THE APPLICATION OF AN OPTICAL OVER-DENSITY GALAXY CLUSTER DETECTION METHOD TO THE DEEP LENS SURVEY

Tom Johnson
Colorado College

ABSTRACT

A list of 400 galaxy cluster candidates with estimated redshifts $0.1 \leq z \leq 1.2$ is presented for four 2°x 2° fields from the Deep Lens Survey, generated with the over-density method from Postman et al. (1996). Candidates with redshift $z > 0.8$ were cut to objectively reduce the number of false detections. This narrowed the candidate list to 350; visual inspection further narrowed the list to 58 significant clusters from $0.2 \leq z \leq 0.8$, with spectroscopic and photometric redshifts included where available. Results are compared to initial shear-selection methods (Wittman 2006) and to the NASA/IPAC Extragalactic Database. Forty-four candidates not in the NASA Database are nominated as significant new clusters. Refinements to this method are suggested to obtain more rigorous results.

1. INTRODUCTION

Galaxy clusters are among the largest structures in the universe (Jeltema et al. 2008) and are known to be useful probes for studying cosmological parameters (Bartlet 1997). They thus provide an obvious test for large-scale structural evolution models (Postman et al. 2002). Creating a comprehensive catalog of clusters from large, deep surveys is imperative for the advancement and refinement of cosmological theory.

1.1 *The Deep Lens Survey*

The Deep Lens Survey (DLS) is a ground-based, deep optical survey of five 2°x 2° fields. It gathered data between 1999-2005 (Wittman et al. 2006) with the primary objective of studying the evolution of clustering over time using weak lensing techniques (Wittman et al. 2002). There is a wealth of knowledge about the Cosmic Microwave Background (CMB) and relatively close galaxy clusters, but there needs to be high quality information on the evolution of structure in between to test modern cosmological models (Wittman et al. 2002). This is the main purpose of the DLS.

1.2 *Cluster Detection Methods*

Thus far, cluster detection methods on the DLS have been focused on weak gravitational lensing techniques, specifically shear selection (Wittman 2006). The fundamental idea of this method is that all galaxies behind a cluster will appear somewhat distorted to an observer by intervening gravitational fields. This will lead to different ellipticity patterns than one would expect without these intermediary gravitational lenses. While there are intrinsic ambiguities in galaxy ellipticity, a large enough sample should provide a random distribution; a gravitational lens, however, should cause some sort of statistically significant alignment between many galaxies (Wittman 2002). Shearing is a result of these gravitational interactions— a clear-cut probe for mass concentrations, whether luminous or not.

The technique has a few drawbacks. It has been shown that shear selection will always detect false positives caused by large-scale structure noise. Weak lensing techniques are additionally hampered by projection effects (see Hennawi & Spergel 2005 for a descriptive account of issues with shear selection techniques). Work is currently going on to improve this type of cluster finder, and both of these issues can be at least partially resolved with X-ray and spectroscopic follow up surveys. In the mean-time, it is prudent for the DLS to have a more traditional list of optically-detected clusters to provide a comparison for various shearing techniques. An optical technique is also important as an additional, independent probe for confirmation of correct cluster detections.

While many optical detection algorithms exist (Gladders & Yee 2000 and Clewley et al. 2007, for instance) the over-density method from Postman et al. (1996) (hereafter referred to as the Postman method) was selected for use on the DLS. It originally cataloged 79 clusters from a 5.1 square degree field from the Palomar Distant Cluster Survey using data from optical and near infrared filters (Postman 1996) and has been used successfully on other surveys (Postman et al. 2002, Olsen et al. 2008). We chose this method due to its previous success and the availability of software that implements the algorithm. While methods like the red-sequence (Gladders & Yee 2000) may be somewhat more reliable because they use color information, the Postman method is proven to be robust.

2. DATA

2.1 *Postman Method Overview*

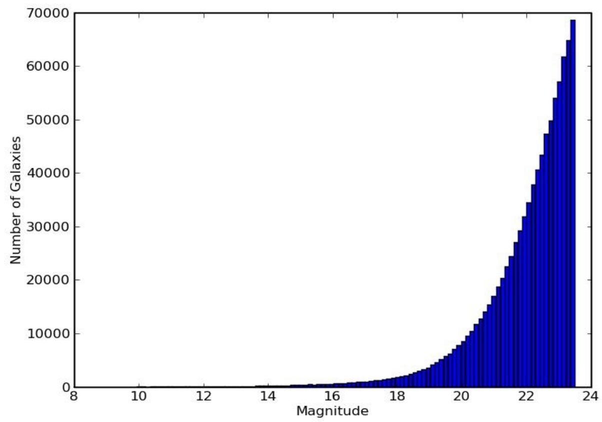

Figure 1 – The PDCS data shows the increase expected by the Postman code. The DLS from Figure 2 was truncated to better fit this model.

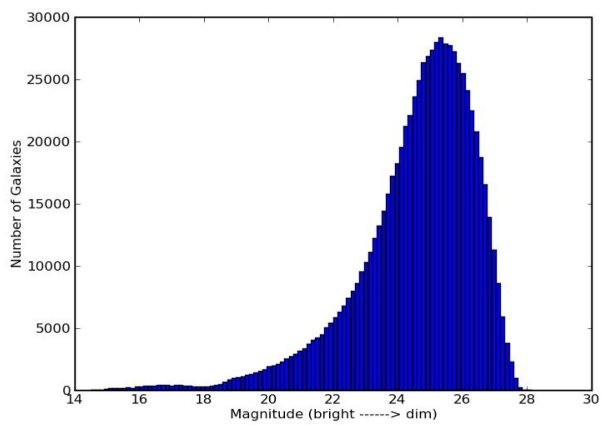

Figure 2 – The original DLS data. The number of detected galaxies drops dramatically above magnitude ~25.

The Postman method is a basic over-density algorithm. A technical description of the code is beyond the scope of this paper, but a general overview is given. (For descriptions of varying technicality, refer to Postman et al. 1996, Postman et al. 2002, or Olsen et al. 2008.) The code first reads in a list of objects, stripping away any foreground stars and bad galaxies. A map is made, with pixels given certain weights based on how many more galaxies they contain than the field background. If enough pixels in a model profile are also above this threshold, the code flags the local maximum (which should be the center) as a cluster. The program is iterated over various redshifts, each of which uses a specific range of object magnitudes. Finally, a list of clusters is compiled from the entire range of redshifts, with overlapping clusters (i.e. those that appear in multiple redshifts) cut down to the most significant redshift.

2.2 *DLS Application of the Postman Method*

The use of the Postman method on DLS data is relatively straightforward; however, there are some distinct differences between the DLS and original PDCS data. For the DLS, stars and bad galaxies are already cut out. Another main difference comes in the use of exclusion zones. Exclusion zones are the areas around very bright, generally saturated, foreground stars that are cut entirely from a dataset. This means that any potentially useful galaxies within that area will be eliminated. The PDCS used square exclusion areas, while the DLS uses a combination of rectangles and circles. David Wittman adapted the Postman code to accept new exclusion zone shapes and files. This modified section allowed the code to read in the DLS exclusion files, but appears to need more debugging (see Section 5).

Written in the mid-1990s, the Postman method relied on cosmological parameters that are no longer accepted. We used a Hubble constant of 72 and a deceleration parameter of -0.55 (see Komatsu et al. 2008). K-corrections were also updated to reflect the DLS filter set.
(see Hogg et al. 2002 for K-correction description).

Another key difference is the depth of the surveys. Postman et al. (1996) used their code on PDCS clusters with magnitude < 23 (Figure 1), while the DLS contains data to magnitudes > 27 (Figure 2). (All magnitudes in this paper are in the R filter.) The Postman code's Luminosity Weighting

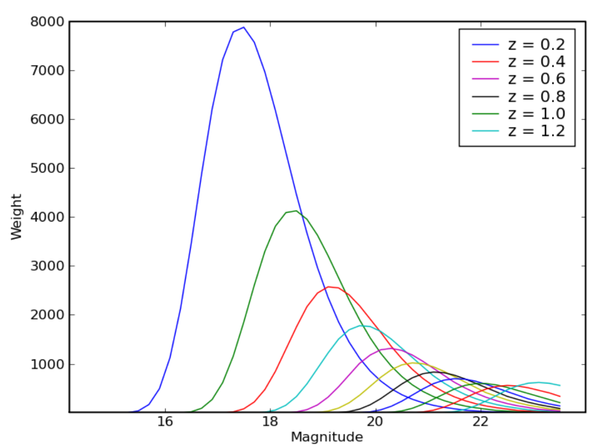

Figure 3- LWF for the original PDCS data. Colored lines represent redshifts, increasing from left to right.

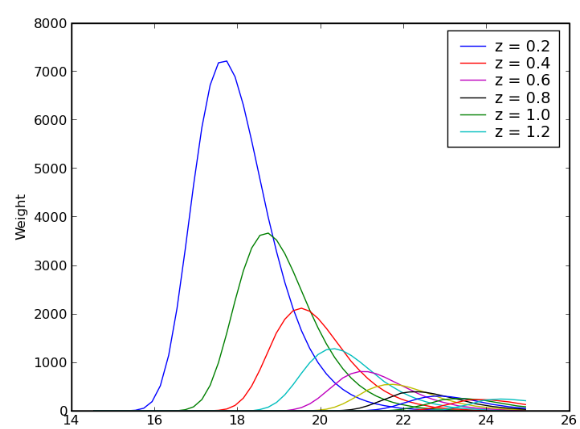

Figure 4 – LWF for the cut DLS data. Note the similarity to Figure 3.

Function (LWF), which assigns field background and pixel weights, defines a cluster as an over-density of galaxies with a central maximum brightness that fits an assumed profile model. Each redshift has a characteristic magnitude which the LWF looks for. These magnitudes are defined by the assumed model; there is a specific magnitude at which the LWF should find the brightest cluster galaxy. With higher redshift iterations, the LWF looks for higher magnitude galaxies to fit its cluster profile (Figures 3 & 4). The LWF gets more spread out at higher redshifts because the contrast between galaxies and background diminishes as magnitude increases. It also assumes a continuous increase of galaxies with increasing magnitude. Using the full DLS dataset breaks this assumption. When the magnitude gets large enough, objects become harder to distinguish from the sky background, and there is a dramatic decrease in galaxies (Figure 2).

To adjust for this, we ran the Postman code on DLS objects with magnitudes < 25. The resulting LWF closely matches the model from the PDCS data (Figure 4). It indicates that low-redshift iterations of the algorithm will give large weight to bright objects (those with smaller magnitudes) while low redshift runs will put more weight on dimmer objects. This process is essential for obtaining redshift estimates for each cluster since the method uses no color information. It merely relies on an assumed cluster model based on luminosity and profile.

Although cutting out dim objects likely eliminates the highest redshift cluster candidates, it allows the Postman method to run more effectively for redshifts $z < 0.9$. This seems to be a good compromise for the objectives of this project since current lens techniques are most sensitive to mass at redshifts between $0.2 \leq z \leq 0.7$ (Wittman 2006).

3. RESULTS

The Postman method was used on four of the DLS four square degree fields. It generated a list of 400 candidate clusters with significance above 2.5. While this threshold may seem low, it appears valid in this dataset because high redshift clusters were systematically given relatively low significances. The candidates had estimated redshifts $0.1 \leq z \leq 1.2$, with an overall density of 25 clusters per square degree. It was most sensitive to clusters from $0.3 \leq z \leq 0.7$. A histogram of cluster candidates for each redshift is given in Figure 5. The full candidate list is given in Appendix A.

While the cluster density found is not out of line with other surveys (see section 4 for comparisons to other surveys), the list seems to be too large. Indeed, by inspecting the clusters with the DLS Navigator tool (the DLS Navigator is an online, visual interface that contains all objects from the DLS in all filters), many seem to be false positives. Clusters with $z > 0.8$ were largely indistinguishable from the field background. The cluster detections at this distance were cut from further analysis.

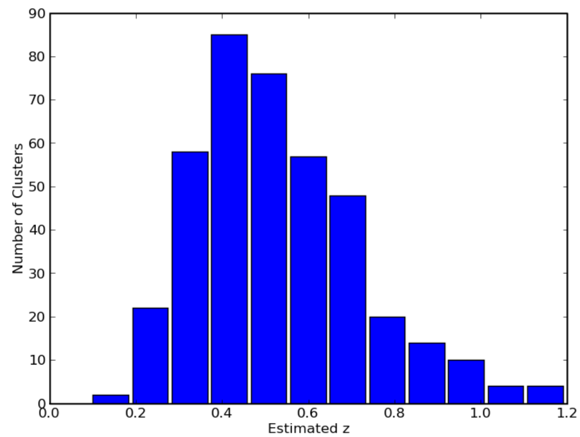

Figure 5 – The complete cluster candidate list sorted by redshift. The Postman method detected many clusters with moderate redshifts.

A visual inspection using the DLS Navigator was used next to test the cluster candidates. This is obviously a subjective guide, but it is a useful check. The Postman method relies on magnitudes in only one band when selecting clusters. Since the Navigator has the advantage of color information, galaxies of similar redshift immediately catch the eye. One can easily dismiss candidates that have little or no color correlation. This type of visual inspection has been used successfully on over-density algorithms in the past (Olsen et al. 2008).

A final list of significant clusters was created with this visual inspection. To make the process more objective, candidates were included if they fulfilled a few requirements: there should be some reasonable cluster center, there should be at least five notable galaxies with similar redshifts, whether they be photometric or spectroscopic, and the photometric or spectroscopic redshifts must be within 0.15 of the estimated redshift. These conditions were set by looking

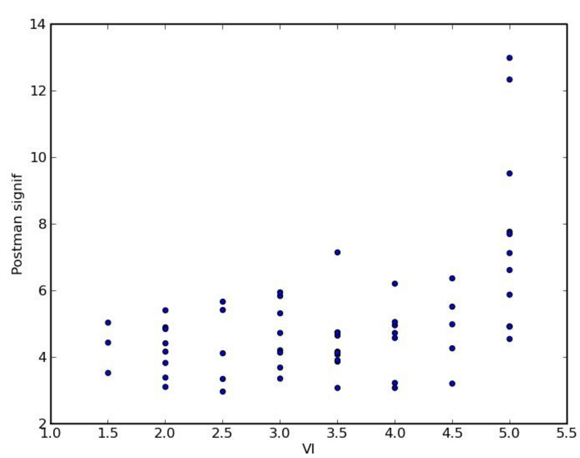

Figure 6 – VI scale vs. Postman significance for final cluster list. There is perhaps a moderate correlation here. Notice the upper envelope.

at previously known clusters. Obviously, the code does not take all of these conditions into account. Its LWF is limited in finding the cluster center because galaxies are smeared out among a pixel. The other requirements attempt to compensate for the intrinsically poor estimation of redshift by the Postman method. (Without color, it is much more difficult to accurately estimate redshifts. See Table 1 and Figure 7 for discrepancies between estimated, spectroscopic and photometric redshifts.)

Clusters of the same estimated redshift were tested at the same time. This allowed more consistency in choosing clusters, hopefully limiting subjective biases. For instance, a rich cluster at z = 0.5 may be much more obvious visually than one at z = 0.8. Comparing clusters of similar redshifts mitigates that issue. This problem is compounded, however, by the fact the Postman method shows preference for moderate redshift clusters. As shown in Figure 3, relatively few candidates were found with z > 0.8. Obviously, this is from the previously discussed cut of dim objects. An unfortunate consequence is the effect on significance of high redshift clusters. For example, a fairly obvious cluster at estimated z = 0.8 (ID#34) was given low significance by the algorithm. Looking at candidates by redshift and then by significance, instead of just going through the list by significance, reveals a less biased final cluster list.

Additionally, a five-point subjective scale (Visual Inspection scale, or VI) was produced to help sort clusters. A 5 indicates an obvious, rich cluster, while a 1 indicates an obscure, possibly non-cluster. Clusters in between may have obvious over densities in multiple redshifts or may lack a well-defined center. It was created independently of the letter scale used by Olsen (2008) but is of similar structure. There is a marginal correlation between VI and the significance reported by the Postman method (Figure 6).

4. SUMMARY AND DISCUSSION

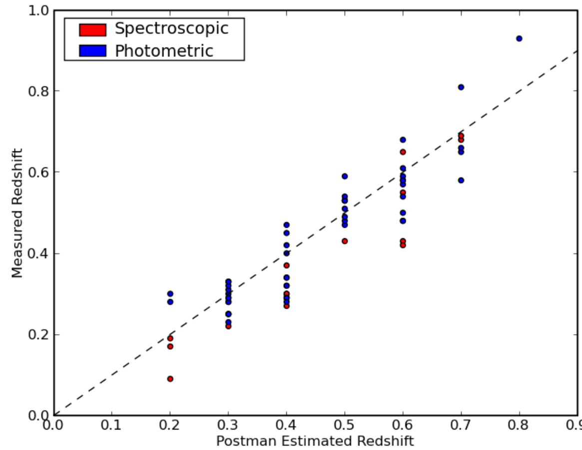

Figure 7 – A comparison between the estimated redshifts from the Postman method and measured redshifts. The dashed line has a slope of 1. There are some large discrepancies, with a tendency towards over-estimation.

The first test for the final list of clusters was a direct comparison to the first shear-selected catalog from Wittman 2006 (refer to that paper for pictures and descriptions of each cluster.) Wittman et al. presented eight shear-selected clusters from the DLS with X-Ray follow up data. All eight of these shear-selected clusters were found with the Postman method. Two of them, however, did not pass the visual inspection test. These are easily explained. In the case of 10:49:41, -04:17:44, spectroscopic and photometric redshifts were highly varied. Since there were no consistent redshifts throughout the over density, the cluster was discarded. For the cluster at 09:16:00, +29:31:34, the visual inspection dismissed the cluster as the spectroscopic redshifts were over 0.2 higher than the estimations from the Postman method. The fact that these clusters were ruled out by the visual inspection suggests changes should be made in the objective measures of the VI.

Figure 8- Cluster ID#3. This over-density is easily verified visually as a cluster. It gets a 5 on the VI scale due to the obvious center and strong abundance of similarly colored galaxies. Note the lensing on the upper right of the center.

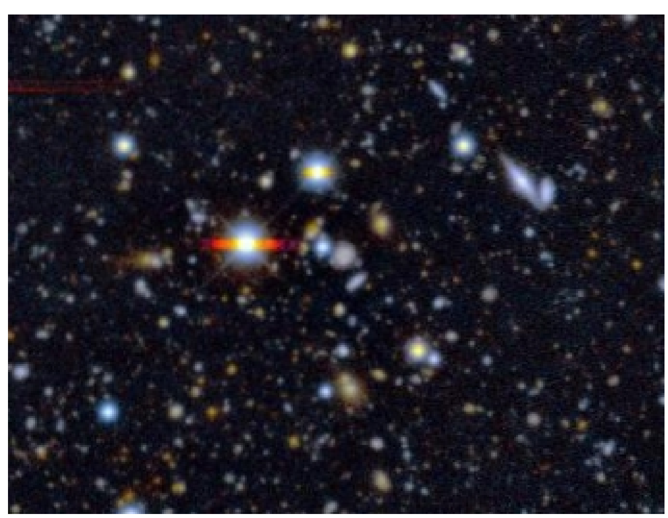

Figure 9- There is a marginal over-density here, but the candidate is readily dismissed. The lack of a reasonable center and the variation in colors, in addition to photometric redshift comparisons, point to a false detection.

Allowing a greater range of photometric and spectroscopic redshifts, along with a more careful analysis of those redshifts,would likely catch more clusters, including the two in question.

The final list of 58 cluster candidates is perhaps too small. This list would lead to a density of ~3.6 clusters per square degree. The final density found by Olsen (2008) reveals a cluster density of ~20 per square degree, and Postman (1996) found a cluster density of ~16 per square degree. A few possibilities for this difference exist. The Olsen (2008) and Postman (1996) survey areas could be exceptionally rich, or the DLS survey area could be a poor source of galaxy clusters. The former is possible, as the fields of those surveys were relatively small, at 3.1 and 5.1 square degrees, respectively. The latter seems to be rather unlikely because of the large, 16 square degree area of the DLS used in this analysis. A better explanation is the stringency of this project's visual inspection. It was likely too strict. A more accommodating method that included candidates with redshift $z > 0.8$ and included all significances would create a more complete cluster list.

The rest of the visually inspected clusters were checked with the NASA/IPAC Extragalactic Database (NED) to see if they had been previously cataloged. Of the 58 final cluster candidates, 44 were not found in NED. Those that were found have their published object names given. Those that were not are nominated as potentially significant new clusters.

5. FUTURE WORK

Additional work would need to be done to prepare a more rigorous, publishable list of new cluster candidates. A clear and effective example is presented by Olsen (2008). First, exclusion zones need to be handled more effectively. Wittman's correction appears not to be working quite correctly; output results were the same as when a blank exclusion zone file was used. This means that the exclusion zones were likely left as holes, which undoubtedly has an effect on the field background and weights determined by the LWF. (Of note: we found that Postman's published results (1996) contained the same bug.) To correct for this, one could plug randomly distributed galaxies into the holes. While this would not likely aid directly in cluster detection, it would create a more realistic background. A different strategy would be to incorporate a function to ignore the holes when determining background. In other words, taking out the area left by the exclusion zones would lead to a higher, more correct background density of clusters. This could cut down on the amount of spurious detections of low significance clusters.

Another step would be to modify the LWF itself. Cutting off magnitudes > 25 is a huge problem when trying to detect higher redshift clusters. Catalogs from Olsen (2008), coincidentally, were also cut at the limiting magnitude of 25. Tuning the LWF to accept or to expect the drop off of galaxy counts at dimmer magnitudes would allow detections of more distant clusters.

A modified version of the visual inspection method should also be employed. Obviously, the rejection of two clusters found by shear selection is disturbing, as is the low final cluster density. Tweaks on the parameters of the objective test should be devised and performed by someone more experienced in looking at galaxy clusters, or a more direct counterpart to the Olsen (2008) inspection method could be applied.

While not yet of publishable quality, the data from this project should be very useful to many working with the DLS. It provides a neat and extensive list of cluster candidates. Shear selection methods can be gauged quickly against this catalog. Furthermore, the clusters not in NED are nominated as possible new clusters. Using a refined version of the Postman method in tandem with other methods would provide a definitive catalog of new clusters in the DLS. Such a catalog could provide cosmologists with an invaluable tool for tracing large-scale structural formation and evolution.

6. ACKNOWLEDGEMENTS

I would like to thank David Wittman for all of his guidance and help with this project. Additional thanks should be given to Perry Gee for help and to Marc Postman for allowing the use of his code. The National Science Foundation, UC Davis Physics Department, and specifically Rena Zieve should all be acknowledged for hosting the 2008 summer Research Experience for Undergraduates program.

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TABLE 1
Final List of Cluster Candidates Ranked by VI

ID	R.A. (J2000)	Dec (J2000)	Estimated z	Spectral z	Photo z	Postman sig.	VI	In NED?	Object Name/Notes
1	13:59:43.63	-11:39:41.90	0.3	-	0.28	7.76	5	N	
2	13:55:30.55	-10:52:06.31	0.4	0.37	-	6.61	5	N	
3	10:55:10.83	-05:04:17.40	0.7	0.68	-	7.69	5	Y	CXOU J105510-050414
4	10:53:29.14	-04:48:44.30	0.2	0.17	-	5.87	5	N	
5	10:48:08.48	-04:12:05.62	0.3	0.25	0.3	4.91	5	N	
6	09:21:12.68	30:28:22.19	0.6	0.43	0.48	9.51	5	Y	CXOU J092110+302751
7	09:20:50.84	30:27:42.30	0.4	0.29	-	12.33	5	Y	CXOU J092053+302800
8	09:20:20.22	30:30:26.60	0.3	0.29	-	12.98	5	Y	ABELL 0781
9	09:16:11.33	29:52:04.70	0.5	0.53	-	7.12	5	N	
10	09:16:07.47	30:27:20.48	0.6	0.65	-	4.54	5	N	
11	05:14:22.12	-49:04:32.41	0.2	0.09	-	4.92	5	Y	APM 051330.5-490720
12	14:02:01.83	-10:23:28.61	0.5	0.43	-	4.98	4.5	Y	CXOU J140159-102301
13	13:58:42.31	-10:41:30.80	0.5	-	0.51	3.2	4.5	N	Lensing
14	10:52:46.51	-04:25:12.11	0.3	0.25	0.28	5.51	4.5	N	
15	10:49:28.46	-04:51:56.92	0.3	-	0.31	4.26	4.5	N	
16	05:22:17.01	-48:18:23.51	0.4	0.3	-	6.36	4.5	Y	CXOU J052215-481816
17	10:55:22.51	-04:55:45:80	0.3	-	0.33	4.95	4	N	
18	10:53:39.55	-04:36:28.12	0.4	0.27	0.29	4.72	4	N	
19	09:20:57.53	29:41:09.89	0.4	0.3	-	4.57	4	Y	MaxBCG J140.22212+29.68449
20	09:19:52.25	30:17:07.51	0.5	-	0.48	5.05	4	N	
21	09:18:04.10	30:57:00.11	0.6	0.42	0.5	3.22	4	N	
22	09:16:55.43	30:00:34.49	0.4	0.32	0.34	6.2	4	Y	ZwCl 0914.1+3010
23	05:16:04.36	-48:54:55.58	0.6	-	0.58	3.07	4	N	
24	14:01:41.60	-10:48:43.88	0.3	-	0.25	4.11	3.5	N	
25	14:01:20.02	-11:27:41.69	0.3	-	0.33	4.07	3.5	N	
26	10:54:17.72	-05:48:53.39	0.2	0.19	0.28	4.64	3.5	Y	DLSCL J1054.1-0549
27	10:51:06.99	-04:47:36.10	0.6	0.55	-	3.86	3.5	N	
28	10:48:17.48	-05:03:03.10	0.5	-	0.53	4.73	3.5	N	
29	09:21:33.41	30:13:03.79	0.4	-	0.4	7.14	3.5	N	May be part of candidate #30
30	09:21:27.15	29:58:28.88	0.4	-	0.45	4.74	3.5	Y	MaxBCG J140.33444+30.17197
31	09:18:38.09	29:27:33.59	0.6	-	0.57	3.07	3.5	N	
32	09:16:35.06	29:21:09.50	0.3	0.22	0.23	4.16	3.5	Y	NSC J091638+291943
33	05:18:20.48	-49:00:41.90	0.6	-	0.59	4.13	3.5	N	
34	05:14:18.32	-48:34:05.92	0.8	-	0.93	3.9	3.5	N	
35	14:00:02.03	-10:25:41.59	0.5	-	0.53	4.72	3	N	
36	13:59:24.16	-11:51:08.78	0.4	-	0.32	5.31	3	N	
37	10:52:06.05	-05:38:43.51	0.3	-	0.32	4.2	3	N	
38	10:51:35.87	-05:05:25.80	0.4	-	0.28	4.13	3	N	
39	09:17:16.08	30:17:14.50	0.5	-	0.59	3.68	3	N	
40	05:21:38.08	-48:17:02.51	0.4	-	0.34	5.83	3	Y	CXOU J052159-481606
41	05:20:55.20	-48:20:57.10	0.5	-	0.47	5.94	3	N	
42	05:20:05.31	-48:08:57.41	0.7	-	0.81	3.35	3	N	
43	13:59:22.30	-10:56:21.19	0.7	0.69	0.66	3.34	2.5	N	
44	13:57:12.49	-11:00:35.10	0.5	-	0.54	5.41	2.5	N	
45	05:23:13.37	-49:29:36.49	0.6	-	0.48	2.96	2.5	N	
46	05:16:49.15	-49:42:32.40	0.4	-	0.29	5.66	2.5	N	
47	05:14:55.99	-49:51:52.70	0.4	-	0.47	4.11	2.5	N	
48	10:55:38.73	-05:29:57.19	0.3	-	0.29	4.84	2	N	
49	10:48:50.93	-05:39:01.58	0.6	-	0.58	3.38	2	N	
50	09:22:30.58	30:12:49.50	0.6	-	0.54	4.16	2	N	
51	09:17:45.89	30:45:44.78	0.6	-	0.68	3.82	2	N	
52	05:21:15.10	-49:56:54.10	0.2	-	0.3	4.89	2	Y	ABELL S0525
53	05:21:06.47	-48:45:46.51	0.6	-	0.61	3.1	2	N	
54	05:19:43.25	-48:18:33.80	0.7	-	0.58	4.41	2	N	
55	05:18:45.12	-48:46:07.50	0.4	-	0.42	5.4	2	N	
56	10:50:16.73	-05:12:01.12	0.7	-	0.65	3.52	1.5	N	
57	09:17:57.94	30:38:16.30	0.5	-	0.49	4.43	1.5	N	
58	05:22:02.34	-49:09:19.30	0.4	-	-	5.03	1.5	Y	ABELL 3337

Appendix A

Full Cluster List

R.A. (J2000)	Dec (J2000)	z_{est}	Significance
09:20:20.22	+30:30:26.60	0.3	12.98
09:20:50.84	+30:27:42.30	0.4	12.33
09:21:12.68	+30:28:22.20	0.6	9.51
09:21:23.41	+30:13:3.80	0.4	7.14
09:16:11.33	+29:52:4.70	0.5	7.12
09:16:55.43	+30:00:34.50	0.4	6.20
09:21:4.29	+30:07:6.50	0.6	5.62
09:22:57.77	+30:00:23.80	0.5	5.58
09:18:8.64	+30:23:35.50	0.2	5.46
09:22:12.92	+30:06:29.40	0.3	5.40
09:23:25.83	+30:44:46.80	0.3	5.14
09:19:52.25	+30:17:7.50	0.5	5.05
09:23:48.00	+29:05:10.00	0.4	5.02
09:18:36.05	+29:54:9.10	0.4	5.02
09:21:27.15	+29:58:28.90	0.4	4.74
09:20:57.53	+29:41:9.90	0.4	4.57
09:16:7.47	+30:27:20.50	0.6	4.54
09:21:36.38	+30:12:7.70	0.2	4.51
09:22:25.06	+29:52:23.80	0.4	4.43
09:17:57.94	+30:38:16.30	0.5	4.43
09:21:7.16	+30:33:29.30	0.8	4.33
09:17:51.65	+30:24:33.50	0.3	4.33
09:15:51.16	+30:02:24.10	0.5	4.24
09:22:29.27	+30:13:19.80	0.6	4.16
09:16:35.06	+29:21:9.50	0.3	4.16
09:22:48.42	+30:58:43.60	0.3	3.99
09:17:14.75	+30:41:47.00	0.8	3.98
09:22:14.78	+30:17:47.40	0.5	3.94
09:24:0.78	+30:47:56.00	0.4	3.91
09:19:25.69	+30:17:15.60	0.6	3.90
09:23:40.76	+29:29:20.10	0.3	3.88
09:19:1.25	+30:22:24.80	0.5	3.86
09:17:45.89	+30:45:44.80	0.6	3.82
09:16:13.82	+29:16:14.70	0.4	3.78
09:16:22.25	+29:06:33.40	0.1	3.72
09:18:45.24	+30:21:55.60	0.6	3.69
09:17:16.08	+30:17:14.50	0.5	3.68
09:23:22.96	+30:37:16.40	0.5	3.67
09:19:38.54	+30:33:13.90	0.5	3.64
09:18:21.19	+29:51:3.00	0.6	3.61
09:16:26.98	+30:19:29.50	0.3	3.61
09:14:58.44	+30:57:59.00	0.6	3.60
09:19:3.79	+30:17:45.40	0.3	3.51
09:15:3.29	+29:47:42.70	0.3	3.49
09:19:48.17	+30:02:51.90	0.3	3.46
09:20:48.36	+30:18:32.20	0.7	3.40
09:17:35.76	+30:54:15.70	0.5	3.39
09:17:8.82	+29:50:34.40	0.5	3.38
09:17:55.14	+30:27:33.20	1.1	3.38
09:23:3.42	+29:40:3.20	0.3	3.35
09:21:43.42	+29:43:34.10	0.2	3.35
09:16:53.45	+30:37:58.30	0.6	3.34
09:20:55.77	+29:46:54.30	0.6	3.33
09:20:55.34	+29:27:8.70	0.6	3.31
09:22:10.17	+30:32:36.50	0.3	3.29
09:17:46.05	+30:31:6.70	0.7	3.26
09:16:32.72	+30:58:31.30	0.8	3.26
09:22:4.75	+29:27:38.80	0.3	3.25
09:23:44.96	+30:32:8.10	0.7	3.24
09:18:4.10	+30:57:0.10	0.6	3.22
09:17:18.63	+30:33:39.80	1.1	3.21
09:20:28.50	+29:12:7.50	0.5	3.19
09:14:59.51	+29:56:45.10	0.3	3.12
09:17:47.80	+30:52:1.40	0.7	3.10
09:23:6.65	+30:53:20.80	0.5	3.08
09:19:53.32	+30:22:28.20	1.0	3.08
09:21:41.36	+30:53:33.50	0.3	3.07
09:18:38.09	+29:27:33.60	0.6	3.07
09:20:57.46	+30:14:8.70	0.9	3.06
09:22:27.33	+30:33:57.70	0.8	3.04
09:23:47.28	+30:42:29.50	0.9	3.00
09:20:1.24	+30:26:19.00	1.0	3.00
09:15:42.96	+30:41:25.60	0.3	3.00
09:23:57.39	+30:19:5.40	0.6	2.98
09:18:48.28	+30:13:2.20	0.4	2.98
09:20:44.68	+30:05:2.50	1.1	2.95
09:16:37.42	+30:31:30.00	0.4	2.95
09:22:7.54	+30:56:29.00	1.2	2.93
09:21:42.92	+30:51:9.60	0.5	2.93
09:21:45.93	+30:13:33.00	0.9	2.91
09:18:13.50	+30:38:30.60	0.3	2.91
09:15:8.77	+30:07:56.40	0.5	2.90
09:23:51.52	+30:29:22.70	1.0	2.88
09:20:32.47	+30:38:10.50	0.9	2.88
09:24:4.76	+30:53:59.80	0.7	2.85
09:15:17.10	+30:45:3.00	0.9	2.85
09:23:59.10	+29:36:8.20	0.4	2.82
09:18:13.93	+30:40:49.10	1.0	2.82
09:16:37.96	+29:08:10.40	0.4	2.81
09:15:37.77	+30:31:55.20	0.8	2.80
09:18:29.54	+30:15:24.40	0.6	2.78
09:15:28.51	+30:23:47.10	0.6	2.76
09:23:54.37	+30:59:4.20	1.0	2.75
09:23:52.41	+29:02:27.40	0.7	2.75
09:20:5.29	+29:18:29.10	1.0	2.75
09:17:6.47	+30:55:40.00	1.0	2.75
09:22:24.01	+29:43:14.20	1.2	2.74
09:18:55.07	+30:38:35.10	0.3	2.74
09:20:43.82	+29:14:12.10	0.3	2.72
09:18:19.37	+30:27:33.70	0.6	2.72
09:14:59.61	+30:46:37.50	0.6	2.72
09:19:38.07	+29:38:27.00	0.4	2.65
09:24:9.02	+30:33:11.40	1.1	2.64
09:21:52.31	+30:22:14.30	0.7	2.64
09:20:23.21	+29:55:56.60	1.2	2.64
09:17:9.78	+30:51:49.70	0.8	2.64
09:17:40.77	+30:48:45.10	1.0	2.64
09:22:46.53	+30:25:3.80	0.3	2.62
09:24:2.90	+29:18:1.70	0.5	2.61
09:18:23.71	+30:35:50.90	1.0	2.61
09:19:19.90	+29:38:16.80	0.7	2.60
09:17:11.50	+30:24:15.00	0.5	2.59

09:15:56.95	+29:28:18.40	0.4	2.59	05:20:55.67	-48:13:2.20	0.4	4.78
09:24:7.68	+30:45:13.90	1.0	2.57	05:22:59.70	-48:11:18.30	0.4	4.72
09:15:8.46	+30:24:31.90	0.9	2.57	05:15:53.53	-49:45:28.80	0.4	4.64
09:21:41.39	+30:40:52.60	0.4	2.56	05:20:17.02	-48:17:8.10	0.5	4.45
09:21:31.27	+30:39:53.90	1.2	2.56	05:19:43.25	-48:18:33.80	0.7	4.41
09:19:59.59	+30:41:54.60	0.6	2.55	05:15:59.26	-48:07:18.00	0.2	4.35
09:20:29.40	+30:45:14.70	0.5	2.54	05:21:3.35	-49:26:25.60	0.4	4.29
09:23:57.90	+30:21:22.30	0.4	2.53	05:15:49.79	-48:11:24.00	0.4	4.20
09:18:56.79	+29:51:37.60	0.7	2.53	05:18:24.21	-48:42:30.00	0.6	4.13
09:23:19.45	+29:07:17.90	0.6	2.50	05:14:55.99	-49:51:52.70	0.4	4.11
09:21:14.28	+29:49:39.70	0.9	2.48	05:18:0.57	-48:35:34.20	0.5	4.02
09:20:12.69	+30:54:25.90	0.5	2.48	05:18:20.48	-49:00:41.90	0.6	3.99
09:16:1.43	+29:26:19.00	0.6	2.46	05:20:38.78	-49:42:46.00	0.4	3.93
09:22:31.50	+29:47:5.80	0.7	2.45	05:14:18.32	-48:34:5.90	0.8	3.90
09:17:18.11	+29:33:20.70	0.4	2.44	05:19:48.06	-48:56:23.30	0.4	3.83
09:15:32.64	+30:58:15.30	1.0	2.44	05:19:9.95	-48:40:53.40	0.2	3.77
09:21:3.95	+29:16:47.20	0.5	2.42	05:24:17.02	-48:56:27.40	0.3	3.65
09:21:36.86	+29:14:15.40	0.5	2.42	05:16:37.64	-48:59:43.80	0.4	3.58
09:19:16.62	+29:52:7.40	0.5	2.42	05:15:18.87	-48:41:50.60	0.3	3.57
09:23:56.39	+29:54:13.60	0.4	2.39	05:18:52.11	-48:36:52.00	0.6	3.51
09:15:39.53	+29:37:52.70	0.4	2.39	05:17:52.63	-48:28:29.50	0.4	3.47
09:23:51.93	+29:16:17.80	0.3	2.38	05:19:40.01	-48:29:8.90	0.4	3.45
09:18:48.32	+30:46:53.40	0.5	2.36	05:14:24.70	-49:49:52.40	0.6	3.41
09:23:35.66	+29:34:52.40	0.7	2.35	05:20:41.15	-49:07:24.40	0.4	3.38
09:19:58.88	+30:48:46.50	1.1	2.35	05:20:5.31	-48:08:57.40	0.7	3.35
09:19:47.69	+29:16:18.00	0.8	2.35	05:16:33.92	-49:12:41.50	0.7	3.33
09:20:10.28	+29:54:33.30	0.4	2.34	05:22:44.30	-49:25:59.10	0.5	3.31
09:19:12.57	+30:43:40.50	0.4	2.32	05:15:34.33	-49:23:6.60	0.2	3.30
09:19:56.98	+29:04:16.10	0.4	2.28	05:16:12.97	-48:25:50.20	0.4	3.29
09:16:45.01	+30:50:15.20	0.8	2.26	05:16:4.13	-49:50:21.50	0.6	3.26
09:19:30.20	+30:42:43.80	0.8	2.24	05:15:1.67	-49:37:21.10	0.2	3.25
09:15:50.54	+30:47:40.50	0.8	2.24	05:16:57.85	-48:25:35.00	0.4	3.24
09:17:39.58	+29:22:29.70	1.1	2.21	05:22:41.92	-48:05:54.40	0.7	3.21
09:19:48.59	+29:51:7.90	0.7	2.20	05:21:31.04	-49:53:47.50	0.6	3.21
09:17:16.67	+29:11:27.40	1.0	2.20	05:20:40.30	-49:50:26.10	0.5	3.21
09:21:21.53	+29:20:48.00	0.4	2.19	05:20:21.00	-48:33:27.90	0.3	3.21
09:16:33.63	+30:34:53.20	0.9	2.19	05:21:3.35	-49:51:47.70	0.9	3.20
09:19:11.49	+29:29:59.30	0.5	2.17	05:25:26.87	-49:06:48.90	0.2	3.19
09:20:34.13	+29:46:5.70	1.0	2.16	05:21:6.47	-48:45:46.50	0.6	3.10
09:19:52.40	+29:29:35.40	0.2	2.15	05:23:2.36	-48:57:23.30	0.2	3.07
09:21:47.12	+30:58:53.50	0.6	2.14	05:17:37.94	-49:22:20.50	0.4	3.07
09:21:25.42	+29:47:40.00	0.5	2.14	05:16:4.36	-48:54:55.60	0.6	3.07
09:18:20.93	+30:54:33.80	0.4	2.14	05:14:55.21	-48:54:40.30	0.6	3.05
09:16:45.15	+30:10:50.80	0.9	2.13	05:24:5.26	-49:29:7.80	0.4	3.04
09:15:55.74	+30:54:58.00	0.9	2.13	05:17:45.87	-49:01:53.00	0.9	3.04
09:20:19.62	+30:11:38.60	0.8	2.10	05:23:43.29	-49:35:12.20	0.2	3.02
09:18:57.92	+29:29:45.30	0.1	2.10	05:18:11.53	-49:31:44.80	0.9	3.02
09:19:12.10	+30:37:11.50	0.7	2.08	05:24:6.76	-48:29:2.80	0.5	3.01
09:23:8.59	+29:45:54.40	0.8	2.07	05:15:21.36	-49:12:6.40	0.6	3.01
09:23:27.07	+29:19:38.60	0.6	2.07	05:24:2.76	-49:15:19.70	0.4	2.98
09:23:11.12	+29:35:42.00	1.1	2.07	05:13:52.21	-49:57:39.50	0.5	2.97
09:21:22.02	+29:26:48.40	0.8	2.01	05:23:13.37	-49:29:36.50	0.6	2.96
05:22:17.01	-48:18:23.50	0.4	6.36	05:22:56.03	-48:32:17.50	0.4	2.96
05:20:55.20	-48:20:57.10	0.5	5.94	05:21:39.52	-49:17:7.80	0.7	2.96
05:21:38.08	-48:17:2.50	0.4	5.83	05:14:19.14	-49:35:51.10	0.9	2.96
05:16:49.15	-49:42:32.40	0.4	5.66	05:17:16.25	-48:03:19.40	0.2	2.94
05:18:45.12	-48:46:7.50	0.4	5.40	05:24:53.29	-48:09:45.20	0.1	2.93
05:20:46.92	-48:05:16.80	0.5	5.04	05:21:56.96	-49:45:2.20	0.4	2.89
05:22:2.34	-49:09:19.30	0.4	5.03	05:16:16.45	-48:40:32.70	0.5	2.89
05:14:22.12	-49:04:32.40	0.2	4.92	05:25:51.99	-49:51:34.60	0.7	2.88
05:21:15.10	-49:56:54.10	0.2	4.89	05:22:0.66	-49:51:56.10	0.7	2.88
05:21:30.42	-48:12:36.10	0.7	4.83	05:17:12.08	-48:07:28.00	0.6	2.86

05:14:34.31	-48:21:40.10	0.7	2.86	10:48:8.48	-4:12:5.60	0.3	4.91
05:23:21.06	-48:39:41.00	0.5	2.85	10:55:38.73	-5:29:57.20	0.3	4.84
05:21:20.27	-49:07:26.80	0.9	2.85	10:50:9.09	-4:20:2.50	0.4	4.77
05:18:3.65	-48:01:16.20	0.4	2.85	10:48:17.48	-5:03:3.10	0.5	4.73
05:23:9.99	-49:14:0.90	0.3	2.81	10:53:39.55	-4:36:28.10	0.4	4.72
05:22:32.42	-49:30:18.20	0.4	2.77	10:54:17.72	-5:48:53.40	0.2	4.64
05:14:12.04	-49:13:48.20	0.4	2.77	10:55:13.80	-4:21:28.10	0.3	4.53
05:14:17.93	-48:26:54.40	0.4	2.75	10:54:6.75	-5:33:48.50	0.5	4.45
05:23:42.78	-48:01:37.10	0.4	2.70	10:55:57.07	-4:22:45.50	0.5	4.40
05:23:42.96	-48:18:7.80	0.5	2.66	10:54:42.66	-5:39:29.90	0.4	4.30
05:20:11.93	-49:05:3.50	0.6	2.63	10:49:28.46	-4:51:56.90	0.3	4.26
05:18:2.83	-49:01:2.40	0.4	2.62	10:52:6.05	-5:38:43.50	0.3	4.20
05:25:42.05	-48:28:47.70	0.5	2.61	10:51:35.87	-5:05:25.80	0.4	4.13
05:16:56.47	-48:20:3.40	0.6	2.60	10:50:27.55	-5:43:54.10	0.4	4.12
05:15:22.29	-49:00:46.00	0.8	2.60	10:50:25.66	-4:27:3.50	0.4	4.08
05:19:0.23	-49:52:28.10	0.7	2.59	10:50:13.16	-5:21:22.10	0.6	4.07
05:22:3.66	-48:59:51.40	0.7	2.58	10:55:44.85	-4:13:56.50	0.3	4.05
05:18:8.81	-48:45:20.50	0.8	2.58	10:52:1.46	-5:53:9.90	0.2	4.02
05:23:42.44	-48:23:31.00	0.4	2.57	10:50:24.12	-4:35:33.10	0.5	3.92
05:19:2.05	-49:48:51.50	0.5	2.56	10:51:6.99	-4:47:36.10	0.6	3.86
05:14:20.30	-48:49:36.80	0.7	2.55	10:52:51.95	-4:32:15.70	0.4	3.85
05:19:46.31	-48:01:7.50	0.5	2.52	10:51:41.97	-5:56:29.20	0.4	3.85
05:22:12.55	-49:41:47.80	0.3	2.51	10:48:16.50	-4:46:45.00	0.4	3.60
05:25:51.23	-49:07:21.10	0.7	2.49	10:50:57.74	-5:57:1.90	0.5	3.59
05:20:23.24	-49:17:49.60	0.4	2.49	10:51:9.43	-4:09:45.10	0.7	3.53
05:16:21.97	-48:46:4.00	0.4	2.49	10:49:36.38	-4:17:40.50	0.3	3.53
05:24:48.11	-49:13:9.90	0.6	2.46	10:50:16.73	-5:12:1.10	0.7	3.52
05:23:34.06	-48:38:53.50	0.6	2.46	10:53:1.93	-5:00:50.10	0.3	3.49
05:20:20.46	-49:14:38.50	0.6	2.43	10:54:45.87	-5:14:6.70	0.3	3.45
05:14:3.95	-48:02:11.30	0.6	2.43	10:51:1.21	-4:29:7.60	0.6	3.44
05:21:26.31	-49:54:49.10	0.1	2.42	10:52:54.27	-4:29:21.20	0.6	3.42
05:14:1.79	-49:03:47.30	0.7	2.40	10:48:50.93	-5:39:1.60	0.6	3.38
05:19:5.19	-48:59:51.90	0.2	2.39	10:48:32.46	-5:42:53.30	0.7	3.37
05:16:20.40	-48:33:24.50	0.4	2.37	10:51:29.19	-4:00:48.50	0.7	3.34
05:24:39.33	-48:48:50.90	0.7	2.36	10:50:1.56	-5:58:40.20	0.3	3.33
05:19:2.79	-48:01:5.00	0.6	2.36	10:51:23.86	-4:53:45.70	0.3	3.29
05:15:27.45	-49:18:42.60	0.4	2.36	10:49:48.51	-4:32:39.50	0.7	3.28
05:17:43.42	-49:45:10.80	0.7	2.34	10:52:58.08	-5:48:0.10	0.4	3.23
05:23:58.77	-48:46:17.10	0.6	2.33	10:49:38.17	-4:12:58.60	0.5	3.22
05:17:0.85	-49:44:53.90	0.1	2.33	10:55:55.34	-4:39:45.20	0.4	3.21
05:25:15.98	-49:54:40.80	0.1	2.30	10:52:39.05	-5:15:17.90	0.8	3.21
05:18:24.55	-48:07:2.20	0.2	2.30	10:55:23.46	-5:45:12.70	0.6	3.15
05:18:10.68	-49:50:51.20	0.8	2.29	10:49:22.64	-5:18:32.50	0.4	3.11
05:18:33.61	-48:10:27.30	0.7	2.26	10:49:52.68	-5:31:4.00	0.5	3.07
05:24:2.55	-48:11:43.60	0.8	2.25	10:53:44.78	-5:19:54.20	0.3	3.06
05:16:53.31	-48:33:8.00	0.6	2.25	10:55:50.65	-4:53:57.70	0.5	2.99
05:14:8.23	-48:54:24.20	0.8	2.24	10:51:55.98	-5:28:44.70	0.6	2.99
05:18:32.47	-49:58:45.20	0.4	2.22	10:50:55.40	-4:38:30.80	0.8	2.93
05:20:0.85	-49:56:1.10	0.6	2.18	10:55:38.54	-5:11:46.20	0.4	2.89
05:24:29.62	-49:45:33.00	0.7	2.17	10:52:12.62	-5:23:13.70	0.3	2.89
05:21:49.78	-49:25:5.60	0.5	2.14	10:49:33.75	-4:58:14.60	0.6	2.89
05:14:51.13	-49:45:30.10	0.8	2.13	10:55:55.52	-4:05:3.60	0.3	2.88
05:17:1.82	-49:08:4.80	0.8	2.12	10:51:21.30	-4:31:44.10	0.5	2.88
05:26:0.85	-49:25:45.10	0.2	2.09	10:50:7.31	-5:31:43.50	0.3	2.85
05:17:43.92	-49:56:6.00	0.7	2.07	10:54:54.57	-5:49:20.60	0.6	2.84
05:16:57.61	-48:49:49.50	0.6	2.06	10:48:28.68	-5:58:49.30	0.3	2.82
05:25:45.71	-48:47:31.20	0.4	2.04	10:54:7.09	-5:11:33.50	0.5	2.79
05:15:14.79	-48:24:1.20	0.6	2.04	10:52:27.51	-5:02:1.50	0.4	2.75
10:55:10.83	-5:04:17.40	0.7	7.69	10:48:19.02	-5:29:40.00	0.5	2.75
10:53:29.14	-4:48:44.30	0.2	5.87	10:54:7.83	-5:19:5.10	0.8	2.74
10:52:46.51	-4:25:12.10	0.3	5.51	10:49:19.76	-5:35:12.90	0.7	2.74
10:55:22.51	-4:55:45.80	0.3	4.95	10:48:27.21	-5:35:53.30	0.4	2.74

10:52:47.69	-4:50:36.80	0.4	2.71
10:51:28.37	-5:51:53.10	0.7	2.69
10:48:30.39	-4:20:15.60	0.6	2.69
10:55:55.90	-5:13:28.30	0.9	2.67
10:49:20.01	-5:39:28.60	0.5	2.66
10:53:54.38	-5:28:29.20	0.8	2.65
10:51:16.00	-4:38:53.20	0.4	2.65
10:49:1.60	-4:10:29.50	0.6	2.63
10:52:19.92	-5:58:19.90	0.5	2.62
10:53:59.93	-4:26:52.40	0.4	2.61
10:49:43.29	-5:51:2.50	0.5	2.61
10:49:26.69	-5:05:35.70	0.7	2.61
10:52:26.99	-4:27:50.80	0.8	2.60
10:54:26.13	-5:20:32.60	0.6	2.56
10:53:3.87	-5:39:29.50	0.7	2.54
10:49:42.13	-5:56:56.60	0.8	2.52
10:55:21.35	-4:05:9.30	0.6	2.48
10:48:21.86	-4:03:48.70	0.4	2.48
10:50:29.35	-5:47:22.30	0.7	2.47
10:52:48.70	-5:18:45.00	0.3	2.46
10:52:46.15	-4:58:7.00	0.7	2.46
10:55:55.51	-5:43:6.20	0.8	2.45
10:54:20.07	-5:54:15.40	0.7	2.43
10:49:3.22	-5:54:13.90	0.8	2.43
10:48:12.39	-5:20:45.60	0.5	2.43
10:55:49.04	-5:57:18.20	0.6	2.41
10:48:30.09	-5:49:46.10	0.6	2.37
10:50:1.28	-4:03:2.70	0.8	2.36
10:54:49.36	-5:18:20.70	0.8	2.34
10:51:47.64	-4:34:12.40	0.5	2.32
10:55:55.63	-5:00:21.50	0.7	2.31
10:55:32.36	-5:22:13.50	0.6	2.31
10:54:0.26	-5:41:26.40	0.6	2.30
10:48:41.45	-4:25:3.60	0.4	2.30
10:49:33.30	-4:35:37.10	0.4	2.28
10:55:3.39	-4:18:50.00	0.7	2.26
10:50:1.83	-4:43:29.20	0.5	2.26
10:55:21.52	-4:18:51.80	0.7	2.25
10:51:59.95	-4:02:6.60	0.6	2.24
10:48:21.48	-5:13:0.60	0.6	2.24
10:49:7.41	-5:57:54.80	0.6	2.21
10:54:24.83	-4:51:11.70	0.6	2.19
10:54:12.30	-4:53:0.20	0.8	2.15
10:52:41.65	-5:42:57.20	0.8	2.13
10:55:57.46	-5:37:14.40	0.8	2.11
10:48:31.30	-4:13:50.60	0.8	2.11
10:55:27.16	-5:31:26.90	0.8	2.10
13:59:43.63	-11:39:41.90	0.3	7.76
13:55:30.55	-10:52:6.30	0.4	6.61
13:57:12.49	-11:00:35.10	0.5	5.41
14:01:14.50	-11:36:8.20	0.3	5.31
13:59:24.16	-11:51:8.80	0.4	5.31
14:02:1.83	-10:23:28.60	0.5	4.98
14:01:54.79	-10:38:7.60	0.4	4.96
14:03:10.11	-11:15:51.60	0.2	4.90
14:00:2.03	-10:25:41.60	0.5	4.72
13:55:40.33	-10:53:40.10	0.7	4.52
14:02:37.32	-12:00:44.40	0.4	4.46
14:02:27.45	-10:46:16.50	0.3	4.37
14:02:42.59	-11:10:27.00	0.5	4.24
14:01:41.60	-10:48:43.90	0.3	4.11
14:01:20.02	-11:27:41.70	0.3	4.07

13:57:56.02	-10:52:6.80	0.7	4.04
14:00:6.78	-10:07:19.00	0.5	4.00
13:57:55.67	-11:18:5.80	0.4	3.89
14:01:20.55	-11:15:22.20	0.3	3.80
14:02:4.81	-11:00:2.80	0.3	3.75
14:02:56.28	-10:11:44.00	0.3	3.72
13:55:25.13	-10:39:22.60	0.4	3.72
13:55:59.63	-11:53:25.40	0.5	3.67
14:00:53.55	-12:00:58.50	0.4	3.64
13:56:32.48	-10:57:16.90	0.8	3.58
13:56:4.46	-11:29:37.80	0.5	3.57
13:59:46.47	-11:27:20.40	0.5	3.53
13:58:41.92	-11:44:24.10	0.4	3.50
13:55:19.59	-11:51:0.30	0.5	3.42
13:56:28.20	-10:54:2.30	0.3	3.38
13:57:58.22	-10:10:8.10	0.6	3.36
13:56:27.85	-11:37:48.90	0.5	3.35
13:59:22.30	-10:56:21.20	0.7	3.34
13:55:37.21	-11:17:17.00	0.6	3.29
13:55:33.77	-12:02:5.30	0.7	3.25
13:56:36.18	-11:03:43.00	0.5	3.24
14:02:8.16	-10:50:25.80	0.5	3.21
13:57:0.46	-11:10:36.20	0.5	3.21
14:01:48.03	-10:15:55.30	0.4	3.20
13:58:42.31	-10:41:30.80	0.5	3.20
13:56:3.47	-10:59:53.30	0.6	3.16
13:57:46.67	-11:41:45.30	0.4	3.15
13:59:37.79	-11:00:34.10	0.5	3.13
13:56:23.81	-11:31:27.00	0.2	3.12
13:58:35.84	-11:33:4.30	0.5	3.11
13:57:17.33	-11:16:59.10	0.5	3.11
13:55:58.26	-10:45:34.70	0.7	3.10
13:55:38.18	-10:35:52.90	0.5	3.08
13:58:8.57	-10:36:33.90	0.9	3.00
13:58:53.98	-11:16:38.20	0.2	3.00
14:00:36.57	-10:58:5.00	0.4	2.99
14:00:54.32	-10:28:25.60	0.5	2.98
13:56:2.27	-11:32:47.20	0.8	2.96
13:59:1.41	-10:53:36.50	0.2	2.95
13:58:2.89	-11:41:38.80	0.3	2.95
14:01:51.23	-10:06:16.80	0.5	2.94
13:55:40.65	-11:09:49.00	0.8	2.94
14:01:5.38	-11:12:0.60	0.5	2.93
13:57:17.18	-11:31:5.00	0.7	2.91
14:01:47.92	-10:34:6.40	0.2	2.89
14:01:34.41	-10:36:48.60	0.6	2.86
14:02:5.54	-11:47:31.40	0.7	2.85
13:58:41.31	-11:14:47.90	0.5	2.85
14:00:25.27	-10:38:20.30	0.8	2.84
14:00:36.07	-11:59:57.60	0.7	2.83
13:56:57.35	-11:37:19.10	0.4	2.79
13:55:36.12	-11:06:29.60	0.6	2.79
13:59:58.28	-10:39:41.30	0.6	2.78
13:55:18.60	-10:25:22.30	0.7	2.77
14:02:54.97	-10:52:34.20	0.5	2.76
14:00:54.88	-11:50:19.30	0.4	2.75
13:58:42.23	-10:51:51.40	0.6	2.75
13:59:48.80	-10:07:51.30	0.7	2.74
13:57:27.90	-11:20:43.30	0.6	2.74
13:58:4.88	-11:27:17.00	0.3	2.73
13:56:39.05	-11:13:32.80	0.7	2.71
14:01:25.78	-10:51:51.00	0.6	2.70

13:55:24.95	-10:05:11.10	0.4	2.70
13:56:12.44	-11:13:30.20	0.8	2.68
13:55:19.57	-11:01:55.20	0.7	2.66
14:00:18.59	-10:45:28.90	0.4	2.65
13:56:5.25	-11:45:48.10	0.3	2.64
13:58:28.35	-10:17:17.50	0.3	2.63
13:57:52.11	-11:27:27.60	0.5	2.63
14:03:22.73	-12:00:8.20	0.5	2.62
14:03:16.40	-11:33:28.70	0.9	2.62
13:59:11.05	-11:13:43.60	0.4	2.61
13:55:24.35	-11:28:10.80	0.4	2.61
13:58:59.67	-11:38:47.00	0.7	2.60
13:56:56.99	-10:33:19.00	0.7	2.59
14:03:18.52	-11:07:18.90	0.7	2.55
13:58:38.24	-10:19:2.50	0.2	2.55
13:58:22.61	-10:42:0.00	0.7	2.55
13:57:18.61	-11:59:34.90	0.5	2.55
14:02:26.83	-10:03:46.80	0.5	2.54
13:58:7.61	-11:08:37.90	0.5	2.53
13:56:55.35	-11:44:48.40	0.7	2.53
13:58:14.78	-10:51:18.80	0.5	2.52
13:56:45.12	-11:30:38.10	0.6	2.52
14:03:13.09	-11:40:46.00	0.3	2.51
13:58:48.28	-12:01:29.60	0.4	2.51
13:58:3.43	-10:59:35.60	0.8	2.48
13:58:29.25	-11:55:58.90	0.5	2.46
14:02:43.81	-11:02:26.60	0.7	2.44
13:57:57.12	-11:59:29.20	0.3	2.39
14:02:46.54	-10:05:36.30	0.6	2.37
14:01:17.21	-10:27:6.00	0.4	2.37
13:56:50.29	-12:01:47.40	0.3	2.36
13:57:14.31	-10:24:18.70	0.8	2.35
14:02:49.64	-10:55:55.90	0.4	2.34
13:57:36.26	-11:11:8.00	0.8	2.33
13:56:28.92	-11:23:52.50	0.5	2.31
13:55:35.76	-11:29:48.50	0.6	2.30
14:02:15.93	-11:24:48.50	0.3	2.29
13:58:8.82	-10:46:24.80	0.8	2.29
13:56:37.62	-11:54:59.60	0.4	2.29
13:59:58.74	-10:13:13.30	0.5	2.28
13:56:39.04	-10:21:59.80	0.4	2.28
13:59:22.11	-10:05:42.30	0.7	2.24
13:59:1.98	-10:22:32.20	0.3	2.24
13:58:19.69	-11:21:4.30	0.6	2.24
13:55:17.50	-11:38:50.90	0.5	2.24
13:58:7.87	-11:54:59.20	0.8	2.22
14:01:30.15	-11:44:49.30	0.7	2.21
14:00:45.32	-10:52:38.50	0.7	2.21
13:58:58.86	-10:09:36.30	0.5	2.21
13:58:28.28	-10:31:46.90	0.7	2.19
13:55:28.42	-11:24:20.30	0.7	2.19
13:55:45.98	-10:26:19.20	0.5	2.16
13:59:7.73	-10:13:19.90	0.8	2.15
13:56:3.94	-11:05:53.90	0.5	2.13
14:00:44.17	-11:04:16.60	0.5	2.12
13:55:22.44	-10:12:27.60	0.7	2.10
14:03:1.45	-11:27:29.80	0.7	2.09
14:00:0.29	-11:22:26.70	0.8	2.09
13:58:39.72	-10:31:48.80	0.5	2.09
14:02:41.24	-10:12:25.10	0.7	2.08
14:02:11.85	-11:07:17.30	0.6	2.08
13:58:55.56	-10:14:50.90	0.6	2.08
13:56:44.52	-11:50:5.70	0.8	2.08
13:56:27.69	-11:57:6.90	0.7	2.08
14:03:6.56	-11:54:6.50	0.8	2.07
14:00:42.47	-10:43:54.10	0.7	2.06
13:55:58.92	-10:17:59.20	0.7	2.06
14:00:4.65	-10:45:58.60	0.8	2.03
13:57:51.39	-10:32:17.50	0.4	2.02