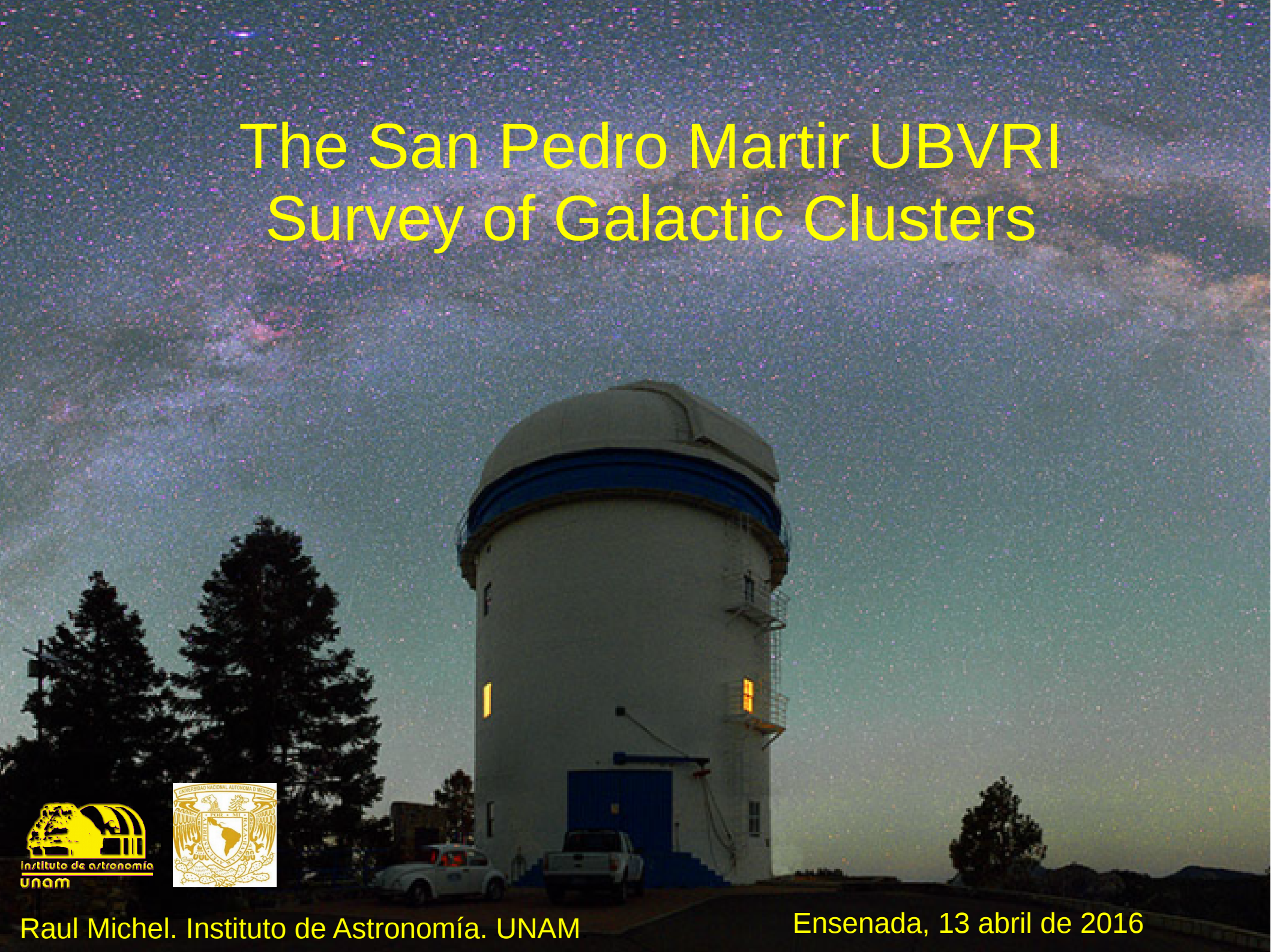
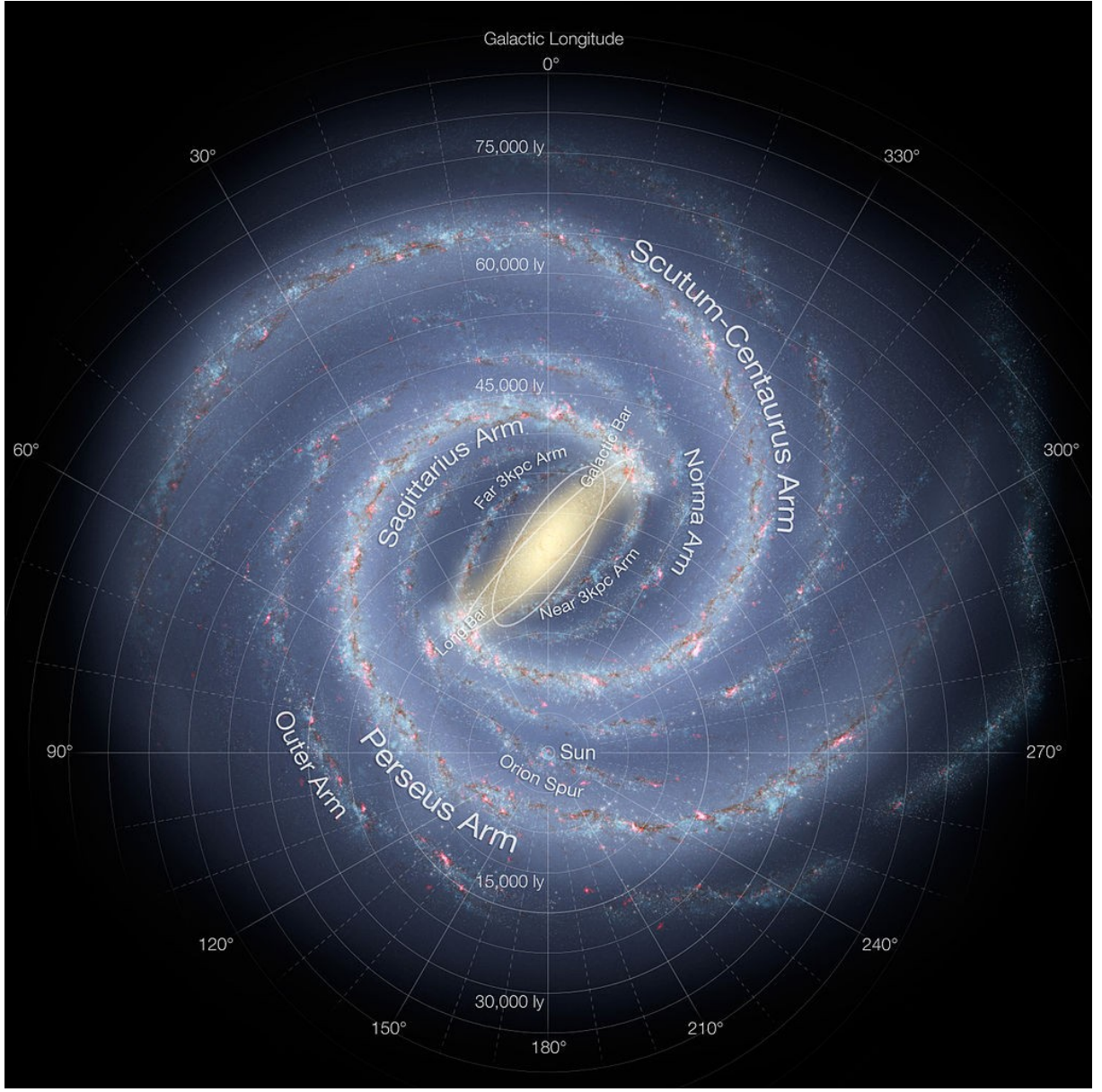
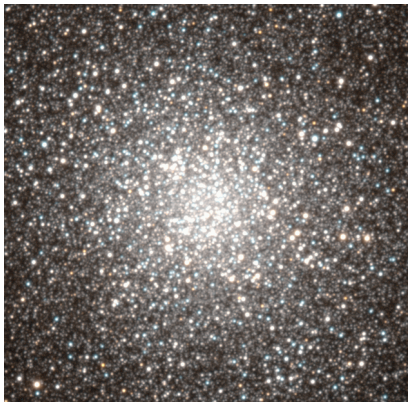
The San Pedro Martir UBVRI Survey of Galactic Clusters

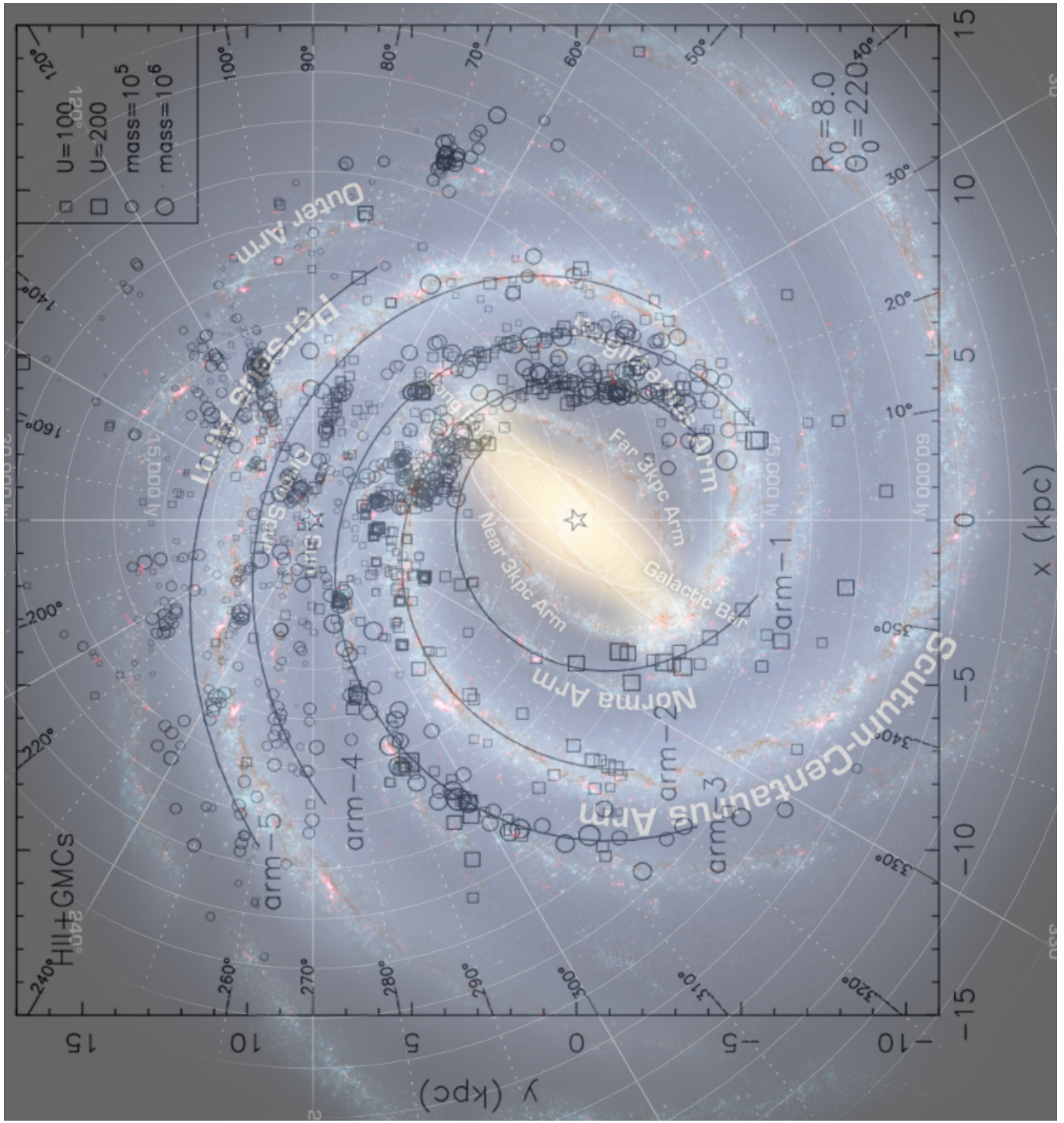


Raul Michel. Instituto de Astronomía. UNAM

Ensenada, 13 abril de 2016


Galactic Longitude
0°
30°
330°
75,000 ly
60,000 ly
45,000 ly
60°
300°
Scutum-Centaurus Arm
Sagittarius Arm
Far 3kpc Arm
Galactic Bar
Norma Arm
Near 3kpc Arm
Long Bar
90°
270°
Outer Arm
Perseus Arm
Sun
Orion Spur
15,000 ly
120°
240°
30,000 ly
150°
210°
180°





Hou, Han and Shi 2009

HII y GMC regions

Sky brightness[f]	Dark	Bright
U	21.5	19.3
B	22.3	19.8
V	21.2	19.7
R	20.7	19.6
I	19.2	19.4
J	16.4	
H	14.1	
K’	14.9	

Optical turbulence[g]	
Altitude (km)	Seeing
2-4	0.44”
4-9	0.17”
9-16	0.24”
16-21	0.08”
21-25	0.02”

Mean water vapor content (PWV):
2.63mm (satellite), 2.40mm (radiometer)

Referencias:

f) Richer 2005 in http://haro.astrossp.unam.mx/indexspm.html: 2004-2005 period, units are mag/arcsec.

g) Avila et al. 2003, RMxAA(SC), 19, 11:Generalized Scidar measurements, SPM 2000 campaign.

Sky transparency annual statistics[a,b]	
Usable nights	80.1%
Clear nights	73.2%
Photometric nights	61.3%

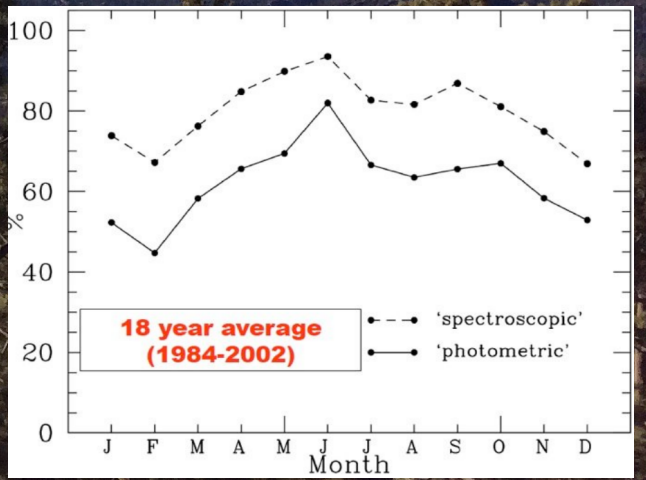
Seasonal seeing[c]	
Median annual	0.61”
Spring	0.58”
Summer	0.58”
Autumn	0.68”
Winter	0.69”

Referencias:

a) Erasmus & van Staedel 2003, A Satellite Report of Cloud Cover and Water Vapor in the Southwestern U.S.A. and Northern Mexico, Second Report.

b) Tapia 2003, RMxAA(SC), 19, 75: 1984-2002 period.

c) Echevarría 2003, RMxAA(SC), 19, 41; Michel et al. 2003a, RMxAA(SC), 19, 37; Michel et al. 2003b, RMxAA, 39, 291.



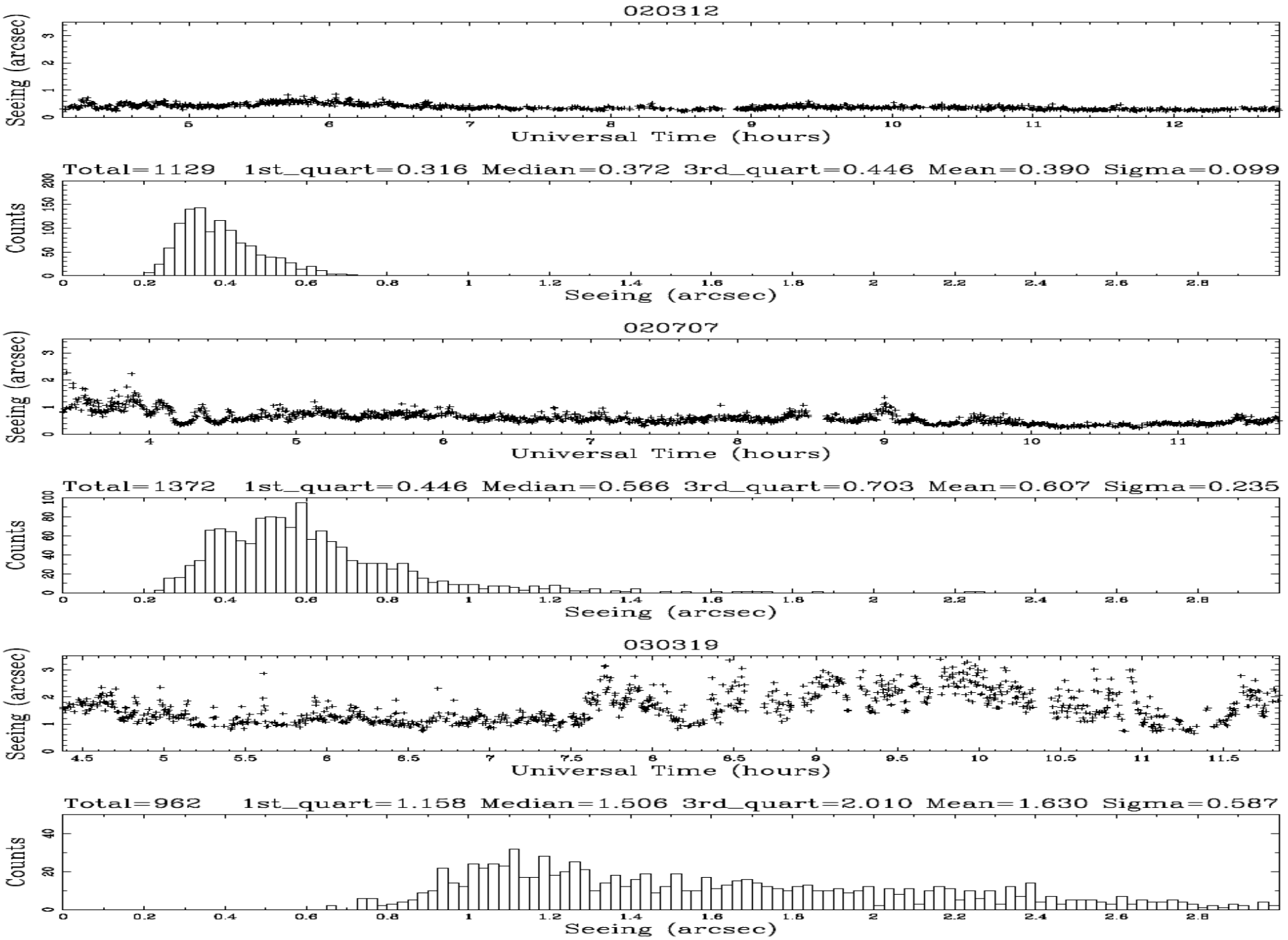


Fig. 3. Examples of good, average and bad observing nights.


DIMM
Old dome
1.5m
0.84m

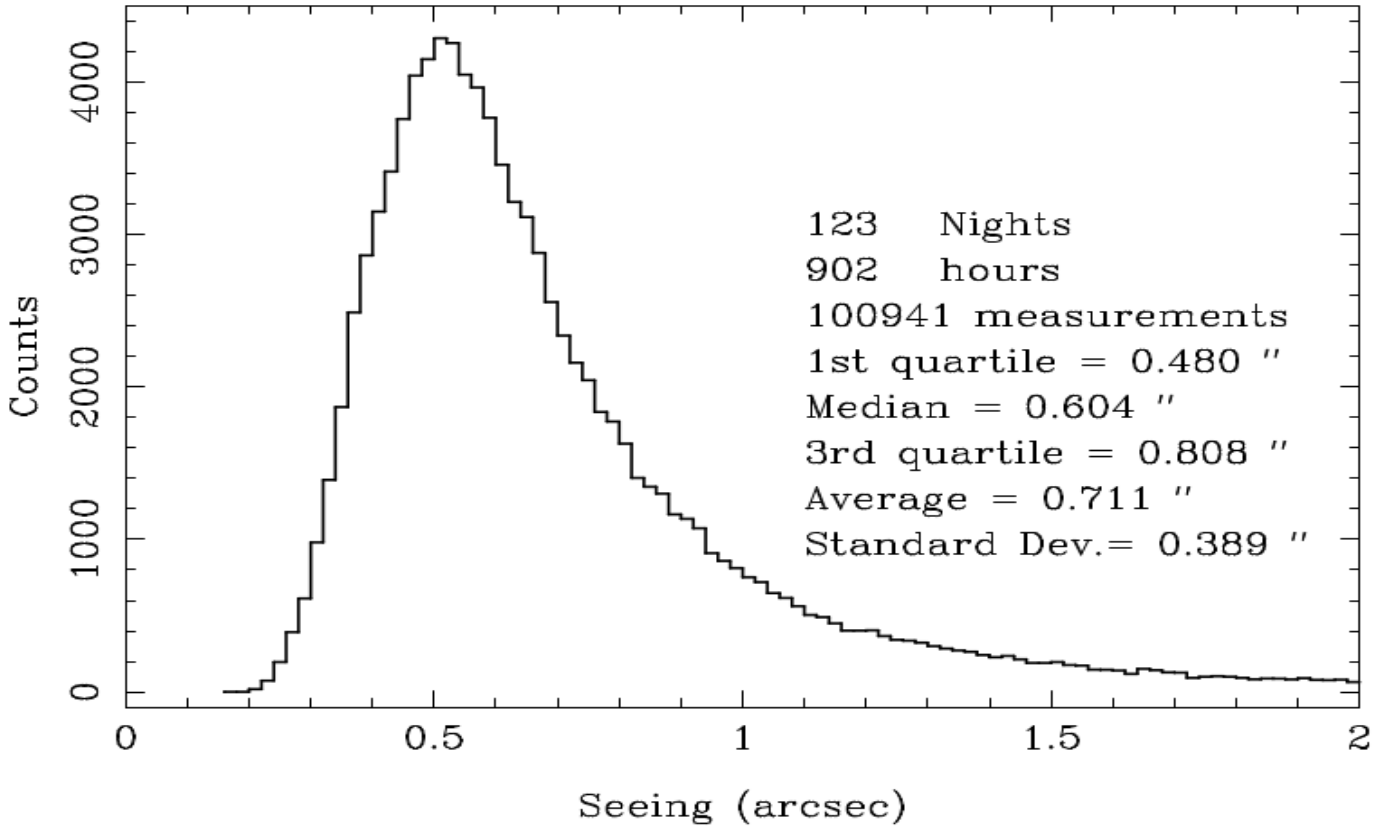
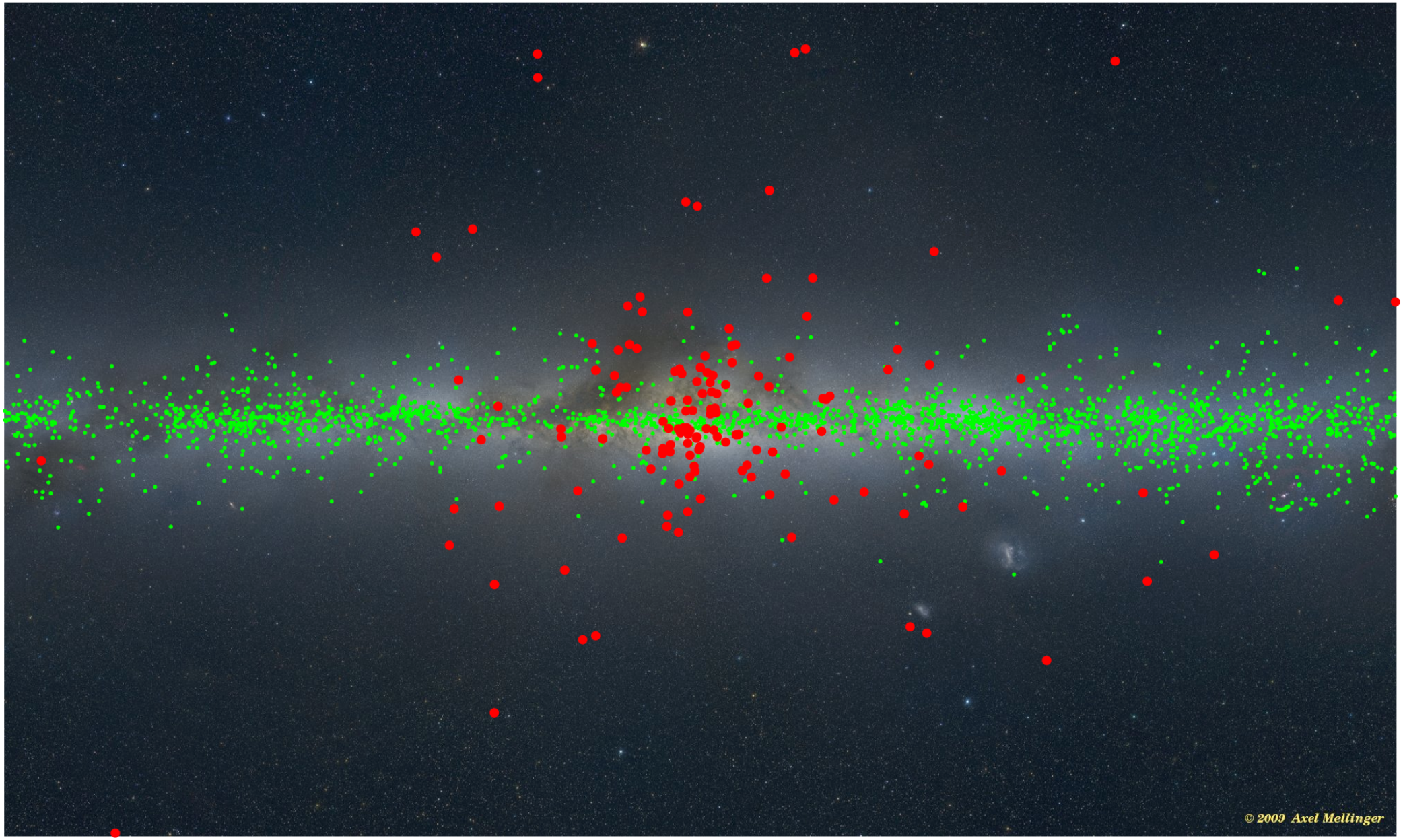

Counts
0
1000
2000
3000
4000
0
0.5
1
1.5
2
Seeing (arcsec)
123 Nights
902 hours
100941 measurements
1st quartile = 0.480 "
Median = 0.604 "
3rd quartile = 0.808 "
Average = 0.711 "
Standard Dev.= 0.389 "

TABLE 3

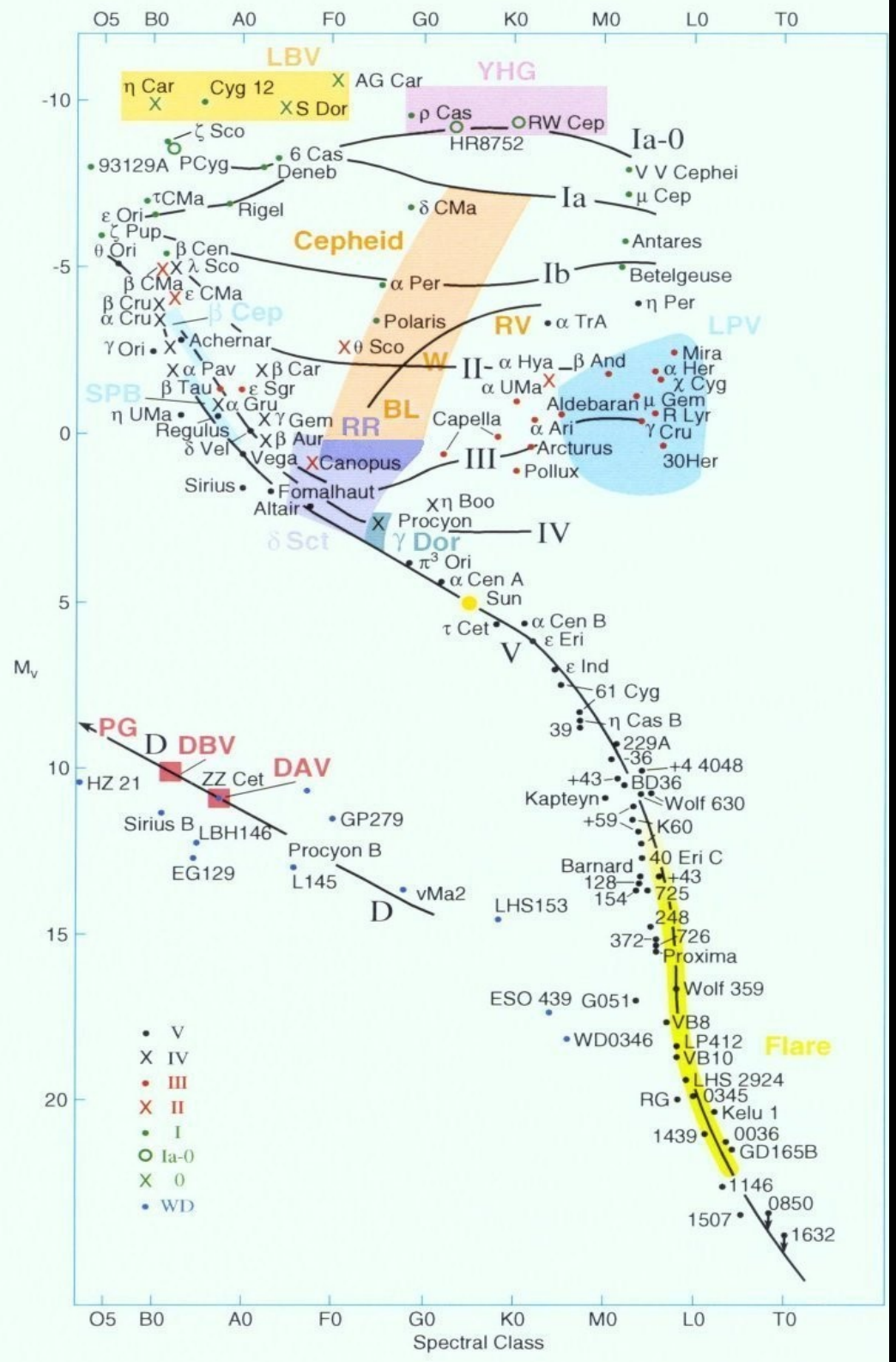
COMPARISON WITH SIMILAR DIMM STUDIES IN OTHER SITES

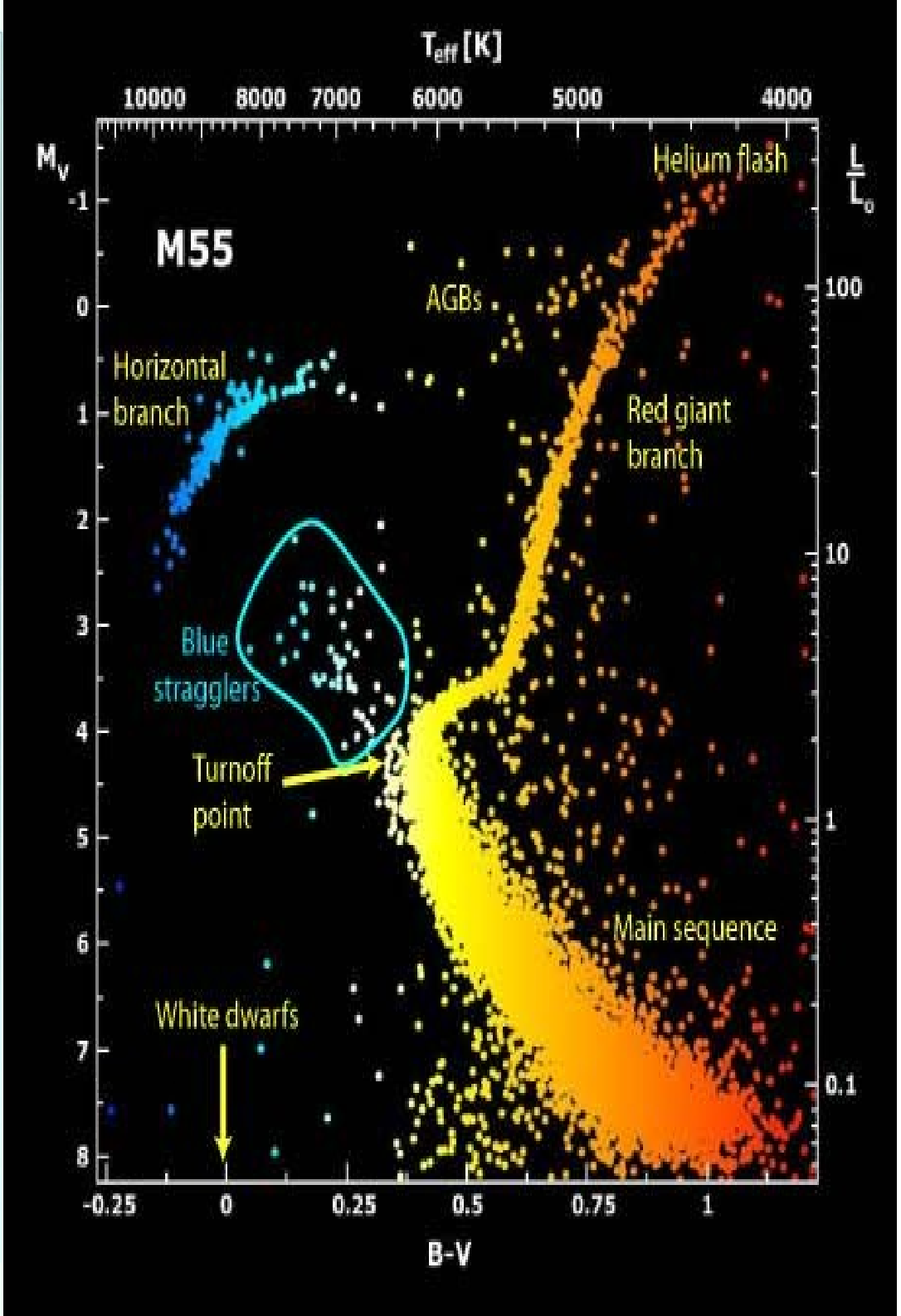
Site	Site Elev. (m)	DIMM Height (m)	Exp. Time (ms)	1^{st} Qrt. (arcsec)	Median (arcsec)	3^{rd} Qrt. (arcsec)	Mean (arcsec)	N_{nights}	Start	End	Ref.
Paranal, Chile	2636	6	5	0.64	0.82	1.08	0.91	~ 1700	03/98	11/02	(1)
La Silla, Chile	2335	6	5	0.70	0.89	1.15	0.97	~ 1400	03/99	11/02	(1)
Maidanak, Uzbekistan	2580	6	0	0.55	0.69	0.90	0.76	725	08/96	11/00	(2)
Apache Point, USA	2788	···	20	0.83	1.03	1.30	1.17	261	02/99	06/03	(3)
Kunming, China	1940	4	20	···	1.09	···	0.95	256	05/95	12/96	(4)
Gaomeigu, China	3193	4	20	···	0.78	···	0.70	234	05/95	12/96	(4)
La Palma, Spain	2400	5	10	~ 0.52	0.69	~ 0.90	···	233	10/94	08/98	(5)
Mount Fowlkes, USA	2027	1.8	10	~ 0.88	1.03	~ 1.28	···	186	07/01	07/02	(6)
San Pedro Mártir, México	2800	8.3	6	0.48	0.60	0.81	0.71	123	08/00	06/03	(7)
Sierra Negra, México	4580	5	10,20	0.62	0.78	1.05	0.90	85	02/00	04/03	(8)
Siding Springs, Australia	1130	2	10	···	···	···	1.20	64	06/93	12/93	(9)
Cerro Tololo, Chile	2200	6	0	0.79	0.96	1.17	···	48	05/02	07/02	(10)
Cerro Chico, Chile	5150	2.5	0	0.55	0.71	0.87	···	38	07/98	10/00	(11)
Devasthal, India	2540	2	10	···	1.07	···	1.20	37	10/98	12/98	(12)
South Pole	3200	12	33	~ 1.20	1.70	~ 2.20	···	28	05/95	09/95	(13)
Mauna Kea, USA	4123	···	0	···	0.88	···	0.92	13	05/02	06/02	(14)
Cananea, México	2480	2	20	0.78	0.91	1.08	···	···	02/99	10/99	(15)
Karoo Plateau, S. Africa	1760	···	···	0.74	0.92	1.16	···	···	04/94	02/98	(16)

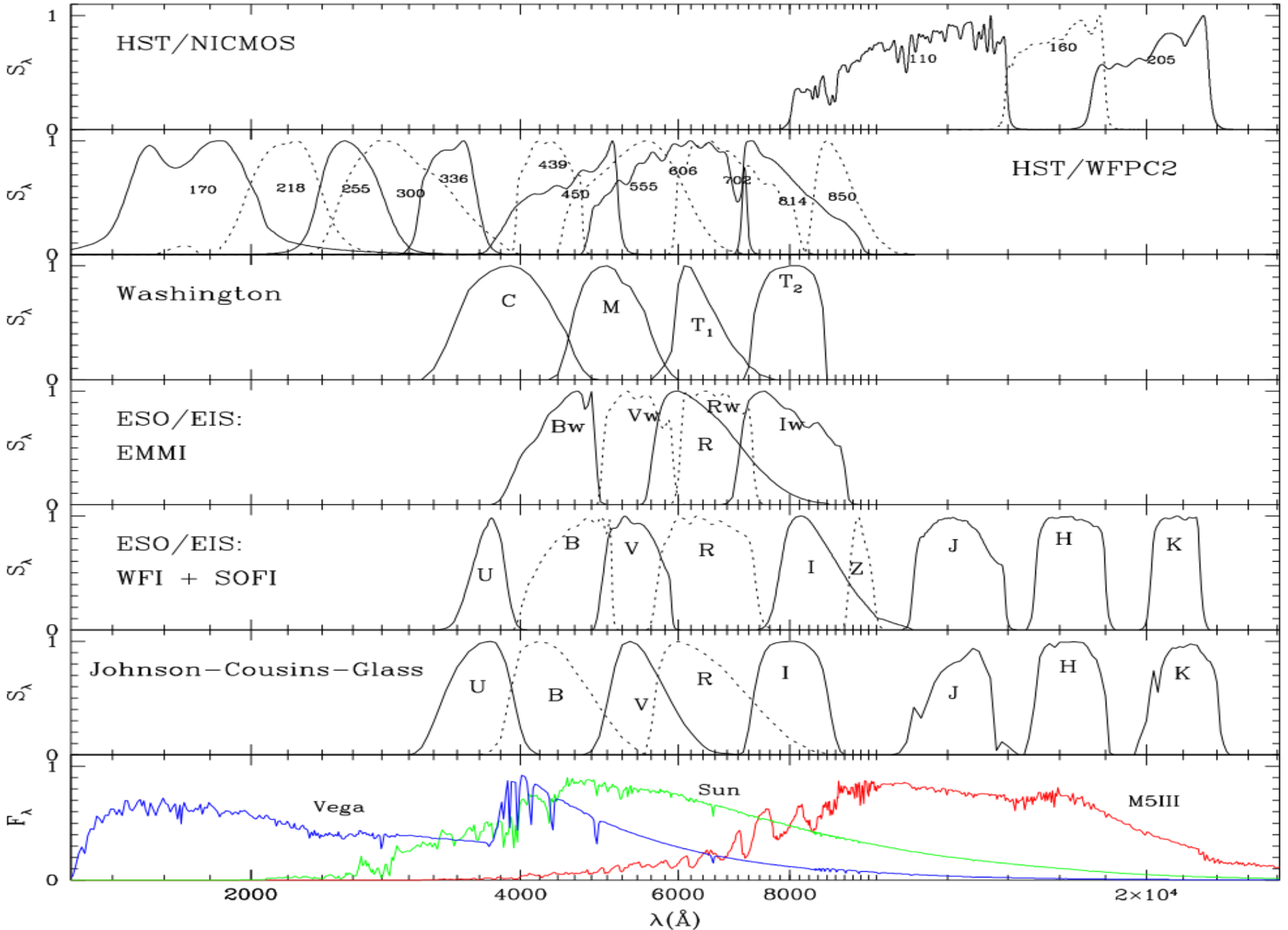
References: (1) ESO (2002); (1) ESO (2002); (2) Ilyasov (2002); (3) Rest (2002); (4) Qian et a. (2001); (4) Qian et a. (2001); (5) Wilson et al. (1999); (6) Barker et al. (2003); (7) this work; (8) Carrasco et al. (2003); (9) Wood et al. (1995); (10) Tokovinin et al. (2003); (11) Giovanelli et al. (2001); (12) Stalin et al. (2001); (13) Loewenstein et al. (1998); (14) Chun et al. (2002); (15) INAOE (2002); (16) Erasmus (2000).

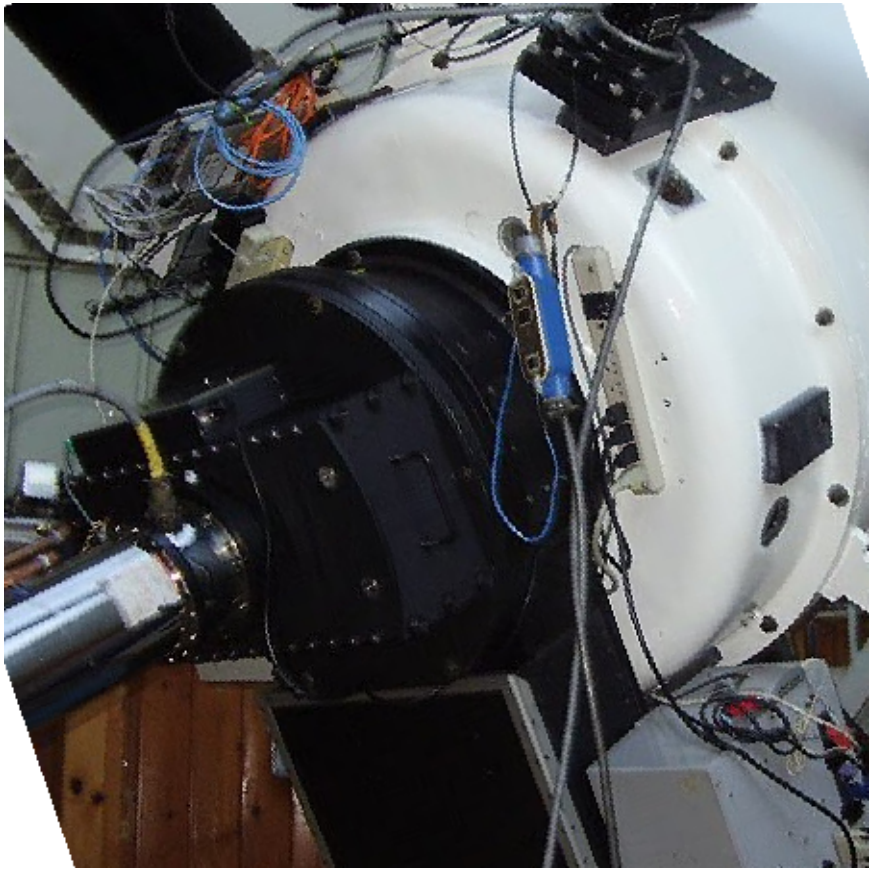


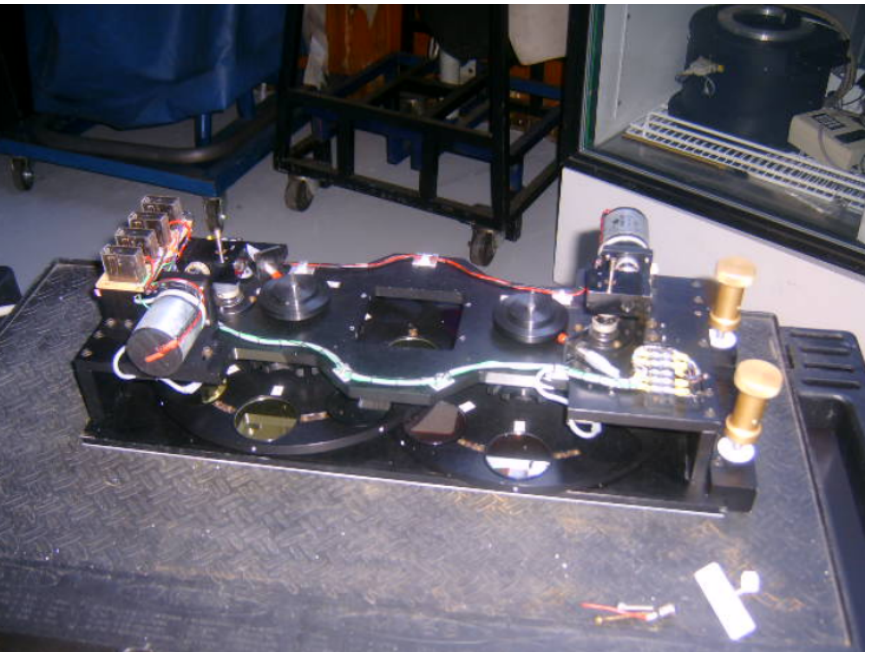
Kharchenko et al. 2013.
2272 (1615 observable from SPM) open clusters, 147 (117) globular clusters.

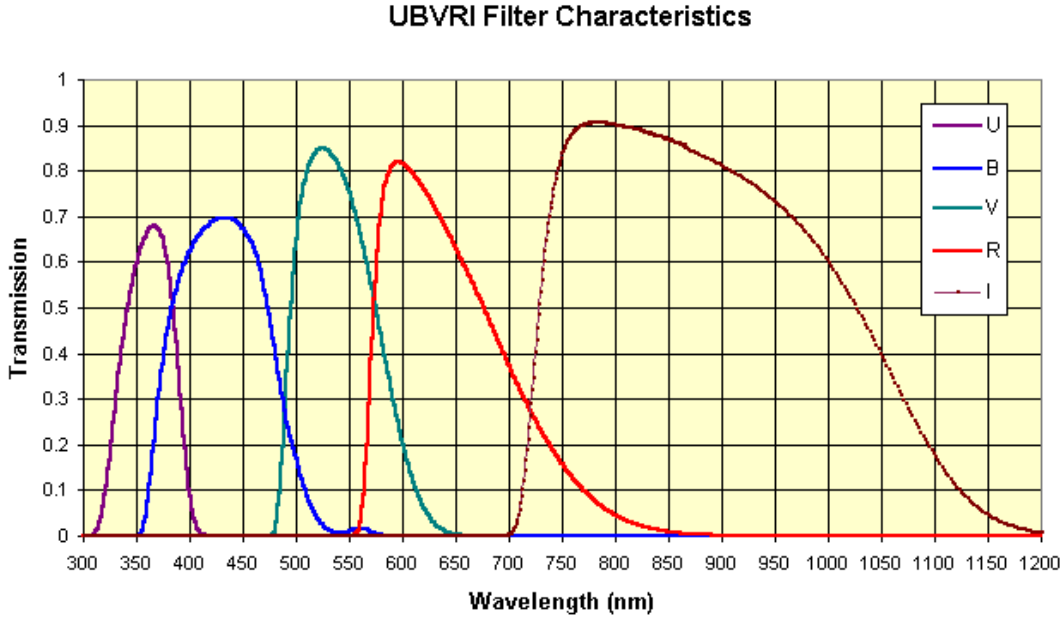

O5 B0 A0 F0 G0 K0 M0 L0 T0
LBV
η Car
Cyg 12
AG Car
S Dor
YHG
ρ Cas
RW Cep
HR8752
Ia-0
ζ Sco
93129A
PCyg
6 Cas
Deneb
V V Cephei
Ia
τCMa
Rigel
δ CMa
μ Cep
ε Ori
ζ Pup
Cepheid
Antares
θ Ori
β Cen
λ Sco
Ib
Betelgeuse
β CMa
ε CMa
α Per
η Per
β Cru
α Cru
β Cep
Polaris
RV
α TrA
LPV
γ Ori
Achernar
θ Sco
W
II
α Hya
β And
Mira
α Her
χ Cyg
α Pav
β Car
α UMa
SPB
β Tau
ε Sgr
Aldebaran
μ Gem
R Lyr
η UMa
α Gru
BL
Capella
α Ari
γ Cru
Regulus
γ Gem
RR
III
Arcturus
30Her
δ Vel
β Aur
Vega
Canopus
Pollux
Sirius
Fomalhaut
Altair
η Boo
Procyon
IV
δ Sct
γ Dor
π3 Ori
α Cen A
Sun
τ Cet
α Cen B
ε Eri
V
ε Ind
61 Cyg
η Cas B
39
229A
36
+4 4048
+43
BD36
Kapteyn
Wolf 630
+59
K60
40 Eri C
Barnard
128
+43
154
725
248
372
726
Proxima
Wolf 359
ESO 439
G051
VB8
WD0346
LP412
Flare
VB10
LHS 2924
RG
0345
Kelu 1
1439
0036
GD165B
1146
0850
1507
1632
LHS153
PG
D
DBV
DAV
ZZ Cet
HZ 21
Sirius B
LBH146
GP279
EG129
Procyon B
L145
vMa2
D
M_V
V
IV
III
II
I
Ia-0
0
WD
Spectral Class


T_eff [K]
10000 8000 7000 6000 5000 4000
M_V
L/L_o
M55
Helium flash
AGBs
Horizontal branch
Red giant branch
Blue stragglers
Turnoff point
Main sequence
White dwarfs
-1 0 1 2 3 4 5 6 7 8
100 10 1 0.1
-0.25 0 0.25 0.5 0.75 1
B-V


HST/NICMOS
110
160
205
HST/WFPC2
170
218
255
300
336
439
450
555
606
702
814
850
Washington
C
M
T1
T2
ESO/EIS:
EMMI
Bw
Vw
Rw
R
Iw
ESO/EIS:
WFI + SOFI
U
B
V
R
I
Z
J
H
K
Johnson−Cousins−Glass
U
B
V
R
I
J
H
K
Vega
Sun
M5III
Sλ
Fλ
2000
4000
6000
8000
2×10⁴
λ(Å)

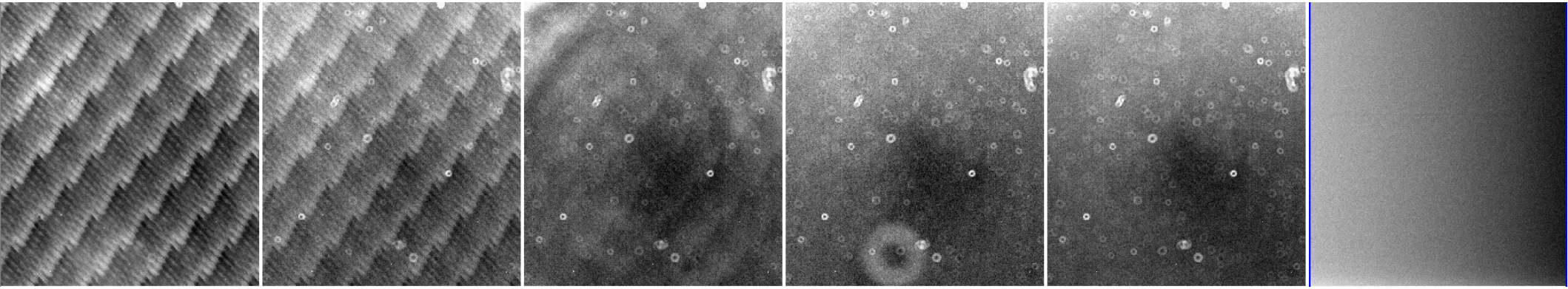





UBVRI Filter Characteristics
Transmission
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200
Wavelength (nm)
U
B
V
R
I

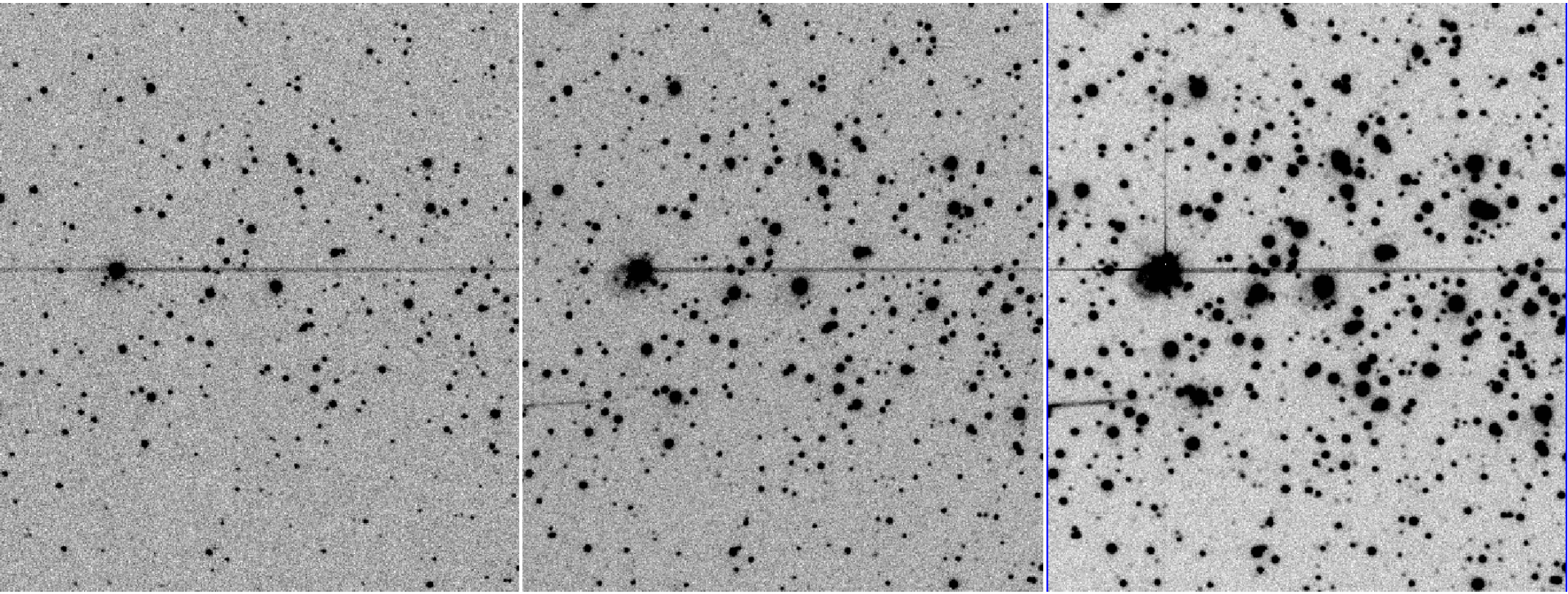
	Obs Run	Photometric	Nights	Good Stds	Clusters	Telescope	CCD	Stage	Observers
2	201603	10	1	10	2	84cm	Marconi3	a	Michel
3	201603_OSN	10	1	10	9	84cm	OSN	a	Michel-OSN
4	201602_2m	10	3	10	19	2m	Marconi4	a	Michel
5	201602e	10	2	10	17	84cm	Marconi3	a	Michel
6	201602d	10	2	10	12	84cm	Marconi3	r	Michel
7	201602c	10	1	10	10	84cm	Marconi3	r	Michel
8	201602b	10	1	10	10	84cm	Marconi3	r	Michel
9	201602a	10	1	10	8	84cm	Marconi3	r	Michel
10	201601b	10	2	10	16	84cm	Marconi3	r	Michel
11	201601a	10	3	10	19	84cm	Marconi3	r	Michel
12	201512_OSN	9.5	1	10	9	84cm	OSN	a	Michel-OSN
13	201511	10	3	10	20	84cm	Marconi3	a	Michel
14	201510	10	1	10	5	84cm	Spectral	r	Michel
15	201509_OSN	10	1	10	9	90cm	OSN	a	Costado-OSN
16	201508b	9.5	2	10	17	84cm	Marconi3	a	Michel
17	201508a	10	2	10	6	84cm	Marconi3	r	Eaton
18	201507_OSN	10	6	10	38	90cm	OSN	a	Costado-OSN
19	201506b	10	2	10	7	84cm	Marconi3	r	Michel
20	201506a	10	3	10	9	84cm	Marconi3	r	Eaton-Suarez
21	201503b	10	2	10	20	84cm	Marconi3	r	Michel
22	201503a	10	2	10	19	84cm	Marconi3	r	Michel
23	201501c	10	2	10	22	84cm	Marconi3	a	Michel-Eaton
24	201501b	10	2	10	15	84cm	Marconi3	r	Michel-Eaton
25	201501a	8	1	10	10	84cm	Marconi3	r	Michel-Eaton
26	201411_BAO	8	3	10	10	84cm	BAO	r	Michel-Zhongli-Tiangi
27	201410	10	2	10	17	84cm	Esopo	r	Michel
28	201409c	10	2	10	18	84cm	Spectral	r	Michel
29	201409b	10	2	10	16	84cm	Spectral	r	Michel
30	201409a	10	2	10	18	84cm	Spectral	r	Michel
31	201406c	10	2	10	13	84cm	Esopo	r	Michel
32	201406b	9	2	10	10	84cm	Esopo	r	Michel
33	201406a	10	3	10	10	84cm	Esopo	r	Olguín
34	201405b	10	2	10	16	84cm	Esopo	r	Michel
35	201405a	10	2	10	7	84cm	Esopo	r	Michel
36	201404b	10	4	10	24	84cm	Esopo	r	Castro-Altamirano
37	201404a	10	2	10	13	84cm	Esopo	r	Michel
38	201403	10	2	10	19	84cm	Esopo	r	Michel
39	201402	10	2	10	10	84cm	Marconi3	r	Michel
40	201401	10	3	10	18	84cm	Esopo	r	Michel
41	201310b	10	3	10	25	84cm	Esopo	r	Michel
42	201310a	10	3	10	24	84cm	Esopo	r	Michel
43	201309b	10	4	10	21	84cm	Esopo	r	Michel
44	201309a	10	2	10	17	84cm	Esopo	r	Michel
45	201307	10	1	10	6	84cm	Marconi1	a	Michel-Suarez
46	201306	10	4	10	9	84cm	Esopo	a	Michel
47	201302	9.5	4	10	11	84cm	Esopo	r	Castro
48	201208	10	1	10	3	84cm	Esopo	r	Michel
49	201206_Strom	10	7	10	16	84cm	Esopo	r	Michel
50	201201	9	1	10	5	84cm	Esopo	r	Michel
51	201110b	10	2	10	9	84cm	Esopo	r	Michel
52	201110a	10	2	10	12	84cm	Esopo	r	Michel
53	201105c	10	2	10	2	84cm	SITe4	r	Michel
54	201105b	10	3	10	3	84cm	SITe4	r	Michel
55	201105a	10	1	10	1	84cm	SITe4	r	Michel
56	201009c	10	2	10	17	1.5m	Marconi1	r	Michel
57	201009b	10	2	10	19	1.5m	Marconi1	r	Michel
58	201009a	10	3	10	33	1.5m	Marconi1	r	Michel
59	201004	10	2	10	6	84cm	Esopo	r	Michel
60	200910	10	4	10	15	84cm	SITe3	r	Michel
61	200908	9	2	10	11	84cm	Marconi1	r	Michel-Castro

flat U | flat B | flat V | flat R | flat I | bias

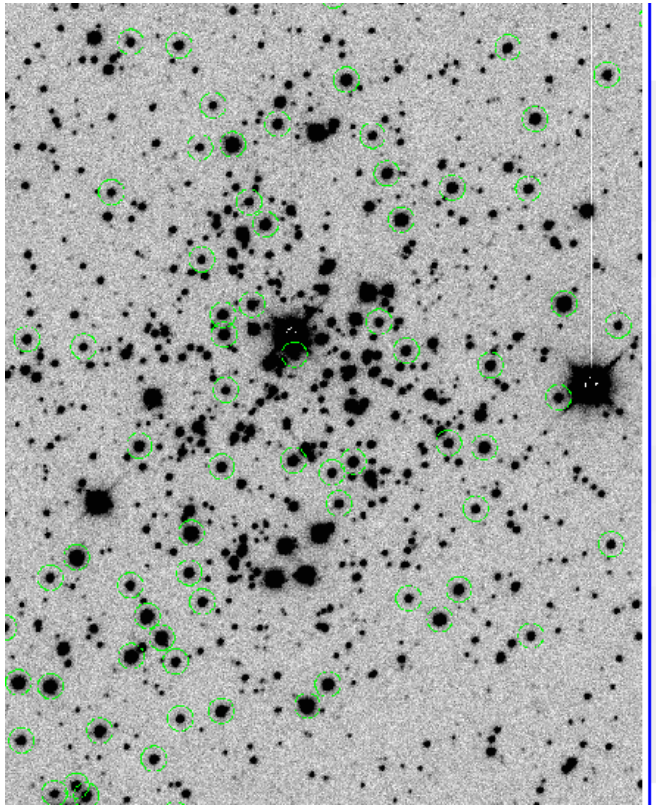


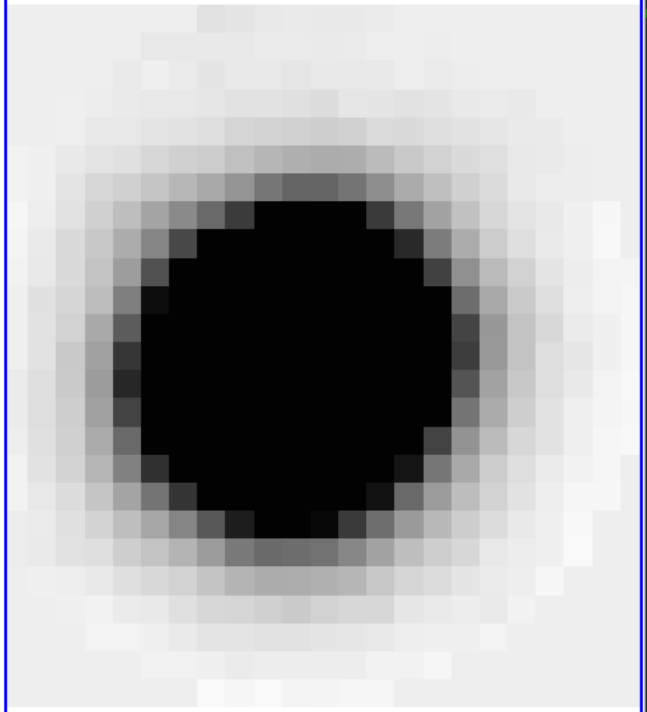
NGC 2627 filter R

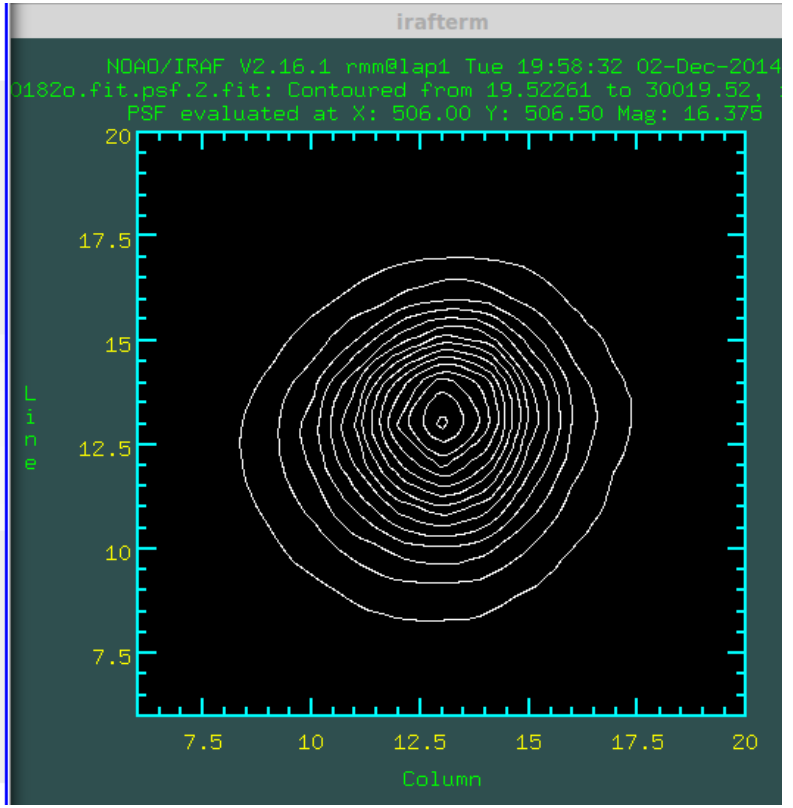
2 sec | 20 sec | 200 sec



Fitting a psf function

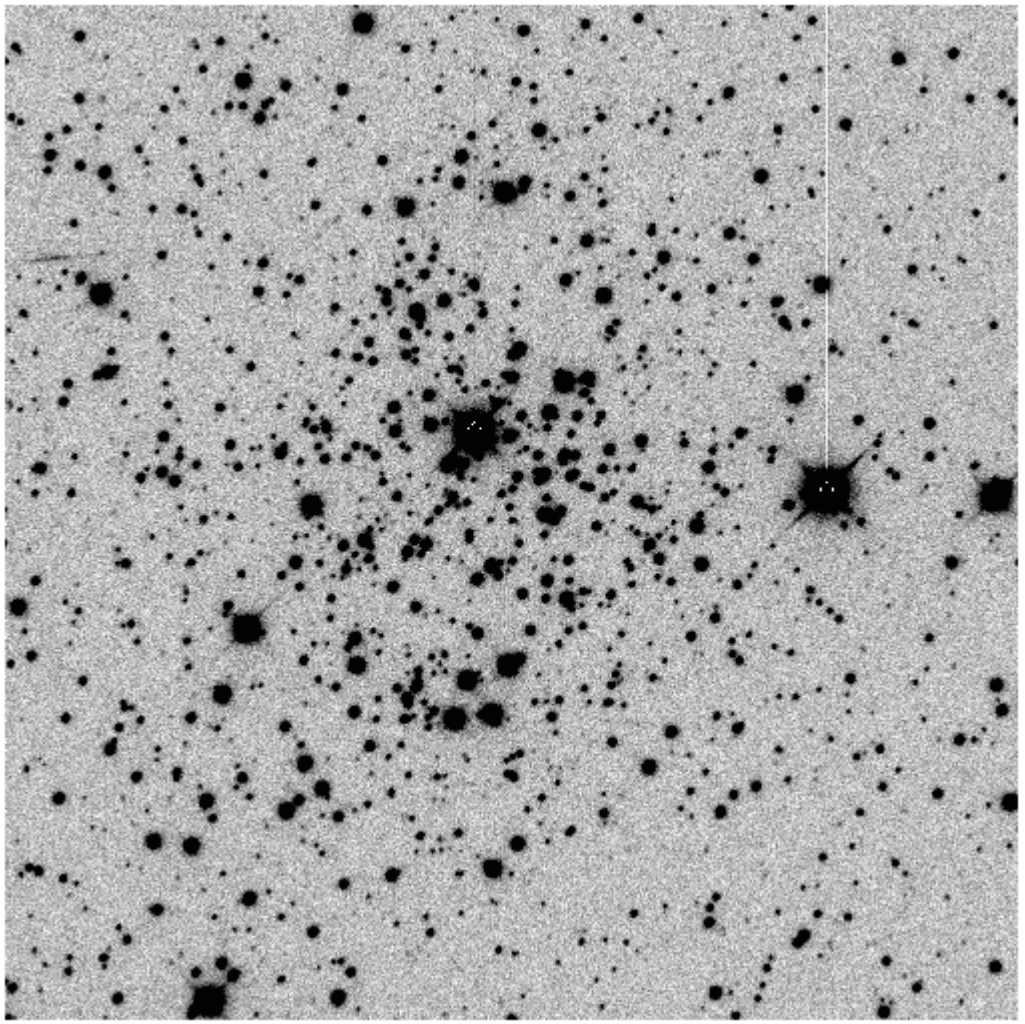


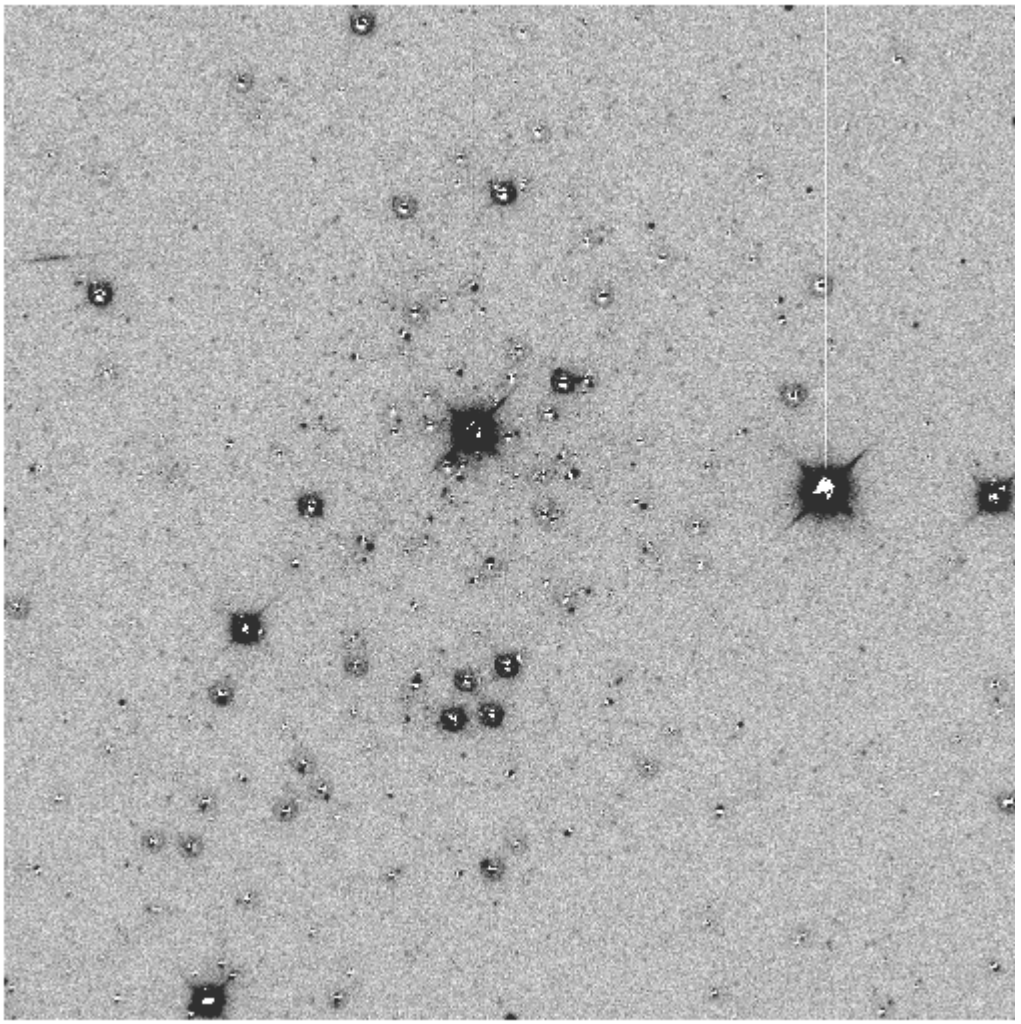




Do the psf photometry with ALLSTAR

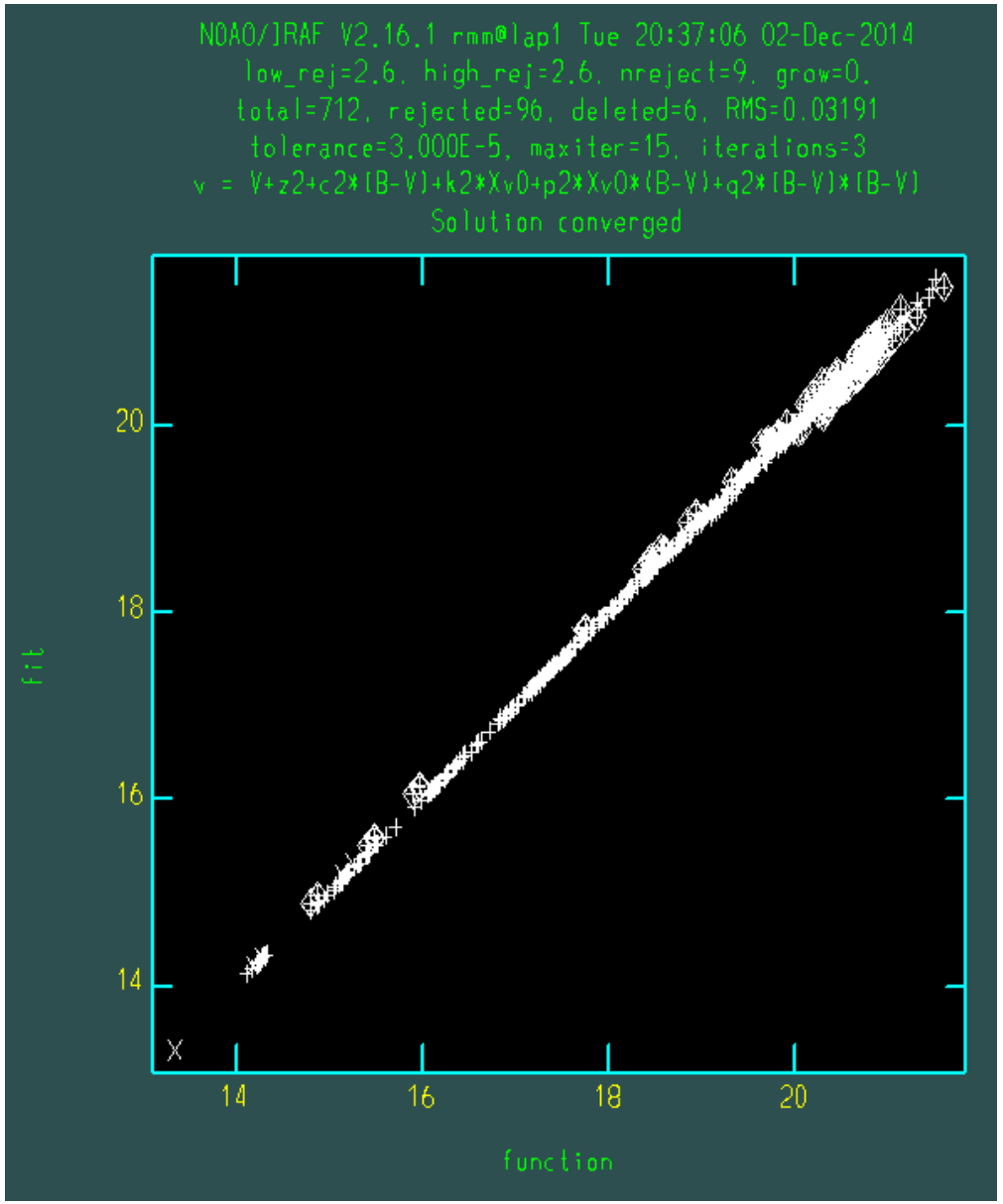
Extracting stars' information

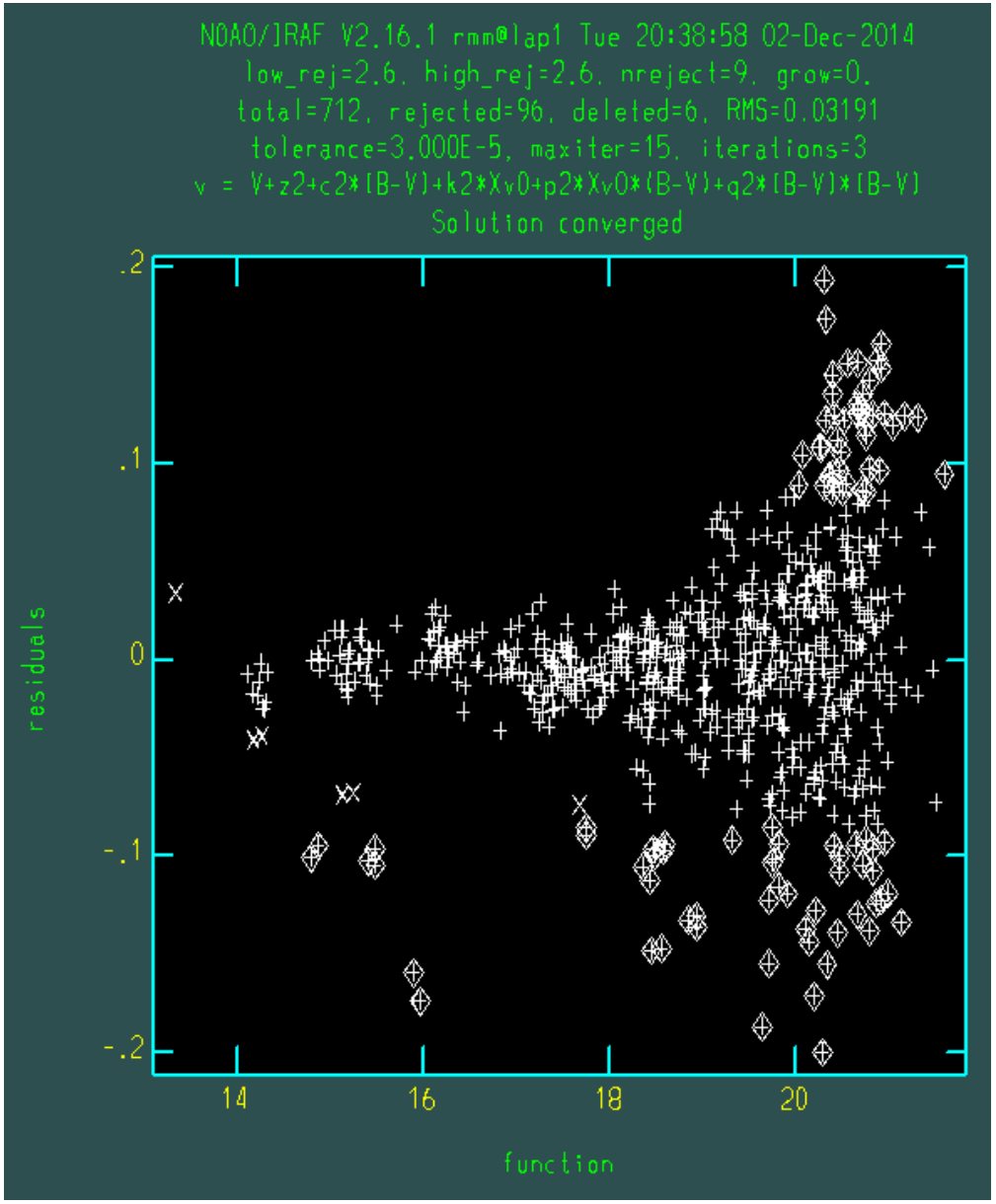




Merge with other photometries

Define transformation equations based on standard stars observations





Example... observing run August 2015.

Table 1. Observed open clusters and standard fields.

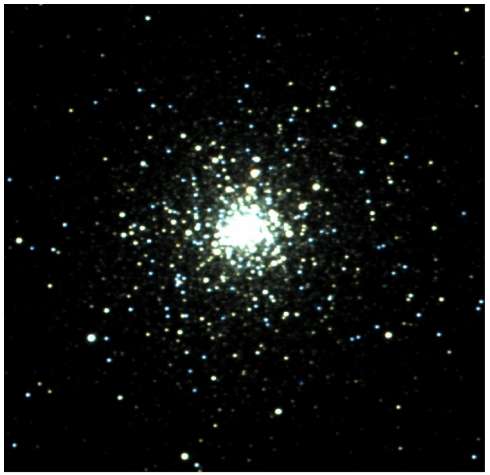
Cluster	RA (2000)	DEC (2000)	LJD (days)	Air mass	Filter U Exp. Time (s)	Filter B Exp. Time (s)	Filter V Exp. Time (s)	Filter R Exp. Time (s)	Filter I Exp. Time (s)
BDSB 47	23:52:58.1	+60:28:17.8	2457248	1.148 – 1.151	90,900	50,500	30,300	20,200	2,20,200
Basel 13	21:12:31.2	+46:32:13.6	2457247	1.038 – 1.042	90,900	5,50,500	3,30,300	2,20,200	2,20,200
Berkeley 61	00:48:12.0	+67:11:23.8	2457248	1.238 – 1.240	900	50,500	30,300	20,200	2,20,200
ESO 525-08	19:27:13.2	−23:34:53.5	2457248	1.727 – 1.773	900	50,500	30,300	20,200	2,20,200
FSR 0019	17:35:36.9	−21:03:55.8	2457247	1.629 – 1.674	900	50,500	3,30,300	2,20,200	2,20,200
FSR 0041	17:03:32.8	−08:51:14.0	2457247	1.303 – 1.318	900	50,500	30,300	2,20,200	2,20,200
FSR 0293	21:27:53.4	+47:09:25.1	2457248	1.041 – 1.045	90,900	5,50,500	3,30,300	2,20,200	2,20,200
FSR 0370	23:21:35.8	+40:54:08.0	2457247	1.015 – 1.021	900	50,500	30,300	2,20,200	2,20,200
FSR 0479	00:21:11.5	+54:49:33.9	2457247	1.093 – 1.095	900	50,500	30,300	20,200	20,200
FSR 0536	01:19:42.6	+63:03:09.3	2457247	1.179 – 1.182	900	500	300	200	20,200
Kronberger 52	19:58:08.0	+30:53:20.8	2457247	1.001 – 1.020	90,900	50,500	30,300	2,20,200	2x2,2x20,2x200
MWSC 5748	20:28:58.8	+00:24:04.3	2457248	1.162 – 1.174	900	50,500	3,30,300	2,20,200	2,20,200
NGC 6293	17:10:11.1	−26:35:12.5	2457248	1.865 – 1.882	900	50,500	30,300	20,200	2,20,200
NGC 6401	17:38:37.3	−23:54:54.8	2457248	1.741 – 1.784	90,900	50,500	30,300	20,200	20,200
NGC 7099	21:40:22.2	−23:10:57.6	2457247	1.710 – 1.737	90	50,500	30,300	20,200	20,200
NGC 7538	23:13:31.4	+61:29:50.6	2457248	1.160 – 1.162	900	50,500	30,300	20,200	2,20,200
Teutsch 7	19:47:42.6	+24:15:34.2	2457247	1.007 – 1.011	9,90,900	5,50,500	3,30,300	2,20,200	2,20,200
GD246	23:12:21.3	+10:47:27.6	2457247	1.066 – 2.092	2x300	2x150	2x100	2x60	2x60
GD246	23:12:30.9	+10:46:50.6	2457248	1.080 – 2.113	2x300	2x150	2x100	2x60	2x60
PG2213-006	22:16:20.7	−00:19:23.5	2457247	1.176 – 1.994	2x300	150,200	100,120	60,80	60,80
PG2213-006	22:16:26.9	−00:19:56.3	2457248	1.171 – 1.172	300	150	100	60	60
PG2336+004	23:38:44.6	+00:43:03.4	2457248	1.190 – 2.752	200,300	2x60	25,30	2x15	2x15

BDSB 47

FSR 0019

NGC 7538

NGC 7099



$$u = U + z_{UUB} + k_{UUB}X_U + c_{UUB}(U-B) + p_{UUB}X_U(U-B) \quad (1a)$$

$$u = U + z_{UUV} + k_{UUV}X_U + c_{UUV}(U-V) + p_{UUV}X_U(U-V) \quad (1b)$$

$$b = B + z_{BUB} + k_{BUB}X_B + c_{BUB}(U-B) + p_{BUB}X_B(U-B) \quad (1c)$$

$$b = B + z_{BBV} + k_{BBV}X_B + c_{BBV}(B-V) + p_{BBV}X_B(B-V) \quad (1d)$$

$$v = V + z_{VBV} + k_{VBV}X_V + c_{VBV}(B-V) + p_{VBV}X_V(B-V) \quad (1e)$$

$$v = V + z_{VVR} + k_{VVR}X_V + c_{VVR}(V-R) + p_{VVR}X_V(V-R) \quad (1f)$$

$$r = R + z_{RVR} + k_{RVR}X_R + c_{RVR}(V-R) + p_{RVR}X_R(V-R) \quad (1g)$$

$$r = R + z_{RRI} + k_{RRI}X_R + c_{RRI}(R-I) + p_{RRI}X_R(R-I) \quad (1h)$$

$$i = I + z_{IVI} + k_{IVI}X_I + c_{IVI}(V-I) + p_{IVI}X_I(V-I) \quad (1i)$$

$$i = I + z_{IRI} + k_{IRI}X_I + c_{IRI}(R-I) + p_{IRI}X_I(R-I) \quad (1j)$$

where u, b, v, r and i are the magnitudes in the instrumental system, whereas U, B, V, R, and I are the magnitudes in the standard system, and X is the air mass during the measurement.

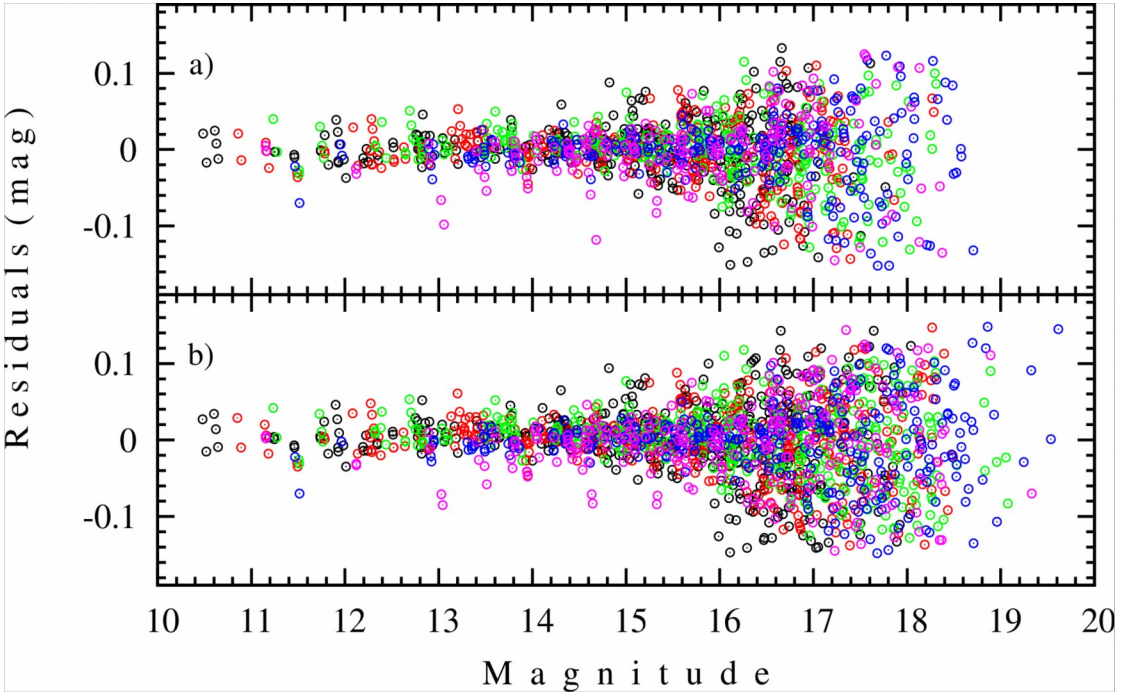
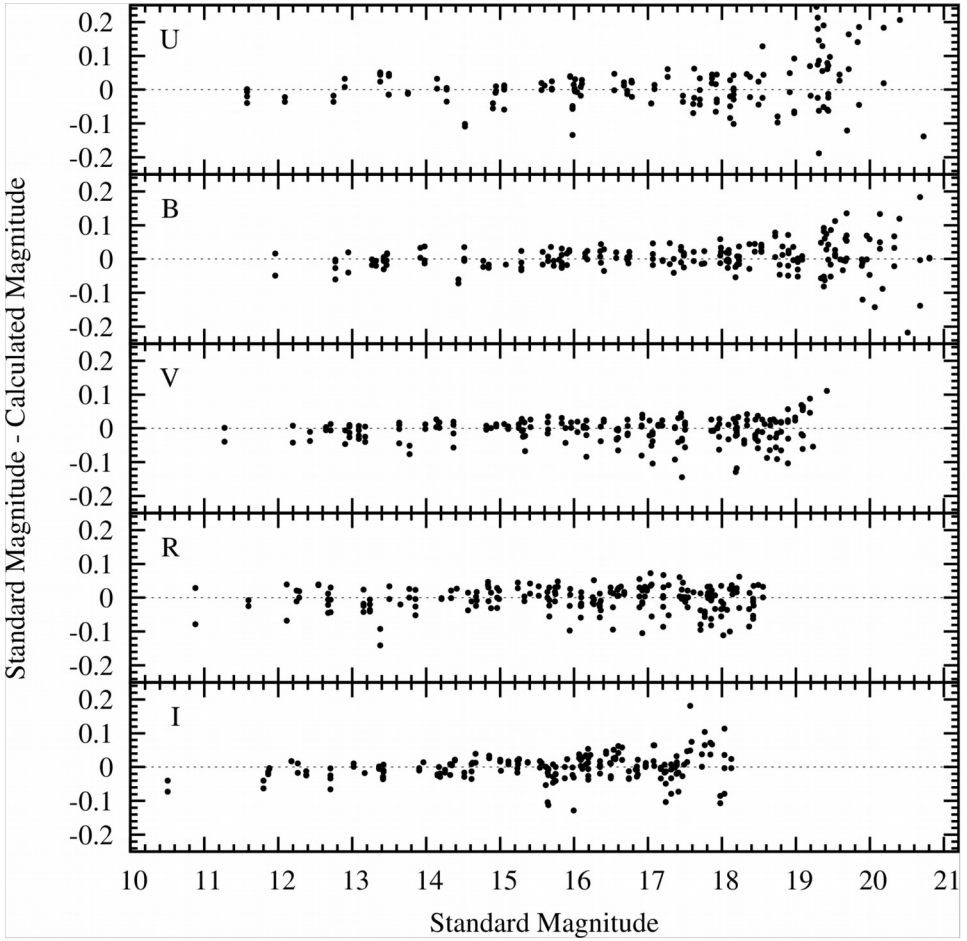


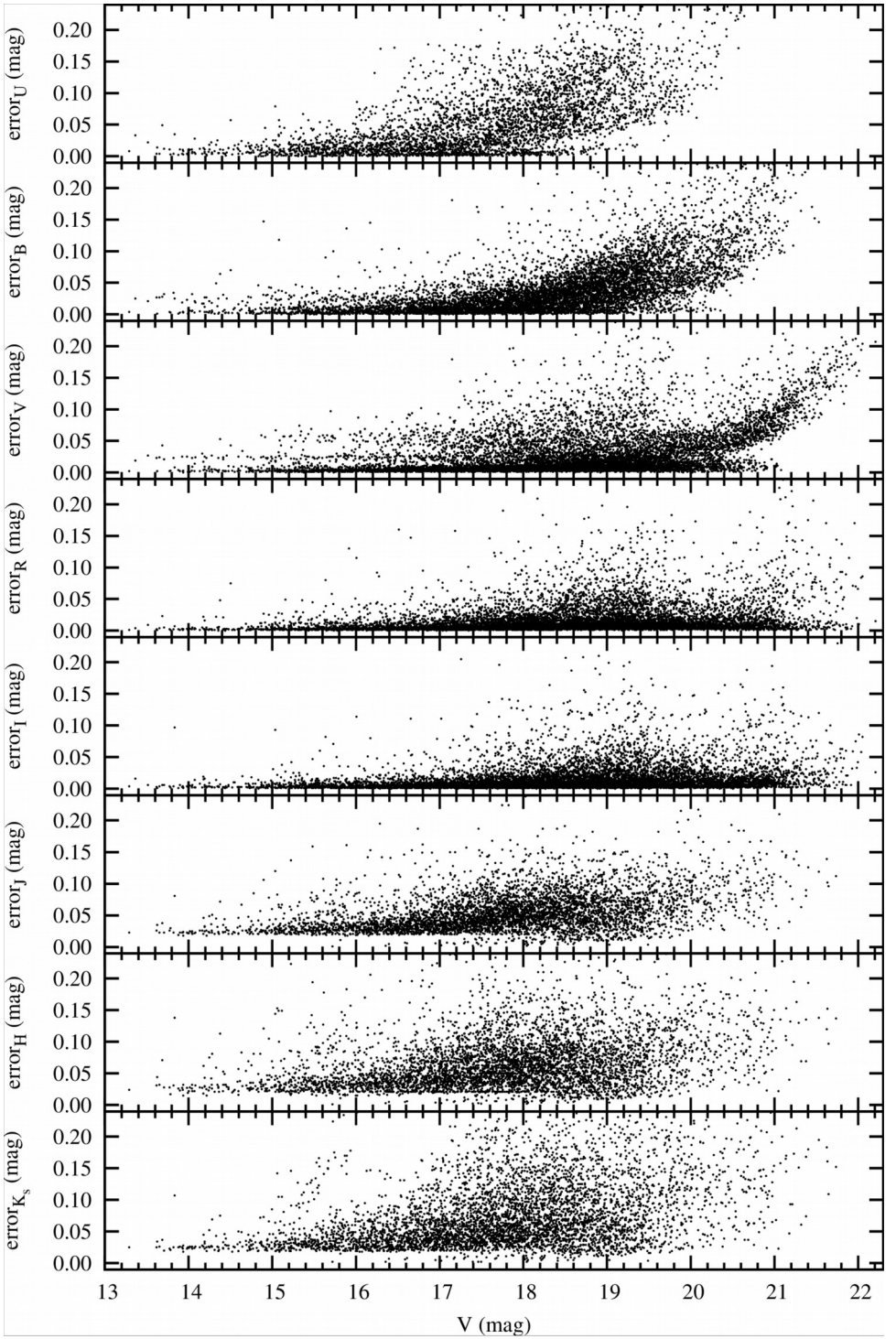
Table 4. Coefficients of the transformation equations.

	First Pass					Second Pass			
index	z	k	c	rms	points	c	p	rms	points
UUB	3.541±0.013	0.444±0.008	-0.083±0.010	0.041	146	-0.087±0.036	0.006±0.022	0.053	221
UUV	3.559±0.015	0.444±0.009	-0.045±0.006	0.045	142	-0.064±0.014	0.016±0.009	0.051	216
BUB	1.972±0.007	0.226±0.005	-0.022±0.005	0.023	146	-0.002±0.024	-0.014±0.014	0.033	221
BBV	2.001±0.011	0.225±0.006	-0.048±0.009	0.037	211	-0.065±0.018	0.021±0.011	0.055	305
VBV	2.209±0.013	0.145±0.007	0.078±0.011	0.043	211	0.070±0.015	0.009±0.009	0.048	305
VVR	2.190±0.014	0.147±0.007	0.187±0.018	0.047	242	0.145±0.025	0.026±0.015	0.051	327
RVR	2.238±0.013	0.108±0.007	0.113±0.016	0.043	242	0.090±0.024	0.019±0.015	0.049	327
RRI	2.240±0.013	0.108±0.007	0.114±0.017	0.043	252	0.142±0.023	-0.014±0.015	0.053	345
IVI	2.400±0.014	0.067±0.007	-0.065±0.009	0.048	235	-0.059±0.012	0.001±0.007	0.056	327
IRI	2.393±0.015	0.072±0.008	-0.126±0.021	0.053	252	-0.153±0.025	0.036±0.016	0.059	345

Test of transformation



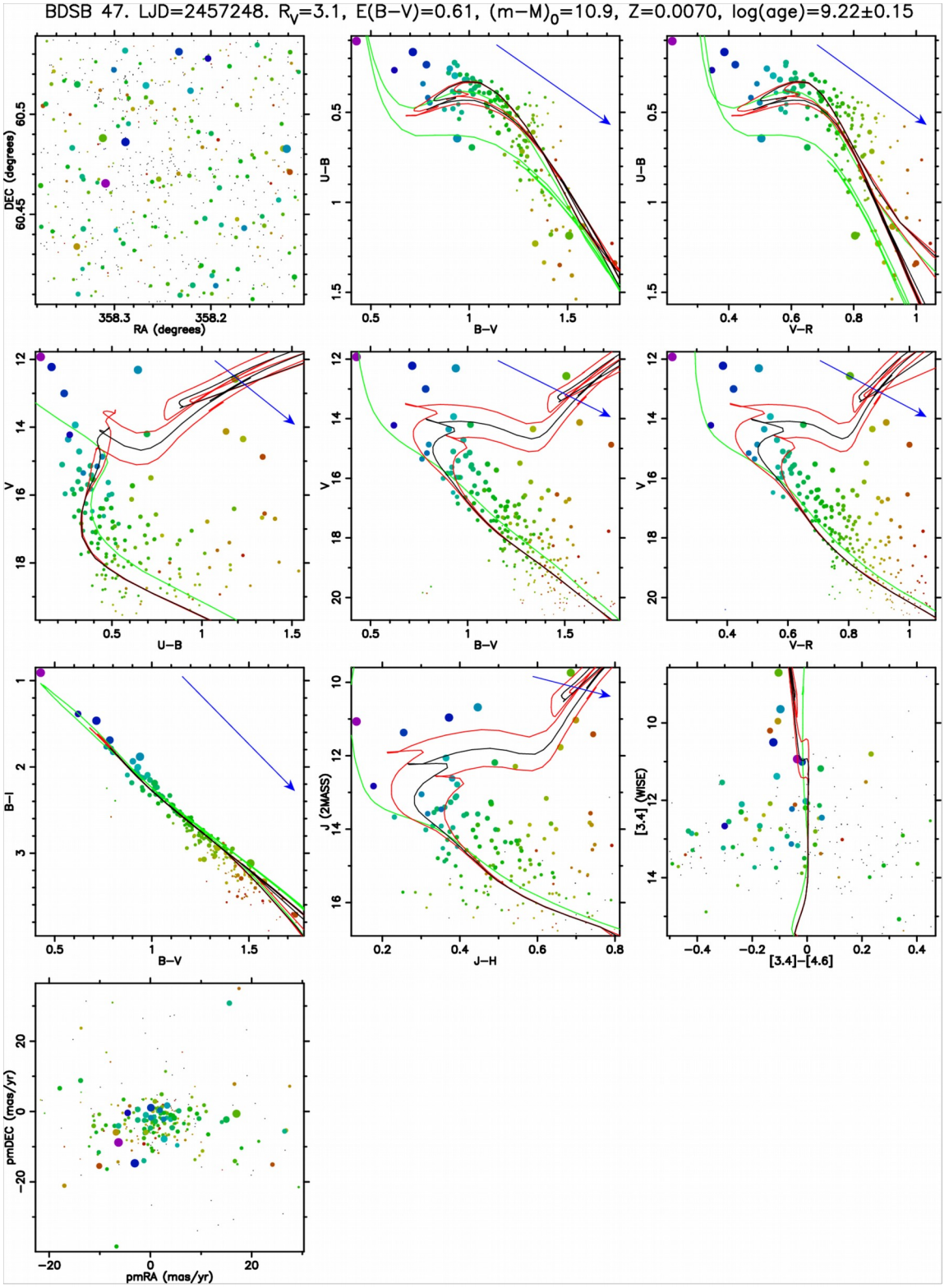
Magnitude errors

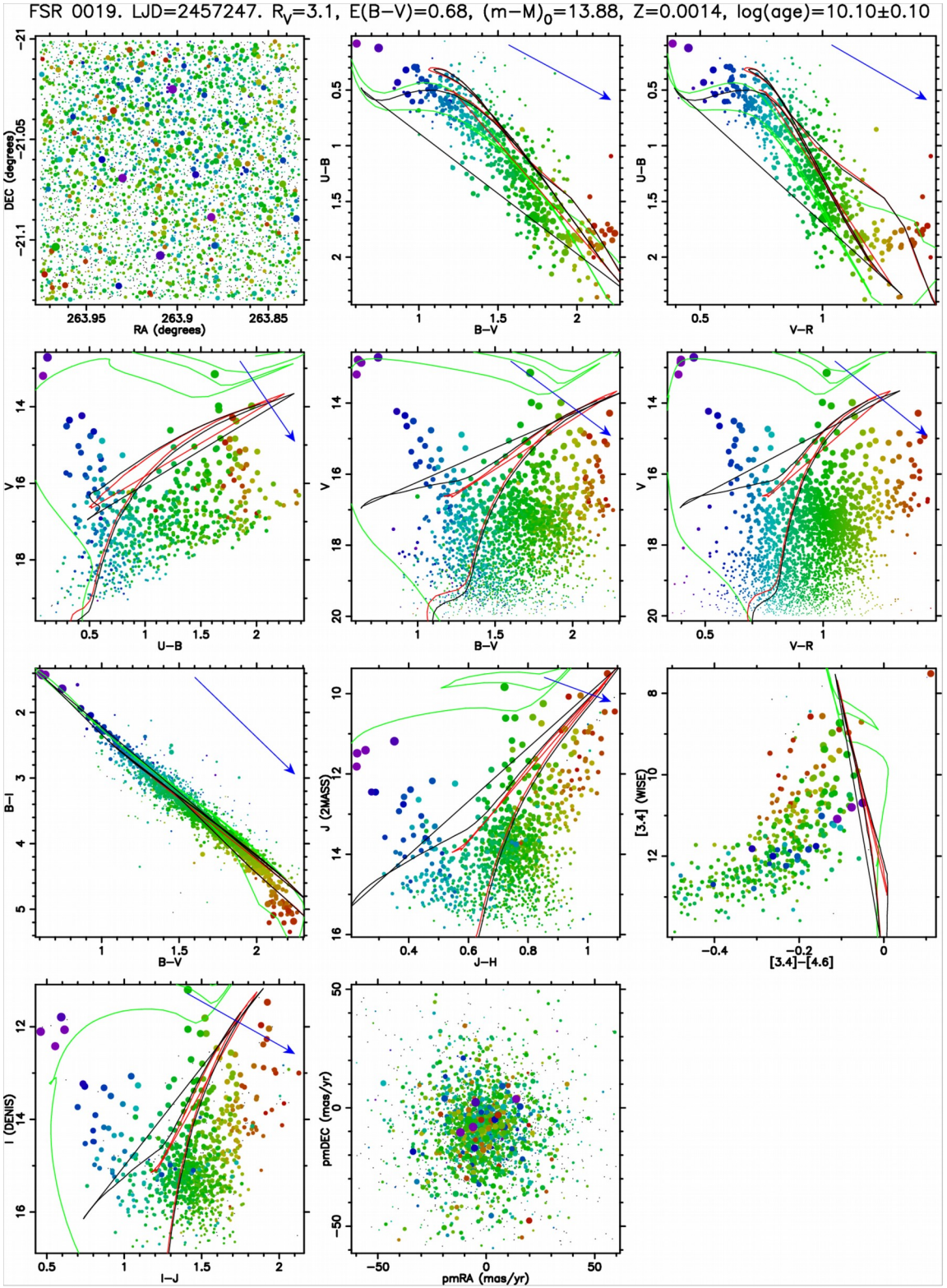


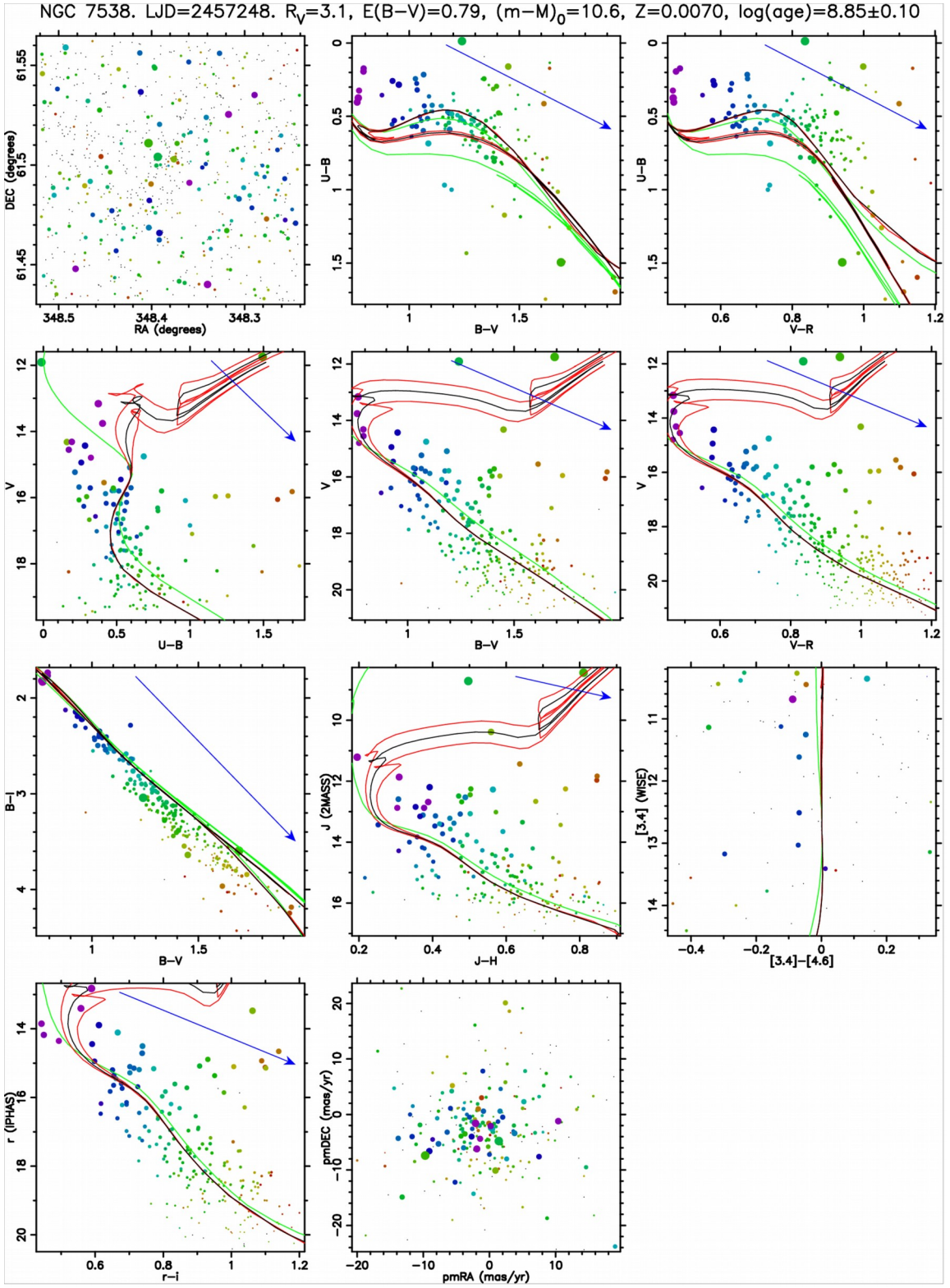
Merge with other data sets

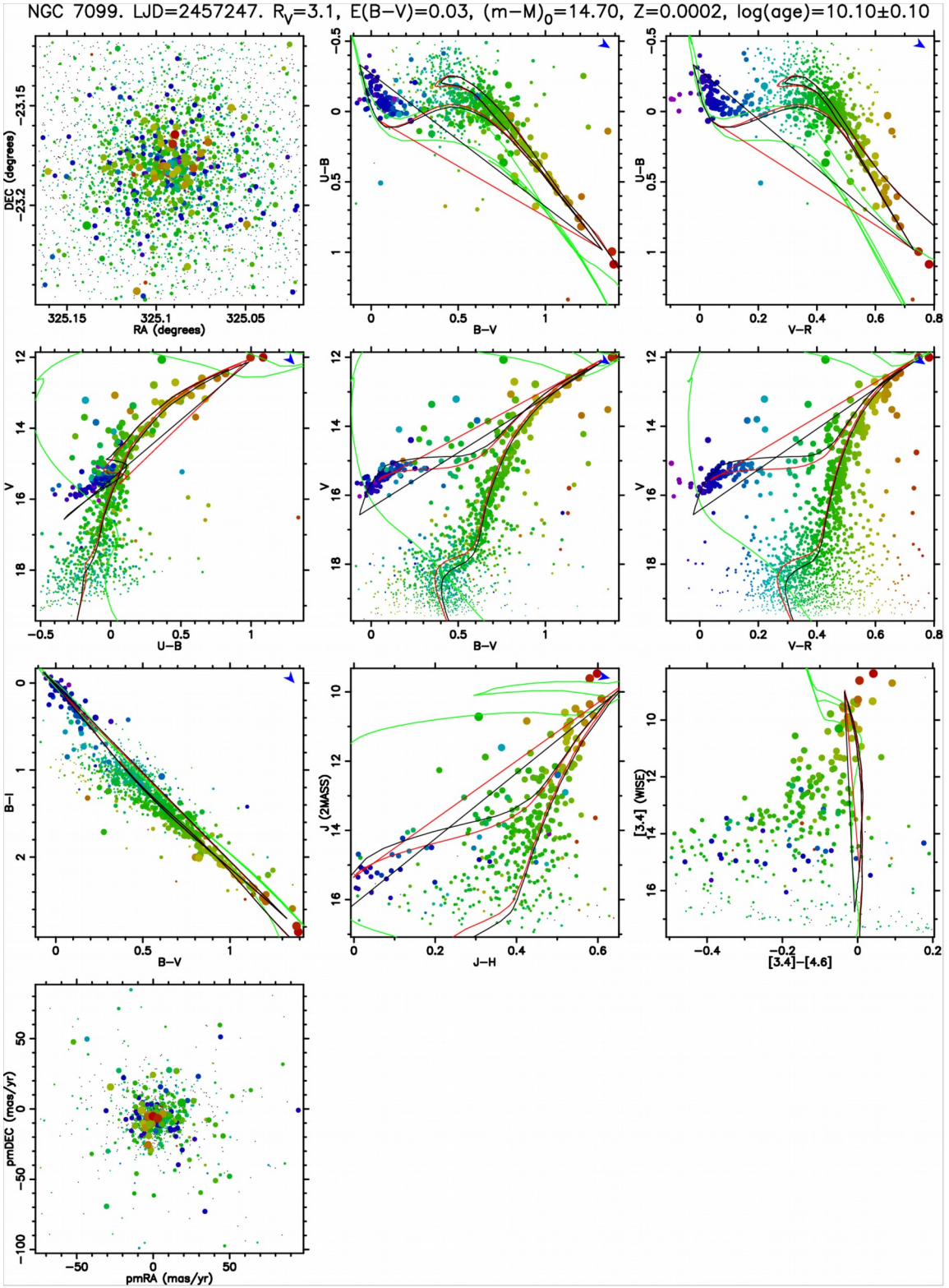
Table 5. Number of measurements in each field.

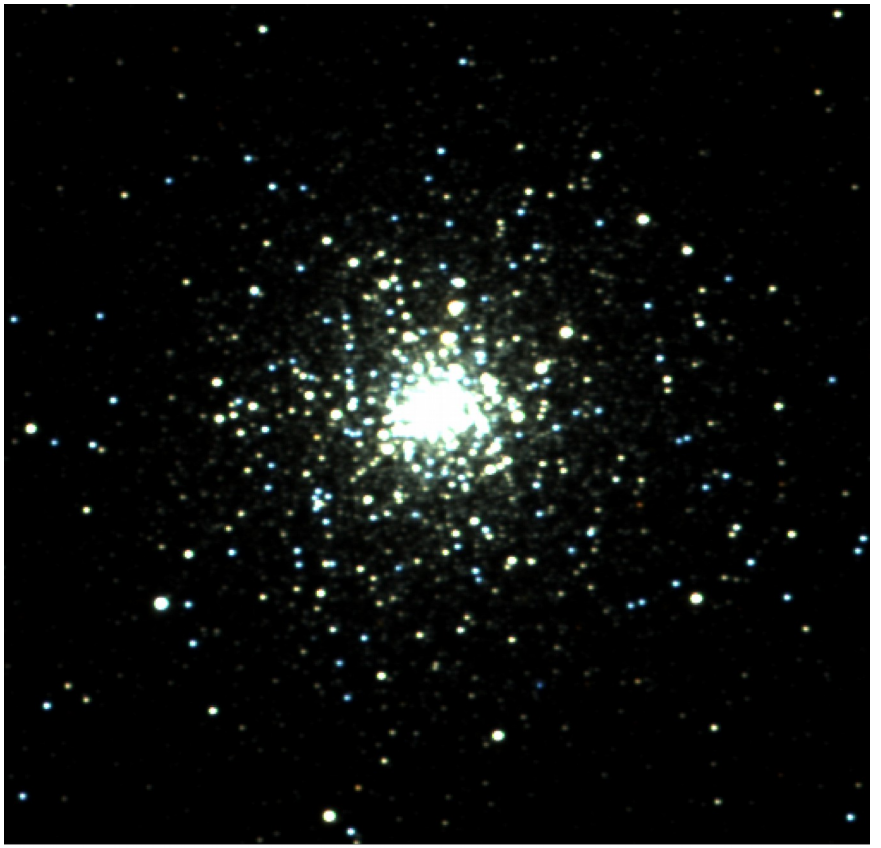
Object	U	B	V	R	I	2MASS	WISE	IPHAS	UKIDSS	SDSS	GLIM	DENIS	GALEX	PPMXL
Basel 13	559	1049	1458	1804	1807	1315	1010	3476	4513	0	0	0	0	2171
Berkeley 61	361	769	1078	1423	1431	381	564	1125	0	0	0	0	0	822
ESO 525-08	504	843	970	1103	1015	283	512	0	0	0	0	123	0	779
FSR 0019	675	2155	2562	2683	2627	1961	940	0	0	0	0	1641	0	3913
FSR 0041	147	324	417	472	446	219	422	0	0	0	0	83	0	362
FSR 0293	1078	1628	1811	2096	2125	809	583	2115	0	0	0	0	0	1417
FSR 0370	130	197	258	307	310	121	332	0	0	0	0	0	0	314
FSR 0479	362	503	576	760	766	262	463	0	0	0	0	0	0	610
FSR 0536	139	344	592	871	888	566	545	648	0	0	0	0	0	677
Kronberger 52	1207	1763	2056	2404	2440	3773	1701	8181	8141	0	0	0	0	6615
MWSC 5748	259	418	488	584	576	600	979	0	0	1247	0	178	0	1262
NGC 6293	1337	2361	2520	2856	2867	1787	791	0	0	0	0	819	0	3653
NGC 6401	827	2729	3026	3318	3374	6142	1187	0	0	0	0	1928	0	5288
NGC 7099	860	1530	1795	1829	1509	709	851	0	0	0	0	0	9	1715
NGC 7538	151	265	336	366	369	485	221	283	0	0	0	0	0	422
Teutsch 7	223	750	1366	2094	2102	3775	1947	6579	10752	21	4784	0	0	3846

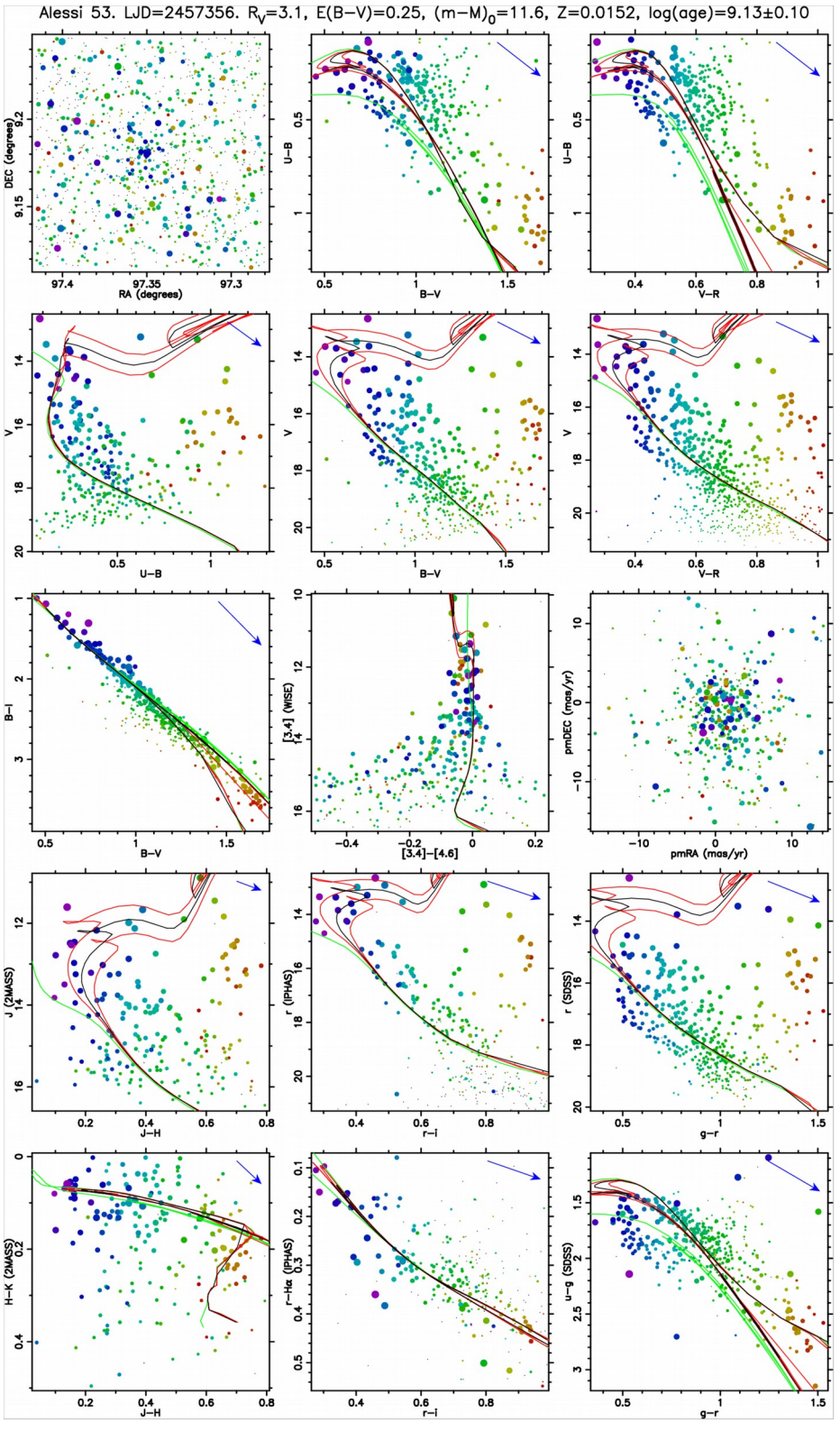

BDSB 47. LJD=2457248. R_V=3.1, E(B−V)=0.61, $(m-M)_0$=10.9, Z=0.0070, log(age)=9.22±0.15
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
J (2MASS)
J−H
[3.4] (WISE)
[3.4]−[4.6]
pmDEC (mas/yr)
pmRA (mas/yr)


FSR 0019. LJD=2457247. R_V=3.1, E(B−V)=0.68, $(m-M)_0$=13.88, Z=0.0014, log(age)=10.10±0.10
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
J (2MASS)
[3.4] (WISE)
J−H
[3.4]−[4.6]
I (DENIS)
I−J
pmDEC (mas/yr)
pmRA (mas/yr)


NGC 7538. LJD=2457248. R_V=3.1, E(B−V)=0.79, $(m-M)_0$=10.6, Z=0.0070, log(age)=8.85±0.10
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
J (2MASS)
J−H
[3.4] (WISE)
[3.4]−[4.6]
r (IPHAS)
r−i
pmDEC (mas/yr)
pmRA (mas/yr)


NGC 7099. LJD=2457247. R_V=3.1, E(B−V)=0.03, $(m-M)_0$=14.70, Z=0.0002, log(age)=10.10±0.10
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
J (2MASS)
J−H
[3.4] (WISE)
[3.4]−[4.6]
pmDEC (mas/yr)
pmRA (mas/yr)




Alessi 53. LJD=2457356. R_V=3.1, E(B−V)=0.25, $(m-M)_0$=11.6, Z=0.0152, log(age)=9.13±0.10
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
[3.4] (WISE)
[3.4]−[4.6]
pmDEC (mas/yr)
pmRA (mas/yr)
J (2MASS)
J−H
r (IPHAS)
r−i
r (SDSS)
g−r
H−K (2MASS)
r−Hα (IPHAS)
u−g (SDSS)

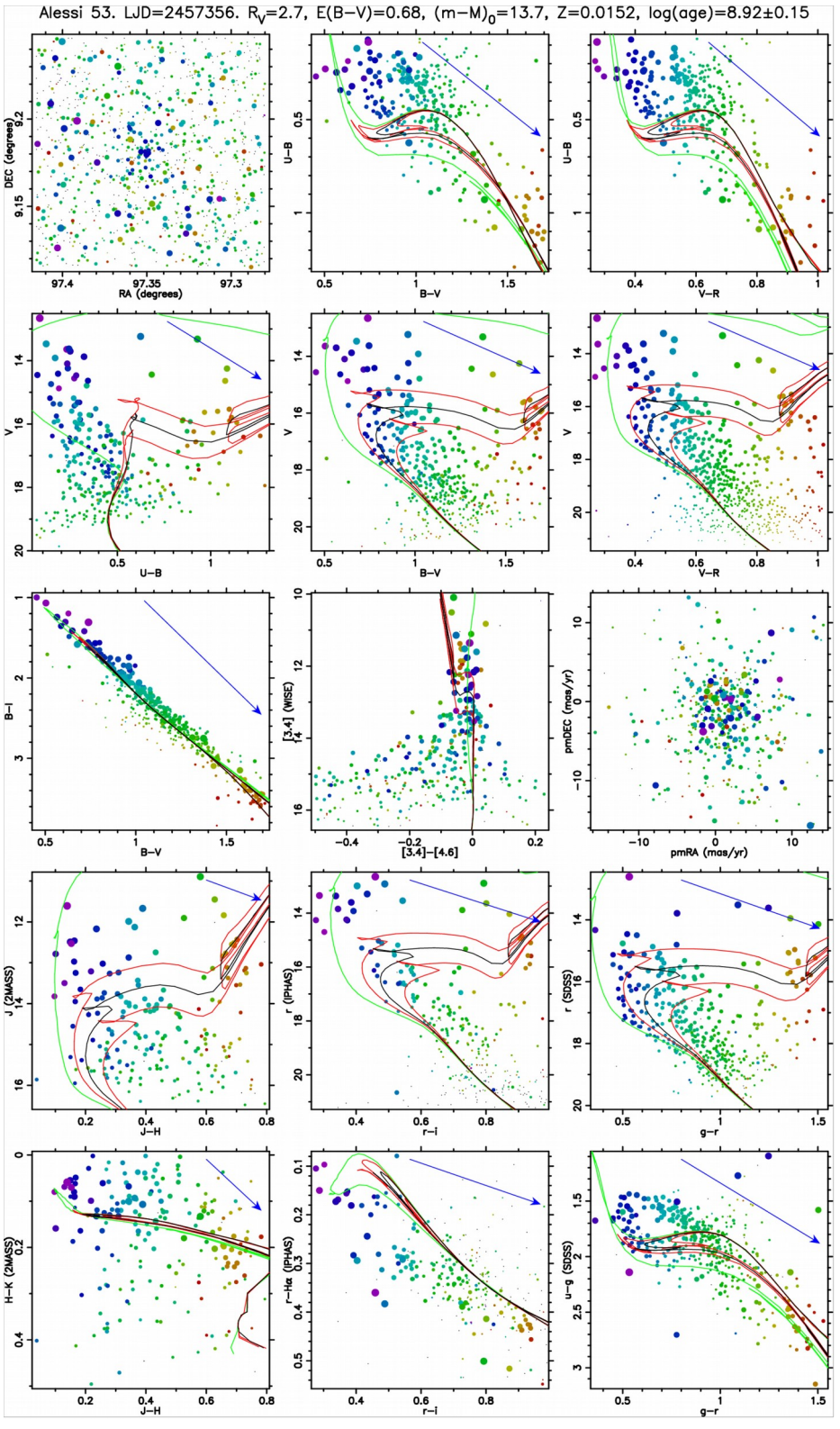
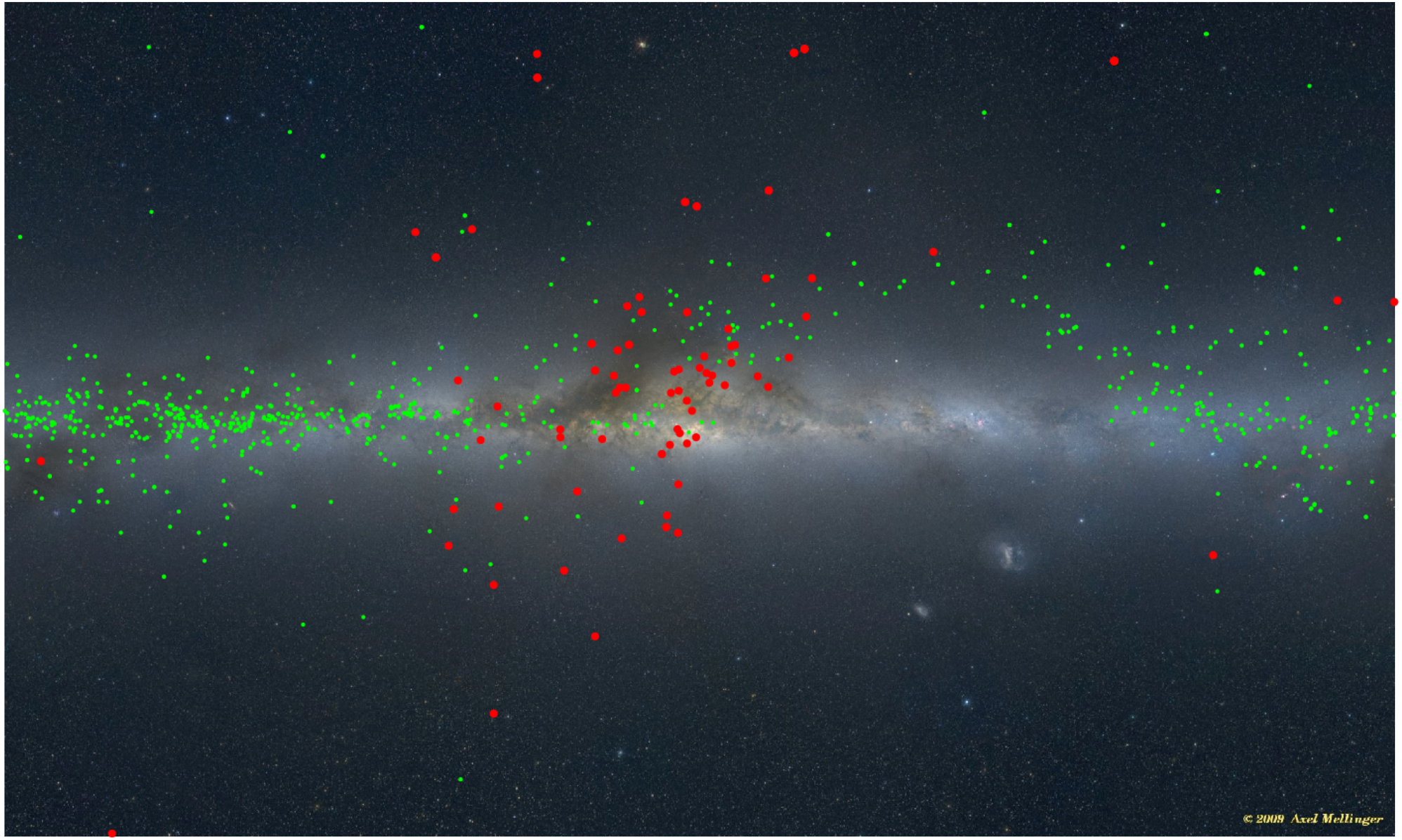

Alessi 53. LJD=2457356. R_V=2.7, E(B−V)=0.68, $(m-M)_0$=13.7, Z=0.0152, log(age)=8.92±0.15
DEC (degrees)
RA (degrees)
U−B
B−V
V−R
V
B−I
[3.4] (WISE)
[3.4]−[4.6]
pmDEC (mas/yr)
pmRA (mas/yr)
J (2MASS)
J−H
r (IPHAS)
r−i
r (SDSS)
g−r
H−K (2MASS)
r−Hα (IPHAS)
u−g (SDSS)

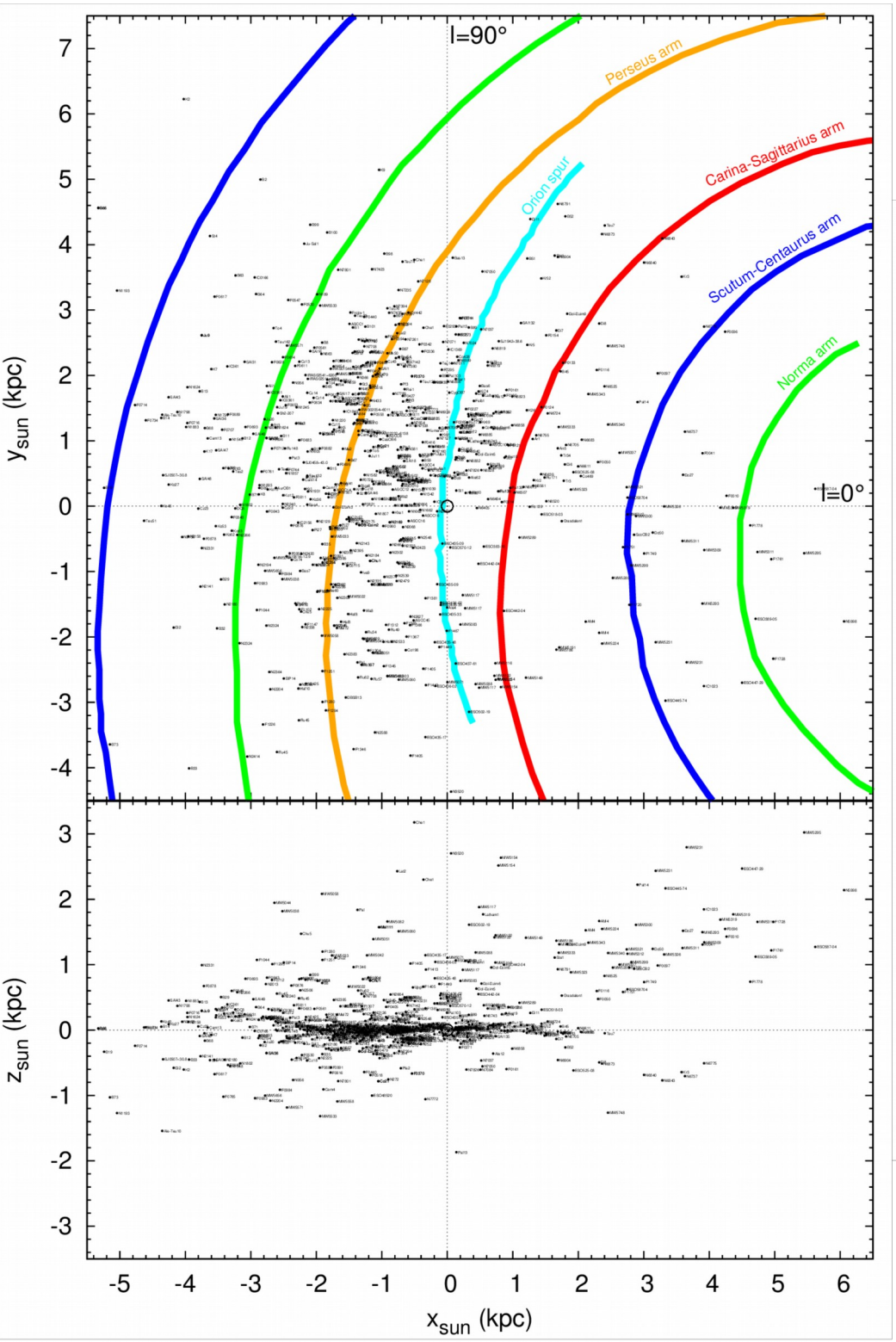
Table 6. Physical parameters.

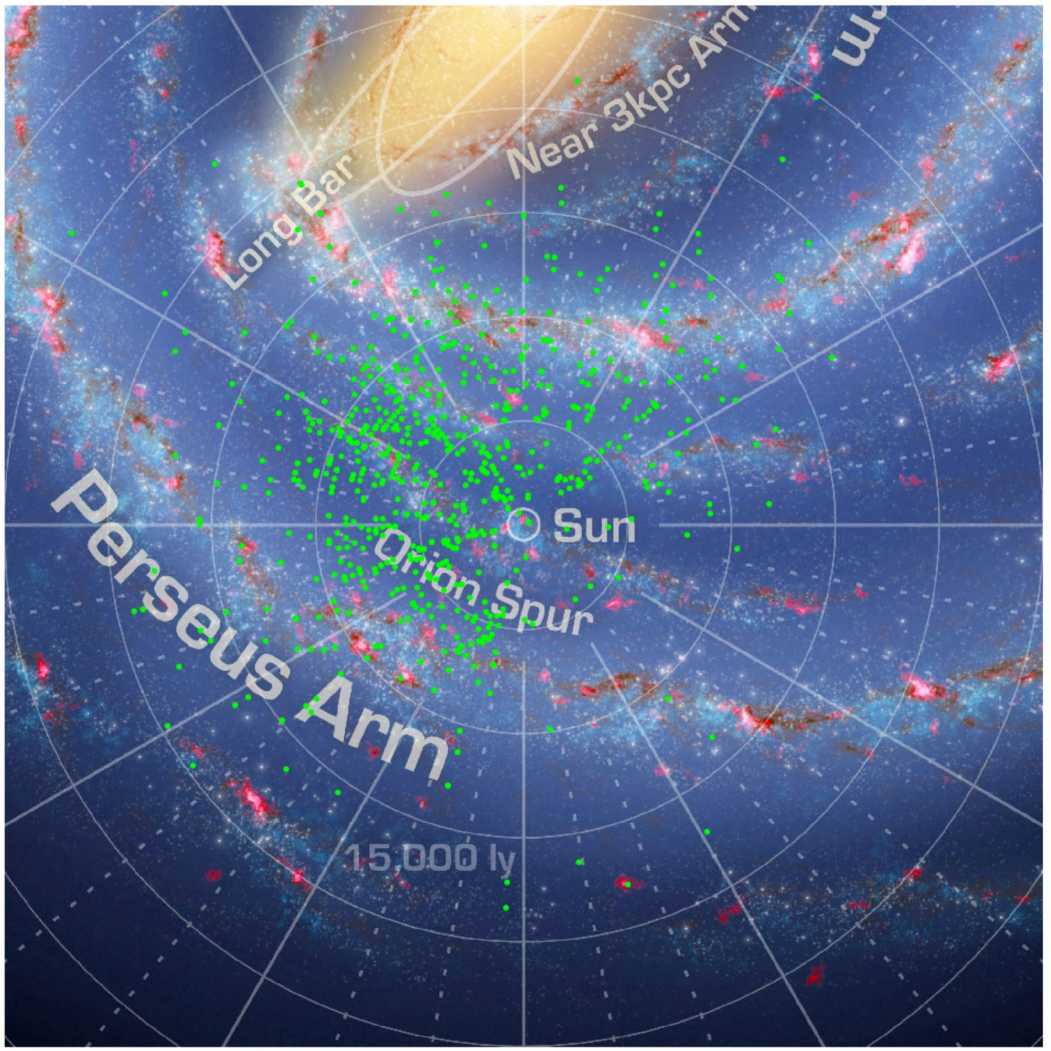
Cluster	LJD $(days)$	R_V (mag)	$E(B-V)$ (mag)	$(m-M)_0$ (mag)	Dist. (pc)	Z	$[Fe/H]$ (dex)	$log(age)$ (yr)	Filters	References
Basel 13	2457247	3.1	0.41	12.90	3802	0.0152	0.000	9.22±0.15	UBVRI	this paper
Basel 13	2457247	3.1	0.28	12.60	3311	0.0152	0.000	8.90±0.15	UBVRI	this paper
		3.1	0.34	10.59	1313	0.0152	0.000	8.96	BVJHK	Kharchenko et al. (2013)
		3.1	0.48	11.60	2089	0.0152	0.000	8.90	BVJHK	Bukowiecki et al. (2011)
Berkeley 61	2457248	2.8	0.89	11.70	2188	0.0030	-0.705	8.00±0.10	UBVRI	this paper
		3.1	1.04	11.66	2153	0.0152	0.000	8.98	BVJHK	Kharchenko et al. (2013)
		3.1	0.69	12.90	3802	0.0152	0.000	8.25	BVJHK	Bukowiecki et al. (2011)
		3.1	1.09	12.62	3342	0.0152	0.000	8.90	JHK	Tadross (2008)
ESO 525-08	2457248	3.1	0.10	11.50	1995	0.0040	-0.580	9.80±0.10	UBVRI	this paper
		3.1	0.48	12.05	2566	0.0152	0.000	9.20	BVJHK	Kharchenko et al. (2013)
		3.1	0.48	11.95	2455	0.0152	0.000	8.95	BVJHK	Bukowiecki et al. (2011)
		3.1	0.36	11.07	1637	0.0152	0.000	9.00	JHK	Tadross (2008)
FSR 0019	2457247	3.1	0.68	13.88	5970	0.0014	-1.036	10.10±0.10	UBVRI	this paper
		3.1	0.98	13.88	5984	0.0014	-1.048	10.10	BVJHK	Kharchenko et al. (2013)
FSR 0041	2457247	3.1	0.53	13.00	3981	0.0070	-0.337	9.44±0.10	UBVRI	this paper
		3.1	0.58	13.01	4003	0.0152	0.000	9.50	BVJHK	Kharchenko et al. (2013)
FSR 0293	2457248	3.1	0.16	12.20	2754	0.0130	-0.068	9.00±0.20	UBVRI	this paper
		3.1	0.40	12.24	2802	0.0152	0.000	9.22	BVJHK	Kharchenko et al. (2013)
FSR 0370	2457247	3.1	0.09	11.57	2061	0.0060	-0.404	9.40±0.10	UBVRI	this paper
		3.1	0.40	11.57	2062	0.0152	0.000	9.15	BVJHK	Kharchenko et al. (2013)
FSR 0479	2457247	3.4	0.23	11.80	2291	0.0080	-0.279	9.10±0.20	UBVRI	this paper
		3.1	0.48	11.55	2038	0.0152	0.000	8.80	BVJHK	Kharchenko et al. (2013)
FSR 0536	2457247	3.1	1.20	12.00	2512	0.0152	0.000	8.60±0.10	UBVRI	this paper
		3.1	1.20	12.39	3001	0.0152	0.000	8.40	BVJHK	Kharchenko et al. (2013)
Kronberger 52	2457247	3.1	0.77	12.88	3767	0.0152	0.000	8.80±0.10	UBVRI	this paper
Kronberger 52	2457247	3.1	0.13	10.10	1047	0.0152	0.000	9.00±0.15	UBVRI	this paper
		3.1	0.98	12.19	2735	0.0152	0.000	9.00	BVJHK	Kharchenko et al. (2013)
		3.1	0.77	12.88	3767	0.0152	0.000	8.80	BVJHK	Bukowiecki et al. (2011)
		3.1	2.45	9.24	705	0.0152	0.000	8.11	JHK	?
		3.1	2.45	9.24	705	0.0152	0.000	8.11	JHK	Kronberger et al. (2006)
MWSC 5748	2457248	3.1	0.14	12.70	3467	0.0130	-0.068	9.28±0.20	UBVRI	this paper
NGC 6293	2457248	3.1	0.36	14.88	9462	0.0002	-1.881	10.10±0.10	UBVRI	this paper
		3.1	0.36	14.88	9475	0.0002	-1.978	10.10	BVJHK	Kharchenko et al. (2013)
NGC 6401	2457248	3.1	0.72	15.13	10617	0.0014	-1.036	10.05±0.10	UBVRI	this paper
		3.1	0.72	15.13	10597	0.0014	-1.023	10.05	BVJHK	Kharchenko et al. (2013)
NGC 7099	2457247	3.1	0.03	14.70	8710	0.0002	-1.881	10.10±0.10	UBVRI	this paper
		3.1	0.03	14.54	8110	0.0002	-1.978	10.10	BVJHK	Kharchenko et al. (2013)
NGC 7538	2457248	3.1	0.79	10.60	1318	0.0070	-0.337	8.85±0.10	UBVRI	this paper
		3.1	1.15	12.24	2800	0.0152	0.000	6.30	BVJHK	Kharchenko et al. (2013)
Teutsch 7	2457247	3.1	1.67	13.46	4920	0.0152	0.000	8.35±0.10	UBVRI	this paper
Teutsch 7	2457247	3.1	0.93	9.60	832	0.0050	-0.483	9.00±0.10	UBVRI	this paper
		3.1	1.67	13.46	4929	0.0152	0.000	8.65	BVJHK	Kharchenko et al. (2013)
		3.1	1.15	12.87	3750	0.0152	0.000	9.05	BVJHK	Bukowiecki et al. (2011)
		3.1	1.57	14.25	7079	0.0152	0.000	8.48	JHK	Kronberger et al. (2006)

Current status...



687 observed open (green) and 76 globular clusters (red)


l=90°
l=0°
Perseus arm
Orion spur
Carina-Sagittarius arm
Scutum-Centaurus arm
Norma arm
y_{sun} (kpc)
z_{sun} (kpc)
x_{sun} (kpc)


Long Bar
Near 3kpc Arm
Sun
Orion Spur
Perseus Arm
15,000 ly

Web page… www.astrosen.unam.mx/~rmm/SPMO_UBVRI_Survey

observations.html - Mozilla Firefox

File Edit View History Bookmarks Tools Help

observations.html

www.astrosen.unam.mx/~rmm/SPMO_UBVRI_Survey/observations.html

psf penny moffat

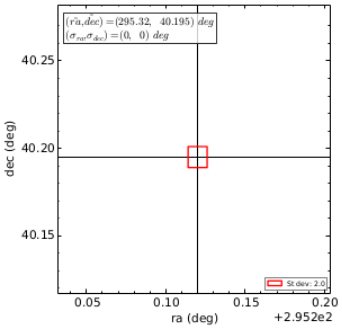
gmail ADS SIMBAD: Query by id... StarAlt

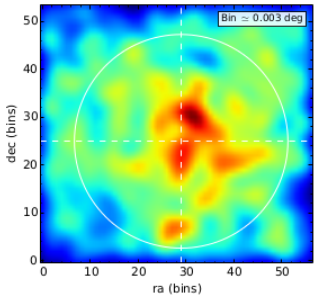
Num.	Cluster	View			LJD	Rv	E(B-V)	(m-M)o	Z	log(age)	RA(2000)	DEC(2000)	Longitude	Latitude	Dist(par)	Obs. run	Observers
1	1636-283	field	fit	hess	2456771	3.6	0.46	14.6	0.0011	10.10	249.860284	-28.407800	351.906400	12.087670	8317.638	201404b	Castro-Altamirano
2	AH03_J2011+26.7	field	fit	hess	2455459	3.1	0.62	10.2	0.0152	8.67	302.988744	26.733254	65.736210	-3.923741	1122.018	201009c	Michel
3	Alessi-Teutsch_10	field	fit	hess	2457039	3.4	0.18	13.3	0.0075	9.50	56.115493	29.672835	162.166800	-19.721250	4570.882	201501c	Michel-Eaton
4	Alessi_4	field	fit	hess	2457039	2.7	0.06	10.9	0.0065	9.12	154.069928	-34.366375	269.915100	18.374120	1548.817	201501c	Michel-Eaton
5	Alessi_10	field	fit	hess	2457217	3.1	0.09	8.5	0.0152	8.40	301.179420	-10.488975	31.637950	-20.982640	501.187	201507_OSN	Costado@OSN
6	Alessi_12	field	fit	hess	2457216	3.1	0.06	9.7	0.0100	9.30	310.845219	23.786732	67.403180	-11.434290	870.964	201507_OSN	Costado@OSN
7	Alessi_19	field	fit	hess	2457216	3.1	0.17	10.3	0.0080	9.40	274.788760	12.192097	40.314170	12.616540	1148.154	201507_OSN	Costado@OSN
8	Alessi_53	field	fit	hess	2457356	3.1	0.27	11.6	0.0152	9.13	97.347679	9.180727	202.256500	-0.666575	2089.296	201511	Michel
9	Alessi_60	field	fit	hess	2456753	3.7	0.27	11.8	0.0060	8.65	105.622240	-1.134706	215.202800	1.940591	2238.721	201404a	Michel
10	Alessi_62	field	fit	hess	2457218	3.1	0.17	8.7	0.0152	9.05	283.975654	21.618565	52.814920	8.735486	549.541	201507_OSN	Costado@OSN
11	Alessi_J2327+55	field	fit	hess	2457280	3.1	0.24	11.1	0.0090	8.45	351.916763	55.593575	111.227900	-5.363085	1621.810	201509_OSN	Costado@OSN
12	Alicante_1	field	fit	hess	2456674	2.9	0.58	12.4	0.0040	7.00	59.759879	57.225313	146.250900	3.107351	3019.952	201401	Michel-Tapia
13	Alicante_1	field	fit	hess	2456726	3.4	0.54	12.6	0.0120	6.90	59.802008	57.228145	146.266400	3.124347	3311.311	201403	Michel
14	AM_4	field	fit	hess	2456800	3.1	0.02	12.4	0.0050	9.40	208.960789	-27.179247	320.147600	33.530190	3019.952	201405b	Michel
15	AM_4	field	fit	hess	2457422	3.1	0.02	12.2	0.0080	9.40	208.915024	-27.093706	320.131300	33.623950	2754.229	201602b	Michel
16	Andrews-Lindsay_5	field	fit	hess	2455455	4.6	0.68	11.4	0.0300	8.90	281.074773	-4.923920	27.737150	-0.660592	1905.461	201009a	Michel
17	Archinal_1	field	fit	hess	2455455	3.1	1.85	11.1	0.0152	8.15	283.709444	5.549021	38.258920	1.773345	1659.587	201009a	Michel
18	Arp_2	field	fit	hess	2456922	2.7	0.12	17.4	0.0003	10.10	292.183161	-30.356302	8.544643	-20.785410	30902.954	201409b	Michel
19	ASCC_1	field	fit	hess	2456959	3.1	0.41	12.5	0.0100	8.95	2.421521	62.704126	118.166300	0.219247	3162.278	201410	Michel
20	ASCC_2	field	fit	hess	2457280	2.8	0.19	11.0	0.0070	8.85	4.867369	55.649259	118.399200	-6.940973	1584.893	201509_OSN	Costado@OSN
21	ASCC_4	field	fit	hess	2457360	3.1	0.32	9.4	0.0100	9.25	13.311414	61.596103	123.147100	-1.274970	751.623	201512_OSN	Michel@OSN
22	ASCC_6	field	fit	hess	2457422	3.3	0.24	10.8	0.0110	8.00	26.815193	57.673762	130.363700	-4.390317	1412.538	201602b	Michel
23	ASCC_8	field	fit	hess	2457280	3.1	0.60	11.7	0.0152	7.77	35.187104	59.691650	133.987800	-1.249259	2187.762	201509_OSN	Costado@OSN
24	ASCC_10	field	fit	hess	2457408	3.5	0.24	9.4	0.0152	8.30	51.772380	35.034042	155.623000	-17.773980	758.578	201601a	Michel
25	ASCC_11	field	fit	hess	2457280	3.1	0.31	9.4	0.0100	8.35	53.064359	44.838597	150.561300	-9.233962	758.578	201509_OSN	Costado@OSN
26	ASCC_11	field	fit	hess	2457360	3.1	0.27	9.5	0.0110	8.55	53.059026	44.835544	150.559900	-9.238645	794.328	201512_OSN	Michel@OSN

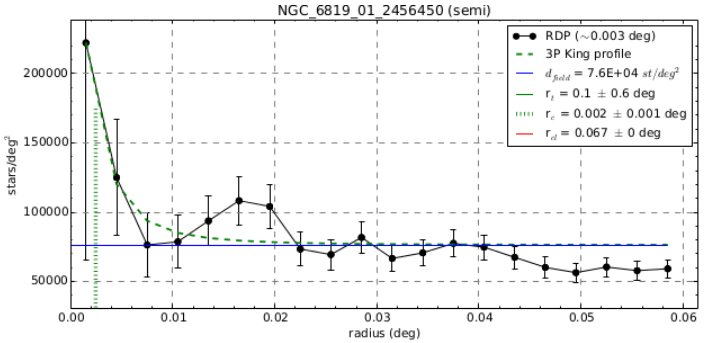
Future work...

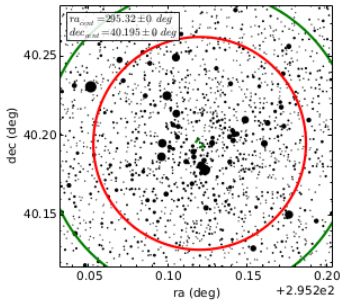
ASteCA

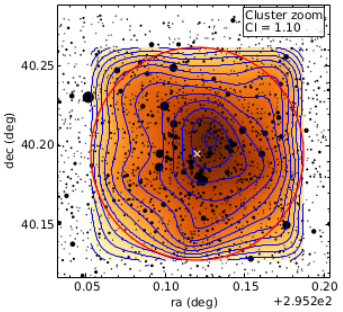
Automated Stellar Cluster Analysis

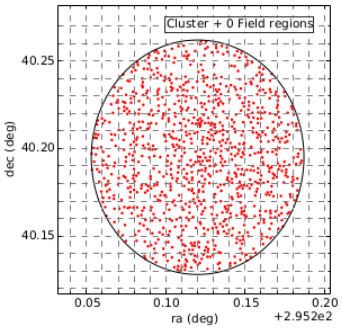


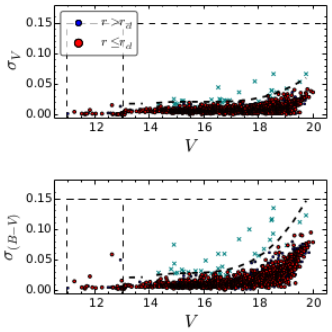


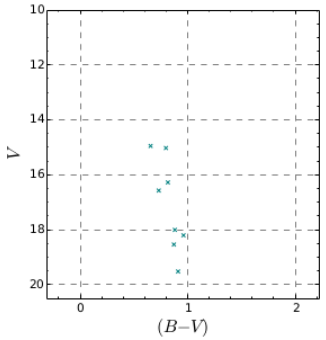


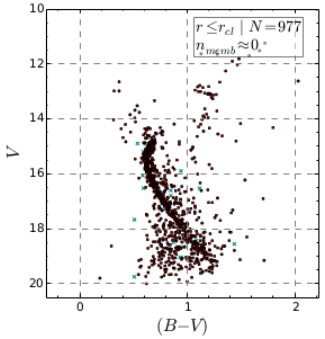


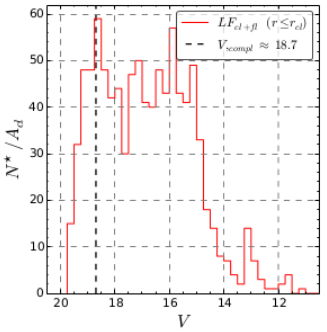


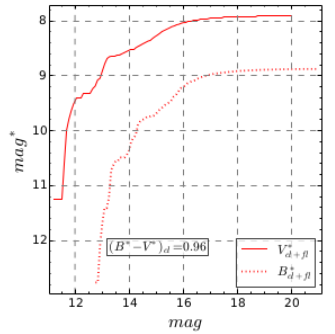


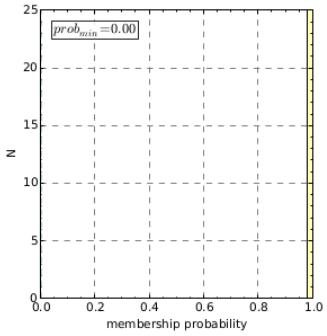


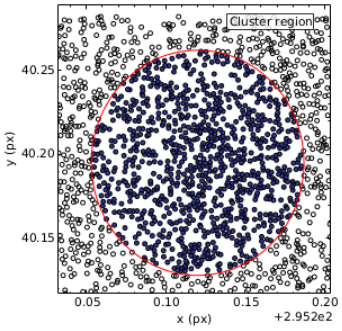


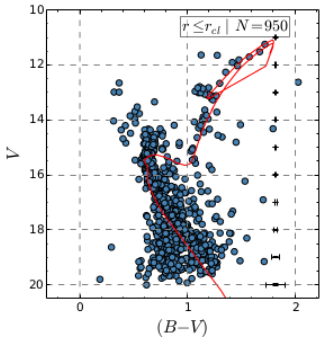


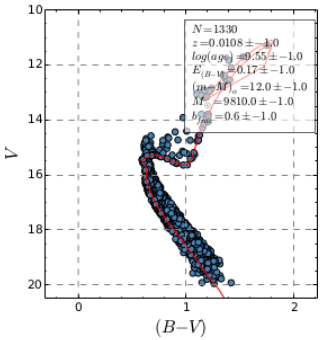




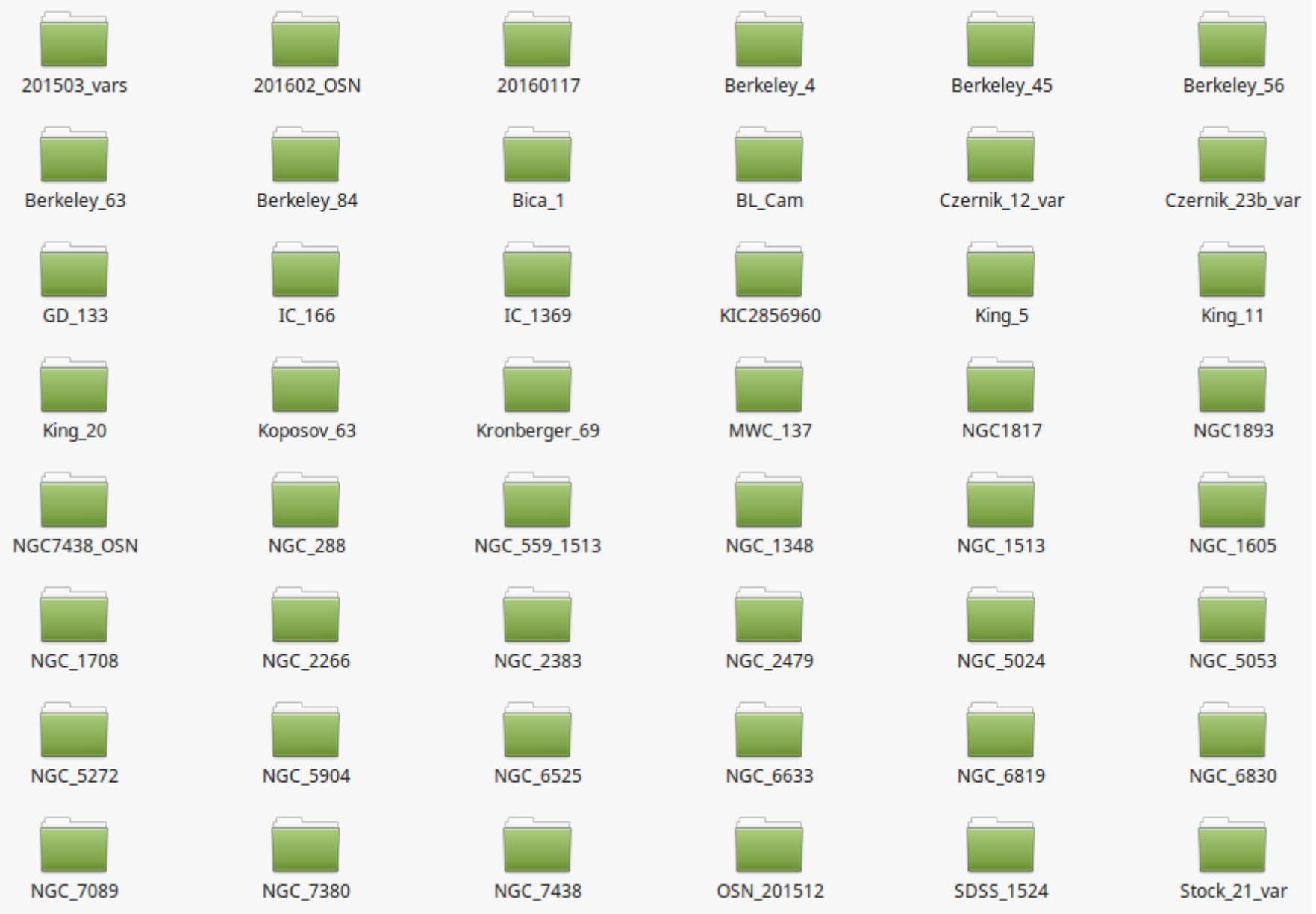






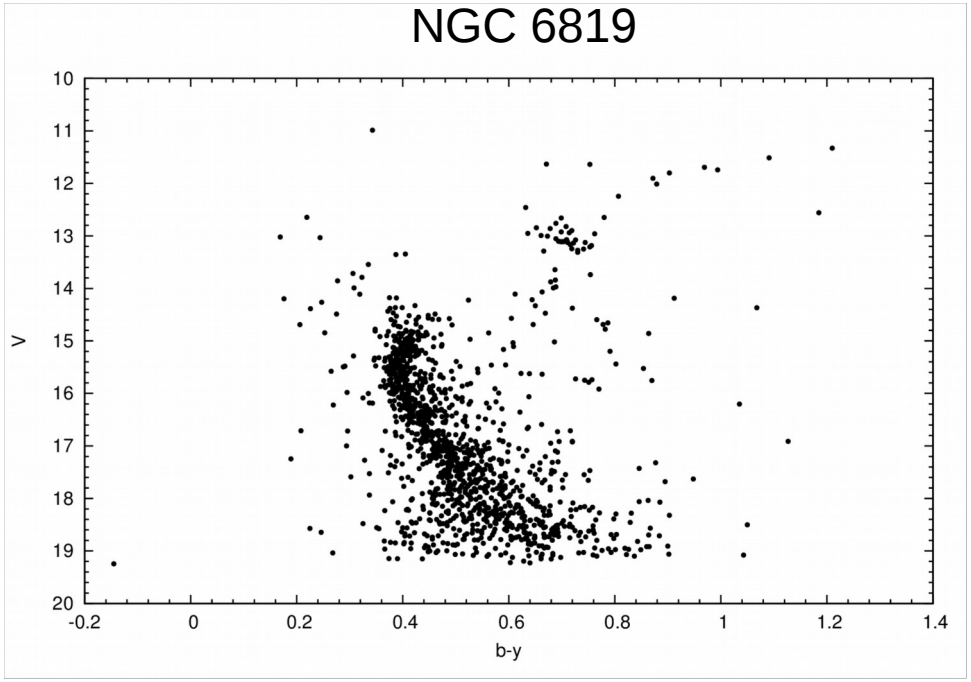


Secondary products… looking for variables

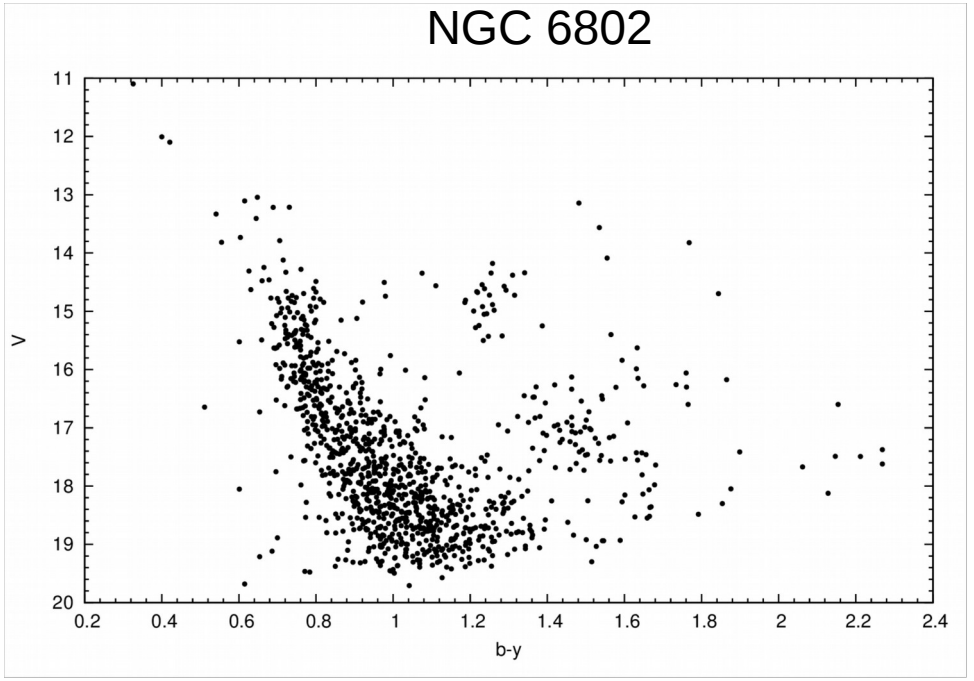


Secondary products… Stromgren photometry

NGC 6819



NGC 6802



Secondary products… contact binaries