Revista Mexicana de Astronomía y Astrofísica, **40**, 137–146 (2004)

NEBULOUS OBJECTS IN THE SOUTHERN HEMISPHERE

A. L. Gyulbudaghian,[1] J. May,[2] L. González,[2] and R. A. Méndez[3]

Received 2003 September 26; accepted 2004 March 30

RESUMEN

Hemos realizado una inspección de las placas del Hemisferio Sur con el propósito de buscar objetos nebulosos no reportados con anterioridad. Se encontraron 93 objetos, de los cuales 62 están asociados con fuentes puntuales del IRAS. Algunos de estos objetos son similares a objetos Herbig-Haro, mientras que otros son glóbulos cometarios, grupos compactos de estrellas rojas enanas y objetos que semejan pequeñas regiones de estrellas en formación.

ABSTRACT

We have inspected plates of the Southern Hemisphere with the purpose of finding previously unreported nebulous objects. We found 93 objects, of which 62 are associated with IRAS point sources. Some of these objects look like Herbig-Haro objects, while others are cometary nebulae, tight groups of red dwarf stars, and objects resembling small regions of star formation.

Key Words: **ISM: H II REGIONS — ISM: HERBIG-HARO OBJECTS — STARS: EARLY-TYPE — STARS: FLARE — STARS: FORMATION — SURVEYS**

1. INTRODUCTION

We have extensively searched the Northern Hemisphere at optical wavelengths for nebulous objects that could point to regions of recent star formation (e.g., Gyulbudaghian, Glushkov, & Denisyuk 1978; Gyulbudaghian 1998). Attempts to find similar objects in the Southern Hemisphere have also been done, although less systematically (e.g., Reipurth 1983; Gyulbudaghian, Rodríguez, & Villanueva 1993). In this paper we report on a systematic inspection of high-quality film-copies of the ESO B, R, ESO/SRC J, and EJ plates (collectively called "prints" in what follows), aimed to find interesting, previously unreported, nebulous objects. We looked at all the Southern plate prints, but the final detailed search we concentrated mainly on places where dark clouds could be easily identified on the prints.

2. SURVEY OF SOUTHERN PLATES

As a result of our survey the following types of objects, with their defining characteristics, have been found:

1. HH - like objects. HH objects have well-defined boundaries on the prints: semistellar-like nebulosities or filaments, much brighter on the red plates, while on the blue plates only faint patches are visible. These circumstances allow us to find HH objects by direct inspection of the prints. Such surveys have been done for the Northern Hemisphere (e.g., Gyulbudaghian et al. 1978), as well as (partially) for the Southern Hemisphere (e.g., Gyulbudaghian et al. 1993). The present survey reveals several dozen of new HH-like objects. A detailed follow-up would be however required to determine their real physical nature.

2. Cometary nebulae (CN). These nebulae are small and have well-defined shapes: I - cone-like, Ia - bi-conical, II - comma-like, IIa - ring-like (8-like), III - arch-like (see, for example, Gyulbudaghian 1998). Cometary nebulae are usually connected with rapidly-evolving young, or otherwise unstable, stars (e.g., T-Tauris, Herbig Ae/Be, etc.). The ring-like nebulae are particularly interesting, because almost all known FU-Ori stars (FU Ori, V1057 Cyg, V1515 Cyg, Elias 12, RNO 1B) are connected with such nebulae (Croswell, Hartmann, & Avrett 1987; Staude & Neckel 1991).

[1]Byurakan Astrophysical Observatory.
[2]Department of Astronomy, Universidad de Chile.
[3]European Southern Observatory, ESO-Chile.

3. Tight systems of red stars (GR), connected with dark nebulae. During the survey of Northern Hemisphere prints we found a new interesting type of objects: tight systems of red stars (with typically three to eight stars in each system). These systems were projected against a background of, or in connection with, dark clouds. Follow-up spectroscopic observations of the stars composing some of these systems has shown that they are T-Tauri stars (Gyulbudaghian 1995) while, on deeper CCD-images, faint nebulosities, connected with the systems, were detected. These are the so-called "Ambartsumian" trapezium-like systems, for which theoretical considerations suggest that the physical distances between the individual components ought to be almost equal to each other (Ambartsumian 1954). Similar new systems have been also found in the present survey. As the southern prints are deeper than their northern counterparts, the faint nebulosities connected with these systems are clearly seen already on the prints.

4. Regions resembling regions of star formation (SFR). There are several objects in the present paper which look like the well-known region of star formation, Cep A = GGD 37 (a group of bright condensations with bright patches and filaments in a dark cloud, see Gyulbudaghian et al. [1978]). al. 1978). It is well known, that Cep A is connected with several maser sources, IRAS point sources and groups of HH objects (Rodríguez et al. 1980). By analogy, we can presume the presence of such objects in the vicinity of what appear to be star-forming regions included in the present list.

Basic data about the objects found in this survey are summarized in Table 1. Column 1 gives a sequential identification number for each object, while Columns 2 and 3 indicate the coordinates for the center of the object (most objects are extended). In Column 4 we give the plate number where the object was found. In Column 5, the associated IRAS point source (if any) is listed, while in Column 6 we give the corresponding 100 μm flux of these sources. Column 7 gives the difference between the positions of associated IRAS point sources and the object, and in Column 8 we give the type of source. From Table 1 we conclude that the association of our objects with IRAS point sources is rather tight because all objects (with the exception of #14, 89, and 93) fall inside the error boxes of these sources.

In § 3 we give a detailed description of each object, including their characteristic size and their associated IRAS point sources, and we also mention the association of some of them (17 objects in total) with objects from the catalog of nebular objects previously reported by Brand, Blitz, & Wouterloot (1986), and of one object (#5) with an object from the list of cometary nebulae by Gyulbudaghian (1998). In § 4 we present our conclusions.

3. DESCRIPTION OF INDIVIDUAL SOURCES

- Object 1. A star with a semi-ring-like nebula (20 arcsec), at the edge of a dark nebula. It is associated with IRAS 05050–0614, whose colors are characteristic of an embedded young star (i.e., $F(100\ \mu m) \geq F(60\ \mu m) \geq F(25\ \mu m) \geq F(12\ \mu m)$).
- Object 2. A condensation with a nebulous tail (20 arcsec), at the edge of a bright nebula.
- Object 3. A nebulous condensation in a dark nebula, resembles an HH object (8 arcsec).
- Object 4. A star with a comma-like nebula (40 arcsec), at the edge of a dark nebula, near the bright rim. The object is associated with IRAS 05388–0224, whose colors are characteristic of an embedded young star.
- Object 5. It is a star with a semi-ring-like nebula (15 arcsec) embedded in a dark nebula. There are two condensations resembling HH objects in the SW direction. This object is associated with CLN63 (Gyulbudaghian 1998). In the 2MASS images there are two more stars with a semi-ring nebula (see Figure 1, where all three stars are shown by arrows).
- Object 6. An interesting nebulous object (40 arcsec). It is associated with IRAS 05513–1024, whose colors are characteristic of an embedded young star.
- Object 7. Nebulous object (40 arcsec).
- Object 8. It is a nebulous object (20 arcsec) in a dark nebula, resembles an HH object. The object is associated with IRAS 05516+0142, whose colors are characteristic of an embedded young star. In the 2MASS images there is a group of three stars coincident with this object.
- Object 9. A nebulous object (35 arcsec) in a dark nebula. There are condensations resembling HH objects some 5 arcsec in the NE direction.

TABLE 1

LIST OF NEBULOUS OBJECTS OF THE SOUTHERN HEMISPHERE.

ID	RA[a] (hh:mm:ss)	DEC[a] (deg:mm:ss)	Plate Number	IRAS Source	100 μm Flux (Jy)	IRAS-Object (arcsec)	Type[b]
1	05:07:30.2	−06:10:16.3	766EJ	05050–0614	<32.31	10	CN
2	05:07:43.7	−06:11:20.2	766EJ	···	···		HH
3	05:30:25.2	−05:47:01.3	768EJ	···	···		HH
4	05:41:24.5	−02:22:36.7	840EJ	05388–0224	<219.07	3	CN
5	05:47:36.8	+00:39:14.2	840EJ	···	···		CN+HH
6	05:53:39.9	−10:23:50.7	700EJ	05513–1024	51.87	10	CN
7	05:53:44.0	−10:23:44.0	700EJ	···	···		CN+HH
8	05:54:20.1	+01:42:56.1	840EJ	05516+0142	<42.11	10	GR
9	06:07:52.4	−05:16:04.1	769EJ	···	···		CN + HH
10	06:08:00.0	−05:19:02.5	769EJ	···	···		CN
11	06:09:13.7	−06:43:55.2	769EJ	06068–0643	<8.47	3	HH
12	06:57:14.6	−08:19:59.2	700EJ	06548–0815	<129.44	4	SFR
13	07:04:36.0	−11:04:49.4	700EJ	···	···		HH
14	07:04:40.9	−11:06:15.4	700EJ	07024–1102	218.02	60	HH
15	07:09:20.4	−10:50:34.8	700EJ	07069–1045	211.90	10	HH+GR
16	07:09:48.0	−18:36:26.2	558R	07075–1831	<7.32		CN
17	07:10:09.9	−18:29:04.0	558R	···	···		CN
18	07:10:21.6	−18:29:01.0	558R	···	···		CN
19	07:12:25.2	−11:15:35.0	701EJ	07100–1110	25.98	2	CN+HH
20	07:24:13.0	−25:50:10.0	492R	07221–2544	<116.21	6	HH+GR
21	07:24:14.0	−24:38:18.0	492R	07221–2431	93.34	30	SFR+GR
22	07:30:33.4	−18:39:38.0	559R	···	···		N
23	07:34:25.5	−46:54:12.2	257R	07329–4647	<5.82	2	CN
24	07:40:15.8	−33:32:33.8	368R	07383–3325	197.74	2	GR
25	07:45:05.9	−25:31:38.5	493R	07429–2523	242.25	28	CN+HH
26	08:10:42.9	−36:03:32.9	369R	08088–3554	211.27	5	CN+HH
27	08:11:02.1	−36:04:57.7	369R	08091–3556	<211.27	3	HH
28	08:21:04.9	−49:40:57.5	210J	08196–4931	<74.63	10	CN
29	08:22:33.6	−40:24:25.7	313R	08207–4014	<20.51	5	CN
30	08:35:22.4	−40:38:53.0	313R	···	···		HH+SFR
31	08:35:22.5	−40:36:37.2	313R	08335–4026	<388.48	7	CN
32	08:38:05.1	−41:07:44.7	313R	···	···		CN
33	08:38:28.7	−41:02:26.4	313R	···	···		CN
34	08:38:49.0	−40:51:19.4	313R	···	···		CN
35	08:39:03.0	−40:46:10.8	313R	···	···		HH
36	08:43:51.2	−41:43:13.5	313R	08420–4132	<33.80	7	CN
37	08:50:38.7	−45:08:21.6	260R	08488–4457	224.18	4	CN+HH
38	08:52:18.8	−42:15:15.4	313R	···	···		CN
39	08:52:35.5	−42:09:29.9	313R	08507–4157	<34.08	12	CN
40	08:52:52.5	−42:06:17.8	313R	···	···		CN
41	08:56:27.8	−43:05:57.0	260R	08546–4254	2098.23	13	CN
42	08:58:04.3	−47:23:13.0	260R	08563–4711	3153.86	18	CN
43	09:01:52.0	−47:44:15.9	211R	09002–4732	14706.72	25	HH+SFR
44	09:03:07.8	−48:51:24.6	211R	···	···		CN
45	10:07:31.1	−60:03:42.6	127R	10059–5948	23.03	30	GR
46	10:15:31.1	−60:18:45.0	127R	10138–6004	138.74	30	CN
47	10:32:40.9	−61:37:28.0	128R	10308–6122	656.33	6	CN
48	10:32:56.8	−59:37:20.0	129R	10310–5921	<151.48	5	GR
49	10:42:29.2	−63:09:28.0	093R	10406–6253	<66.93	15	CN
50	10:49:57.7	−55:41:07.8	169R	10478–5525	32.31	10	CN+HH
51	10:52:14.3	−56:12:38.1	169R	10501–5556	545.35	12	HH
52	10:56:56.8	−58:36:53.4	128J	10548–5820	<366.84	15	GR
53	10:57:32.1	−62:58:48.0	093R	10555–6242	329.29	9	GR
54	10:59:40.6	−59:01:10.0	129R	10575–5844	218.69	8	CN

TABLE 1 (CONTINUED)

ID	RA[a] (hh:mm:ss)	DEC[a] (deg:mm:ss)	Plate Number	IRAS Source	100 μm Flux (Jy)	IRAS-Object (arcsec)	Type[b]
55	11:03:23.8	−77:41:32.0	038R	···	···		HH
56	11:07:21.7	−77:38:08.0	038R	11059–7721	<74.55	9	CN
57	11:08:50.2	−77:43:39.0	038R	11072–7727	250.12	10	CN
58	11:10:04.4	−76:33:30.0	038R	11083–7618	<282.68	50	CN
59	11:10:20.4	−59:29:24.9	129J	11082–5912	36.13	12	HH+CN
60	11:24:41.5	−58:56:40.0	129R	11223–5840	177.27	5	GR
61	11:24:42.3	−58:56:22.9	129R	···	···		CN+GR
62	11:34:04.5	−63:11:33.0	094J	11317–6254	<51.15	16	CN+HH
63	11:45:34.3	−65:32:56.0	094R	11431–6516	595.46	5	GR
64	12:19:38.5	−62:57:22.0	095R	12169–6240	<475.55	4	CN
65	13:06:57.6	−62:11:58.5	132J	···	···		CN
66	13:09:37.5	−62:13:10.5	132J	···	···		CN
67	13:25:41.5	−59:43:48.0	132J	13224–5928	37.21	6	HH
68	13:32:12.6	−60:25:32.0	132R	···	···		HH
69	13:32:49.5	−60:26:42.0	132R	13294–6011	873.84	6	HH+GR
70	15:44:59.1	−54:02:08.6	178R	15411–5352	<16762.21	12	SFR
71	16:10:27.0	−49:09:22.4	225R	···	···		HH
72	16:24:02.5	−42:53:02.1	276R	16205–4245A	<15.12	16	GR
73	16:26:58.5	−24:45:35.6	517R	16239–2438	<39.83	4	CN
74	16:40:00.5	−48:52:00.0	226R	16362–4845	18723.71	18	SFR
75	16:40:48.1	−47:15:15.5	277J	16371–4709	<426.90	4	CN
76	16:46:20.9	−41:14:52.0	332R	16428–4109	261.00	8	CN
77	16:50:11.0	−46:06:26.8	277R	···	···		GR
78	16:50:19.8	−46:09:07.6	277R	···	···		CN
79	16:59:06.9	−42:41:59.7	277R	16555–4237	2212.96	5	CN+SFR
80	17:01:11.0	−45:46:35.8	277R	16575–4541	<129.66	24	CN
81	17:11:04.1	−27:22:58.6	454R	17079–2719	<124.91	3	HH
82	17:16:13.9	−20:57:46.4	587R	···	···		CN
83	17:17:01.5	−36:20:53.0	392R	17136–3617	13622.23	17	HH+SFR
84	17:21:46.8	−44:08:47.0	278R	17181–4405	169.98	7	CN
85	17:57:42.9	−18:32:26.2	589R	17547–1832	401.10	3	CN
86	18:02:14.0	−20:57:50.0	589R	17590–2058	<369.78	30	CN
87	18:09:30.2	−24:12:25.8	521R	18064–2413	<238.63	9	SFR+HH
88	18:10:28.4	−23:50:56.0	521R	···	···		CN
89	18:10:54.1	−24:08:43.0	521R	18079–2410	<192.78	60	HH
90	18:15:36.2	−18:12:11.5	590R	···	···		HH
91	18:16:58.1	−12:13:42.2	734EJ	···	···		CN+GR
92	18:30:06.1	+00:42:33.9	878EJ	···	···		CN+HH
93	18:30:33.2	−01:52:56.6	878EJ	18278–0156	<44.78	60	CN

[a]Coordinates are approximate since many of the objects are extended, and are given for the J2000 equinox.
[b]CN: Cometary Nebula, GR: Group of red stars, HH: Herbig Haro, SFR: Star forming region, see § 2.

- Object 10. A nebulous object (12 arcsec) with filaments in a dark nebula.

- Object 11. Two jets from a star (10 arcsec), one with a condensation at the end. The star is associated with IRAS 06068–0643, whose colors are characteristic of an embedded young star.

- Object 12. It is a bright nebulous object (30 arcsec) in a dark nebula, a probable region of star formation. The object is associated with IRAS 06548–0815, whose colors are characteristic of an embedded young star. In the 2MASS images there is a group of stars.

- Object 13. A condensation (18 arcsec) at the edge of a bright nebula (a probable HH object).

- Object 14. A condensation at the edge of a bright nebula (13 arcsec), resembles an HH object. The object is associated with IRAS 07024–1102, whose colors are characteristic of an embedded young star.

- Object 15. It is a nebulous object (30 arcsec, a probable HH object). A chain of 4 stars is situated 15 arcsec from this object. The stars and the object are connected with a bright nebula. The object is associated with IRAS 07069–1045, whose colors are characteristic of an embedded young star.

- Object 16. A star with a nebula and filaments (15 arcsec). The 2MASS images exhibit what appear to be jets. It is associated with IRAS 07075–1831 and with object 6 from Brand et al. (1986).

- Object 17. A star with filaments (10 arcsec) at the edge of a bright nebula. It is associated with object 7C from Brand et al. (1986).

- Object 18. A star with a nebula (18 arcsec), at the edge of a bright nebula.

- Object 19. A condensation with a filament (30 arcsec) in a dark nebula, a probable HH object. The object is associated with IRAS 07100–1110, whose colors are characteristic of an embedded young star.

- Object 20. Several nebulous condensations with a faint nebula (30 arcsec), a probable group of HH objects, at the edge of a dark cloud. The object is associated with IRAS 07221–2544, whose colors are characteristic of an embedded young star (see Fig. 1).

- Object 21. A bright nebula (35 arcsec). It is associated with IRAS 07221–2431 and with object 22C from Brand et al. (1986). From the 2MASS images, there is a group of stars in this location.

- Object 22. A nebulous object (10 arcsec).

- Object 23. A condensation (6 arcsec) on the rim of a cometary globule. The object is associated with IRAS 07329–4647, whose colors are characteristic of an embedded young star.

- Object 24. A trapezium-like system (3 stars, 20 arcsec) in a faint nebula. The system is associated with IRAS 07383–3325, whose colors are characteristic of an embedded young star.

- Object 25. Nebulous stars (15 arcsec). They are associated with IRAS 07429–2523, whose colors are characteristic of an embedded young star. Several patches of dust are seen in the vicinity (indicated by arrows in Fig. 1).

- Object 26. Condensations and jets (25 arcsec) near a star, in a dark nebula. The object is associated with IRAS 08088–3554, whose colors are characteristic of an embedded young star. In 2MASS there is a group of stars. There are HH objects in the vicinity (indicated by arrows in Fig. 1).

- Object 27. A condensation with jets and patches (20 arcsec) in a dark nebula (probable HH objects). It is associated with IRAS 08091–3556, whose colors are characteristic of an embedded young star. The arrows in Fig. 1 point to the condensations.

- Object 28. A condensation with filaments (15 arcsec) in a dark nebula, perhaps part of a jet. The object is associated with IRAS 08196–4931, whose colors are characteristic of an embedded young star In the 2MASS K-band image there is a star with two jets.

- Object 29. A nebulous star with filaments (40 arcsec). It is associated with IRAS source 08207–4014 and with object 143B from Brand et al. (1986).

- Object 30. It is a condensation (7 arcsec) near a bright nebula, resembles an HH object. The 2MASS images reveals that there is a star-forming region (35 arcsec in size) some 75 arcsec to the East of Object 30.

- Object 31. A star with a semi-ring-like nebula (25 arcsec), in a dark cloud. The object is associated with IRAS 08335–4026, whose colors are characteristic of an embedded young star.

- Object 32. A condensation with a jet (7 arcsec).

- Object 33. A star with an 8-like nebula (40 arcsec) in a dark cloud.

- Object 34. A star with a semi-ring-like nebula (15 arcsec) in a dark cloud.

- Object 35. A condensation with a filament (15 arcsec) in a dark cloud, a probable HH object. There are two more condensations connected with a spiral filament, 40 arcsec to the South-West.

- Object 36. A condensation with filaments (15 arcsec) in a dark nebula. The object is associated with IRAS 08420–4132, whose colors are characteristic of an embedded young star.

- Object 37. A condensation at the edge of a dark nebula, with filaments and dust patches (30 arcsec). The object is associated with IRAS 08488–4457, whose colors are characteristic of an embedded young star.

- Object 38. A star with filaments (30 arcsec) in a dark nebula. It is associated with object 192B from Brand et al. (1986).

- Object 39. A star with a semi-ring-like nebula (40 arcsec). It is associated with object 192C from Brand et al. (1986) and with IRAS 08507–4157, whose colors are characteristic of an embedded young star.

- Object 40. A star with a semi-ring-like nebula (20 arcsec) at the edge of a dark cloud. It is associated with object 192D from Brand et al. (1986).

- Object 41. A star with a cone-like nebula and nebular filaments (30 arcsec). The object is associated with object 206B from Brand et al. (1986) and IRAS 08546–4254, whose colors are characteristic of an embedded young star.

- Object 42. It is a star with a cone-like nebula and filaments (40 arcsec). The object is associated with object 213A from Brand et al. (1986) and IRAS 08563–4711, whose colors are characteristic of an embedded young star.

- Object 43. A condensation (35 arcsec) in a dark nebula. 30 arcsec to the North-East there are several small patches, resembling HH objects (see Fig. 1). It is associated with object 222 from Brand et al. (1986) and IRAS 09002–4732, whose colors are characteristic of an embedded young star. 2MASS images indicate two star-forming regions in the location of the optical objects and patches, separated by obscuring material (see Fig. 1).

- Object 44. A condensation (15 arcsec) with spiral filaments at the edge of a dark cloud.

- Object 45. It is a nebulous object (7 arcsec) in a dark globule, a probable HH object. The object is associated with IRAS 10059–5948, whose colors are characteristic of an embedded young star. The 2MASS K-band image shows instead a group of stars.

- Object 46. A peculiar bright nebula (10 arcsec) at the edge of a dark nebula. It is associated with object 298 from Brand et al. (1986) and IRAS 10138–6004, whose colors are characteristic of an embedded young star.

- Object 47. Several nebular objects (35 arcsec) in a dark nebula. They are associated with IRAS 10308–6122, whose colors are characteristic of an embedded young star.

- Object 48. A trapezium-like system (4 stars, 15 arcsec) in a dark cloud, the system is connected with a faint nebula. The object is associated with IRAS 10310–5921.

- Object 49. A star with a cone-like nebula (20 arcsec) in a dark cloud. It is associated with object 314 from Brand et al. (1986) and IRAS 10406–6253, whose colors are characteristic of an embedded young star.

- Object 50. It is a star with a cone-like nebula and a jet (15 arcsec) in a dark cloud. The object is associated with object 312A from Brand et al. (1986) and IRAS 10478–5525, whose colors are characteristic of an embedded young star.

- Object 51. A faint nebulous object (2 arcsec) near a bright nebula. It is associated with object 324 from Brand et al. (1986) and IRAS 10501–5556, whose colors are characteristic of an embedded young star.

- Object 52. A star with nebulous filaments (30 arcsec). It is associated with object 329 from Brand et al. (1986) and IRAS 10548–5820, whose colors are characteristic of an embedded young star.

- Object 53. A trapezium-like system (3 stars, 15 arcsec) in a bright nebula. The system is associated with IRAS 10555–6242, whose colors are characteristic of an embedded young star.

- Object 54. A star with a cone-like nebula (8 arcsec). It is associated with IRAS 10575–5844, whose colors are characteristic of an embedded young star.

- Object 55. Nebulous object (3 arcsec) in a dark nebula.

- Object 56. A star with a comma-like nebula (35 arcsec) in a large dark cloud. It is associated with IRAS 11059–7721.

- Object 57. A bi-conical nebula (120 arcsec) in a large dark cloud. It is associated with IRAS

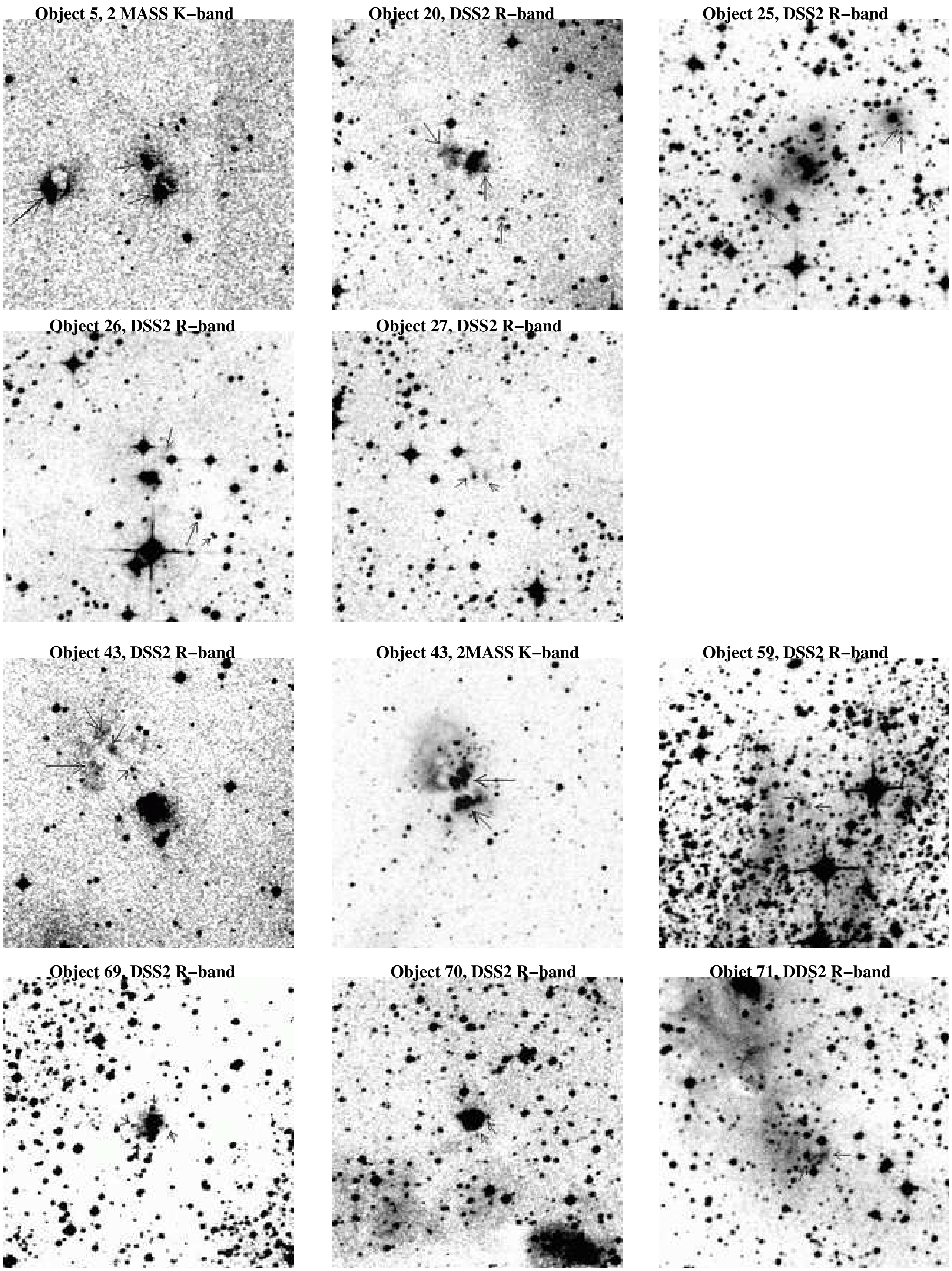

Fig. 1. Thumbnails for some of the most interesting objects given in Table 1, and described in more detail in § 3. North is up and East to the left; all stamps are 6 arcmin by 6 arcmin.

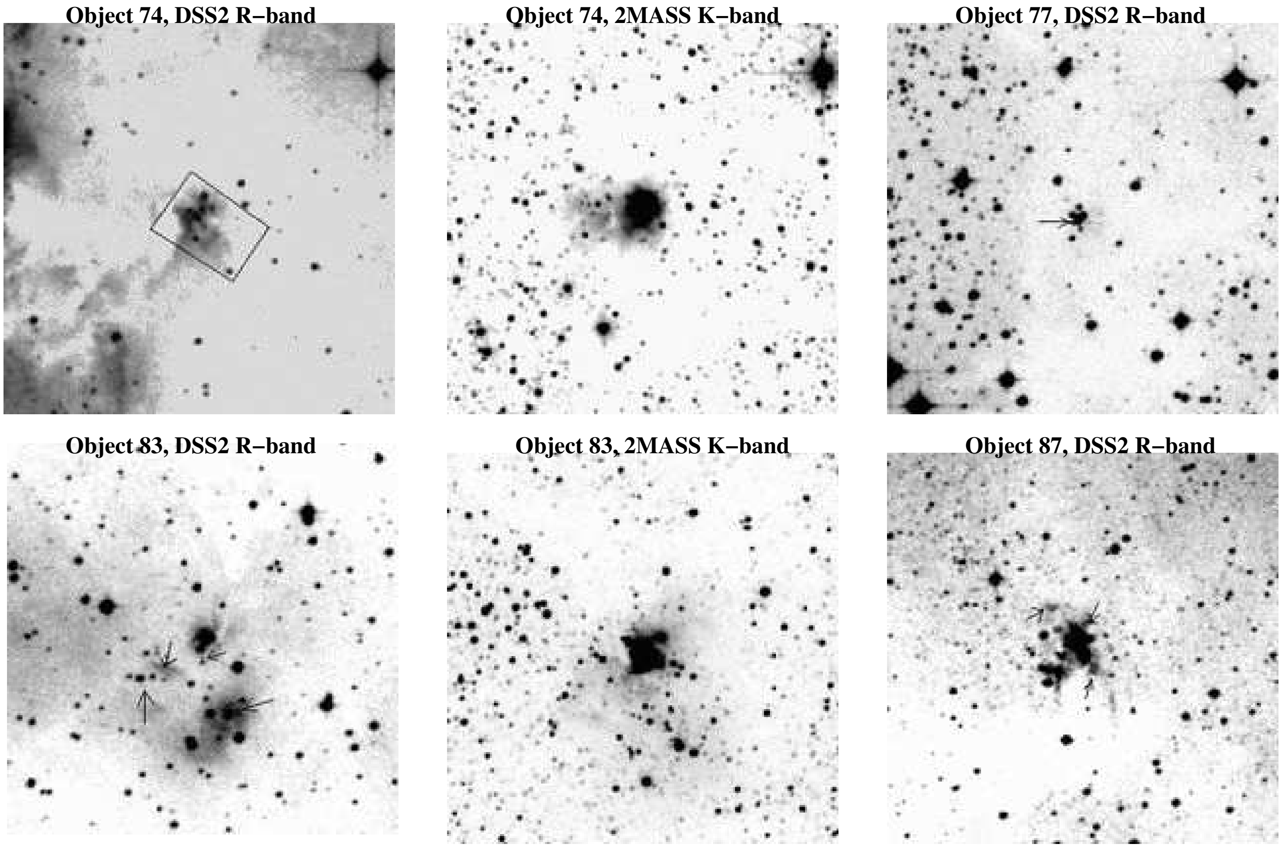

Fig. 2. Thumbnails (continuation) for some of the most interesting objects given in Table 1, and described in more detail in § 3. North is up and East to the left; all stamps are 6 arcmin by 6 arcmin.

11072–7727, whose colors are characteristic of an embedded young star.

- Object 58. A pair of condensations with nebulous tails (8 arcsec), a very interesting object. It is associated with IRAS 11083–7618, whose colors are characteristic of an embedded young star.

- Object 59. A group of condensations (20 arcsec), resembling HH objects (see Fig. 1). It is associated with object 343B from Brand et al. (1986) and IRAS 11082–5912, whose colors are characteristic of an embedded young star.

- Object 60. An interesting nebulous object (12 arcsec) in a dark nebula. The object is associated with IRAS 11223–5840, whose colors are characteristic of an embedded young star. The 2MASS images show a chain of three stars in this location.

- Object 61. Star with a cone-like nebula (10 arcsec), to the NE of object 60. This star is in the chain of three stars (see description for object 60) shown by 2MASS.

- Object 62. An interesting nebulous star with a jet (15 arcsec) at the edge of a bright rim. It is associated with IRAS 11317–6254, whose colors are characteristic of an embedded young star.

- Object 63. A trapezium-like group (3 stars, 7 arcsec), there is a nebulous star 17 arcsec to the South of the group. The object is associated with IRAS 11431–6516, whose colors are characteristic of an embedded young star.

- Object 64. A nebulous condensation (15 arcsec). It is associated with object 386C from Brand et al. (1986) and IRAS 12169–6240, whose colors are characteristic of an embedded young star.

- Object 65. A condensation with nebulous filaments (8 arcsec).

- Object 66. A nebulous object (15 arcsec) at the edge of a dark nebula.

- Object 67. It is a pair of nebulous condensations (15 arcsec) in a small globule. There is a nebulous star 60 arcsec to the North-East. The object is associated with IRAS 13224–5928, whose colors are characteristic of an embedded young star.
- Object 68. Condensation with a filament (13 arcsec) at the edge of a dark cloud, resembles an HH object.
- Object 69. Group of stars (45 arcsec) with four spiral jets and condensations at their ends (see Fig. 1, arrows pointing to the jets). The object is associated with IRAS 13294–6011, whose colors are characteristic of an embedded young star.
- Object 70. An interesting nebulous object (20 arcsec). It is associated with IRAS 15411–5352, whose colors are characteristic of an embedded young star. The 2MASS images indicate that it seems to be a star-forming region (see Fig. 1).
- Object 71. A group of condensations and nebulous filaments (30 arcsec), a possible group of HH objects (see Fig. 1, arrows show the possible HH objects).
- Object 72. A chain of 5 stars (25 arcsec), a faint nebula is connected with it. The object is associated with IRAS 16205–4245A, whose colors are characteristic of an embedded young star.
- Object 73. A double condensation with a filament (35 arcsec), resembles an HH object, in a dark nebula. The object is associated with IRAS 16239–2438, whose colors are characteristic of an embedded young star.
- Object 74. A group of nebulous objects (45 arcsec) in a dark nebula, resembles star-forming region Cep A = GGD 37 (see Figure 2). It is associated with IRAS 16362–4845.
- Object 75. A condensation with a cone-like nebula (10 arcsec) in a small dark cloud. It is associated with IRAS 16371–4709, whose colors are characteristic of an embedded young star.
- Object 76. Two nebulous objects (15 arcsec) at the edge of a dark nebula. They are associated with IRAS 16428–4109, whose colors are characteristic of an embedded young star.
- Object 77. A trapezium-like system (5 stars, 25 arcsec) in a dark cloud. A faint nebulosity is connected with it (see Fig. 2).
- Object 78. A nebulous object (8 arcsec) in a dark nebula.
- Object 79. A star with a cone-like nebula (60 arcsec) in a dark cloud. The object is associated with IRAS 16555–4237, whose colors are characteristic of an embedded young star. In the 2MASS images, it resembles a star-forming region.
- Object 80. It is a star with a semi-ring-like nebul-a (15 arcsec) in a dark cloud. The object is associated with IRAS 16575-4541, whose colors are characteristic of an embedded young star. In the 2MASS images it is rather a cone-like nebula.
- Object 81. A nebulous condensation (15 arcsec) at the edge of a dark cloud, resembles an HH object. It is associated with IRAS 17079–2719, whose colors are characteristic of an embedded young star.
- Object 82. A star with a semi-ring-like nebula (20 arcsec). There is a star with filaments 20 arcsec to the South-West.
- Object 83. A group of nebulous objects (20 arcsec). Resembles a star formation region plus a group of HH objects (like GGD 37 = Cep A, see Figure 1, where both the DSS2-R and 2MASS-K images are given). To the South-East (40 arcsec) there is a chain of 4 nebulous stars (Fig. 1 indicates with arrows the HH objects and the chain of stars). The object is associated with IRAS 17136–3617, whose colors are characteristic of an embedded young star.
- Object 84. A star with a cone-like nebula (20 arcsec). There are other nebular stars in the vicinity (e.g., 30 arcsec due North). The object is at the edge of a dark cloud, and it is associated with IRAS 17181–4405, whose colors are characteristic of an embedded young star.
- Object 85. A condensation with a cone-like nebula (20 arcsec) at the edge of dark and bright nebulae. It is associated with IRAS 17547–1832, whose colors are characteristic of an embedded young star. There is a nebulous star with filaments 1 arcsec to the North-East.
- Object 86. It is a double condensation with a cone-like nebula (15 arcsec), in the center of a dark nebula.

- Object 87. A nebulous object (35 arcsec) at the edge of a dark cloud, it resembles the nuclei of a star-forming region. It is associated with IRAS 18064–2413, whose colors are characteristic of an embedded young star. There are several patches (HH-like) 15 arcsec to the North-East and South-West (see Fig. 1, arrows pointing to the HH objects).

- Object 88. A nebulous star (15 arcsec) at the edge of a dark cloud. There seems to be a filament (jet?) with a condensation, 15 arcsec to the South-East of objects 88.

- Object 89. A nebulous condensation (15 arcsec) at the edge of a dark cloud, it resembles an HH object. The object is associated with IRAS 18079–2410, whose colors are characteristic of an embedded young star.

- Object 90. A condensation (7 arcsec) in a dark cloud, a probable HH object.

- Object 91. A star with a comma-like nebula (7 arcsec) in a dark cloud, at the edge of a bright rim. The 2MASS K-band image shows a group of stars.

- Object 92. A star with filaments (25 arcsec). At the end of one of them (20 arcsec to the North-West) there is a condensation (3 arcsec) resembling an HH object.

- Object 93. It is a star with a semi-ring-like nebula (40 arcsec). The object is associated with IRAS 18278–0156, whose colors are characteristic of an embedded young star.

4. CONCLUSIONS

In this paper we present a list of 93 nebulous objects found in prints of the Southern Hemisphere. 62 of these objects are associated with IRAS point sources, usually having characteristics of embedded young stars. This association is rather tight because in 59 cases the objects fall within the error boxes of these sources (with the exception of objects #14, 89, and 93). Some of these nebulous objects may turn out to be HH objects, and additional studies are required to establish their precise nature. Some are tight groups of red stars, and future investigations will reveal the spectral types of the components of these groups. By analogy with similar objects studied so far in the Northern Hemisphere, we can anticipate the discovery of several water-maser sources, associated with many of the new objects, as well as the detection of molecular outflows and jet-like structures. We expect to carry out a multi-wavelength study of the most interesting objects reported here in the near future.

A.L.G. is indebted to the staffs of the Department of Astronomy at Universidad de Chile and ESO-Chile for hospitality and help during his stay in Chile (March-April 2002). J.M. acknowledges the support from FONDECYT (Chile) grant # 1010431 and from the Chilean Centro de Astrofísica FONDAP # 15010003. R.A.M. acknowledges an ESO-Visiting grant on behalf of A.L.G. The authors are indebted to an anonymous referee for several useful comments.

REFERENCES

Ambartsumian, V. A. 1954, Soobshch. Byurakanskoy Obs., 15, 3
Brand, J., Blitz, L., & Wouterloot, J. 1986, A&AS, 65, 537
Croswell, K., Hartmann, L., & Avrett, E. H. 1987, ApJ, 312, 227
Gyulbudaghian, A. L. 1995, Afz, 38, 17
_________. 1998, Afz, 41, 585
Gyulbudaghian, A. L., Glushkov, Yu. I., & Denisyuk, E. K. 1978, ApJ, 224, L137
Gyulbudaghian, A. L., Rodriguez, L. F., Villanueva, V. M. 1993, RevMexAA, 25, 19
Reipurth, B. 1983, A&A, 117, 183
Rodriguez, L. F., Moran, J. M., Ho, P., & Gottlieb, E. W. 1980, ApJ, 235, 845
Staude, H. J., & Neckel, Th. 1991, A&A, 244, L13

Luis González and Jorge May: Department of Astronomy, Universidad de Chile, Casilla 36-D, Santiago, Chile (lgonzale@das.uchile.cl; jorge@das.uchile.cl).
Armen L. Gyulbudaghian: Byurakan Astrophysical Observatory, 378433 Byurakan, Aragatsotn Province, Armenia (agyulb@bao.sci.am).
René A. Méndez: European Southern Observatory, ESO-Chile, Casilla 19001, Santiago-19, Chile (rmendez@das.uchile.cl).