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Research Note

New probable companions to M 31 found on the POSS-II

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Abstract. We present data on four probable dwarf galaxies found in a wide vicinity of M 31 on the POSS-II film copies. Two of them,the Cassiopeia and Pegasus dwarfs, have are already been confirmed to be real companions of M 31.

Key words: galaxies: dwarf – galaxies: individual: Cassiopea dwarf – galaxies: individual: Pegasus dwarf – galaxies: local group

During the past 20 years after the discovery of four dwarf companions of the spiral galaxy M 31, namely, And I, And II, And III (van den Berg, 1972) and Pisces Dw=LGS-3 (Karachentseva, 1976), no new companions have been found, until the current year when Armandroff et al. (1998a,b) reported on the discovery of two new dwarf companions, And V and And VI.

Continuing our program of search for very nearby dwarf galaxies on the Second Palomar Sky Survey (=POSS-II) films, briefly described in Karachentseva & Karachentsev(1998), we undertook a special search for possible new companions of M 31 based on blue and red POSS-II films.

The emphasis was put on very low surface brightness objects which can be easily missed when inspecting the POSS-I prints.

The region of our survey extended from +19° to +63° on the Declination and from $22^{\rm h}40^{\rm m}$ to $02^{\rm h}40^{\rm m}$ in Right Ascension. Therefore a circular area of a 22° radius was completely inspected around M 31. At a distance to M 31 of about 770 kpc (Friedman & Madore, 1990) the minimum linear radius of the surveyed zone amounted to 300 kpc. It will be recalled that all dwarf spheroidal companions of our Galaxy are situated within a distance of 250 kpc.

Besides And I–III and the LGS-3, well seen on the POSS-II films, we found also in the mentioned area four new low surface brightness objects which may be companions of M 31. Some data on them are presented in Table 1. The columns contain: (1) the object number indicating the POSS-II field number; (2) the equatorial coordinates for epoch 1950.0; (3),(4) the major and minor angular diameters in arcminutes measured on blue and red POSS-II films; (5) the morphological type; (6) a rough estimate of surface brightness; (7) some comments.

As shown by recent observations of the galaxies 240.1= Cassopeia dwarf and 472.2=Pegasus dwarf=And VI made with the 10-m Keck telescope (Grebel, 1998) and the 6-m telescope (Tikhonov, 1998), the distances of both dwarf objects determined from the magnitude of the tip of the red giant branch are in the range 700–800 kpc. This may be considered as a strong evidence for Cassiopeia dwarf and Pegasus dwarf to be gravitationally bound with M 31.

Considering the spatial distributions of the 11 irregular and spheroidal companions of M 31 known at that time, Karachentsev (1996) noted a lack of companions on the northern side of M 31. This N–S asymmetry is obviously caused by galactic extinction which is much stronger in the NE. Updating the M 31 suite by two new dwarf systems, as well by another probable new companion, Cam A (04 19 26.7 +72 41 27) found by Karachentsev (1994), this N–S asymmetry is reduced. Nevertheless, 3 to 5 companions of M 31 might still exist but have not been seen because of galactic extinction and the presence of extended cirrus fields in the wide vicinity of M 31.

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Table 1.

Object	R.A. (1950) DEC	(a x b) b	(a x b) r	Type	SB	Notes
1	2	3	4	5	6	7
191.1	$23^h\ 06^m\ 12^s$ $+56^\circ\ 14'$	2.5 1.6	1.5 1.0	Irr?	Very low	Isolated cirrus?
240.1	$23^h\ 24^m\ 09^s$ $+50^\circ\ 25'$	2.5 2.0	2.2 1.9	Sph?	Very low	Seen on POSS-I
348.1	$23^h\ 43^m\ 03^s$ $+38^\circ\ 26'$	1.1 0.6	– –	Irr	Low	Blue, granulated
472.2	$23^h\ 49^m\ 12^s$ $+24^\circ\ 19'$	4.0 2.0	2.8 1.8	Sph?	Very low	Seen on POSS-I

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