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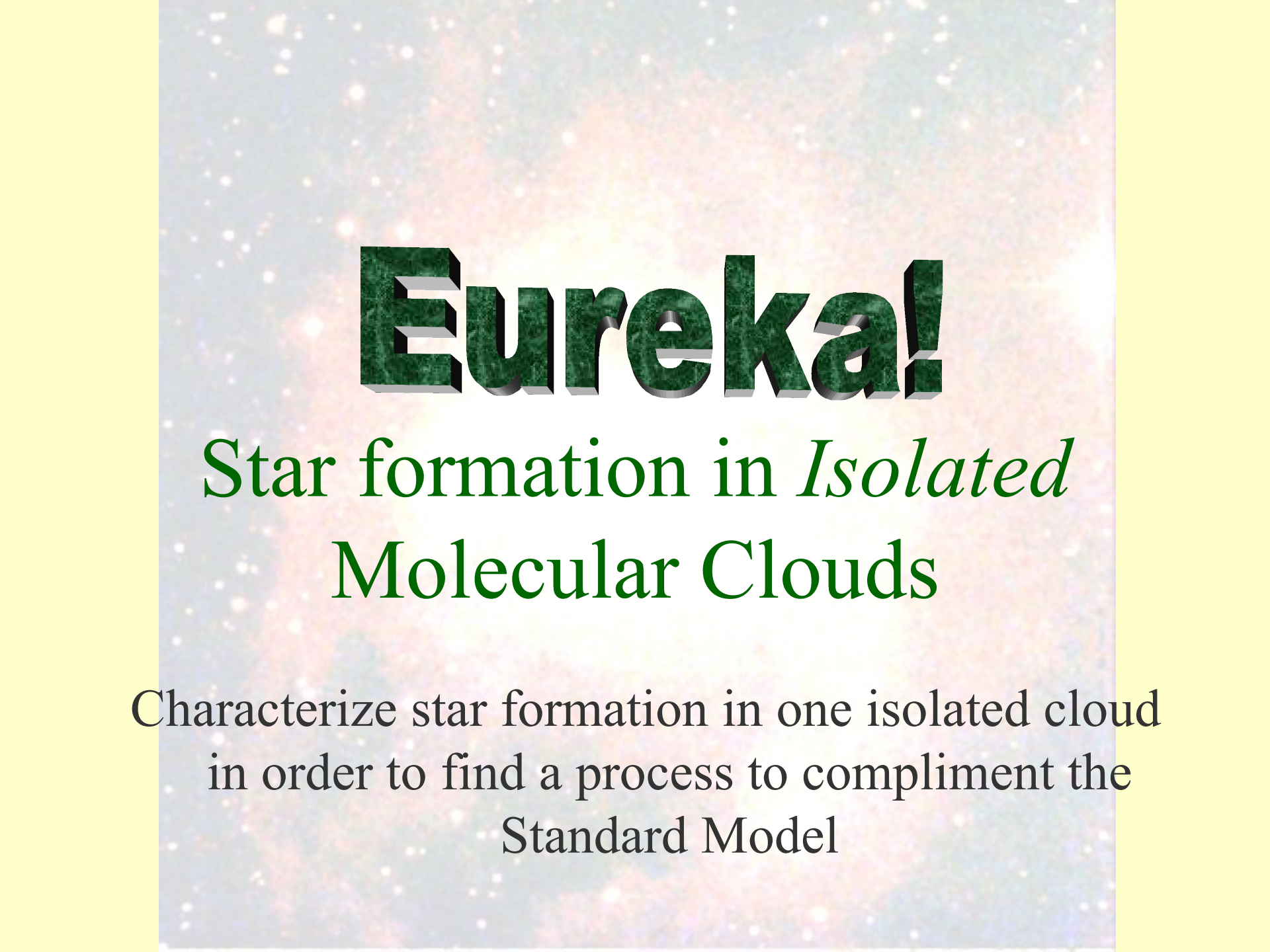
CTIO/University of Washington

NGC 1788



Premise

- ☆ Standard Model for Star Formation
 - ☆ Giant Molecular Clouds
 - ☆ UV radiation from OB Associations
 - ☆ Supernova shockwaves
- ☆ But is it enough?
 - ☆ Spatial distribution of stars
 - ☆ Not all in large clusters
 - ☆ What to do?

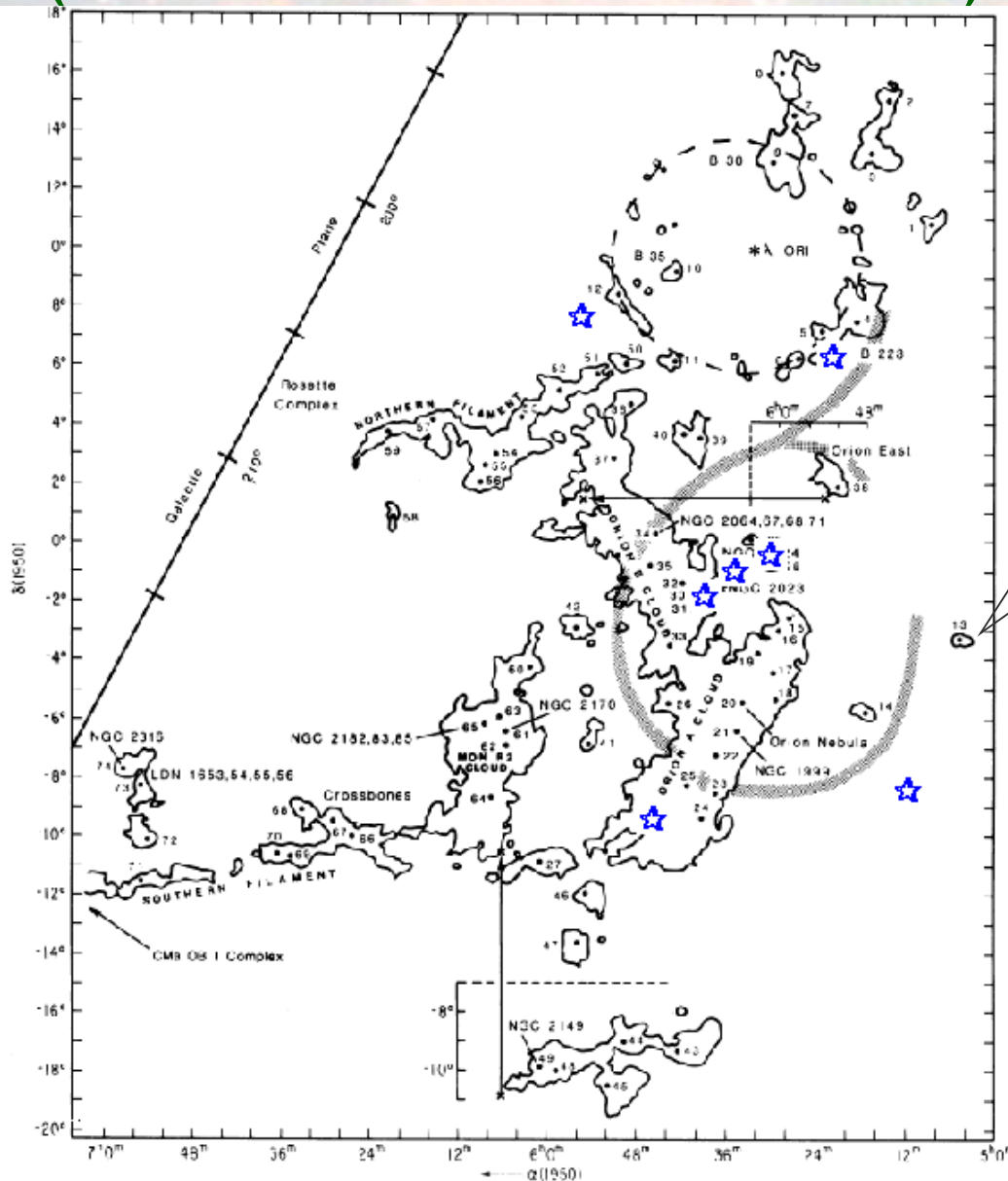


Eureka!

Star formation in *Isolated* Molecular Clouds

Characterize star formation in one isolated cloud
in order to find a process to compliment the
Standard Model

30° x 40°



More about NGC1788 and surrounding region

★ NGC1788

- ★ reflection nebula

- ★ (5:6:48, -3:23:00)

- ★ ~400pc

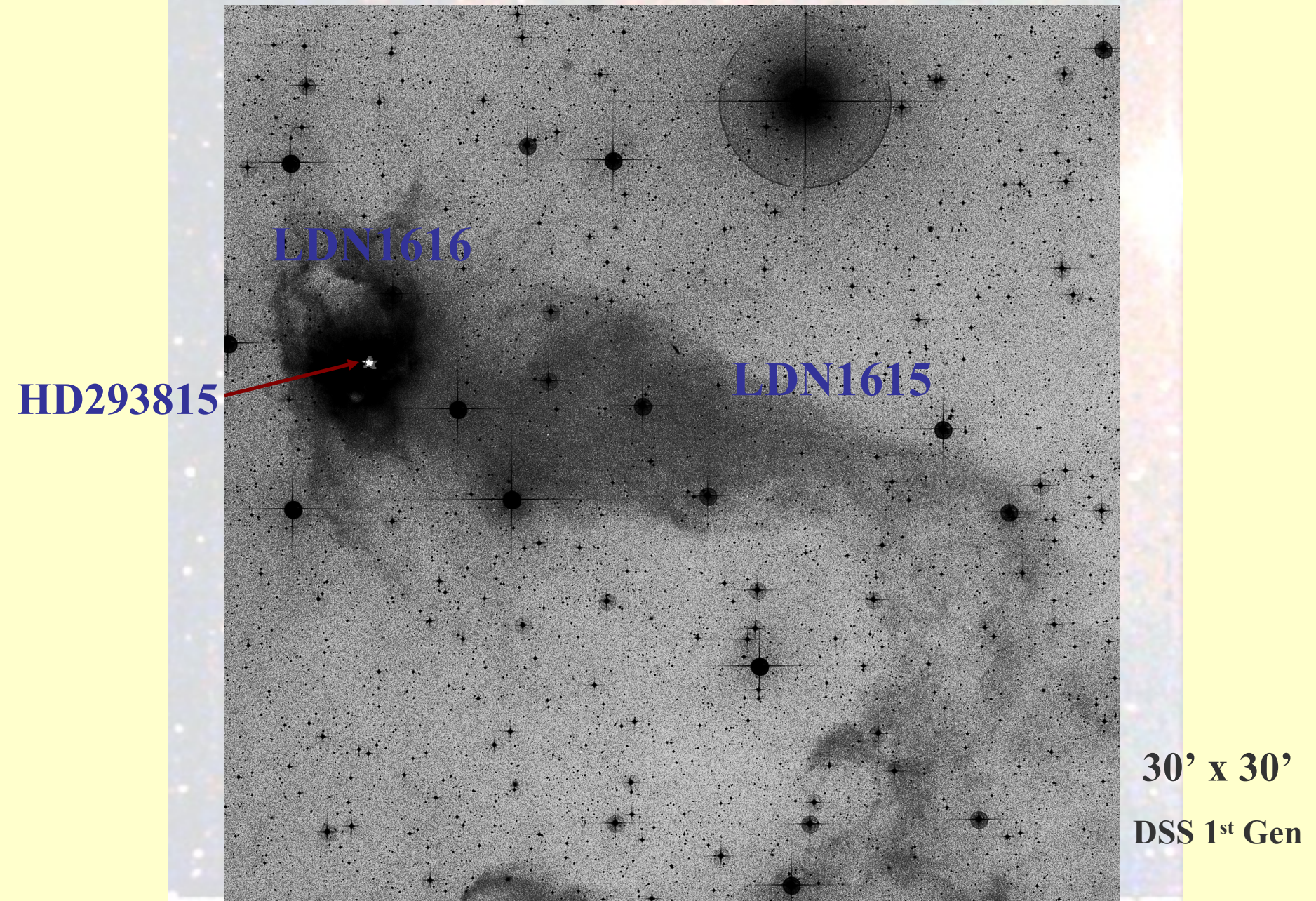
- ★ Illuminated by HD293815 (B9V)

★ LDN1616 & LDN1615

- ★ dusty clouds

- ★ Cometary shape

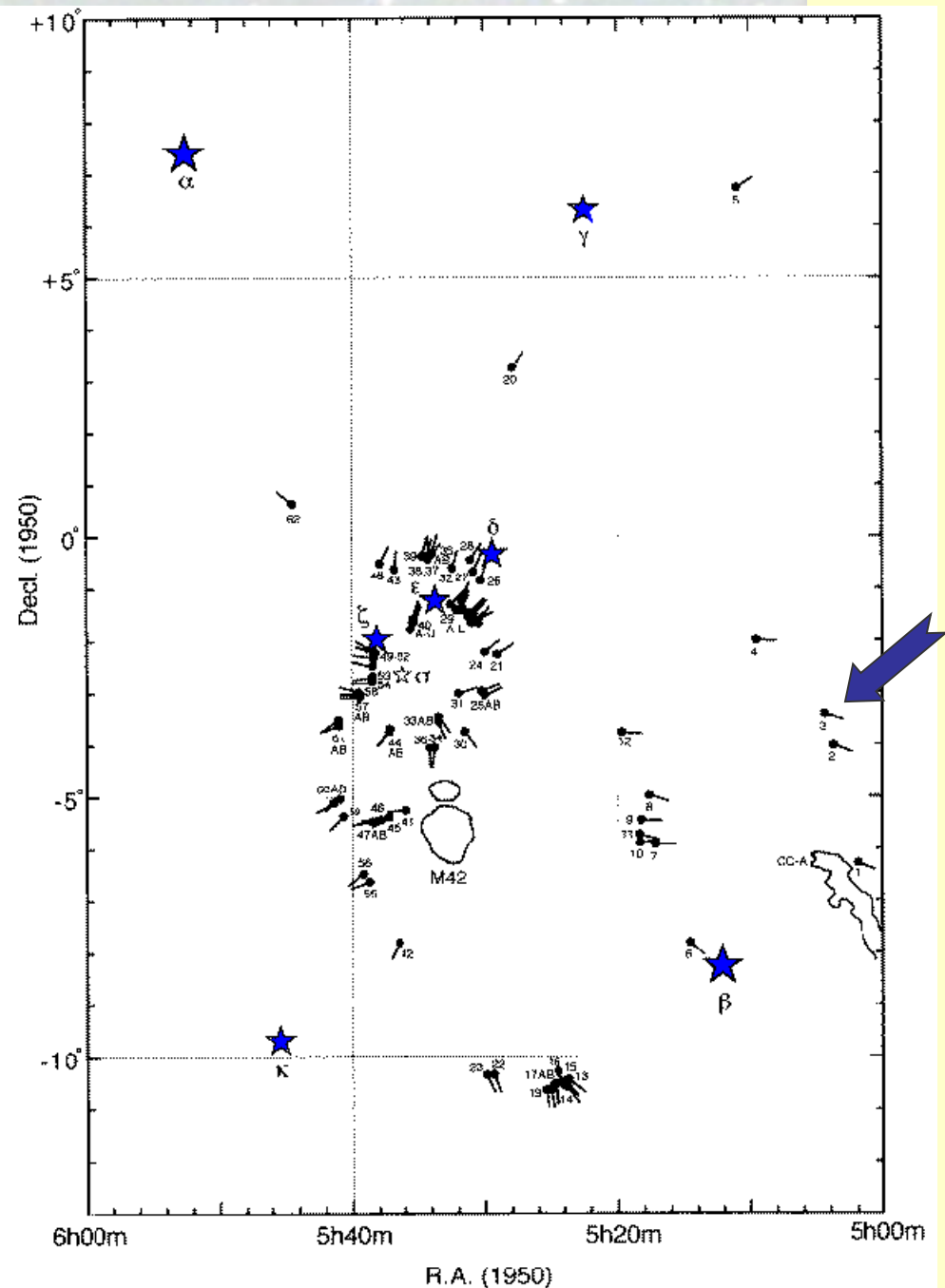
Cometary Clouds



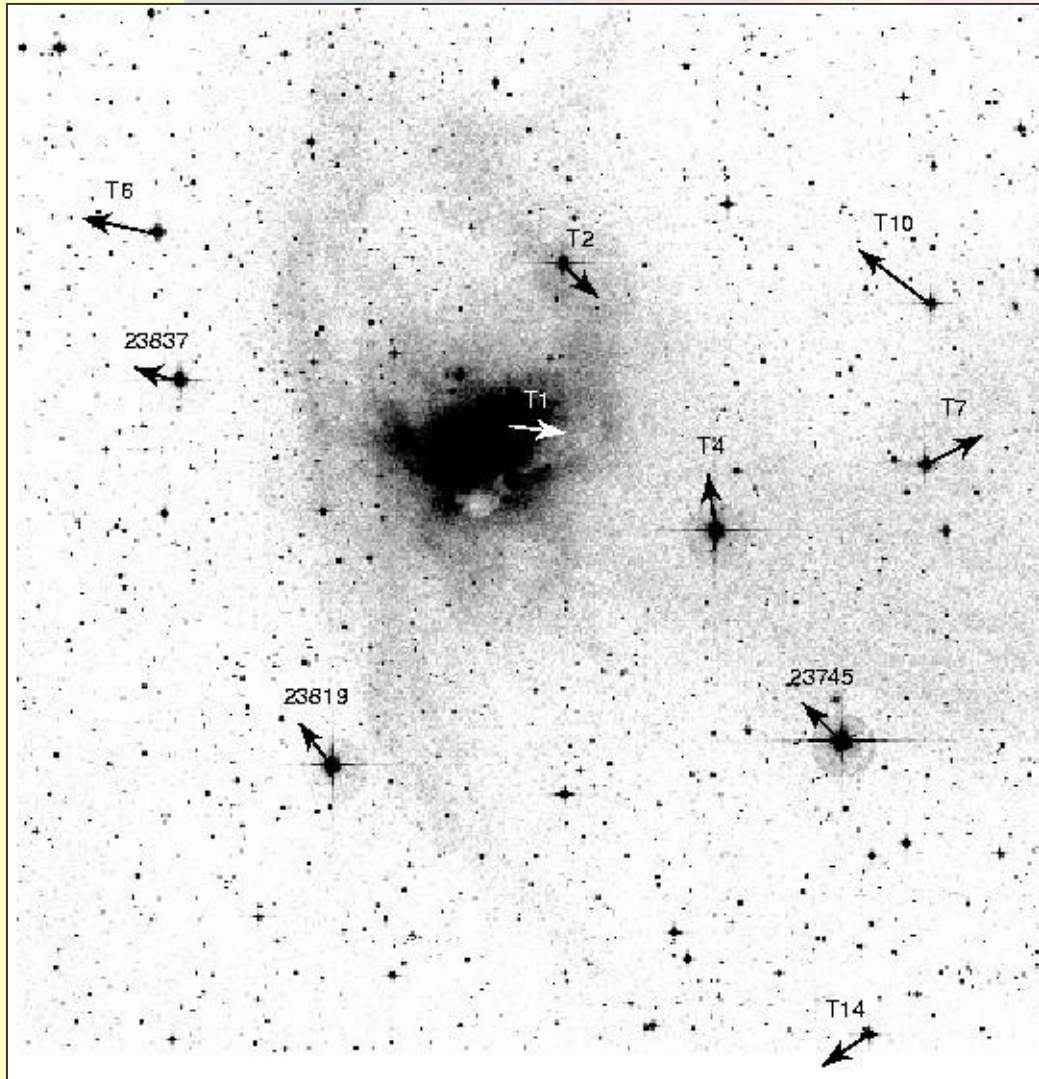
LDN1616 & LDN1615

- ☆ ~50pc from Orion Complex
- ☆ UV radiation from Sigma Orionis
- ☆ Too much?

15° x 25°



Is it disintegrating?



☆ Hipparcos and Tycho Catalogues

☆ Proper Motions

☆ Distances

Multi-Wavelength Survey

★ CTIO:

- ★ 1.5-m Optical Spectra

- ★ 0.9-m Optical Photometry

- ★ 1.5-m Near-Infrared Photometry (center)

★ All-Sky Surveys:

- ★ 2-micron All-Sky Survey (2MASS)

- ★ [Deep Near-Infrared Survey (DENIS)]

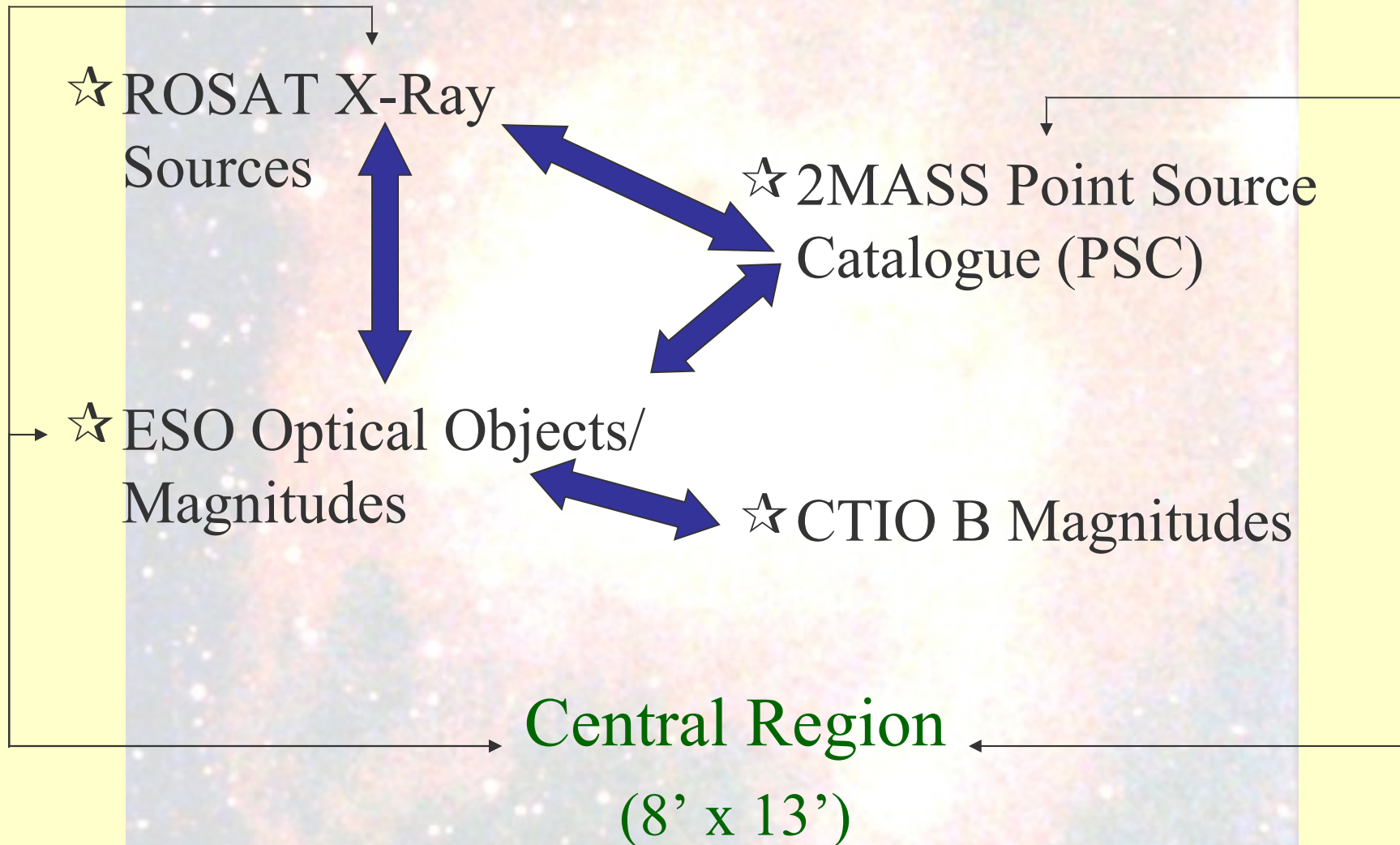
★ Collaborators:

- ★ ROSAT X-ray Sources/T-Tauri Star

- ★ ESO 2.2-m Optical Photometry

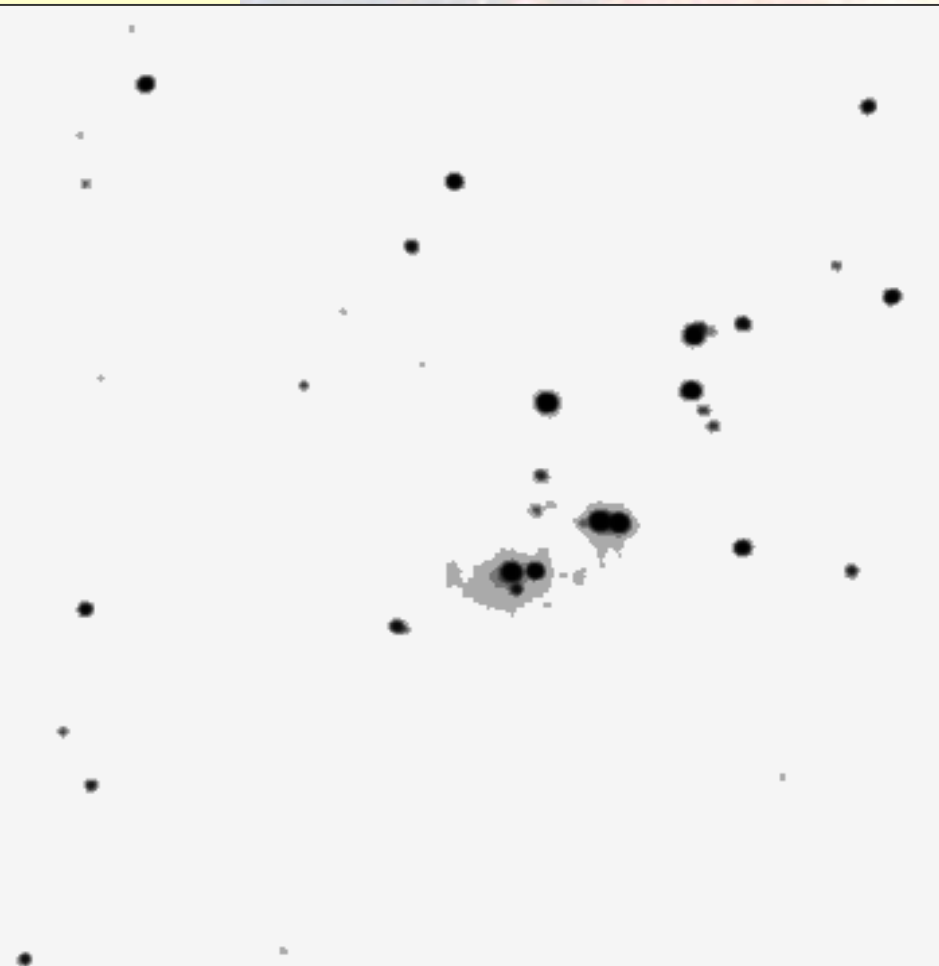
- ★ Radio Data (future)

Matching Wavelengths

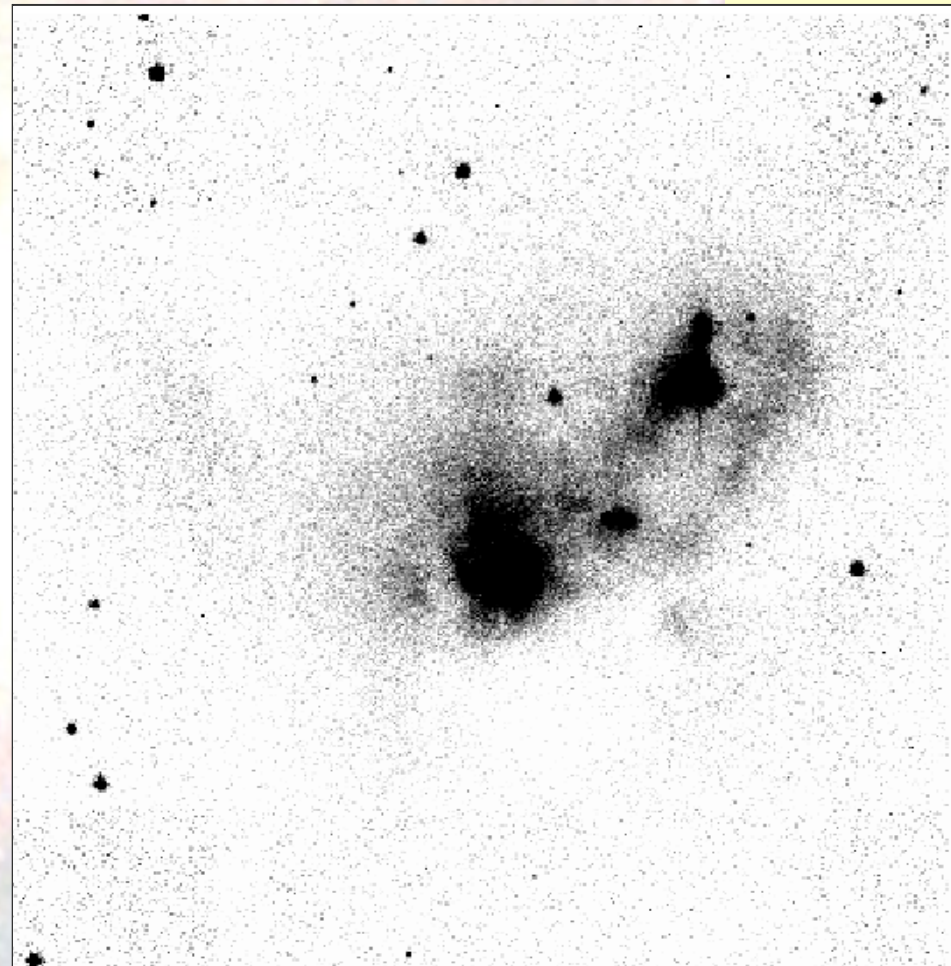


Central Region

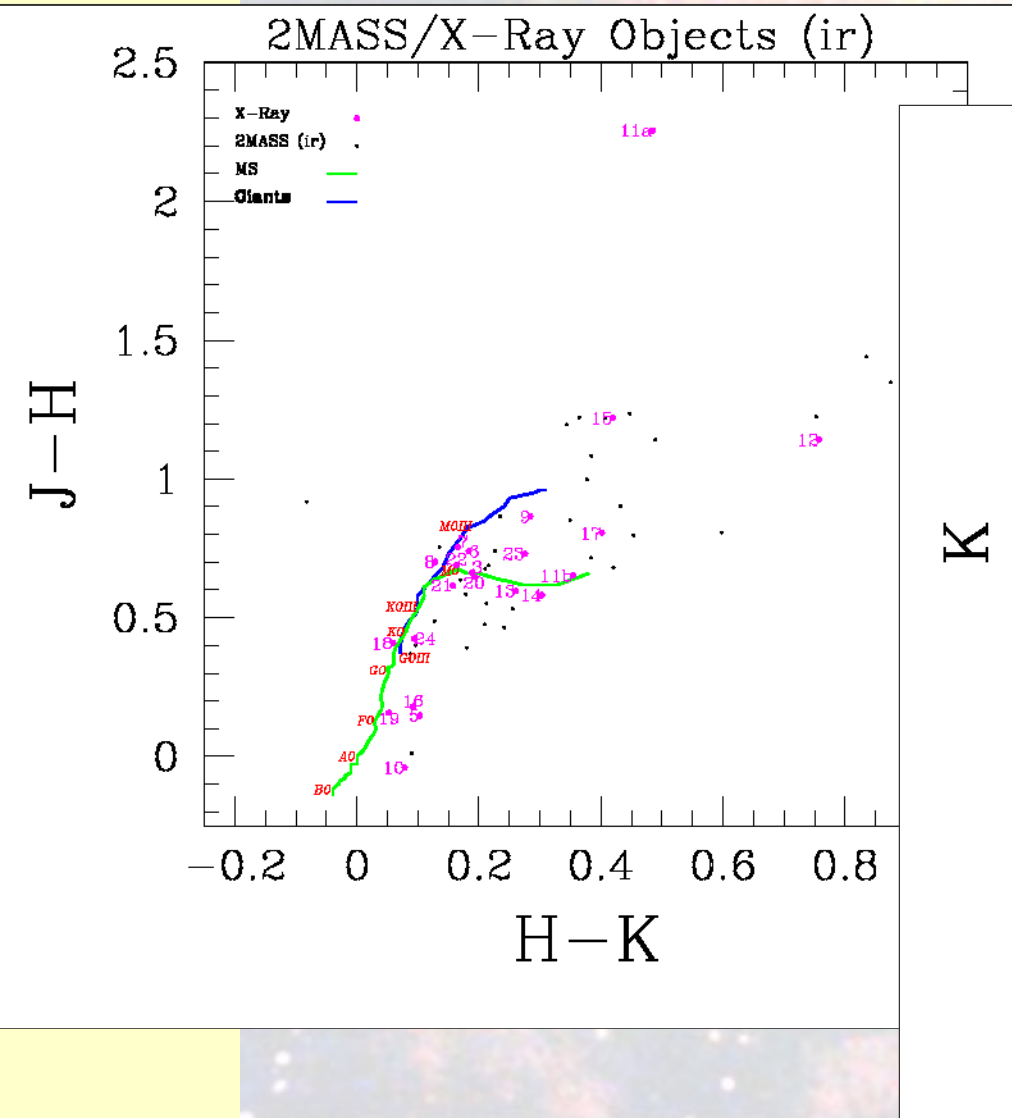
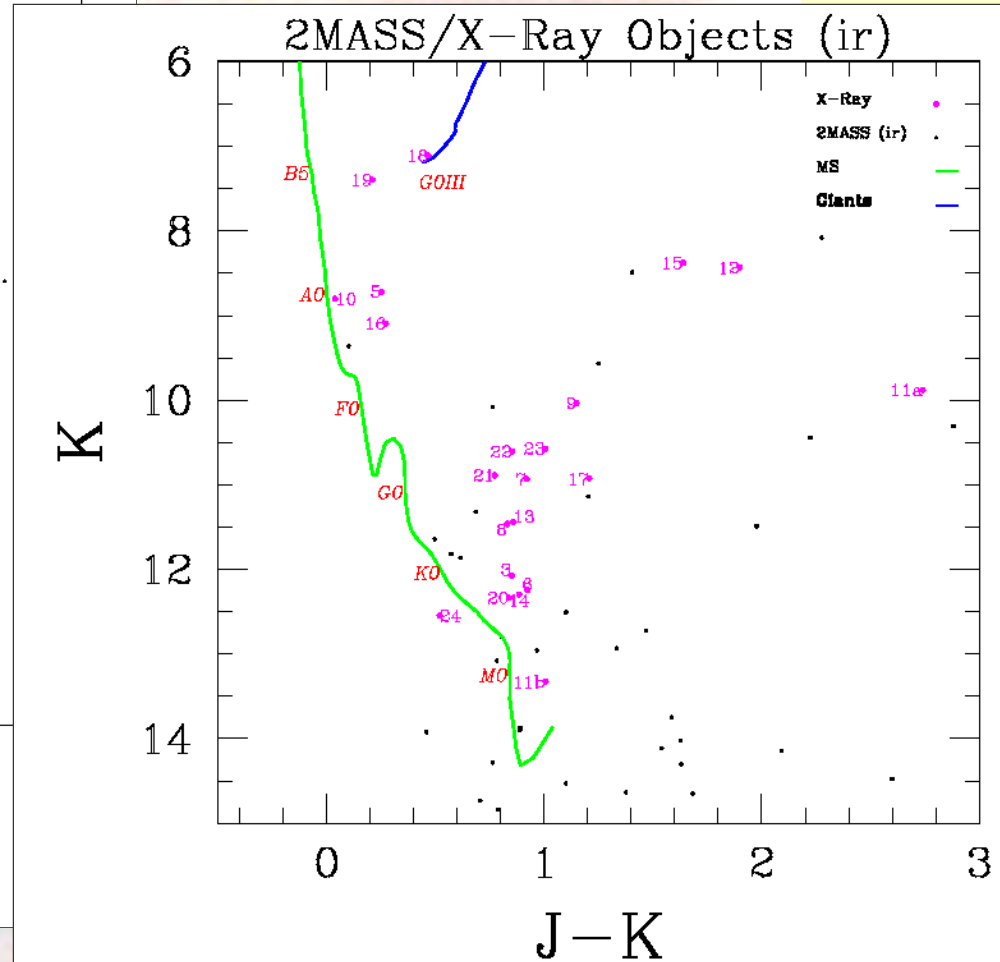
Near-Infrared



Optical

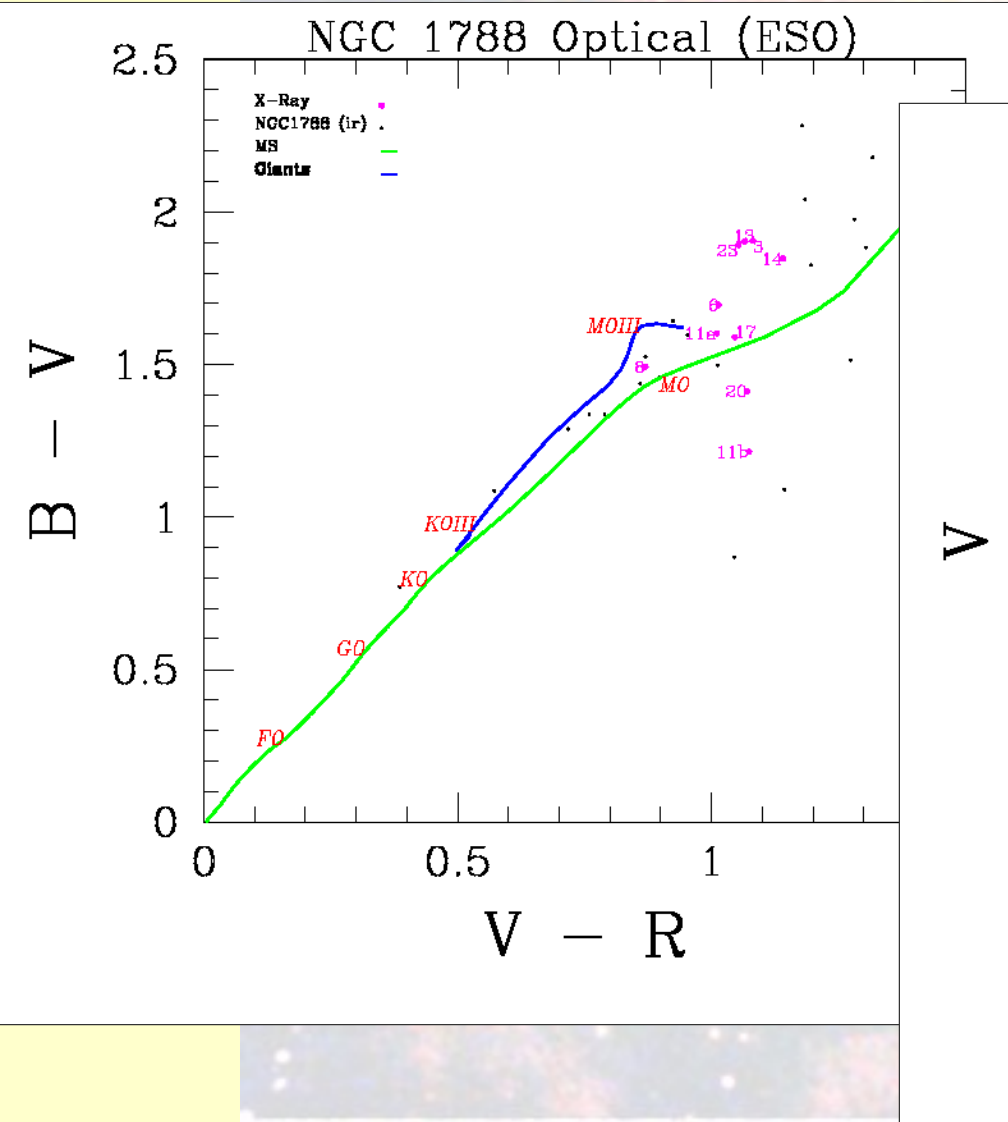
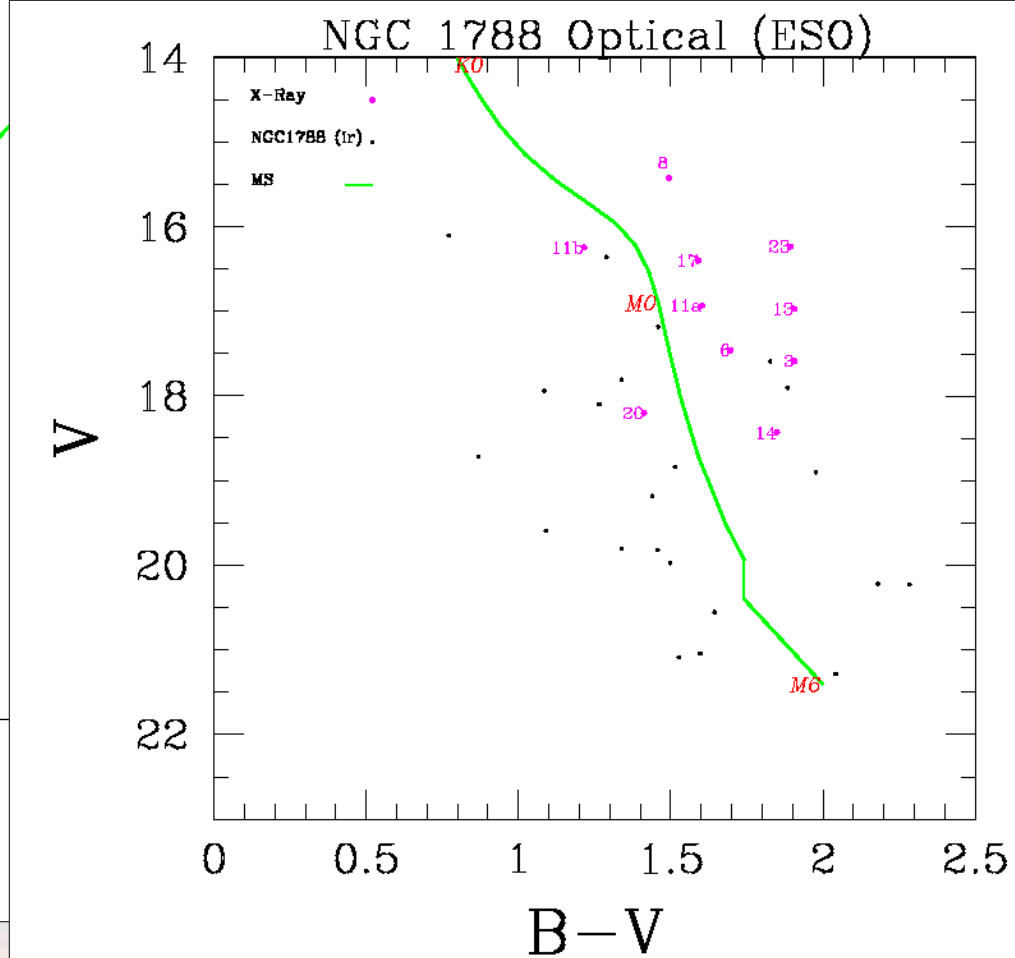


Color-Color & Color-Magnitude Diagrams Near-Infrared (2MASS)



Color-Color & Color-Magnitude Diagrams

Optical (ESO)

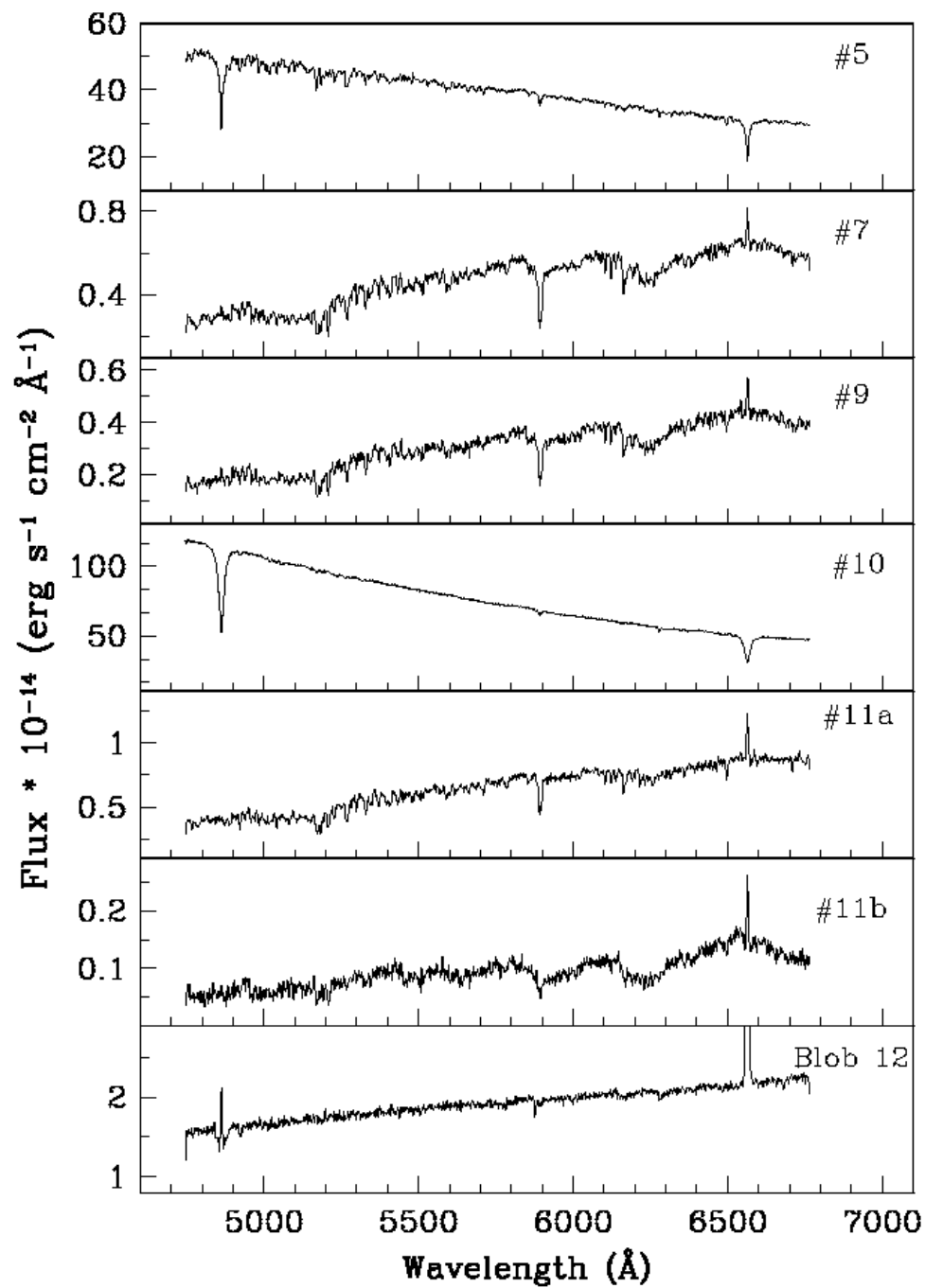
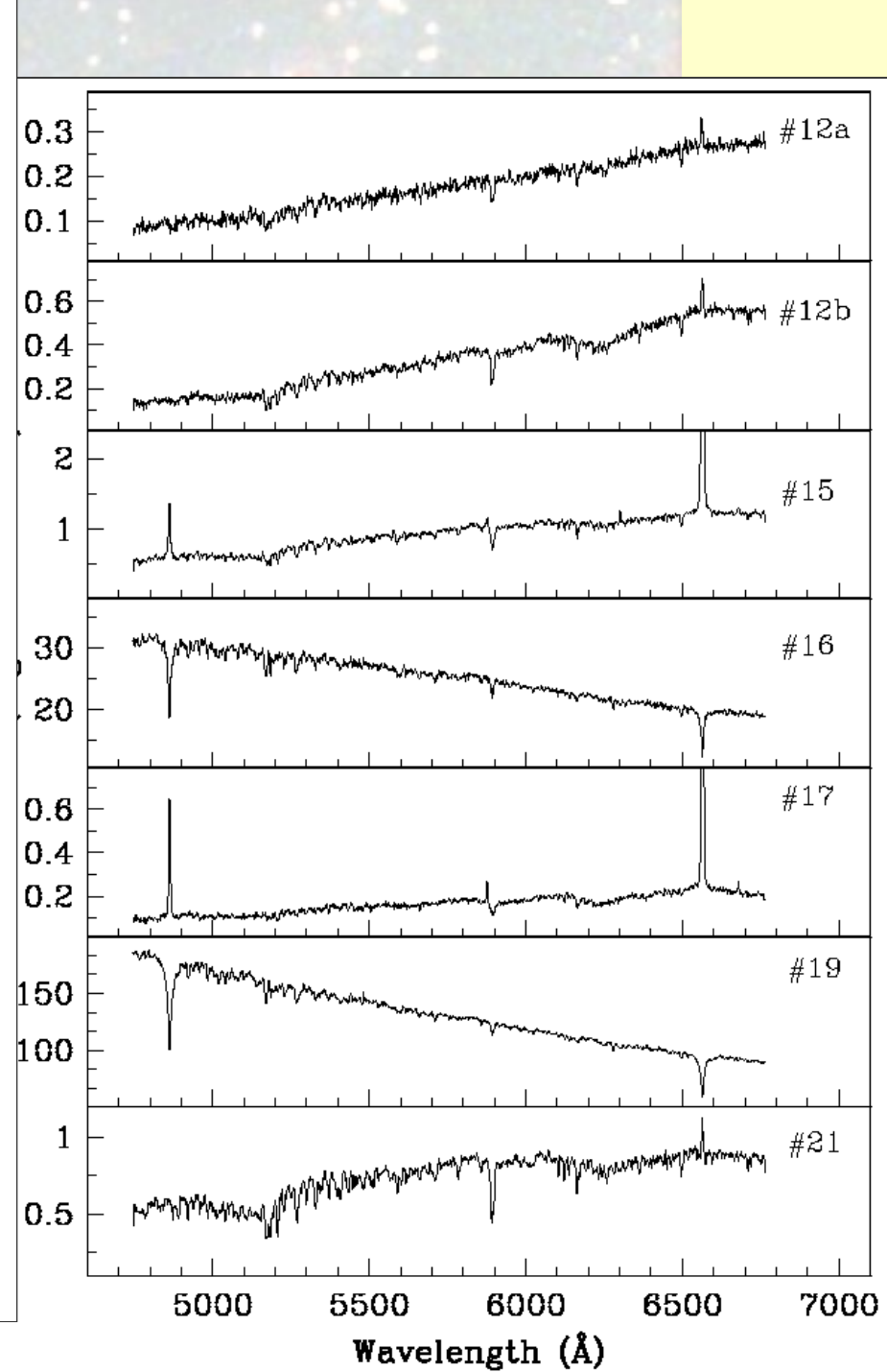


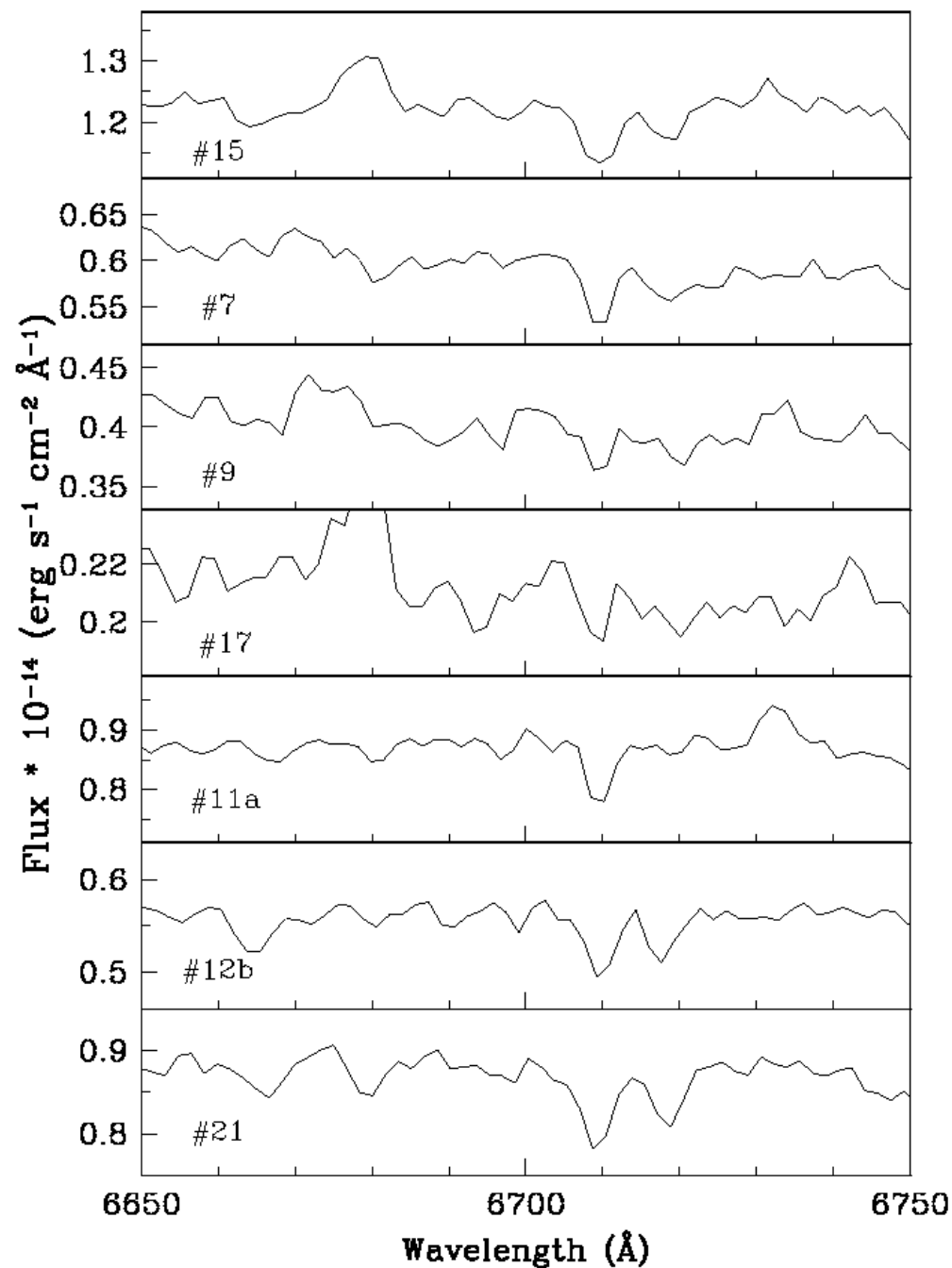
1.5-m Optical Spectra

ID	H α EW (Å) ^a	Li 6708 EW (Å)	Spectral Type
X-Ray Sources			
5	5.51 ± 0.20	...	F5-7
7	– 1.30 ± 0.10	0.39 ± 0.05	K6-8
9	– 1.60 ± 0.11	0.23 ± 0.03	K6-8
10	8.71 ± 0.39	...	A2
11a ^b	– 2.58 ± 0.03	0.38 ± 0.02	K5 double?
11b ^b	– 4.52 ± 0.35	...	M1/M2
12a	– 1.47 ± 0.14	0.10 ± 0.21	K1-3 double lined?
12b	– 1.66 ± 0.09	0.47 ± 0.03	K5
15	– 50.79 ± 3.03	0.35 ± 0.03	K3-5 CTTS?
16	4.63 ± 0.24	...	F5-7
17	– 72.85 ± 1.96	0.18 ± 0.02	K6-8 CTTS?
19	5.85 ± 0.38	...	F3-5
21	– 1.22 ± 0.11	0.44 ± 0.05	K3-5
Blob	– 62.01 ± 1.72	...	HII region?

^a – denotes emission

^b questionable ID with respect to 2MASS and Optical matches





Lithium Spectra

Future Endeavors

- ★ Compare CTIO and ESO photometry
- ★ Higher resolution CTIO NIR photometry of center
- ★ Determine nebula members
- ★ Correlate to radio data

Work in Progress

(Possible thesis work in a year?)





Thank You Oh-So Much!

ID	Right Ascension	DEC	K-Magnitude	J-H	H-K	X-Ray Sources with their 2MASS coordinates and J, H, and K magnitude data						
X-Ray Sources												
18	76.408195	-3.379974	7.112 ± 0.014	0.408 ± 0.023	0.059 ± 0.021 ^b							
16	76.513603	-3.352353	9.095 ± 0.030	0.180 ± 0.042	0.092 ± 0.042							
24	76.599052	-3.479960	12.549 ± 0.044	0.424 ± 0.050	0.094 ± 0.053							
20	76.608299	-3.390816	12.337 ± 0.032	0.646 ± 0.035	0.192 ± 0.039							
19	76.614990	-3.384055	7.397 ± 0.013	0.157 ± 0.044	0.052 ± 0.044							
14	76.615944	-3.340813	12.299 ± 0.031	0.581 ± 0.033	0.303 ± 0.038							
5	76.687927	-3.255841	8.722 ± 0.030	0.147 ± 0.041	0.103 ± 0.047							
7&	76.694374	-3.301538	10.933 ± 0.031	0.754 ± 0.040	0.165 ± 0.040							
23	76.701363	-3.460579	10.574 ± 0.028	0.730 ± 0.033	0.275 ± 0.036							
3	76.704140	-3.095234	12.073 ± 0.034	0.662 ± 0.038	0.188 ± 0.042							
11a ^a	76.711807	-3.326302	9.881 ± null	2.256 ± 0.057	0.484 ± null ^{c,d}							
11b ^a	76.710670	-3.326560	13.329 ± 0.160	0.652 ± 0.148	0.354 ± 0.211 ^c							
15 ^a	76.720261	-3.348090	8.381 ± 0.042	1.219 ± 0.045	0.419 ± 0.053 ^b							
12 ^a	76.727699	-3.334616	8.433 ± 0.032	1.141 ± 0.035	0.757 ± 0.041 ^b							
9 ^a	76.737282	-3.309829	10.034 ± 0.031	0.864 ± 0.035	0.284 ± 0.040							
17 ^a	76.775436	-3.357789	10.927 ± 0.030	0.805 ± 0.036	0.401 ± 0.040							
21	76.795624	-3.398112	10.891 ± 0.031	0.615 ± 0.036	0.157 ± 0.038							
22	76.812500	-3.446426	10.609 ± 0.030	0.689		ID	Right Ascension	Declination	V-Magnitude	B-V	V-R	R-I
13	76.842918	-3.338450	11.444 ± 0.028	0.596		X-Ray Sources						
6	76.858124	-3.286715	12.246 ± 0.034	0.739		6	76.857956	-3.286722	17.457	1.696	1.014	1.535
10	76.872589	-3.311286	8.804 ± 0.028-	0.041		8	76.906883	-3.304333	15.423	1.492	0.869	0.860
8	76.907051	-3.304309	11.464 ± 0.029	0.701		11a ^a	76.711761	-3.326305	16.930	1.602	1.010	1.429
						11b ^a	76.712479	-3.326722	16.244	1.215	1.074	1.072
						13	76.842834	-3.338417	16.969	1.904	1.064	1.760
						14	76.615898	-3.340667	18.429	1.848	1.141	2.090
						17 ^a	76.775368	-3.357805	16.398	1.590	1.045	1.247
						20	76.608253	-3.390639	18.202	1.412	1.070	2.048
						23	76.701332	-3.460528	16.233	1.892	1.053	1.694
						3	76.704033	-3.095250	17.586	1.906	1.081	1.732
						^a X-Ray source with optical match in table						
						^b Faint stars						
						^c questionable matches; crowded region						
						^d no match in B-magnitudes						

2-micron All-Sky Survey Objects within image 'ir.fits'
(X-Ray Source Match)

6	76.689453	-3.300589	14.738	0.113	0.464	0.099	0.241	0.140
18	76.691917	-3.322858	10.307	0.028	1.700	0.033	1.180	0.035
5 (7)	76.694374	-3.301538	10.933	0.031	0.754	0.040	0.165	0.040
36	76.696091	-3.353599	11.865	0.031	0.487	0.035	0.127	0.039
13	76.697754	-3.319332	12.931	0.032	0.902	0.041	0.431	0.042
46	76.703293	-3.376712	14.025	0.063	1.220	0.081	0.406	0.081
45	76.706245	-3.372756	14.478	0.108	1.661	0.240	0.937	0.108
17	76.707390	-3.325831	11.142	0.029	0.852	0.032	0.349	0.036
33	76.707443	-3.350989	10.447	0.029	1.348	0.033	0.874	0.036
26	76.710426	-3.337263	12.517	0.035	0.715	0.040	0.383	0.045
16 (11b)	76.710670	-3.326560	13.329	0.160	0.652	0.148	0.354	0.211
25	76.711418	-3.335513	12.509	0.043	0.680	0.050	0.420	0.052
15 (11a)	76.711807	-3.326302	9.881	null	2.256	0.057	0.484	null ^d
14	76.712425	-3.327160	9.569	0.036	0.796	0.044	0.453	0.049
23	76.712715	-3.333277	9.361	0.031	0.011	0.036	0.089	0.041
24	76.715187	-3.335542	15.138	0.139	0.594	null	1.221	0.139 ^d
32 (15)	76.720261	-3.348090	8.381	0.042	1.219	0.045	0.419	0.053
31	76.722191	-3.347918	8.083	0.032	1.440	0.035	0.834	0.041
30	76.723907	-3.348176	13.081	0.070	-0.628	0.122	1.409	0.141
38	76.724434	-3.354185	14.147	0.113	1.085	0.210	1.005	0.176
29	76.727203	-3.346077	14.303	0.092	1.140	0.126	0.489	0.118
22 (12)	76.727699	-3.334616	8.433	0.032	1.141	0.035	0.757	0.041
27	76.728310	-3.342799	12.056	0.038	2.315	0.084	1.249	0.052
28	76.728783	-3.346702	12.799	0.038	2.120	0.064	1.888	0.074
35	76.728889	-3.353489	9.519	0.029	2.051	0.040	1.436	0.040
37	76.730873	-3.355497	11.491	0.052	1.224	0.064	0.752	0.061
34	76.731339	-3.353633	8.489	0.033	0.806	0.037	0.598	0.042
9 (9)	76.737282	-3.309829	10.034	0.031	0.864	0.035	0.284	0.040
44	76.738235	-3.376143	15.097	0.150	0.688	0.131	0.216	0.183
21	76.740608	-3.330404	14.287	0.068	0.550	0.071	0.212	0.089
11	76.741699	-3.317119	11.320	0.031	0.476	0.036	0.209	0.041
49	76.742622	-3.396161	14.531	0.090	0.865	0.091	0.234	0.112
41	76.743202	-3.359722	11.122	0.033	2.109	0.045	1.058	0.041 ^e
8	76.743828	-3.309914	14.637	0.092	0.998	0.115	0.377	0.119
3	76.744911	-3.298639	15.749	0.349	0.917	0.273	-0.082	0.419
12	76.748741	-3.324462	13.907	0.056	0.677	0.057	0.210	0.071
20	76.752869	-3.332685	12.726	0.034	1.083	0.043	0.384	0.046
48	76.754959	-3.396132	13.751	0.051	1.221	0.064	0.364	0.065
40	76.758804	-3.362394	14.656	0.096	1.235	0.136	0.447	0.126
2	76.769188	-3.298904	10.081	0.030	0.584	0.038	0.178	0.041
10	76.769455	-3.313268	14.841	0.109	0.532	0.111	0.255	0.142
1	76.770653	-3.292746	13.927	0.055	0.370	0.052	0.088	0.069
19	76.773849	-3.331822	14.118	0.063	1.196	0.085	0.343	0.080
43	76.774818	-3.377525	11.822	0.032	0.391	0.036	0.180	0.039
7	76.775414	-3.310128	12.958	0.037	0.740	0.042	0.226	0.048
39 (17)	76.775436	-3.357789	10.927	0.030	0.805	0.036	0.401	0.040
4	76.776024	-3.304681	13.875	0.054	0.753	0.051	0.135	0.066
42	76.777748	-3.371489	12.800	0.036	0.635	0.039	0.169	0.043
47	76.781693	-3.397004	11.643	0.031	0.400	0.035	0.096	0.037

2MASS

ESO Optical

Optical Objects in image 'ir.fits' (numbers correspond to 2MASS IDs and letters to only visual objects)

(X-ray Source Match)

18	76.691887	-3.322750	17.593	1.826	1.196	1.338
13	76.697723	-3.319222	20.556	1.643	0.924	0.868
46	76.703239	-3.376611	20.622	null ^d	1.433	1.361
P ^b	76.706474	-3.393861	21.286	2.041	1.184	1.310
17	76.707352	-3.325750	17.904	1.883	1.305	1.930
33	76.707375	-3.350889	18.836	1.514	1.273	1.817
N	76.708824	-3.379278	21.045	1.596	0.952	0.945
26	76.710419	-3.337250	21.366	null ^d	1.811	2.929
16 (11b) ^c	76.710617	-3.326528	20.031	null ^d	1.050	2.310
25	76.711403	-3.335472	19.596	1.090	1.144	2.321
15 (11a)	76.711761	-3.326305	16.930	1.602	1.010	1.429
14 (11b) ^c	76.712479	-3.326722	16.244	1.215	1.074	1.072
M ^b	76.718056	-3.394695	21.091	1.525	0.869	0.879
35	76.728851	-3.353472	18.717	0.868	1.045	1.626
L	76.729622	-3.387583	19.804	1.338	0.789	0.857
44	76.738159	-3.376139	21.142	null ^d	1.146	1.981
21	76.740555	-3.330417	20.228	2.284	1.179	1.957
49	76.742531	-3.396167	19.181	1.439	0.859	0.987
8	76.743797	-3.309861	19.975	1.497	1.012	1.022
K	76.744759	-3.383139	22.134	null ^d	1.184	1.241
3	76.744804	-3.298528	19.822	1.457	0.900	0.839
J	76.745857	-3.297722	22.344	null ^d	1.415	1.977
12	76.748672	-3.324444	18.097	1.264	0.755	0.879
20	76.752800	-3.332694	18.904	1.976	1.281	1.291
48	76.754868	-3.396167	20.222	2.180	1.317	1.295
H	76.755333	-3.313000	21.519	null ^d	0.615	0.693
I	76.758751	-3.362361	21.220	null ^d	1.236	1.356
G ^b	76.763962	-3.310639	22.512	null ^d	1.252	1.252
D	76.768608	-3.377778	21.656	null ^d	0.753	0.860
F	76.768860	-3.390361	21.994	null ^d	1.318	1.401
10	76.769432	-3.313278	17.937	1.085	0.571	0.565
1	76.770607	-3.292778	16.105	0.771	0.385	0.436
C	76.770844	-3.351055	22.178	null ^d	1.090	1.317
19	76.773804	-3.331833	20.909	null ^d	1.376	1.616
B	76.775314	-3.325861	22.039	null ^d	1.117	0.971
39 (17)	76.775368	-3.357805	16.398	1.590	1.045	1.247
7	76.775368	-3.310139	17.180	1.458	0.899	0.854
4	76.775970	-3.304667	17.806	1.338	0.759	0.774
42	76.777718	-3.371500	16.356	1.288	0.717	0.709
A	76.782356	-3.295389	21.303	null ^d	0.864	0.851