

Near infrared photometry of unassociated IRAS point sources in the zodiacal belt

N. M. Ashok, T. Chandrasekhar, Sam Ragland and P. V. Watson

IR Astronomy Area, Physical Research Laboratory, Ahmedabad 380 009

Abstract. An observational programme to generate a list of bright near infrared sources using IRAS Point Source Catalogue for further studies using lunar occultation technique has been initiated at Physical Research Laboratory, Ahmedabad. The first results consisting of K band photometry of 25 bright unassociated IRAS point sources are presented; for 16 of the sources J and H magnitudes are also given. A large majority of these sources are late type stars with circumstellar shells. A search in Palomar Sky Survey prints to locate the optical counterparts was done for 9 sources; most of them are seen only in the red prints.

Key words : zodiacal belt—IRAS point source—near infrared observations

1. Introduction

The highly sensitive sky survey at far infrared wavelengths (0.5 Jansky at $12\ \mu\text{m}$) by the Infrared Astronomical Satellite (IRAS) has detected a large number of point sources that have no counterparts at other wavelengths in the existing catalogues—these sources are often called unassociated IRAS sources. The main reason for this situation is non-availability of all sky near infrared survey reaching a few Jansky sensitivity level. The only unbiased sky survey done at near infrared wavelengths is Two Micron Sky Survey (TMSS) with a limiting sensitivity of ~ 40 Jansky ($m_k \sim 3$).

A large number of objects in the IRAS Point Source Catalogue are likely to be galactic late type stars surrounded by circumstellar shells. The identification at near infrared wavelengths will allow detailed studies of these sources. A programme to study the circumstellar environment of late type stars using the technique of lunar occultation at near infrared wavelengths is underway at Physical Research Laboratory, Ahmedabad. Several occultation light curves of Two Micron Survey Sources (IRC sources) have been obtained during last two years. A list of unassociated IRAS point sources lying in the zodiacal belt ($-30^\circ < \delta < +30^\circ$) was generated to identify additional sources for lunar occultation studies.

2. Observations

The observations were carried out at the 1.2 m telescope at Gurushikar with a liquid nitrogen cooled InSb photometer. The search for near infrared counterparts was done in K band. The

sensitivity limit for 1 second integration time used for the search is ~ 9 th magnitude (0.1 Jansky). Except for one all other sources were detected. Additional photometry in J and H bands was obtained for 12 brighter sources. The JHK magnitudes are given in table 1 along with the 12 micron fluxes in Jansky. The typical photometric errors are 0.1 magnitude in all bands.

Table 1. JHK magnitudes

IRAS Name	Epoch	J	H	K	$F(12)$
02152 + 2822	1			7.68	121.0
03253 + 2030	1			4.67	16.9
04584 + 0515	1	4.12		3.39	2.4
05146 + 2521	1			4.59	20.0
05423 + 2905	1	7.06	5.60	4.60	49.8
05463 + 2805	1			3.90	17.3
05495 + 2520	1	9.92	7.21	5.33	14.0
06242 + 2830	1			> 9	14.0
06558 + 2853	1			5.69	15.4
07045 + 2418	1	5.37	4.32	3.68	14.8
07217 - 1246	1	9.61	6.85	4.81	104.0
16086 - 2655	3	7.03	5.18	3.87	13.0
16235 - 2416	2			6.41	35.2
16275 - 2638	2			4.23	20.6
16368 - 2400	3	6.20	4.44	3.63	10.2
17027 - 2546	3		7.53	6.40	11.9
17047 - 2848	3		8.43	6.36	40.3
17062 - 2758	3	8.84	6.87	5.80	12.0
17088 - 2700	3			8.23	13.2
17105 - 2804	3	7.65	6.17	5.27	15.9
17122 - 2707	3	8.40	5.95	4.13	47.5
17155 - 2546	3		6.85	5.48	14.0
17168 - 2856	3	6.60	4.88	4.29	15.3
17179 - 2826	3	8.71	6.69	5.13	16.9
17293 - 2941	3	7.43	6.37	6.15	13.2

Epoch (1) 16-18 January 1991, (2) 28 March 1991, (3) 18-27 May 1991.

3. Discussion

Our earlier observations of IRC sources covering the K magnitude range from 0.9 to 2.9 indicate that with 1m class telescope angular diameters can be obtained with the lunar occultation technique for sources up to 5th K magnitude. From table 1 it is seen that 10 out of 25 sources are brighter than $m_k = 5.0$. It thus appears that IRAS point source catalogue can be very fruitfully used to identify a large number of sources that can be studied by the technique of lunar occultation.