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BVRI photometric sequences for nine selected dark globules⋆

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Abstract. Using a CCD detector, *BVRI* photometry has been carried out in the vicinity of nine Lynds dark nebulae. In conjunction with spectroscopic data which could be obtained at a later stage, the data listed herein could be used for possible distance determinations of the nine nebulae.

Key words: galaxies: general — ISM: clouds — ISM: dust, extinction

1. Introduction

In their survey for dense cores in dark clouds, Benson & Myers (1989) included a table of opaque objects stated to be of unknown distance from the solar system. As a necessary precursor to the possible distance determination of six of these cores, the authors have undertaken this programme of *BVRI* photometry using a CCD detector to observe the usually faint stars located within (or thereabouts) the boundary of the visually evident core of the cloud. A further three objects (LDN 1113, LDN 549 and LDN 1225) were added to the above list of six at the time when the observations were made as they were also considered suitable candidates for possible distance determination.

Table 1 lists all the observed data fields in ascending order of right ascension. Columns (3) and (4) list right ascension and declination (2000 equinox) of the Lynds (LDN) or Barnard (B) clouds given in Col. (2). The field number for the purpose of identification within this paper is given in Col. (1).

⋆ Tables 2 to 11 are only available in electronic form at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via http://cdsweb.u-strasbg.fr/Abstract.html

2. Observations and reductions

BVRI measurements were carried out at Calar Alto (Almeria, Spain) during May and July 1993 (when the seeing was poor) and August 1995 (when the seeing was good) using the 1.23 m telescope of the Centro Astronómico Hispano-Alemán (C.A.H.A.). The telescope was equipped with a 1024×1024 pixel TEK 6 CCD camera. The CCD detector is built into a Dewar filled with liquid nitrogen and was cooled to -120 °C. The pixel size is 24μ which is equivalent to $0''.502$. The following Johnson filters were used

B: BG12/1 + BG18/1 + GG385/2
V: BG18/2 + GG495/2
R: OG570/2 + KG3/2
I: RG780/3.

The instrumental magnitudes were corrected for atmospheric extinction and transformed to the *BVRI* Johnson system by means of standard stars from the fields

PG 1633: RA(2000) $16^h35^m24^s$, Dec(2000) $9°47'50''$
NGC 7790: RA(2000) $23^h58^m40^s$, Dec(2000) $61°10'58''$.

The standard stars were chosen from the lists of Landoldt (1992), Christian et al. (1985) and Odewahn et al. (1992). The standard star observations were made at different air masses at least three times per night. The reductions were carried out with ESO-MIDAS 95 software. After flat field and dark field corrections, the fluxes of the single stars were computed using a single aperture routine which subtracts the effect of the sky background in the vicinity of each star. All stars were observed on at least two occasions and exposure times for the field stars ranged from 1800 s to 900 s in B and from 1200 s to 700 s in V whereas the corresponding exposure times for R and I were 400 s. For the standard stars the exposure times were 300 s in B and V and 100 s for R and I. The processing and conversion of the field and standard raw instrumental magnitudes to magnitudes relating to the Johnson system was carried

out producing magnitudes which are correct to at least ± 0.03 mag.

Table 1. List of objects

Field	Object	RA	Dec
1	LDN544, B127	19 01 33	−05 26 47
2	LDN549	19 02 10	−05 15 37
3	LDN567, B132	19 04 11	−04 25 29
4	LDN543, B134	19 06 55	−06 14 19
5	LDN1113, B367	21 44 18	57 10 57
6	LDN1031	21 45 54	47 13 53
7	LDN1225	23 12 16	61 39 59
8	LDN1252 (a,b,2)	23 46 01	63 18 42
9	LDN1257	23 56 10	59 49 50

3. Data

3.1. Introduction

For the nine fields the presentation of the results (Tables 2-11) will follow a similar format. A brief introduction (usually) will be followed by a table of magnitudes V, $B-V$ (where possible), $V-R$ and $V-I$ in the columns from two onwards preceded by our stellar identification number N in Col. 1. Also given (Fig. 1 to Fig. 11) is a computer generated star field for the region which also includes the stellar identification number mentioned above. For each star field given, the orientation is north up and east to the left and the area covered is $8'34'' \times 8'34''$.

3.2. LDN 544 (B127): Data Table 2

LDN 544 is a small molecular cloud which is included in the catalogue of molecular clouds (Clemens & Barvainis 1988) and which has been the subject of deep IRAS photometry and CO spectroscopy (Clemens et al. 1991).

3.3. LDN 549: Data Table 3

LDN 549 is a small molecular cloud which is included in the catalogue of molecular clouds given by Clemens & Barvainis (1988).

3.4. LDN 567: Data Table 4

LDN 567 is a somewhat extended molecular cloud which has been included in the list of dark clouds of opacity 6 (Parker 1988) used in a search for IRAS associations.

3.5. LDN 543 (B134): Data Table 5

LDN 543 is a small molecular cloud which is included in the catalogues of Clemens & Barvainis (1988) and Parker (1988). Interest has been shown in LDN 543 via magnetisation (Porro & Silvestro 1993) and thermal emission studies (Lee & Roger 1987).

3.6. LDN 1113 (B367): Data Table 6

3.7. LDN 1031: Data Table 7

CO_{12} and CO_{13} observations of LDN 1031 have been made by Dobashi et al. (1992).

3.8. LDN 1225: Data Table 8

LDN 1225 is a small molecular cloud which has been the the subject of NH_3 and C_2S observations (Scappini & Codella 1996).

3.9. LDN 1252: Data Tables 9, 10

LDN 1252 is an extended dark cloud composed essentially of two lobes which are presented as LDN 1252a,b and LDN 1252-2 respectively.

3.10. LDN 1257: Data Table 11

LDN 1257 is a dark nebula which according to Hilton & Lahulla (1995) has been the subject of interest in at least eight research publications.

4. Conclusion

Photometric data has been presented for regions in the vicinity of nine dark nebulae. An appropriate use of such data is for the determination of the distances of the nebulae from the sun. Before such distances can be obtained it is necessary to find the spectral type of each star used in the distance determination.

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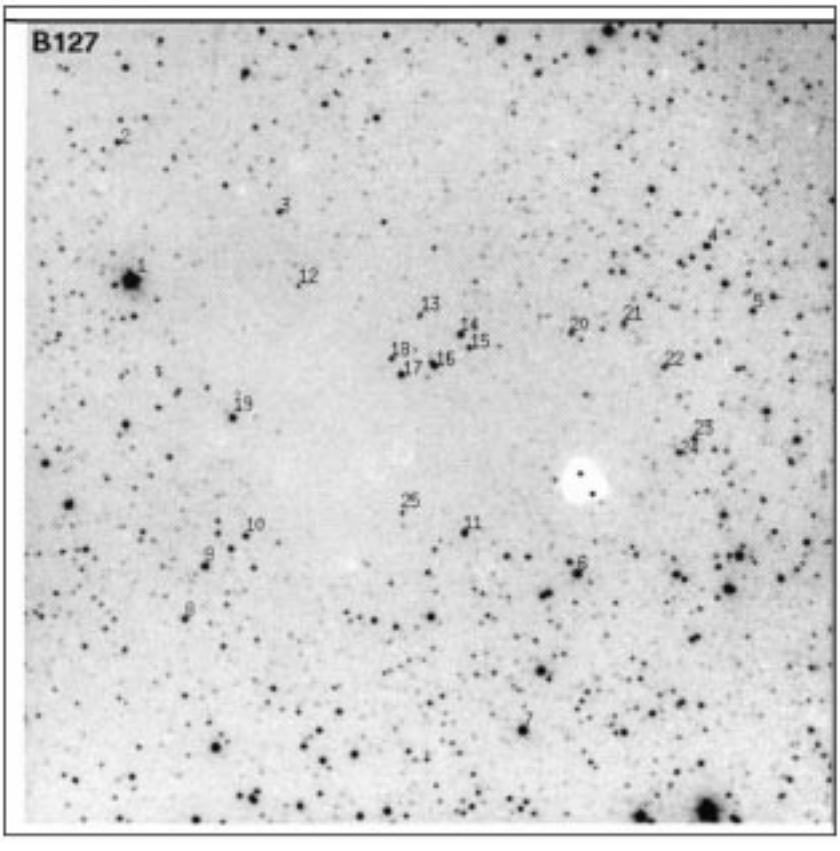


Fig. 1.

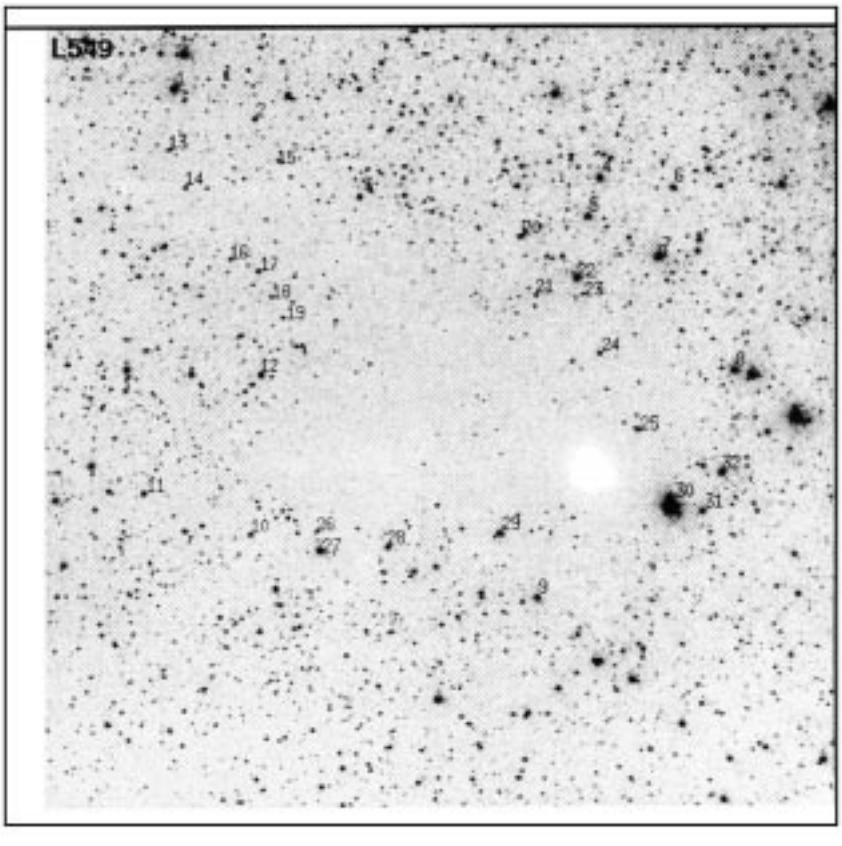
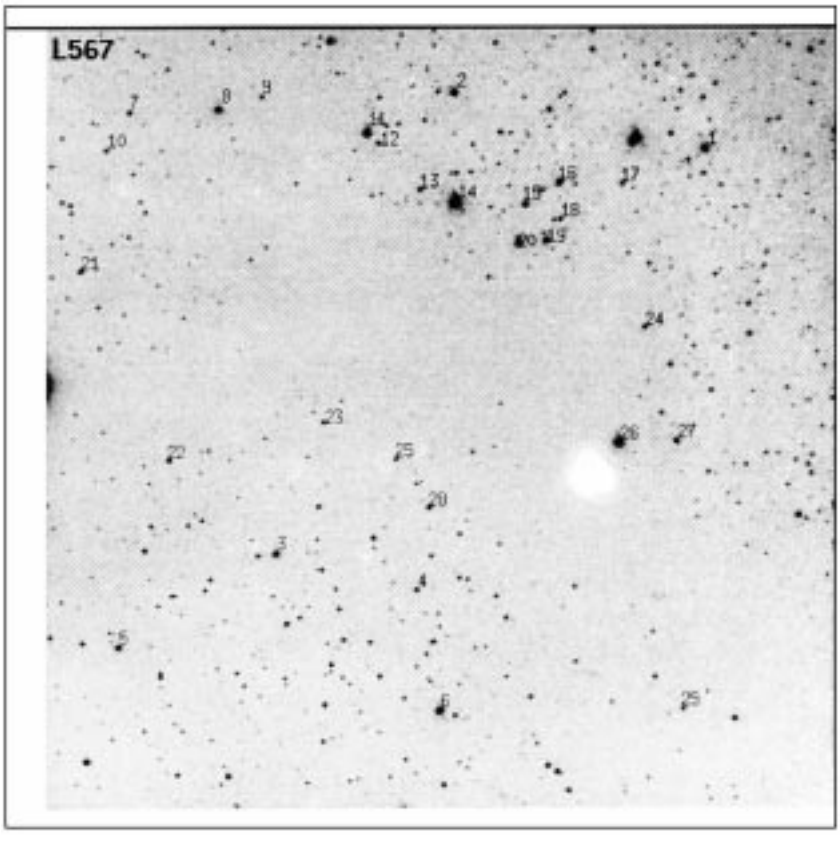


Fig. 2.



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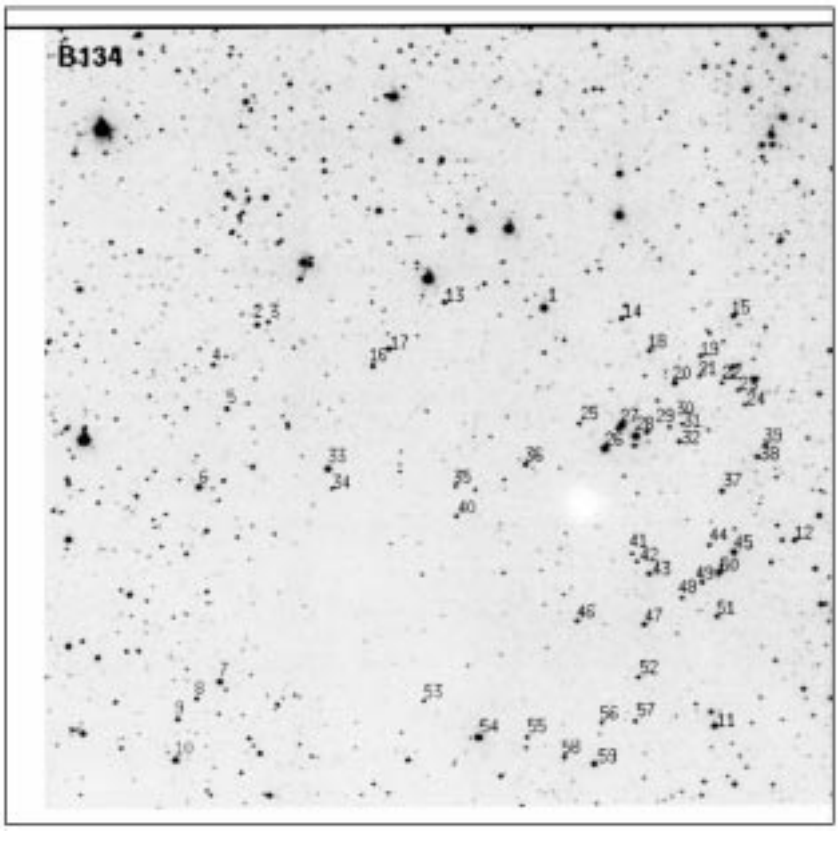
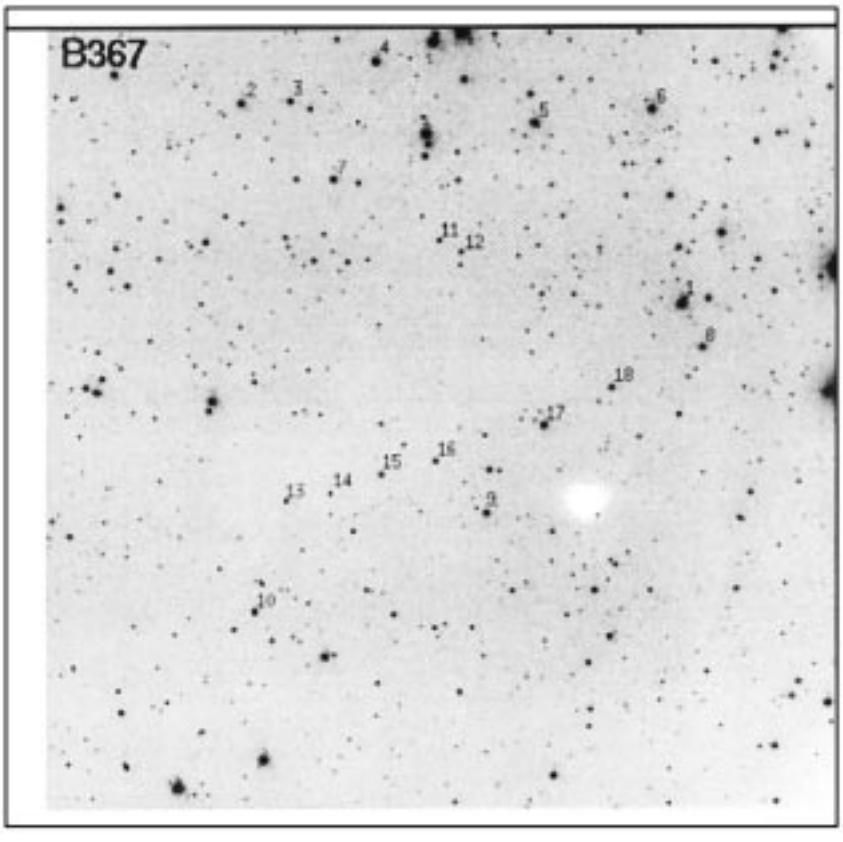


Fig. 4.



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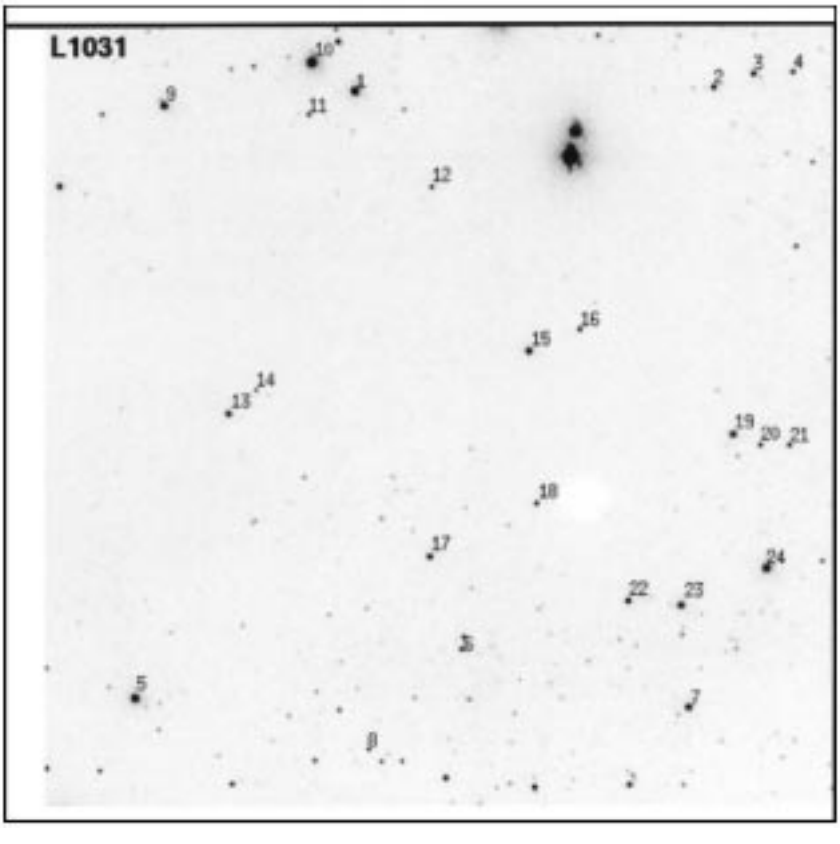

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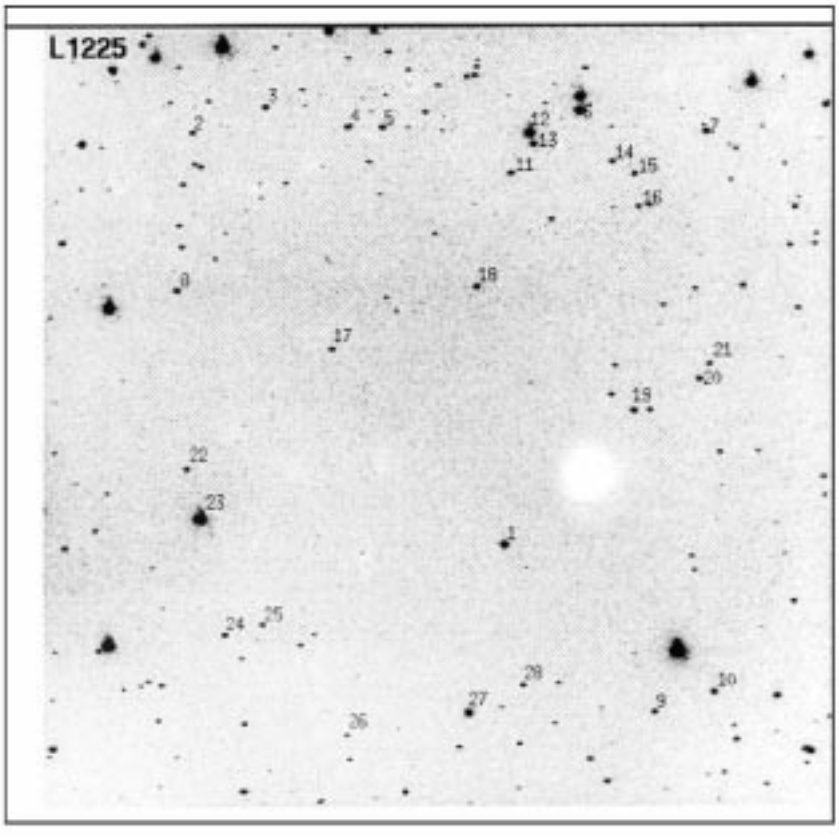

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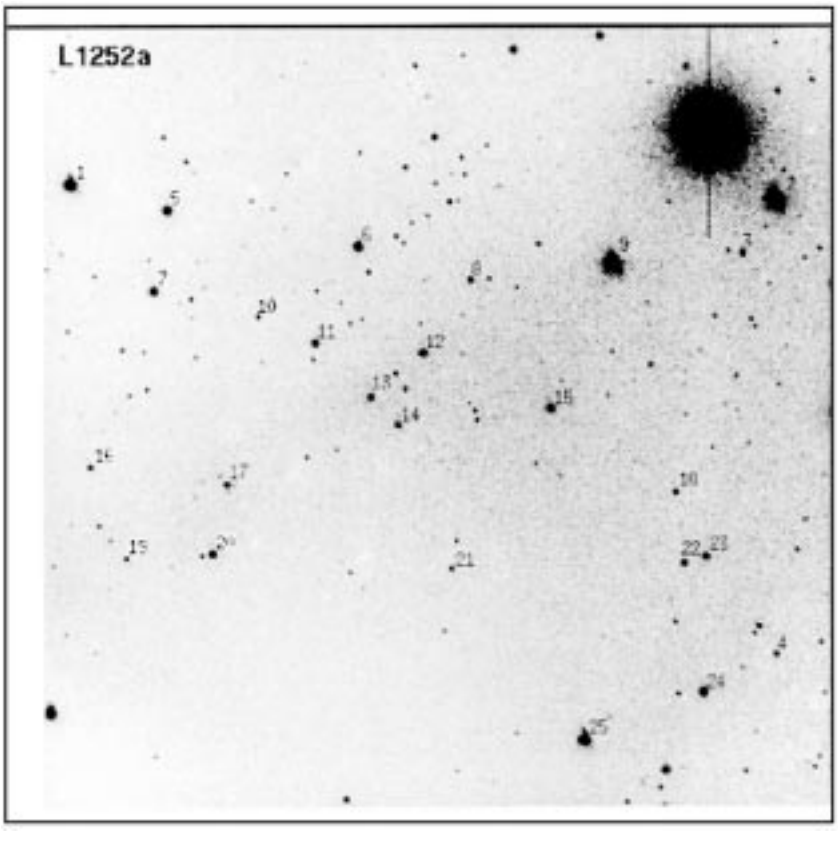

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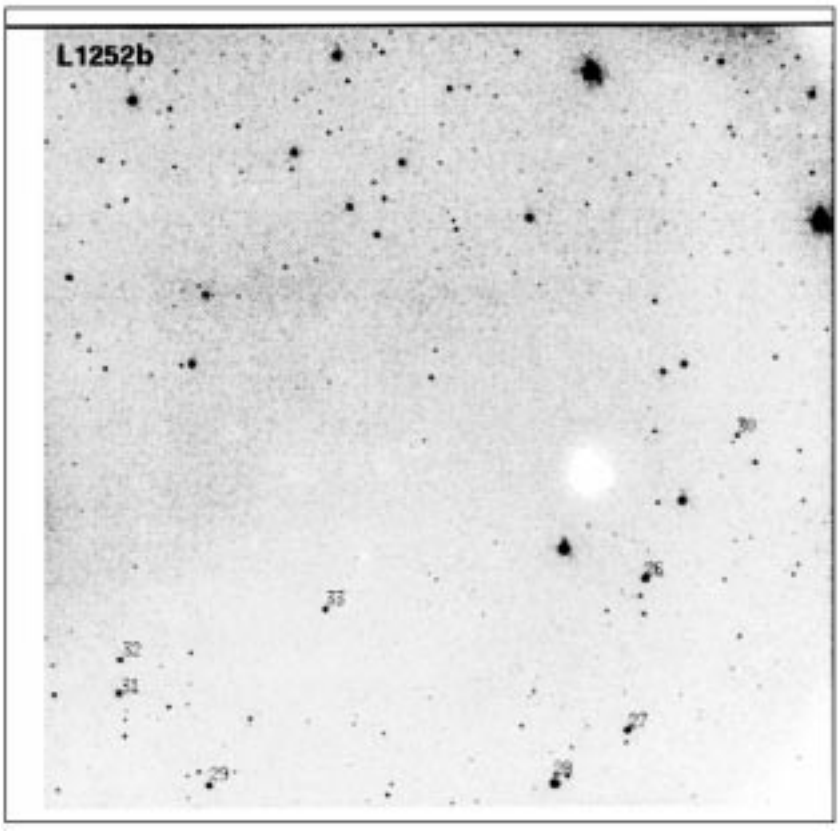
L1252b
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Fig. 9.

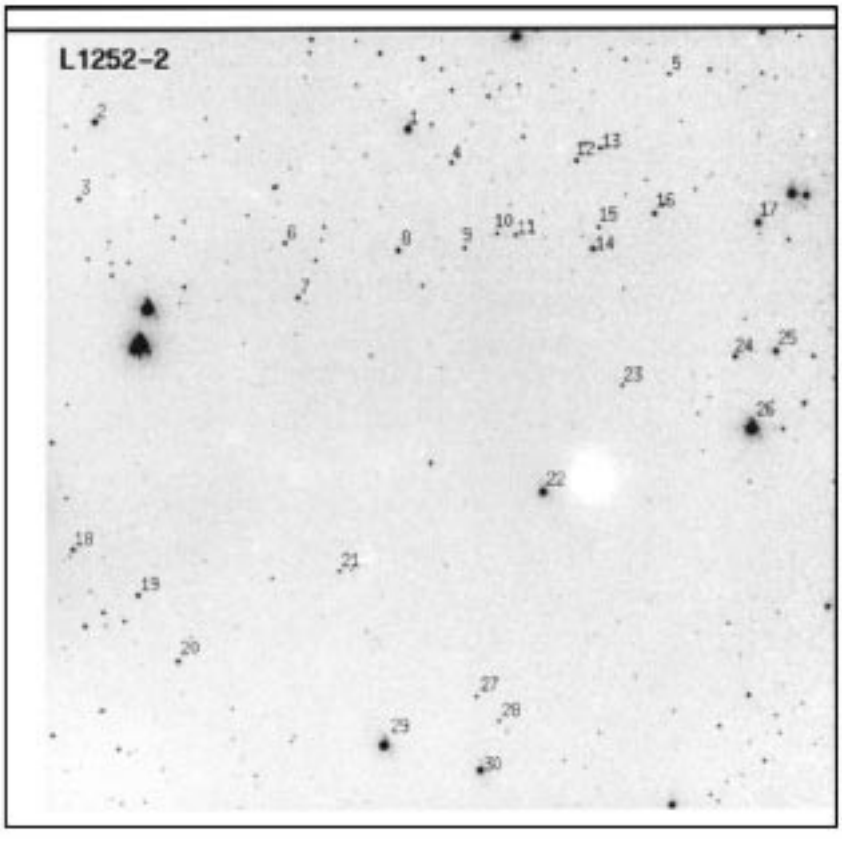
L1252-2
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Fig. 10.

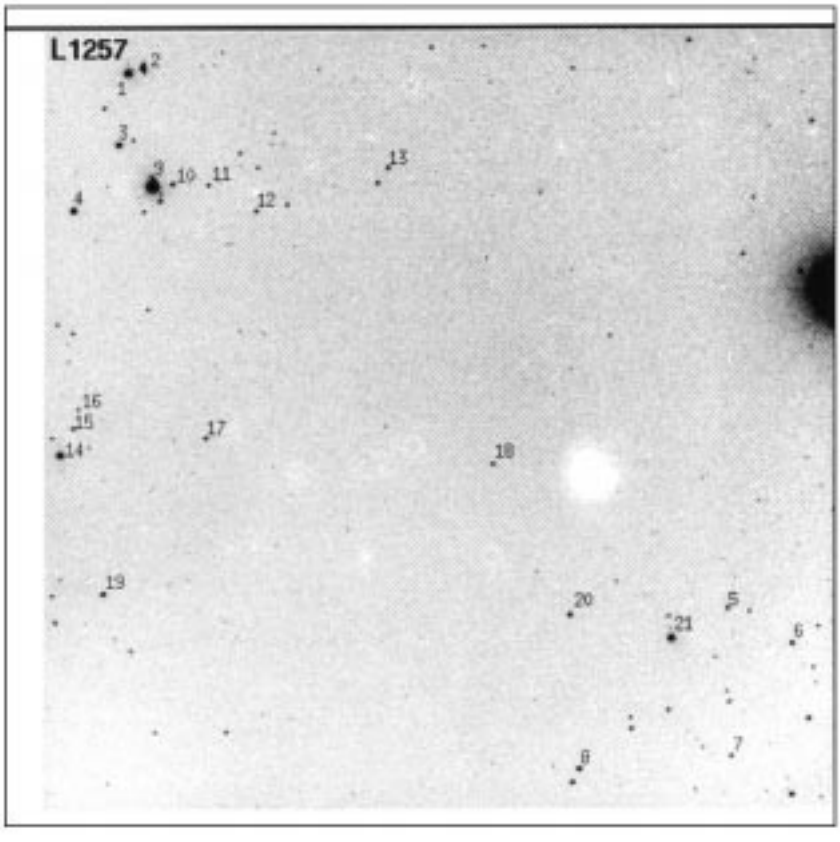

Fig. 11.