Masses of RCS Galaxy Clusters

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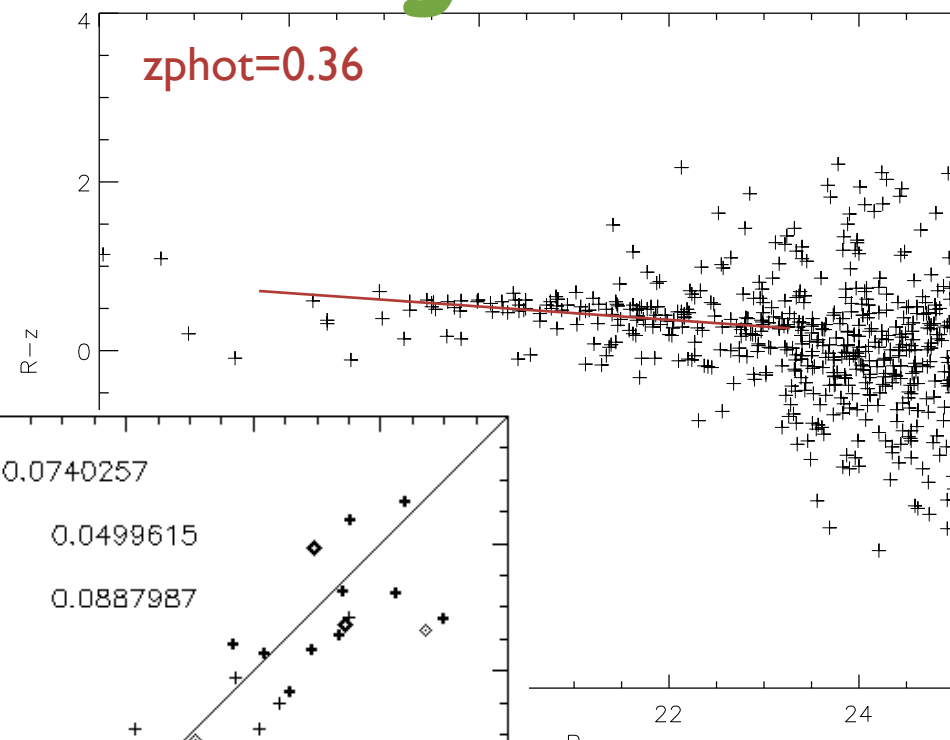
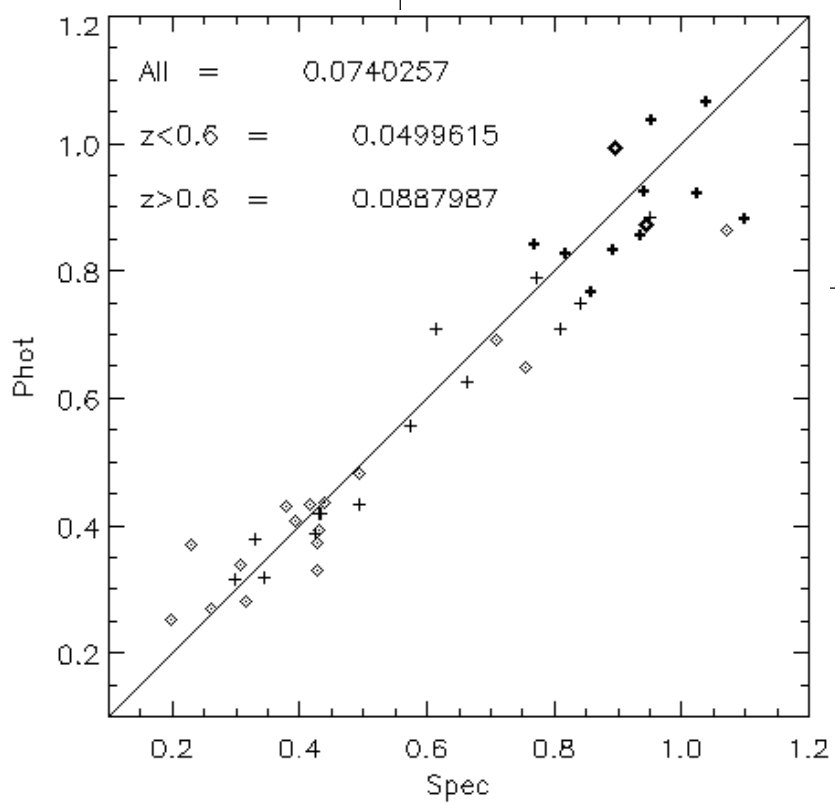
Ringberg 2005

The Red-sequence Cluster Survey

Gladders & Yee (2005)

- 90 sq. deg.
- 2 filters (R, z')
- use red-sequence to ID clusters
  - z
  - richness (B_{gc})



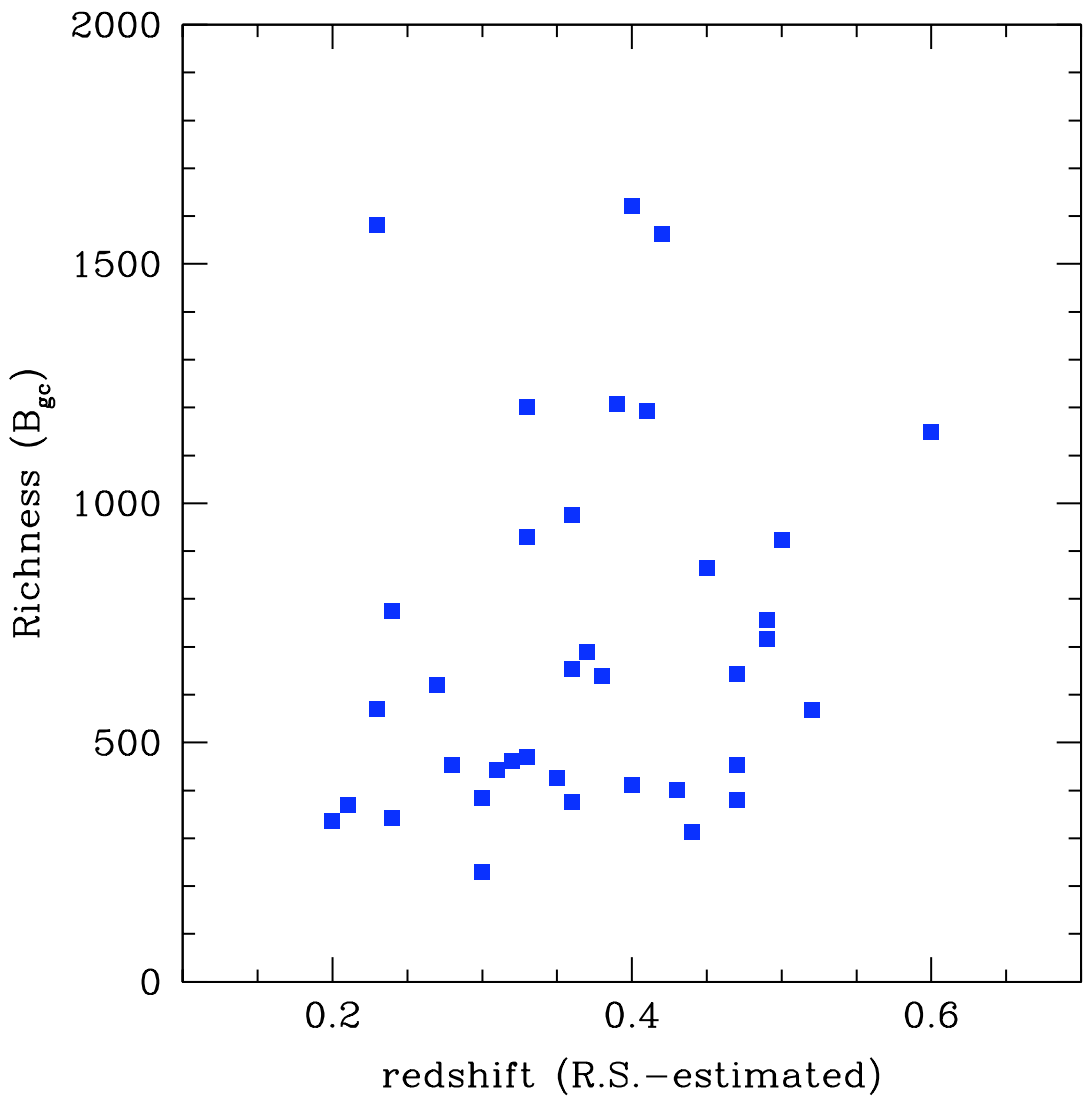


the RCS spectroscopic follow-up survey

- Multi-Object Spectroscopy of galaxies in a subset of the RCS clusters
- select clusters in a wide range of richness
- $0.15 < z < 0.6$ for efficient CFH-MOS & Magellan-LDSS2 observations

Targets

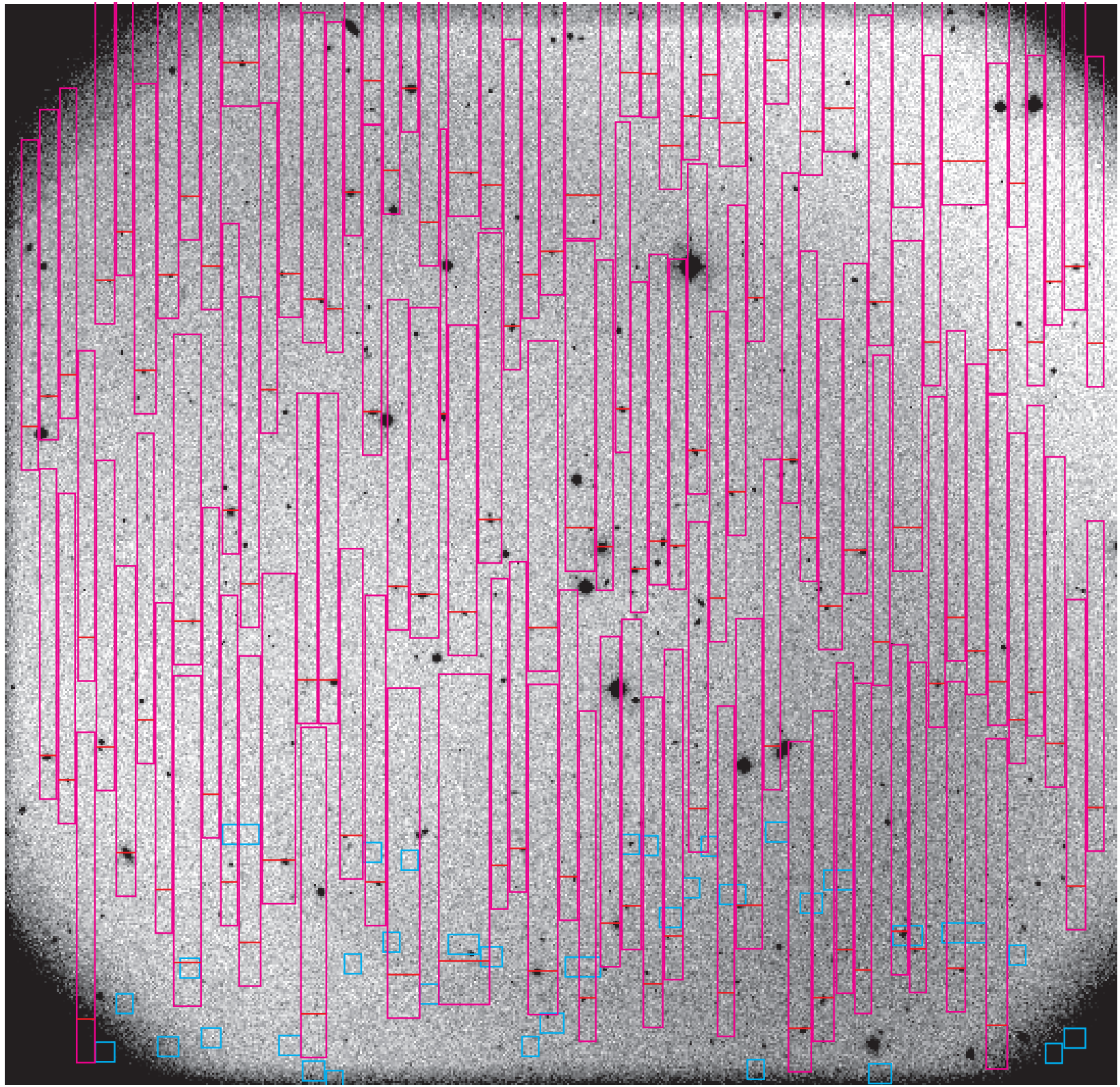
36 clusters, ~7600 slits

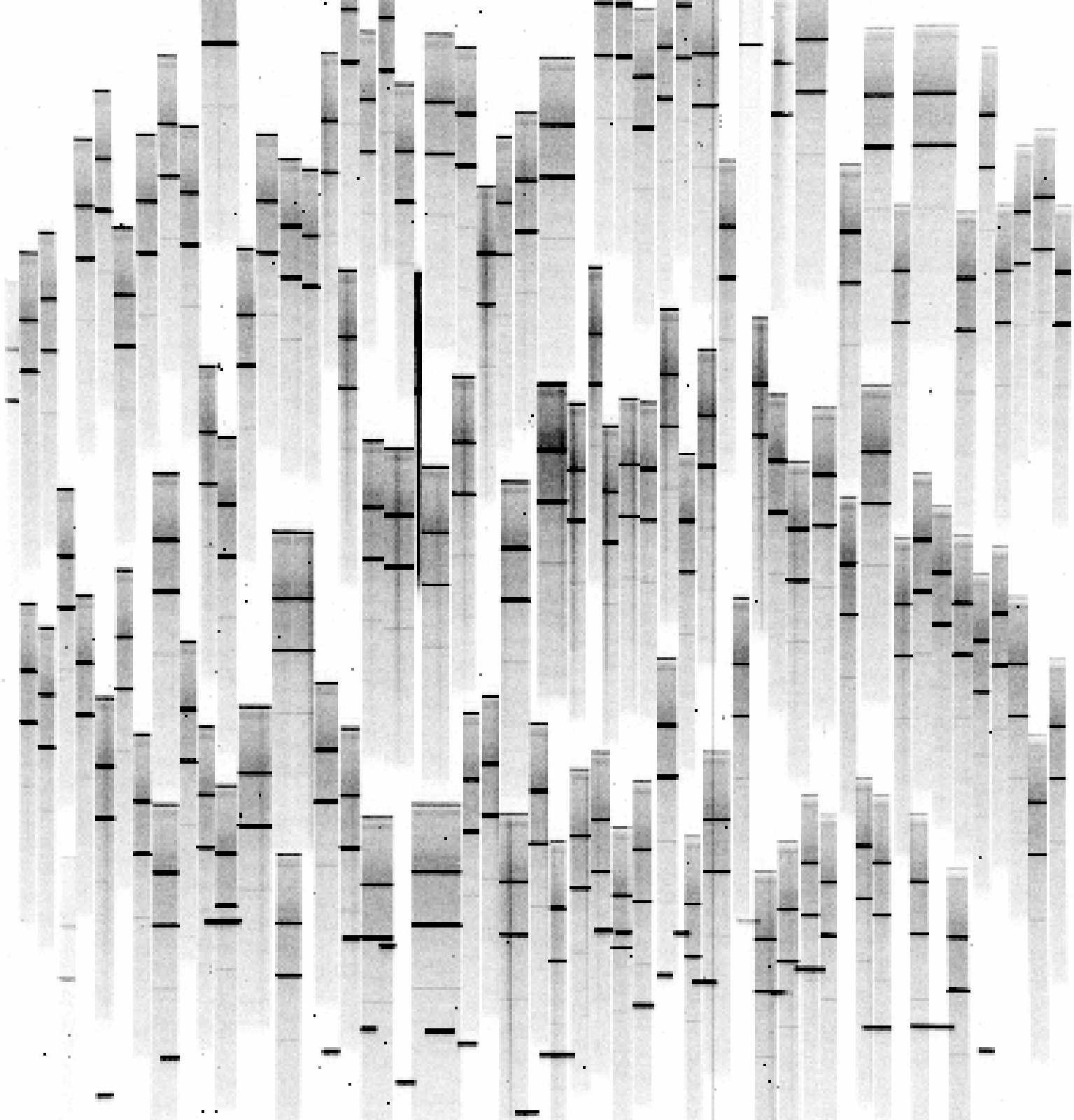


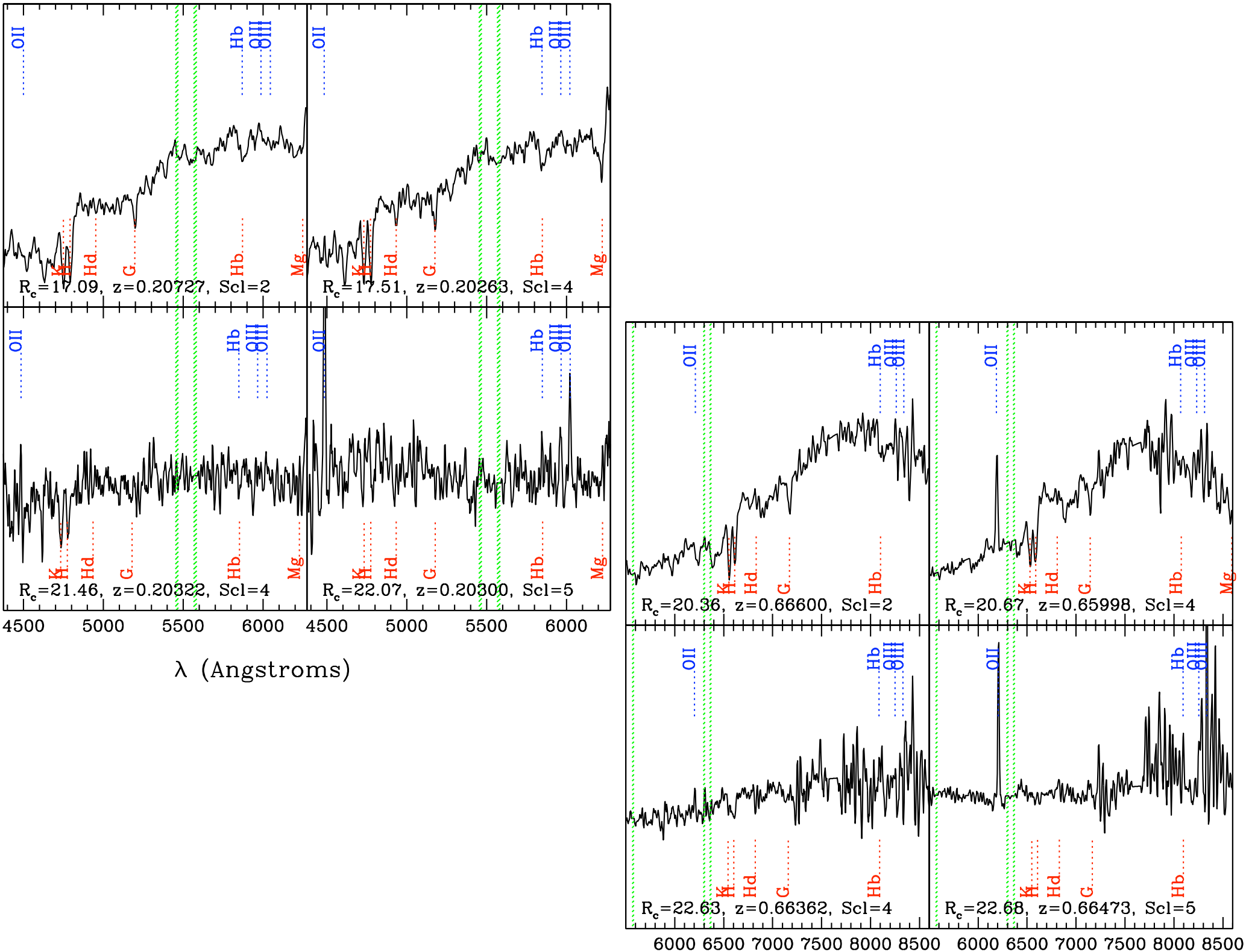
RA (J2000)	Dec (J2000)	z_{phot}	B_{gc}	# pointings	# masks	# slits
Northern Sample ($9' \times 8'$ pointings, $\sim$ 120 slits per mask)						
02:22:40.89	+01:44:42.4	0.20	335	1	2	229
02:23:31.20	+01:18:29.2	0.36	375	1	2	212
02:25:16.39	+00:11:22.1	0.28	453	1	2	246
03:51:39.53	-09:56:31.2	0.24	775	2	3	331
09:28:21.20	+36:46:28.0	0.39	1207	2	4	468
09:30:10.85	+38:41:29.0	0.47	379	1	2	220
11:20:37.64	+25:22:18.1	0.31	443	2	3	334
11:23:21.59	+25:25:58.6	0.32	461	1	2	233
13:25:23.65	+29:19:10.7	0.43	400	1	2	241
14:46:31.81	+08:59:33.6	0.24	343	1	2	224
14:47:07.50	+09:49:16.7	0.23	1581	3	5	529
14:52:59.87	+08:59:22.3	0.47	454	1	2	231
16:15:46.76	+30:57:25.4	0.42	1563	2	4	451
16:20:04.24	+30:44:55.4	0.30	383	1	2	221
13:31:59.06	+28:45:34.5	0.44	313	1	2	224
21:53:14.59	-05:44:19.3	0.35	425	1	2	215
21:57:00.57	-04:42:03.0	0.27	620	2	4	465
23:15:44.99	+00:53:12.9	0.33	1201	1[a]	2	218
23:16:53.95	-00:11:16.0	0.49	755	1[a]	2	222
23:17:36.36	-01:02:57.6	0.21	369	1	2	226
23:18:30.39	-00:24:40.9	0.38	638	1	2	211
Southern Sample ($6' \times 4'$ pointings, $\sim$ 30 slits per mask).						
02:24:02.66	-02:27:27.3	0.33	470	1	2	62
03:34:13:18	-28:25:20.0	0.60	1148	3	6	190
03:36:32.68	-28:47:29.5	0.47	642	3	6	180
04:36:44.00	-28:12:13.1	0.40	411	1	2	58
04:42:07.27	-28:12:54.6	0.41	1192	3	4	59
05:11:20.01	-42:41:45.6	0.36	653	3	4	128
05:15:36.91	-43:25:39.7	0.36	976	1	2	56
05:19:20.50	-42:47:38.8	0.50	924	3	4	128
11:03:41.29	-04:57:36.0	0.37	690	1	2	67
11:07:53.24	-05:16:37.7	0.52	569	1	2	71
21:15:15.60	-63:09:53.1	0.23	571	1	2	60
21:20:06.35	-62:05:57.7	0.45	866	3	6	192
21:21:53.45	-63:35:29.1	0.40	1622	3	4	178
23:43:57.43	-35:17:28.0	0.49	717	3	6	185
23:47:48.18	-35:35:02.6	0.30	229	3	4	121

the RCS spectroscopic follow-up survey

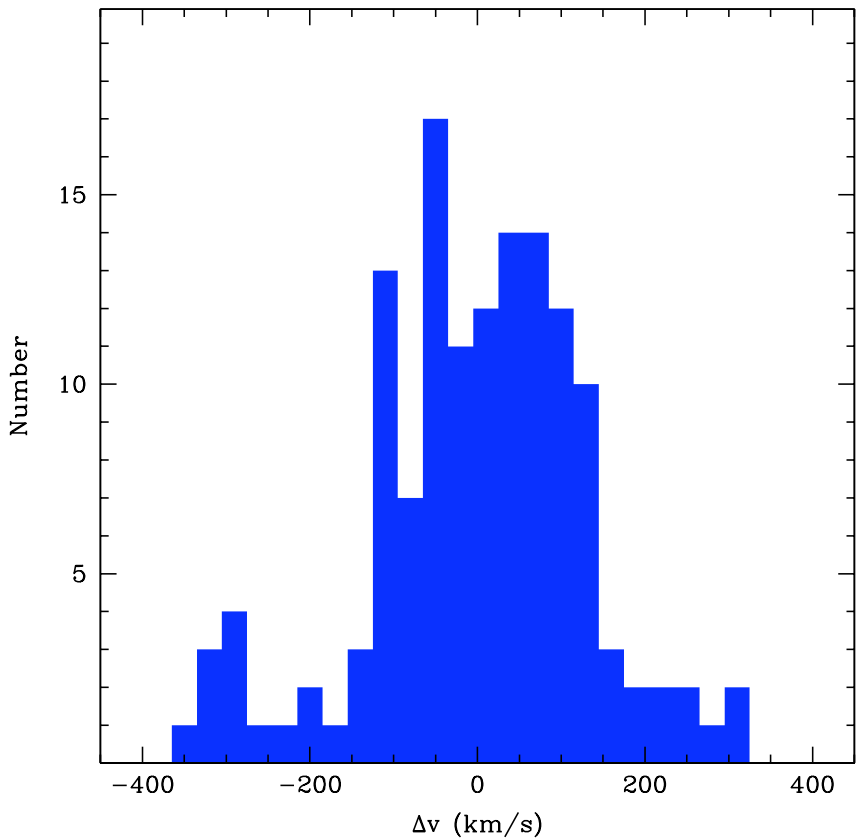
- two masks/field (bright & faint), flanking fields where necessary
  - improved sampling
  - redundant observations
  -
- bandlimiting filter for CFH sample (N×2.5)
- no colour selection criteria



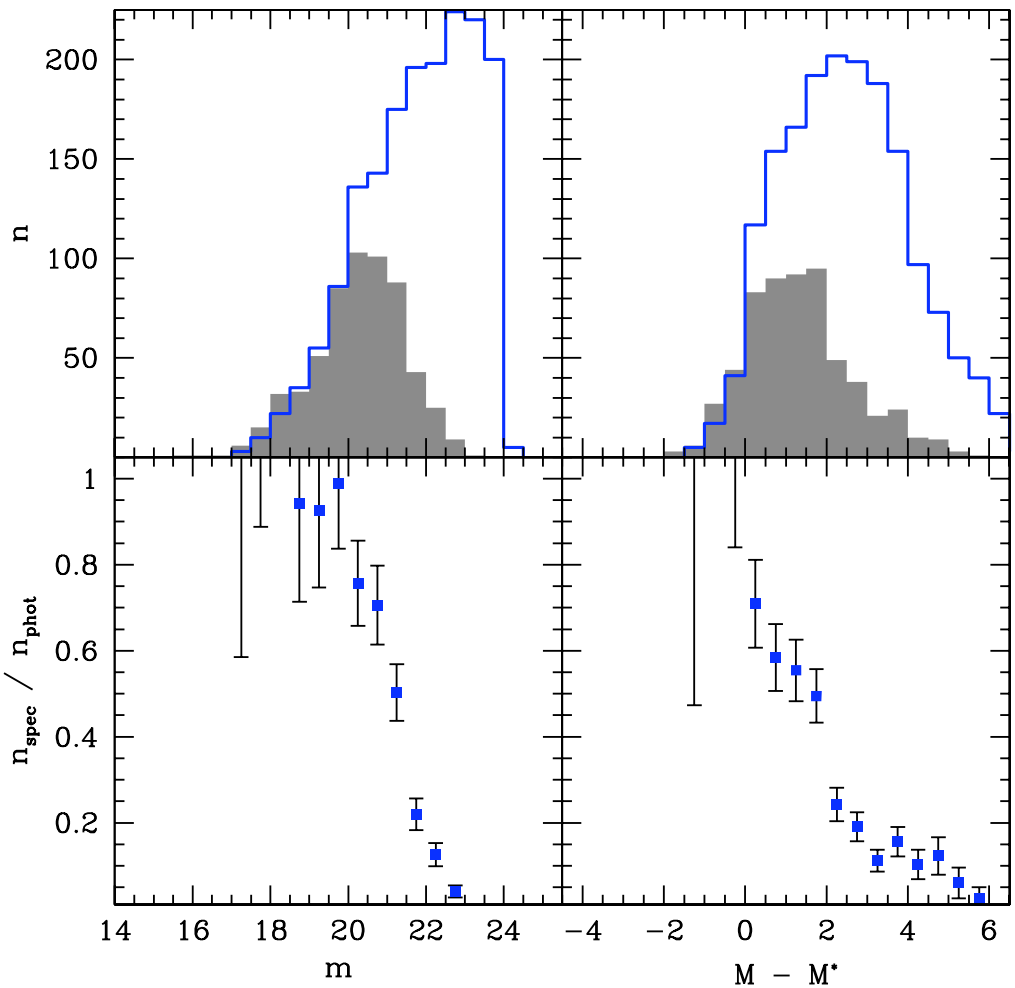


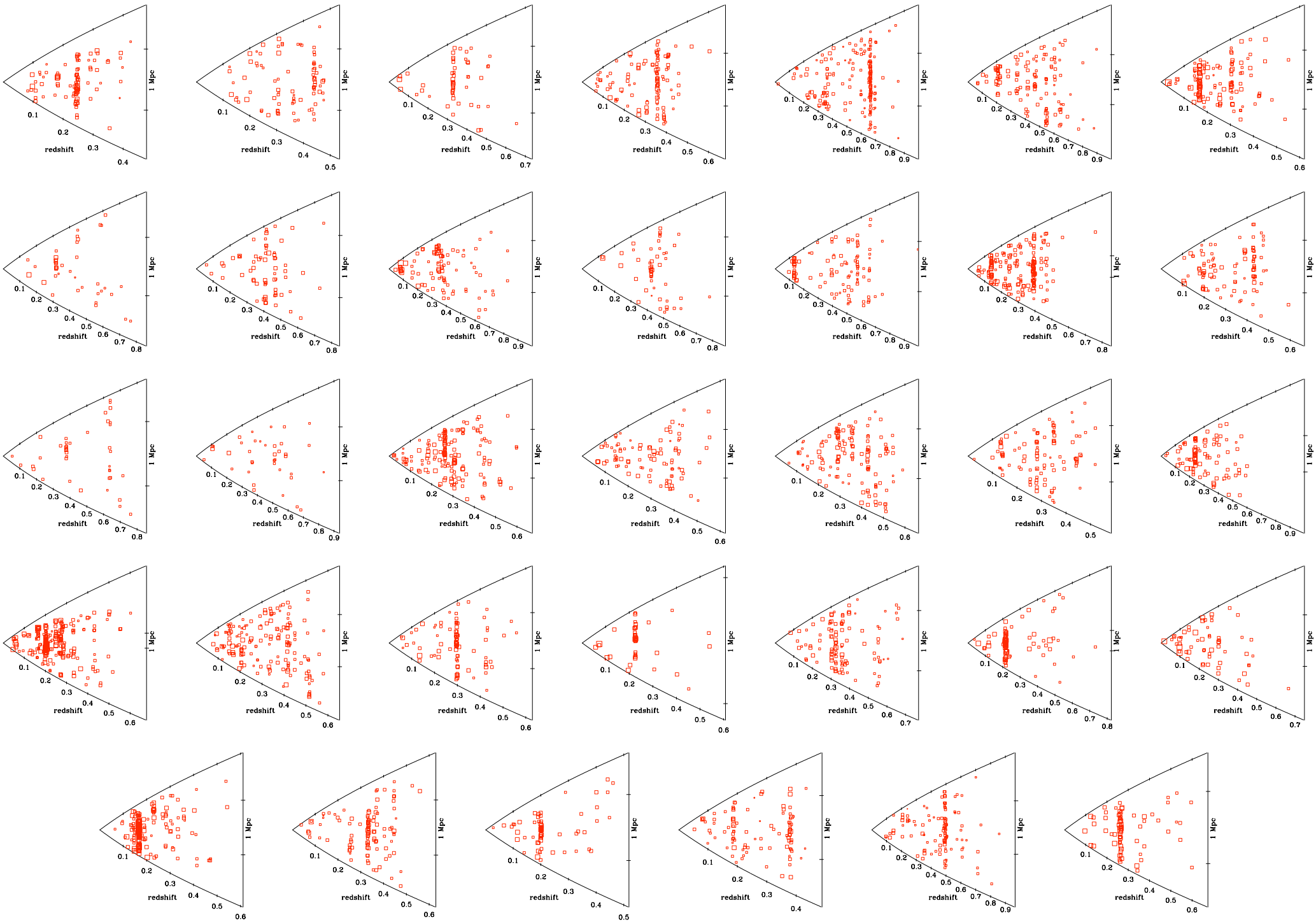

OII
Hb
OIII
K
H
Hd
G
Mg
R_c=17.09, z=0.20727, Scl=2
R_c=17.51, z=0.20263, Scl=4
R_c=21.46, z=0.20322, Scl=4
R_c=22.07, z=0.20300, Scl=5
R_c=20.36, z=0.66600, Scl=2
R_c=20.67, z=0.65998, Scl=4
R_c=22.63, z=0.66362, Scl=4
R_c=22.68, z=0.66473, Scl=5
4500 5000 5500 6000 4500 5000 5500 6000
6000 6500 7000 7500 8000 8500 6000 6500 7000 7500 8000 8500
λ (Angstroms)

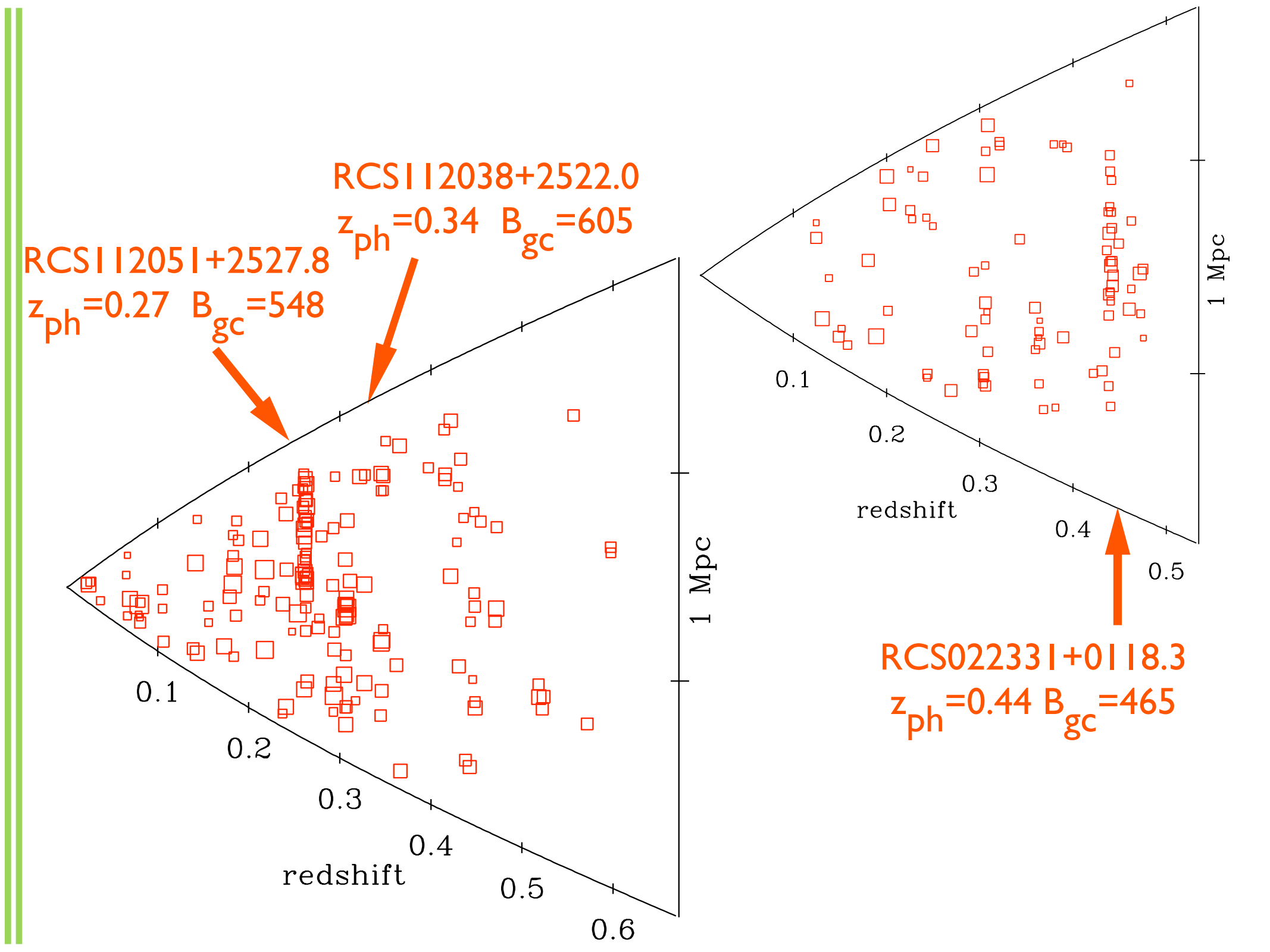
Redshift accuracy



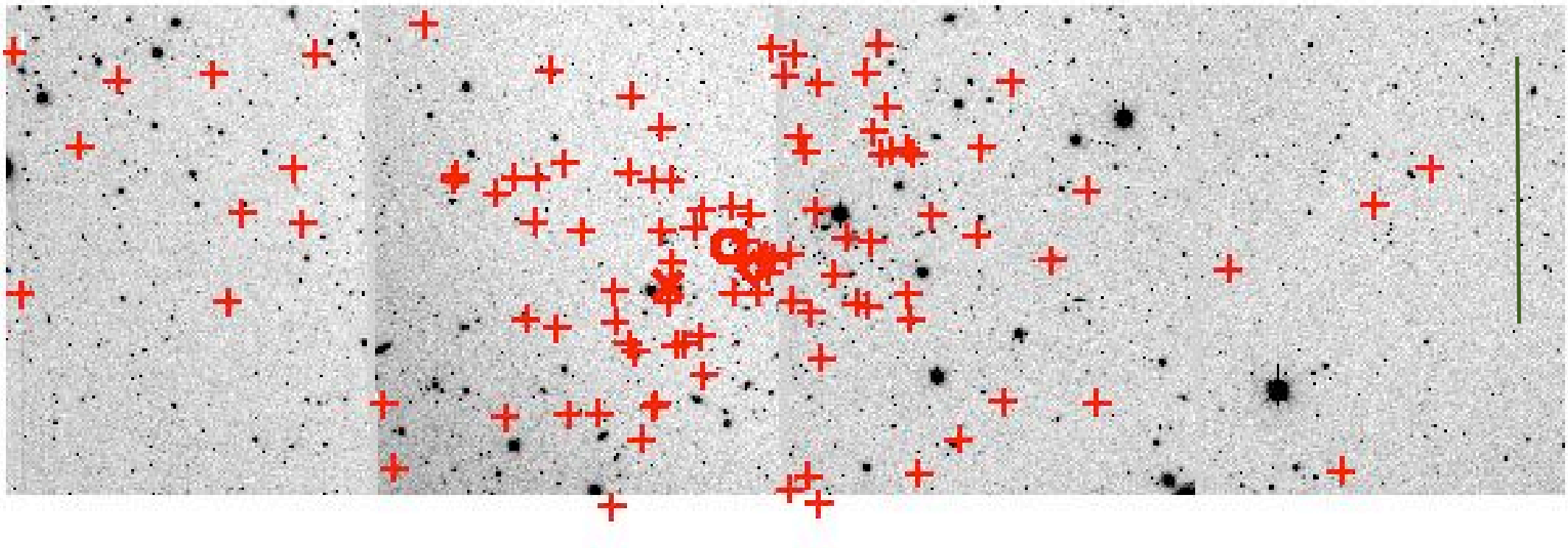
Completeness




redshift
1 Mpc


RCS112038+2522.0
z_{ph}=0.34 B_{gc}=605
RCS112051+2527.8
z_{ph}=0.27 B_{gc}=548
RCS022331+0118.3
z_{ph}=0.44 B_{gc}=465
redshift
0.1
0.2
0.3
0.4
0.5
0.6
1 Mpc

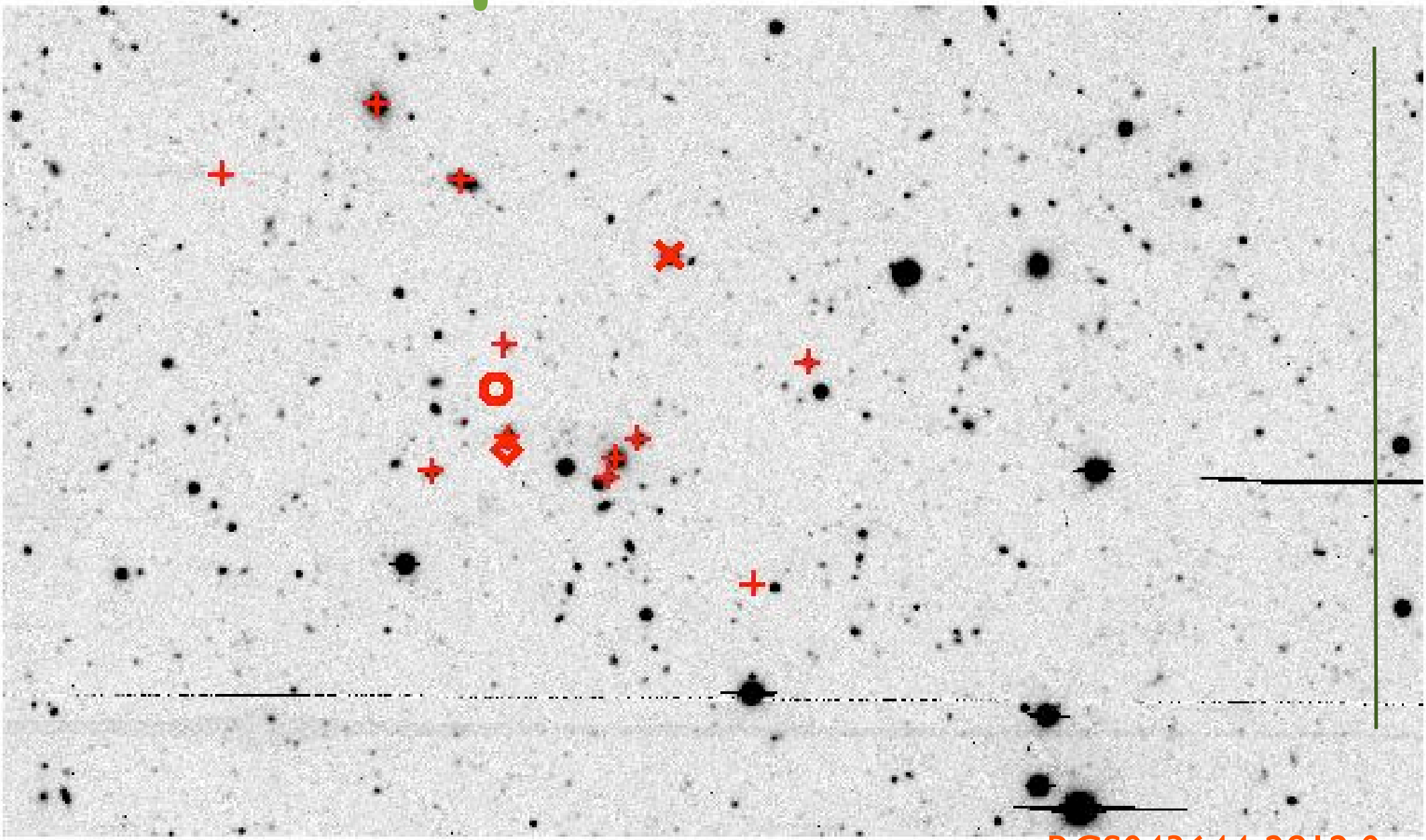
Whoppers



RCS144708+0949.0

z_{sp}=0.20 B_{gc}=1490

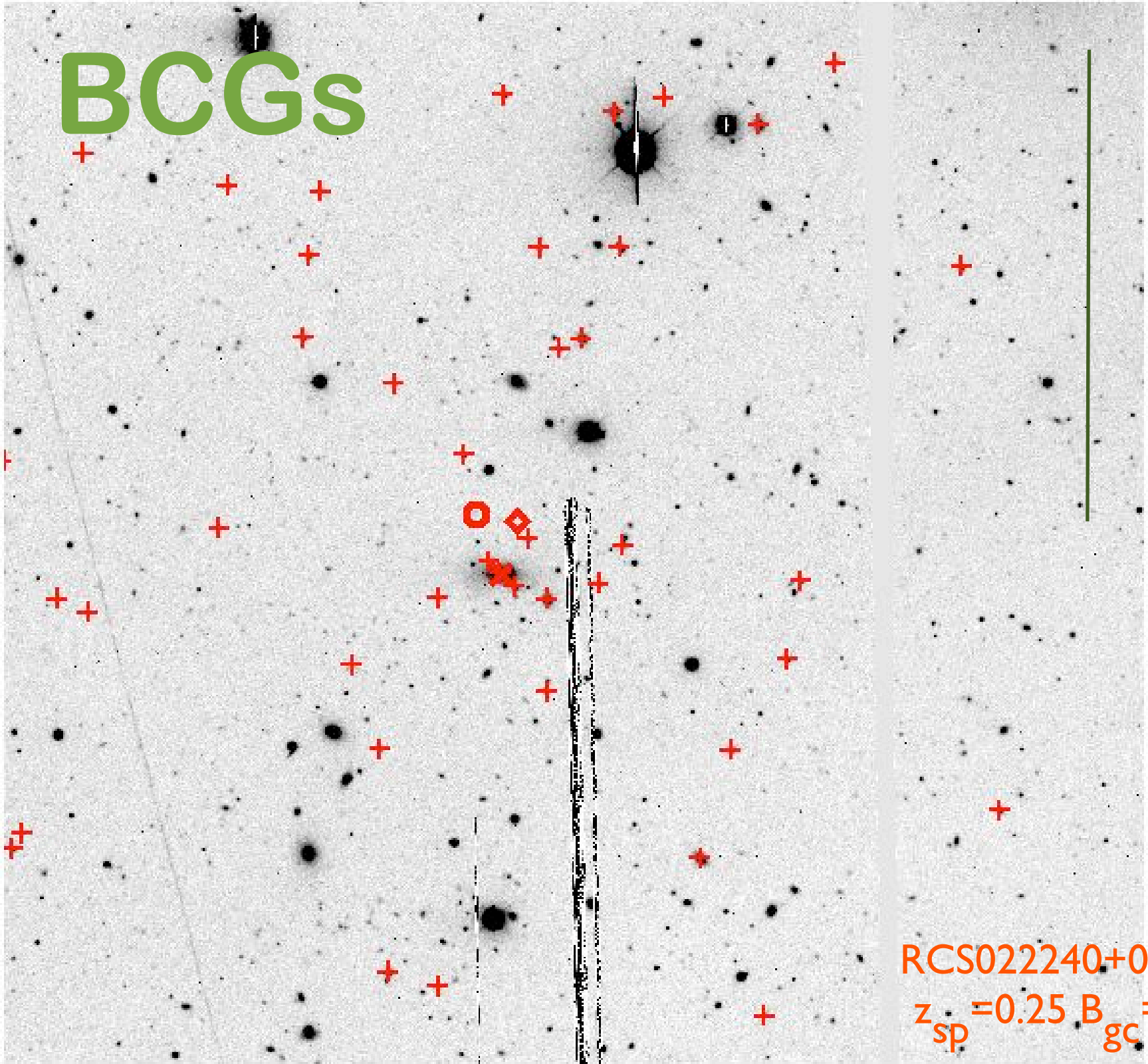
Wimps



RCS043644-2812.0

z_{sp}=0.32 B_{gc}=222

BCGs

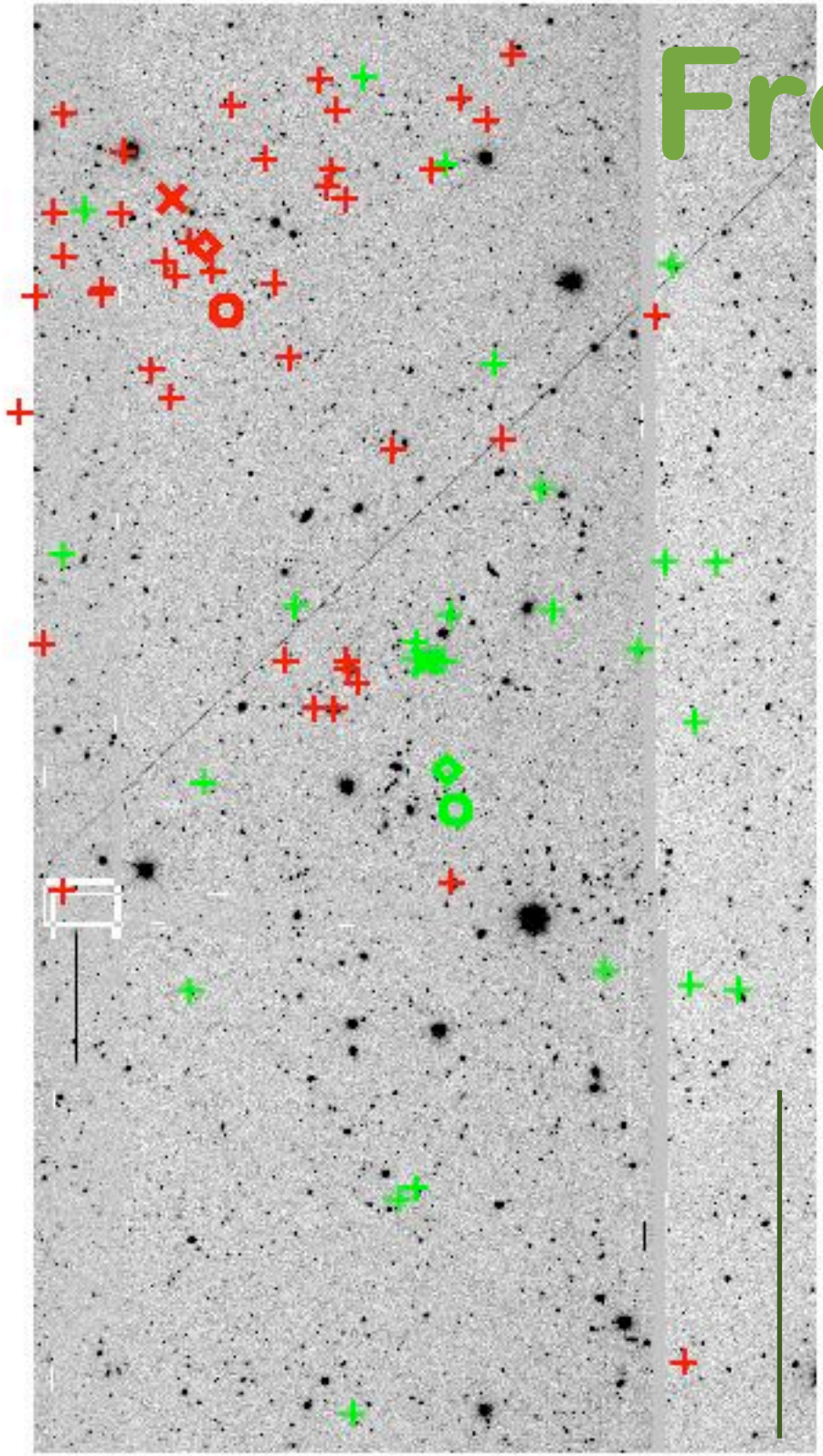


RCS022240+0144.5

z_{sp}=0.25 B_{gc}=660

Freebies

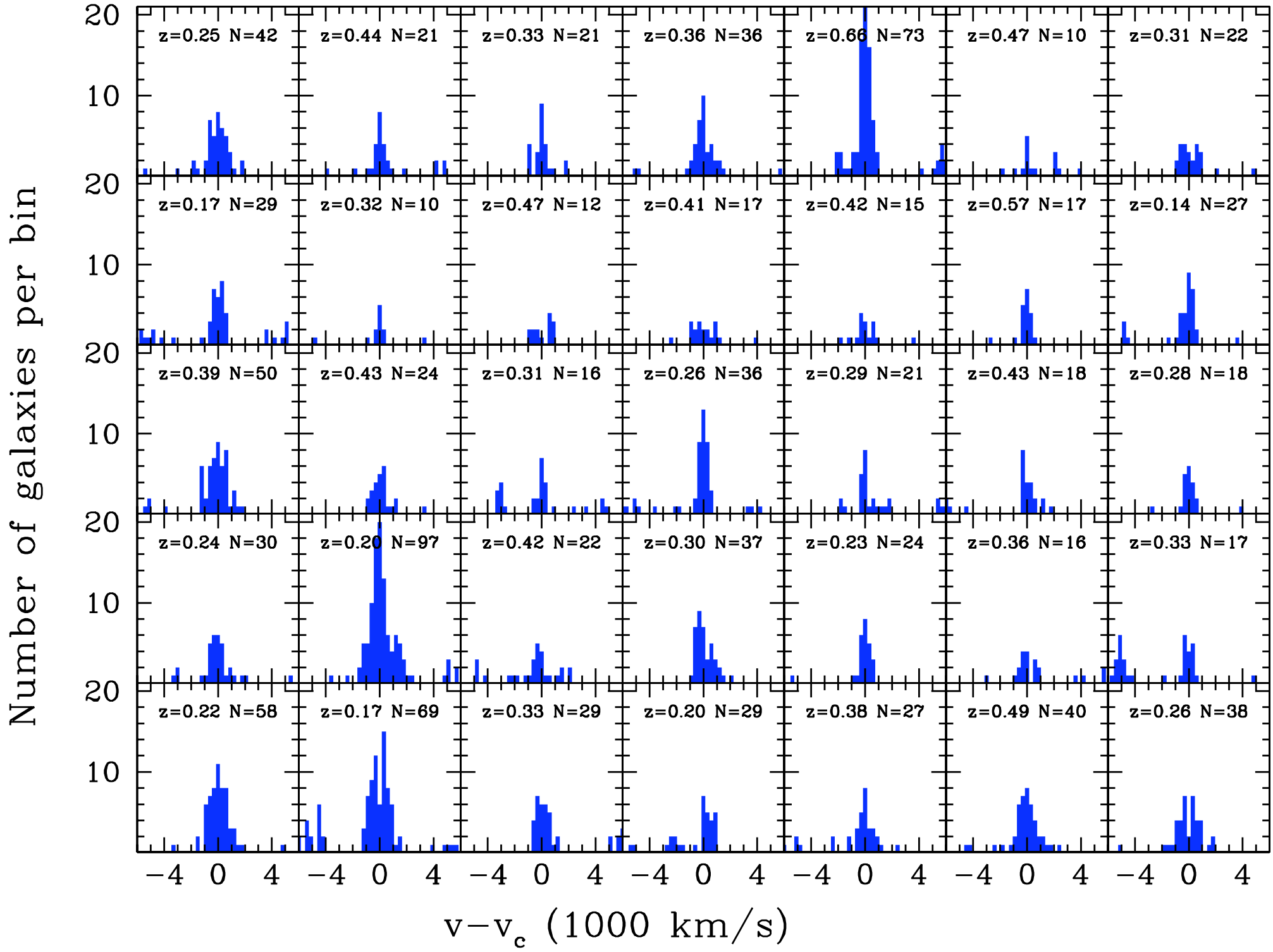
RCS112038+2522.0
z_{sp}=0.31 B_{gc}=462



RCS112051+2527.8
z_{sp}=0.26 B_{gc}=498

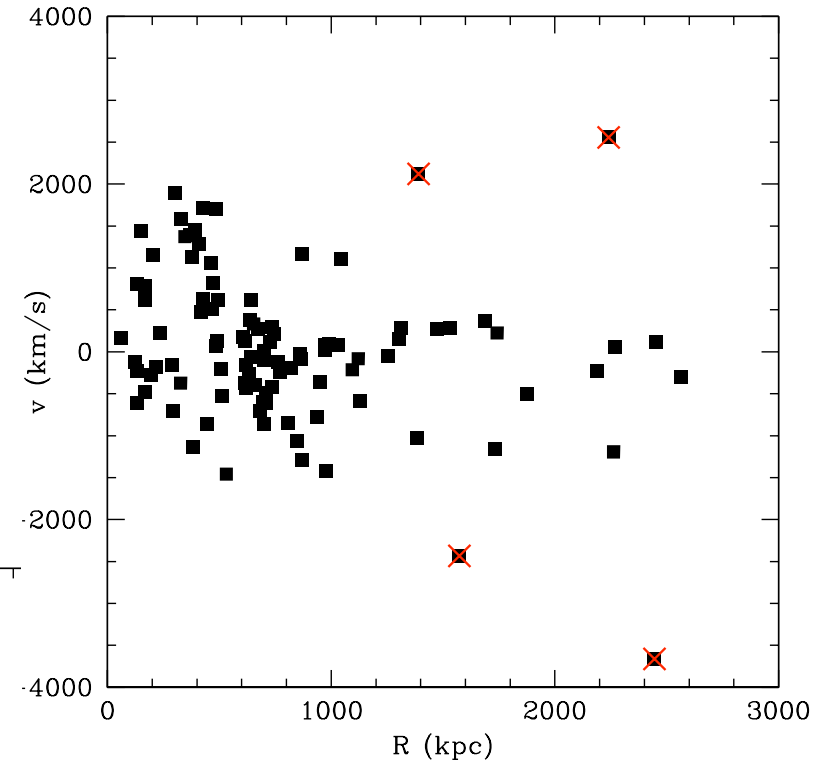
Clusters and members

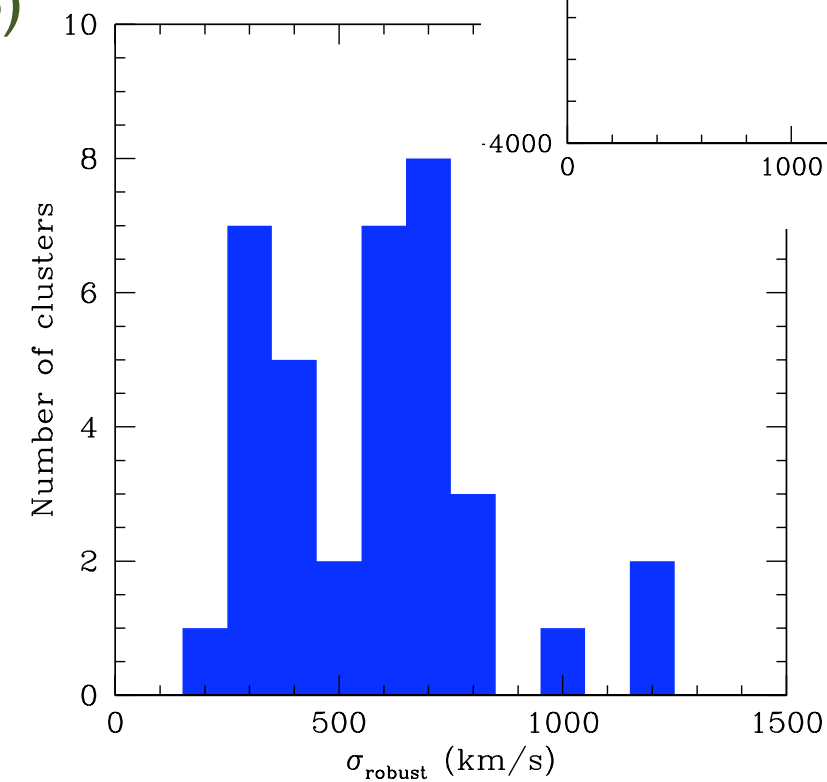
- ~7600 slits in 36 fields, 3645 redshifts
- from 10 to 100 members/cluster
- ~1100 cluster members in 35 clusters, covering 0.44 - 3.3 Mpc


z=0.25 N=42
z=0.44 N=21
z=0.33 N=21
z=0.36 N=36
z=0.66 N=73
z=0.47 N=10
z=0.31 N=22
z=0.17 N=29
z=0.32 N=10
z=0.47 N=12
z=0.41 N=17
z=0.42 N=15
z=0.57 N=17
z=0.14 N=27
z=0.39 N=50
z=0.43 N=24
z=0.31 N=16
z=0.26 N=36
z=0.29 N=21
z=0.43 N=18
z=0.28 N=18
z=0.24 N=30
z=0.20 N=97
z=0.42 N=22
z=0.30 N=37
z=0.23 N=24
z=0.36 N=16
z=0.33 N=17
z=0.22 N=58
z=0.17 N=69
z=0.33 N=29
z=0.20 N=29
z=0.38 N=27
z=0.49 N=40
z=0.26 N=38
Number of galaxies per bin
v−v_c (1000 km/s)

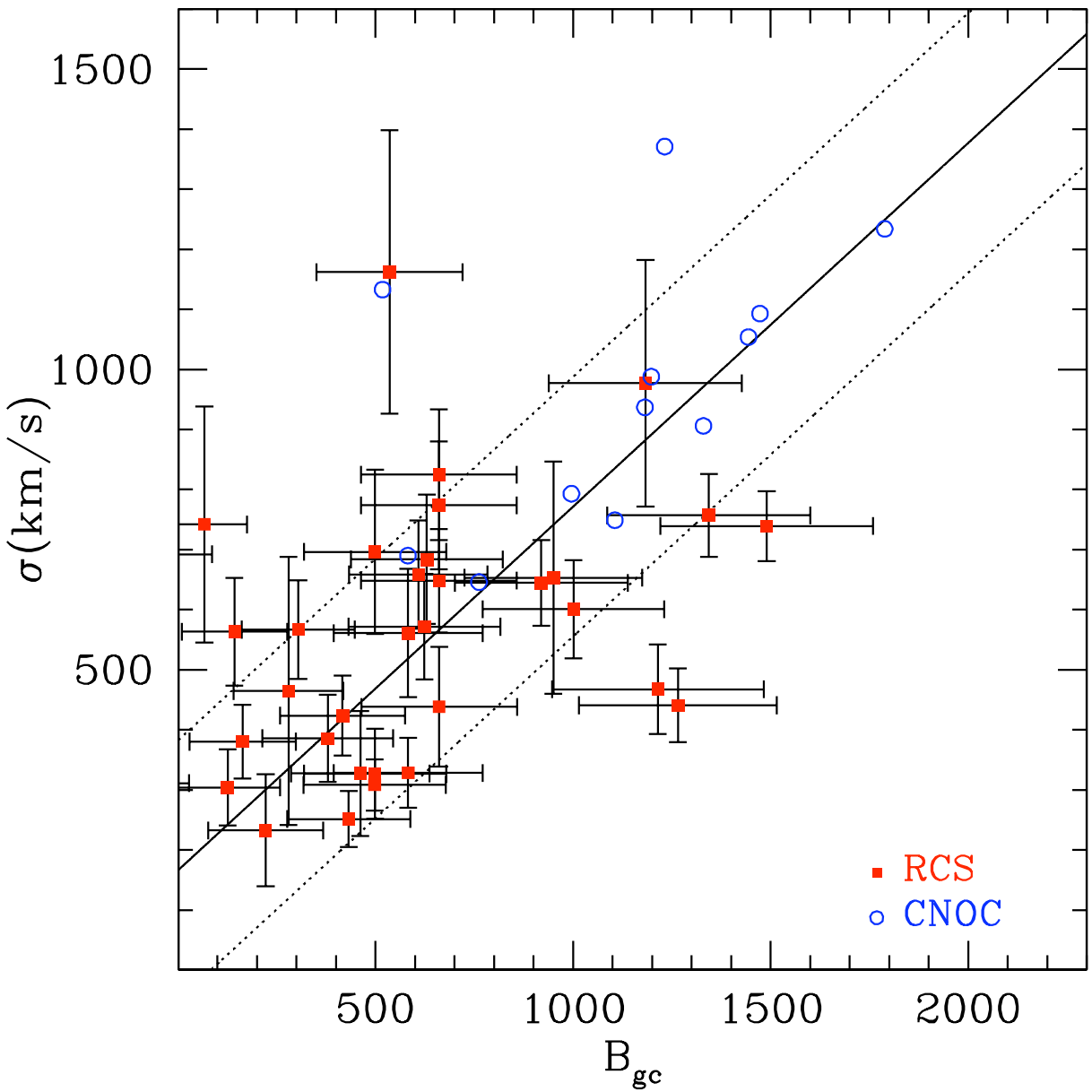
Velocity dispersions

- Interlopers removed by several schemes, including shifting gapper (Fadda et al. 1996)
- dispersions calculated using several estimators, including the "robust" estimator (Girardi et al. 1993)

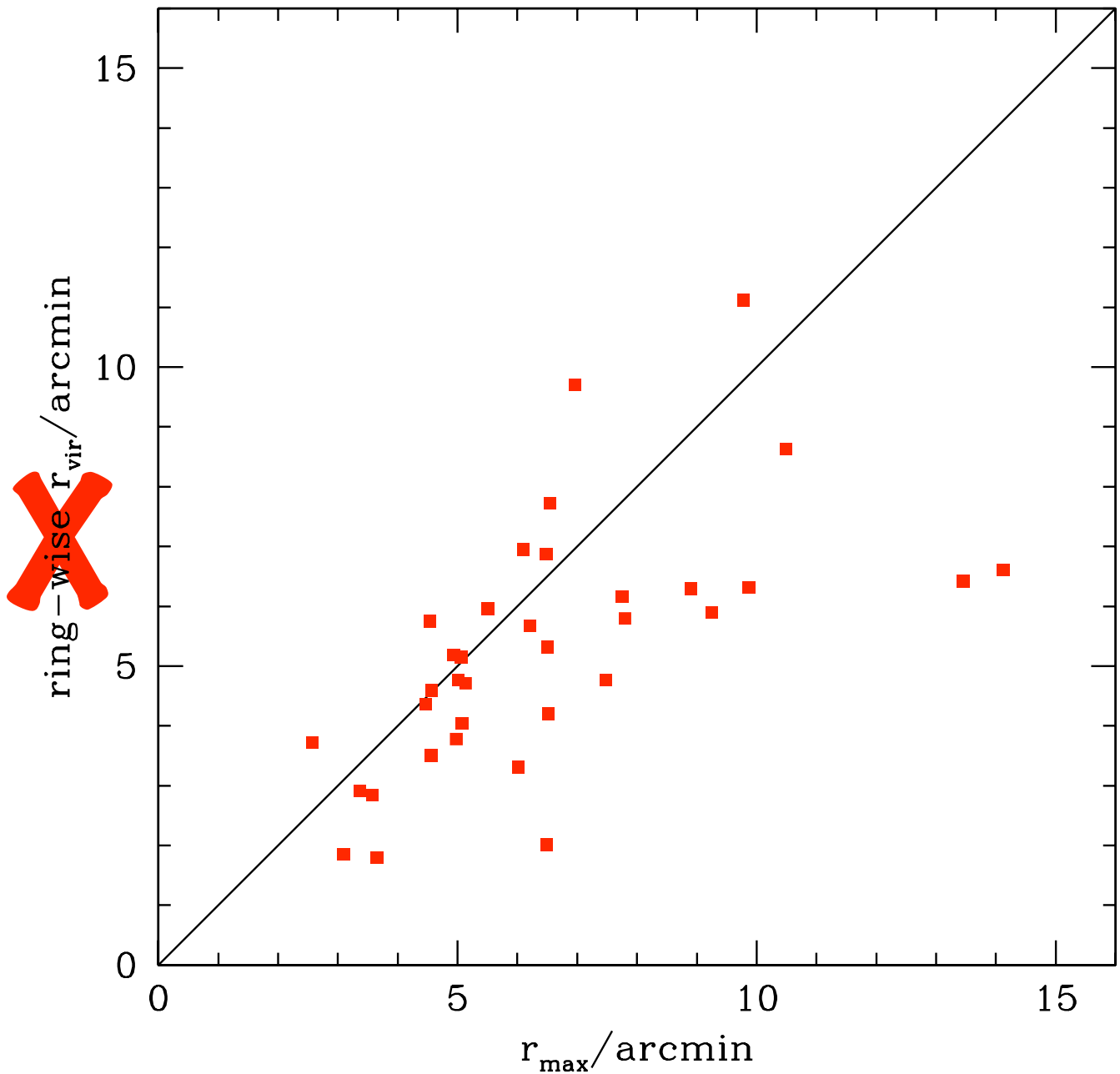




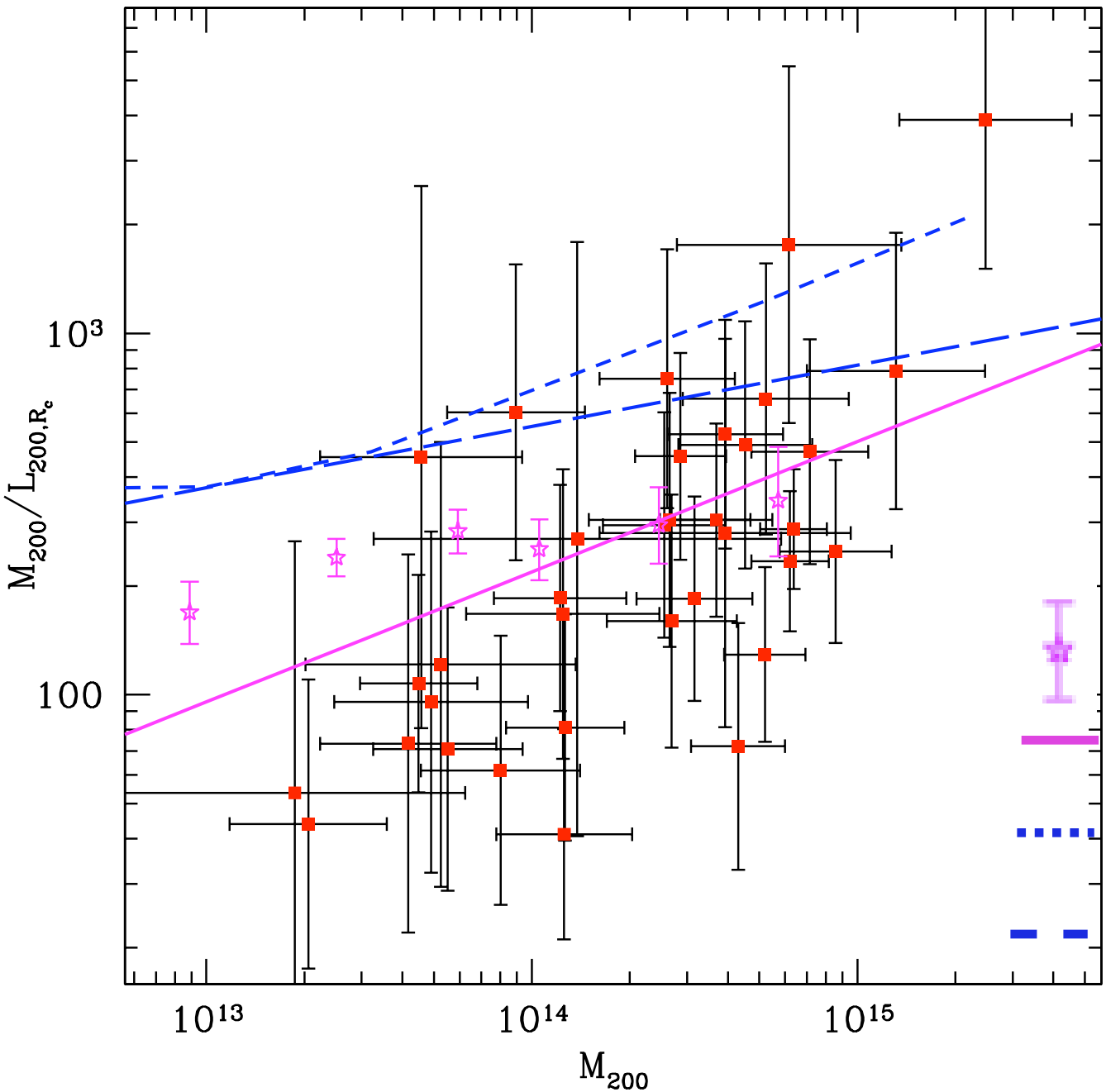
Velocity dispersion vs. richness



Virial radii



Mass-to-light ratios



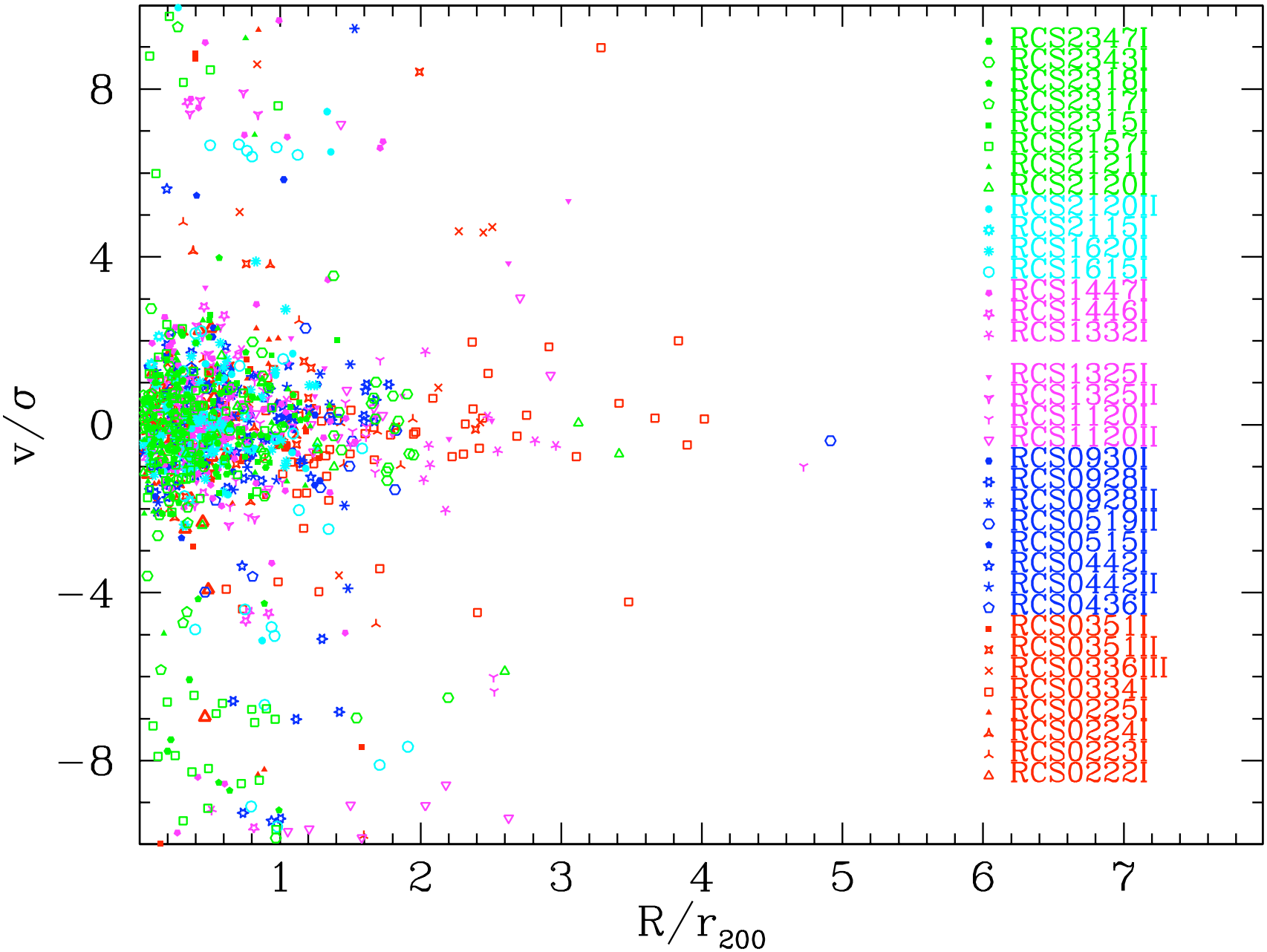
Eke et al. (2005)

Diaz & Muriel (2005)

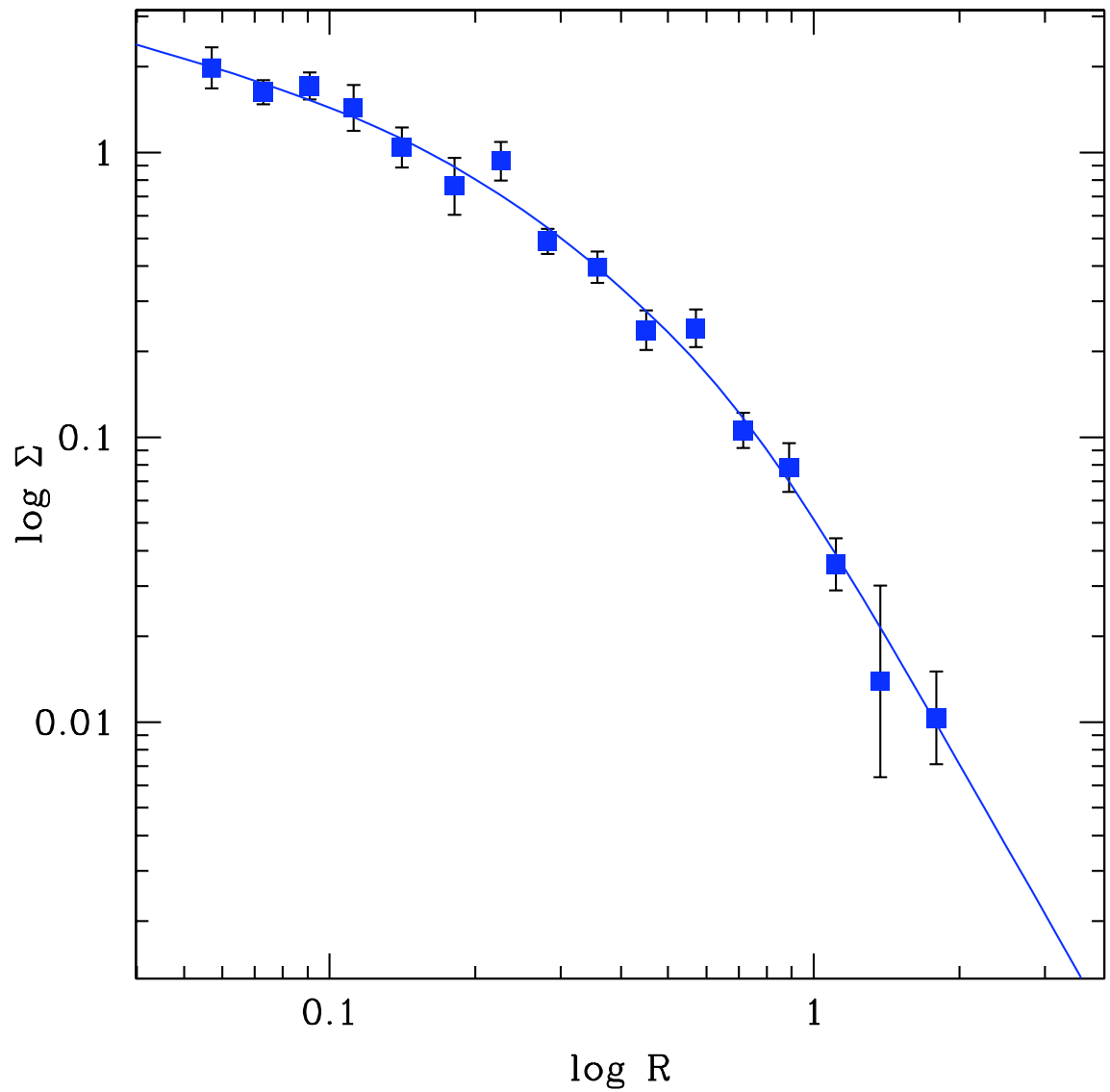
Marinoni & Hudson (2002)

Bahcall & Comerford (2002)
+ Finoguenov (2001)

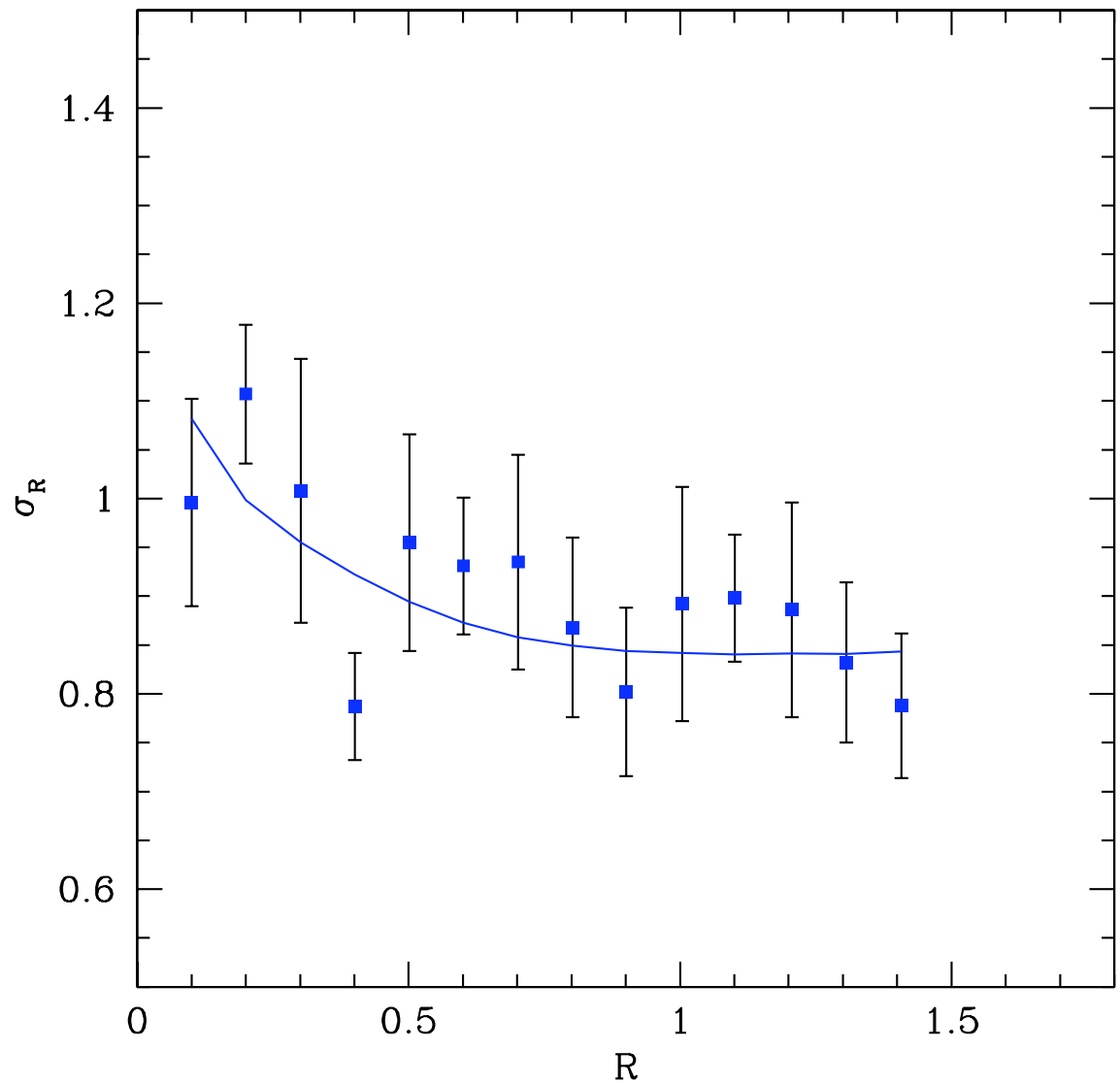
Ensemble cluster



Ensemble (-late): number density



Ensemble (-late): velocity dispersion



Future work

- M(r) [Jeans analysis, higher moments, caustic]
- Add to CNOC for 2x dataset, split into ensembles of
  - low- and high-redshifts (probably no effect)
  - low- and high-masses -- are the profiles the same?, concentration scaling as expected?
- M/L (r)
  - trends different for low- and high-mass clusters?
- connection with lensing, populations, etc...