausible candidate. All candidates are marked in Fig 1 with green circles and are listed in Table 1. Large blue circles show objects that were found before: K_S4 and K_S8 are dwarves from Kim et al. (2011) and S_358 is a dwarf galaxy reported by Spencer et al. (2014).

It would be interesting in the future to obtain spectroscopic confirmation of candidate dwarf galaxies and to expand the FOV to at least half of the M 106 virial radius ($\sim 2° \times 2° \approx 260\text{kpc} \times 260\text{kpc}$), where most of the satellites should

Table 1. Galaxy candidates data: (1) Object labels same as in Fig 1., (2, 3) Celestial coordinates in the J2000 epoch, (4) objID from the SDSS DR14 photometric catalog, (5) Petrosian radius R_{50} in arcseconds in the r-band and (6) g-r color from the SDSS DR14 photometric catalog.

Name	RA [h:m:s]	DEC [d:m:s]	SDSS-DR14 objID	$R_{50}['']$	g-r
A1	12:19:28.045	47:28:19.56	1237661434308329731	3.1	0.49
A2	12:19:41.887	47:27:50.55	1237661434308329632	3.0	0.25
A3	12:19:33.184	47:27:05.92	1237661434308329605	8.6	0.52
A4	12:19:50.121	47:25:27.18	1237661434308330070	3.2	0.49
A5	12:17:49.84	47:24:33.13	1237661434308198442	26.9	0.87
A6	12:19:27.353	47:18:43.93	1237661434308329730	3.9	0.4
A7	12:19:29.290	47:16:28.28	1237661357007503592	2.5	0.33

reside (Moore et al., 1999).

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