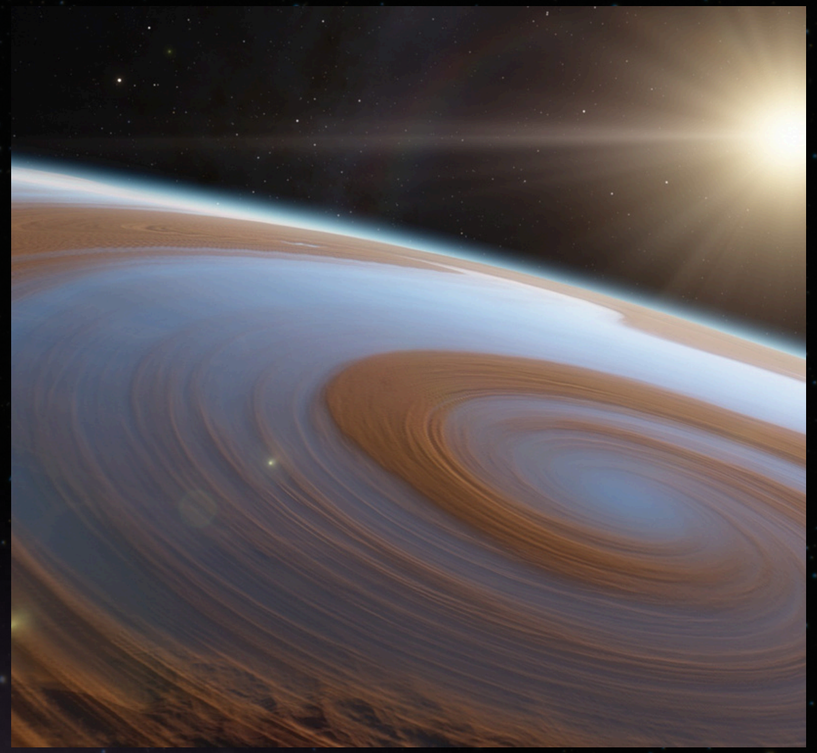
ANALYSIS OF MULTI-WAVELENGTH DATA FOR 30 GALACTIC EMISSION-LINE STARS WITH DUSTY ENVELOPES

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Brief Overview

- Key Terms
- Background of the Study
- Selection of Objects
- Results
- Study Limitations
- Final Conclusions



Key Terms

- B[e] phenomenon
- Circumstellar (CS) Material
- FS CMa-type objects
- Protoplanetary Nebula



Background of the Study

- What was their main goal?
  - To determine if these were young or old stars
- Why did they begin this study?
  - To improve the previous classifications of poorly understood stars
- What telescopes were used?
  - Mt. Orzale, Himalayan Chandra, San Pedro Martir, Lick Observatory, CFHT, McDonald Observatory, and Tien-Shan
- Where did their infrared data come from?
  - IRAS, WISE, 2MASS, AKARI, Herschel

Selection of Objects

- V band magnitude of 11-16 mag
- B - V ≤ 1.3 mag
- J - H ≥ 0.7 mag
- H - K ≥ 0.7 mag

Esscentially

Stars that are:

- Mainly blue in the optical
- Red in the near-IR
- Bright enough to be observed

Table 1. List of objects with IR excesses selected using photometric criteria for those with the B[e] phenomenon

UCAC4	IRAS	R.A.(2000)	Decl.(2000)	V	$B-V$	$J-K$	K	F_{12}	F_{25}	W_1	W_2	W_3	W_4	Sp.T.
		h m s	d m s	mag	mag	mag	mag	Jy	Jy	mag	mag	mag	mag	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
775-008613		01 39 32.6	+64 53 02.3	14.57	–	2.32	9.11	–	–	7.95	7.26	5.41	3.90	
753-023300	01571+6018	02 00 39.5	+60 32 59.1	15.51	–	2.57	9.88	1.17	0.81	7.96	6.79	4.57	3.23	B
719-020488	02162+5326	02 19 35.1	+53 40 19.8	13.64	0.38	1.64	10.81	–	–	9.63	9.02	6.80	5.16	
757-021798	02258+6102	02 29 35.9	+61 15 56.9	14.36	1.02	2.20	8.94	0.63	1.32	7.09	7.08	4.60	2.08	
758-021724		02 34 10.3	+61 24 40.4	14.23	0.83	1.92	9.51	–	–	8.16	7.50	5.31	2.12	B8 ve
757-022712		02 39 50.9	+61 18 28.9	14.37	0.70	1.90	10.19	–	–	9.13	8.31	5.93	4.49	A2e
755-025953		02 47 48.6	+60 57 50.5	14.32	0.73	2.08	9.96	–	–	8.98	8.44	5.93	3.48	A0–1ve
755-026797	02551+6042	02 59 05.1	+60 54 04.1	13.31	0.79	2.15	8.67	1.00	–	7.54	6.75	3.83	1.77	B4 ve
772-020206		03 09 43.5	+64 19 04.5	12.94	0.76	1.36	9.95	–	–	8.51	7.78	4.91	3.03	
608-010843	03519+3123	03 55 03.8	+31 31 57.3	12.14	0.87	1.43	8.86	0.34	0.66	7.84	7.35	5.26	2.96	
767-031204	04141+6307	04 18 41.2	+63 14 40.7	13.99	1.04	1.80	9.90	0.29	0.54	9.11	8.42	5.51	3.27	
695-029496	04265+4845	04 30 16.2	+48 52 10.0	13.27	0.92	1.86	8.88	0.53	0.48	7.82	7.10	4.87	3.34	
668-034110	04577+4328	05 01 20.3	+43 32 50.8	12.55	0.35	2.21	8.91	1.53	0.89	7.04	5.71	3.54	2.49	
615-019793	05111+3244	05 14 26.9	+32 48 03.3	12.25	0.46	1.77	8.48	2.51	5.03	7.91	7.50	3.73	0.95	
579-016291	05311+2534	05 34 17.0	+25 36 16.3	13.09	0.38	1.96	9.49	1.34	1.25	7.71	6.43	3.61	2.18	B2
579-018868	05481+2541	05 51 17.5	+25 42 30.0	12.82	0.87	2.00	8.15	1.77	2.32	6.73	5.86	3.50	1.57	Be
452-018064	06237+0020	06 26 20.0	+00 18 44.2	11.19	1.03	1.55	7.40	0.59	–	6.08	5.21	4.77	4.87	M2–3
368-014782		06 30 16.5	−16 29 37.5	13.99	1.04	1.42	10.38	–	–	9.42	8.59	6.71	5.62	
317-032713		07 48 39.0	−26 40 40.3	13.37	0.61	2.02	9.41	–	–	8.31	7.58	4.61	2.44	
403-115685	19156–0935	19 18 24.0	−09 30 15.0	11.94	0.40	2.96	6.00	23.50	22.20	4.08	3.04	0.59	−0.88	
602-099183c	19552+3005	19 57 12.4	+30 13 16.0	13.45	1.06	2.20	8.10	0.93	0.65	6.58	5.52	4.05	2.98	
633-095796	20098+3622	20 11 43.5	+36 31 08.5	13.05	0.50	1.95	9.08	0.34	0.30	7.95	7.30	5.23	3.41	
712-078173		21 01 44.1	+52 17 17.7	13.25	1.22	1.38	9.18	–	–	8.50	8.10	7.41	5.31	
689-093546	21095+4726	21 11 19.1	+47 38 47.6	12.45	0.61	2.03	8.03	2.19	1.85	6.73	5.59	3.25	1.76	
715-078480		21 27 26.9	+52 59 25.7	11.15	0.71	1.42	7.77	–	–	6.86	5.24	5.50	4.64	OBe
699-087638	21263+4927	21 28 05.4	+49 41 00.2	12.60	0.79	2.83	7.69	2.40	1.05	5.75	4.27	3.09	2.42	
708-091648	21525+5113	21 54 21.2	+51 27 53.6	12.84	0.60	1.96	8.92	0.80	0.80	7.35	6.45	4.24	2.64	Be
737-079327		21 56 28.5	+57 14 45.5	15.89	0.41	2.65	10.31	–	–	8.39	7.18	5.29	4.29	
727-084537		22 21 11.0	+55 15 46.2	12.14	0.30	1.24	9.78	–	–	8.86	8.35	7.58	7.10	B0
762-068204	22541+6205	22 56 07.7	+62 21 48.2	13.51	1.08	2.01	8.43	2.35	3.05	6.92	6.04	2.99	1.15	

NOTE— Column information: (1) – ID from UCAC4, (2) – ID from IRAS, (3) – Right Ascension in J2000, (4) – Declination in J2000, (5) – V–band magnitude, (6) – $B-V$ color-index from UCAC4, (7) – $J-K$ color-index from 2MASS, (8) – K–band magnitude from 2MASS, (9) – flux density in the IRAS 12 μm band in Janskys, (10) – flux density in the IRAS 25 μm band in Janskys, (11) – W1-band (3.35 μm) magnitude from WISE, (12) – W2-band (4.6 μm) magnitude from WISE, (13) – W3-band (11.6 μm) magnitude from WISE, (14) – W4-band (22.1 μm) magnitude from WISE, (15) – spectral type listed in the SIMBAD database.

Results

- The nature and evolutionary status of 11 observed stars remain unknown.
- 16 stars exhibited the B[e] phenomenon and have characteristics consistent with FS CMa stars
- 2 stars with properties that are consistent with early-stage protoplanetary nebulae.
- The possibility of binary systems or products of mergers

Results



- IRAS 06237+0020: Possible early-stage protoplanetary nebula
- IRAS 19156–0935: Strong infrared excess; possible protoplanetary nebula
- IRAS 21095+4726: Possible FS CMa binary or merger candidate
- IRAS 21263+4927: Possible FS CMa-type object
- UCAC4 757-021798: More consistent with an evolved FS CMa object than a young star

Limitations

- A few objectys lacked far-infered measurments
- Some stars had incomplete data across all wavelengths
- Selection bias

Conclusion

- Emission line stars, particulalrly those with infered excesse, are more complex than they initially appear
- Unable to classify 11 stars
- Classified 2 stars as potential early-stage protoplanetary nebula
- Determined that 16 stars exhibit the B[e] phenomenon


THANK
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