THE DISTRIBUTION OF RICH CLUSTERS OF GALAXIES

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Abstract

A catalogue is prepared of 2712 rich clusters of galaxies found on the National Geographic Society--Palomar Observatory Sky Survey. From the catalogue, 1682 clusters are selected which meet specific criteria for inclusion in a homogeneous statistical sample.

An investigation of the sample leads to the following conclusions: (i) The distribution function of clusters according to richness, N(n) increases rapidly as n decreases. (ii) The data allow no significant decision that the spatial density of cluster centers varies with distance. (iii) Galactic obscuration of the order of a few tenths of a magnitude (photored) exists at high northern galactic latitudes around galactic longitude 300°. (iv) There is a highly significant nonrandom distribution of clusters in direction, both when clusters at all distances and when clusters at various distances are considered. An analysis of the distribution yields strong evidence for the existence of second-order clusters, that is clusters of clusters of galaxies. A statistical test shows the observed distribution to be compatible with the assumption of complete second-order clustering of galaxies.

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Introduction

The observational approach to cosmology requires the determination of the distribution and of the kinematical properties of matter in the universe. For remote objects, only the radial components of the space motions are observable, and only two of the spatial coordinates are readily available (say right ascension and declination). Comparison of theory and observation depends in a critical way upon at least a third spatial coordinate, say distance.

Distances to nearby galaxies are determined from the apparent luminosities of their brightest stars. In the nearest galaxies, cepheid variables are particularly important as such distance indicators. However, distances to more remote galaxies (beyond a few million parsecs) must be found from their integrated magnitudes.*

Unfortunately, absolute luminosities are known for comparatively few galaxies, and for those only approximately. The galaxies in even this small sample display a large range of absolute luminosities. It is thus not possible to learn the distance of an isolated galaxy from its apparent magnitude alone. However, clusters of galaxies provide a possible method of determining cosmic distances if some suitable characteristic of the luminosity function for a given cluster, for

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*In the measurement of the total magnitude of a galaxy, because of the difficulty encountered in including the contributions of light from its outermost regions, it is common practice to consider the magnitude included within a given projected radial distance of the center of the galaxy, or within a given isophotal countour (1).

example the magnitude of its nth brightest member, is assumed known. At the present time even the bright end of the luminosity function for clusters in not accurately known, nor is it known how the function might depend upon the richness, distance, or compactness of a cluster. However, there is some observational evidence (1) that the dispersion among the absolute magnitudes of the third, fifth, and tenth brightest galaxies of rich clusters is not over 0.35 magnitudes. The relative distances of clusters may thus be determined approximately.

It might seem that the velocity--distance relation (2,1) would make it possible to determine the distance of a galaxy from its redshift. However, the slope of the velocity--distance relation (Hubble constant) and the nature of any nonlinearities which may exist are known only tentatively. Furthermore, the calibration of the far end of the velocity--distance relation itself has been made with clusters of galaxies for which distance estimates are possible.

Counts of individual galaxies are useful in the investigation of the large scale distribution of cosmic matter (3,4,5,6,7,8,9). The apparent magnitudes of galaxies are, of course, statistically correlated with their distances, but the usefulness of the correlation is limited by the uncertainty of the luminosity function for all galaxies. Clusters of galaxies, on the other hand, provide an independent approach to the problem of the over-all distribution of matter. Since there is a possibility of determining at least relative distances to individual clusters, their spatial distribution is directly obtainable. Zwicky (10,11,12,13) has been investigating the cluster distribution; his published results pertain to a relatively small fraction of the total sky.

The principal statistical limitation of clusters of galaxies for distribution studies has been their small numbers. Prior to 1949, only a few dozen clusters were known. Twenty-five of these had been listed by Shapley in 1933 (14). In recent years, however, two independent photographic programs have indicated that clusters of galaxies are far more numerous than was formerly thought, and that indeed they may be fundamental condensations of matter in the universe. These are the proper motion survey made with the 20-inch astrographic camera of the Lick Observatory and the National Geographic Society--Palomar Observatory Sky Survey.

On the Palomar survey, which is by far the more extensive of the two, tens of thousands of aggregates of galaxies can be identified. Nearly two thousand of these clusters are sufficiently rich as to provide a homogeneous sample large enough to be useful for a provisional statistical investigation. Such an investigation is the purpose of the present program.

The study is in two parts. The first part consists of the compilation of a catalogue of 2712 rich clusters of galaxies discovered on the Sky Survey. The catalogue is intended as a finding list which is expected to be useful for the investigation of problems related to clusters.

In the second part, a homogeneous sample of 1682 clusters is selected from the catalogue for statistical study. The three problems considered are the uniformity of the distribution of clusters with depth in space, the isotropy of the distribution of clusters, and the evidence available for second-order clustering, that is, for the existence of clusters of clusters of galaxies.

PART I

A Catalogue of Rich Clusters of Galaxies

A. Observational Material

The observational material used for this study is the National Geographic Society--Palomar Observatory Sky Survey. The survey covers the sky from the north celestial pole down to declination -27° on photographs taken with the 48-inch Schmidt telescope of the Palomar Observatory. Observations for the Sky Survey were carried out by Dr. Albert G. Wilson (now director of the Lowell Observatory), Mr. Robert G. Harrington of the California Institute of Technology, and the writer. The National Geographic Society provided financial backing for the project, and the Palomar Observatory furnished administration and observing time at the 48-inch telescope.

The telescope is of the standard Schmidt type. The spherical mirror is 72 inches in diameter and has a radius of curvature of 241 inches. The correcting plate is made from 3/8-inch plate glass which transmits half intensity at about 3500 angstroms and actually has a clear aperture not of 48 inches but of 49.5 inches. The effective focal length of the system is 121 inches, giving a focal ratio of f/2.44.

The photographic plates employed are 14 inches square and are one millimeter thick, so that they can be curved in the plate holder to a 121-inch radius along the focal surface which is concentric with the spherical mirror. The image scale is 67.1 seconds of arc per millimeter.

The smallest stellar images have a diameter of about 0.03 millimeters, about the average limit of resolution of the photographic emulsions used. The nonvignetted field of the telescope, determined by the respective sizes of the mirror and correcting plate, is 5.4 degrees in diameter. The computed loss in limiting magnitude because of vignetting at the extreme corners of a 14 x 14-inch plate is less than 0.2 magnitudes.

The total field covered by one plate is 6.6 degrees square. A total of 879 different fields were required to cover the portion of the sky surveyed. Allowance was made for an overlap of at least 0.6 degrees along all edges of adjacent fields.

Each field was photographed with the Schmidt telescope on both blue- and red-sensitive photographic emulsions. The two exposures were taken in immediate succession. The order of the exposures was, however, arbitrary, being generally dictated by convenience or efficiency in arranging the observing schedule.

All exposures were made on photometrically clear nights in the absence of moonlight, and when the seeing disc of a stellar image was not more than three seconds of arc in diameter. Further, all exposures were made as near to the meridian as practicable (with very few exceptions, within two hours) to minimize extinction, differential refraction, and instrumental distortions.

For the blue exposures, the Eastman 103a-O emulsion was used. For the red exposures, the Eastman 103a-E emulsion in combination with a red Plexiglass filter, number 2444 which has transmission characteristics similar to those of the Wratten Number 29 filter, was used.

The exposure times were chosen to reach the faintest stars which can be recorded by the instrument under average observing conditions. They were separately determined by test exposures for each shipment of plates and ranged from 10 to 15 minutes for the blue exposures and from 40 to 60 minutes for the red. All plates were developed in standard formula D-19 developer for five minutes, while being agitated by an electrically operated mechanical rocking device designed to insure uniform development. The contrasts (ratio of density to the logarithm of the exposure for the approximately linear part of the characteristic curves for the emulsions) are between gamma 1.5 and 2.0.

Magnitudes of stellar images on the blue and red plates are approximately on the same color system as that of international photographic magnitudes and red magnitudes of Kron and Smith (15). The differences between blue and red magnitudes of stars on the survey plates are approximately 1.6 times their international color indices. A star with an international color index of 0.7 appears about equally bright on the blue and red plates. The red and blue limiting magnitudes were determined by the writer from six pairs of red and blue plates which contained Selected Area 57. The standards used were the photoelectric measures of stars in SA 57 by W. Baum which were communicated to the writer prior to publication. The limiting photographic magnitude for the blue plates is 21.1, and the limiting photored magnitude for the red plates is 20.0. Here, by limiting magnitude is meant the faintest magnitude for which every star produces an image.

These observations for the Sky Survey were carried out as part of a project sponsored jointly by the National Geographic Society and the Palomar Observatory, and are not properly part of this thesis. A description of the observations has been included here, however, because they are pertinent to the quality of the material used for the study of clusters of galaxies.

The intrinsic international color indices of nearby elliptical and early spiral galaxies cluster between 0.8 and 0.9, while the later spirals are somewhat bluer (16). Owing to the redshift of distant galaxies, the maximum of their spectral energy curves are shifted to the red. The largest red shifts so far measured (1) are about $d\lambda/\lambda=0.2$. A galaxy with an intrinsic effective wavelength of λ5000 would thus appear to have an effective wavelength of λ6000. Therefore, all but the nearest galaxies are more conspicuous on the red survey plates than on the blue. A cluster of galaxies with a redshift of $d\lambda/\lambda=0.2$ although plainly visible on the red plate is so inconspicuous on the blue plate as to be scarcely recognizable as a cluster.

Because of the advantages of the red plates for revealing distant clusters of galaxies, only the red survey photographs were used in the present study. The red plate-filter combination has a wavelength range of from λ6200 (filter cut off) to λ6700, with an effective wavelength near λ6500. The sensitivity curve for the combination is given in figure 1.

B. Definition of a Cluster

In a recent series of papers, Neyman, Scott, Shane, and Swanson developed a theory of galaxian distribution in which it is assumed that all galaxies belong to clusters. In the first paper of the series (4)

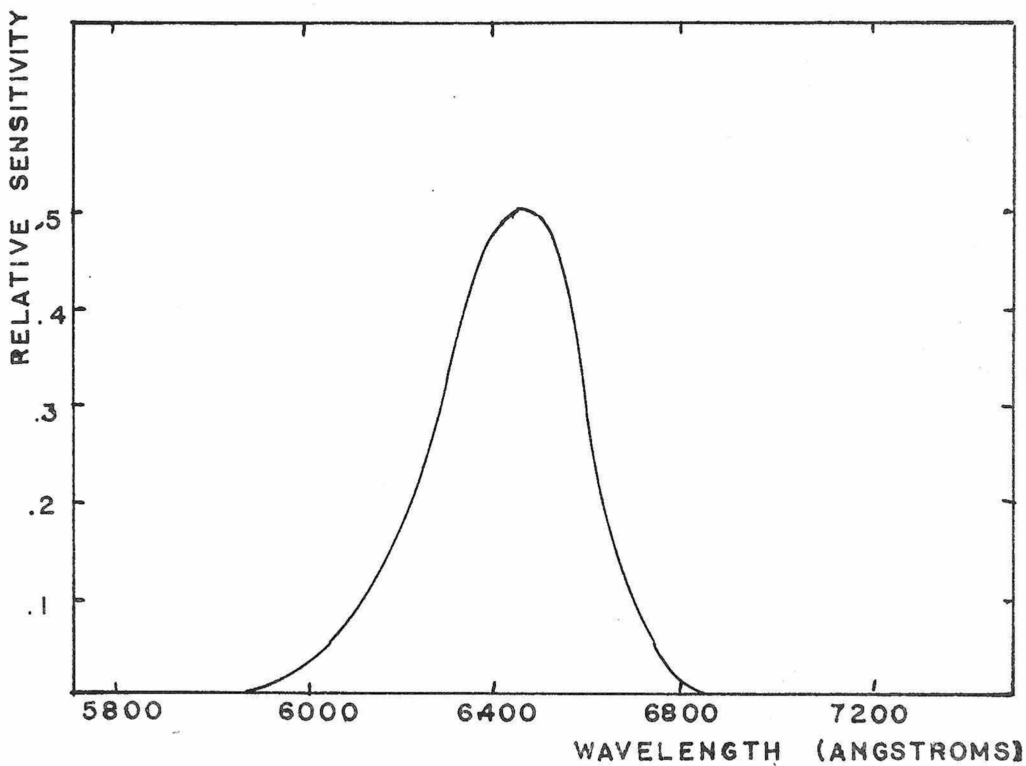

FIGURE I. RED SENSITIVITY RANGE

a probability generating function is derived from which can be predicted on the basis of the theory the probability of an observed distribution of galaxy images on a photographic plate. Their formula includes the effects of the projected distribution along the line of sight of images of galaxies at various distances, of galaxies belonging to clusters centered outside the photograph, and of galaxies contributed to the field by clusters most of whose members lie beyond the magnitude range of the telescope. The formula involves unspecified functions regarding the spatial distribution of galaxies within clusters, the distribution of the number of galaxies per cluster (the possibility of clusters containing only one galaxy is allowed), the limiting magnitude in various portions of the plate, and the luminosity function of galaxies. The only specific assumption is that the distribution of cluster centers is quasi-uniform, that is, according to a Poisson law.

In the second paper of the series (5) certain of these functions are specified, and some of the parameters of the functions are provisionally evaluated from counts of galaxies made at the Lick Observatory. In the third paper (6) the probability generating function with the assumed functions and derived parameters is employed to manufacture a "synthetic plate" which displays a possible distribution of galaxy images in accord with the theory. The distribution of galaxies on the synthetic plate is then compared with the distributions on several actual plates obtained with the 20-inch astrographic camera. The comparisons indicate that the actual distributions of galaxies on the 20-inch plates are compatible with the theory that all galaxies are clustered. Indeed, the actual plates show slightly greater clustering tendency than does the synthetic plate.

The synthetic plate showed considerable "clumpiness" in the distribution of galaxies. At first thought, it would seem that these clumps would indicate galaxies belonging to a particular cluster center. However, when it was checked back to determine which cluster centers the various galaxies in such an association actually came from, it was invariably found that the galaxies included in the "apparent" cluster really were contributed from two or more different cluster centers (7). Thus even though the distributions of galaxies on the 20-inch plates are compatible with the assumption that all galaxies are in clusters, it is not possible (at least on those plates) to identify the clusters to which individual galaxies belong.

The results of the Lick investigation imply that one must exercise considerable caution in deciding what a cluster is. It would appear that many apparent clusters are only projection effects, not physical associations of galaxies. Furthermore, the many clusters projected on top of each other on a photograph create the impression of a general field of galaxies, individual clusters often being "washed out" and indistinguishable from the field. Whereas no attempt has as yet been made to determine whether the distribution of galaxy images on the 48-inch plates is also compatible with the theory of complete clustering, the possibility must be considered that the same difficulties in the identification of clusters on the Palomar survey plates may be encountered as in the case of the Lick survey.

On the other hand, there are some well known rich clusters of galaxies which are unquestionably real physical associations. Consider, as examples, the famous clusters in Virgo and Coma Berenices, both of which have been well studied (11,12,17,18,19,20,21). The following arguments can be advanced in support of their reality as clusters: Firstly, the areal numerical densities of galaxies in these clusters substantially exceed the densities of the surrounding fields. Secondly, the dispersion in magnitudes among the members of these clusters is in reasonable agreement with our estimates of the dispersion of magnitudes of the brighter galaxies in our neighborhood. In particular, in each cluster large numbers of galaxies have nearly the same magnitudes, and also similar angular sizes. Thirdly, the spatial distributions of galaxies within the clusters are reasonable considering the numbers of galaxies within the clusters. Specifically, the Coma Cluster has approximately the (isothermal) distribution of a relaxed system, while the less rich Virgo Cluster has not (11). Fourthly, the galaxies within the clusters are observed to have about the same radial velocities; assuming the velocity--distance relation, their similar velocities imply similar distances. Fifthly, the internal dispersion of velocities in the clusters can be applied, with basic mechanics, to compute the average masses of their brighter members (11,18,22,23). The masses so obtained ($1 - 2 \times 10^{11}$ solar masses) are in satisfactory agreement with the masses of bright galaxies obtained by other methods (24,25,26).

For the purpose of the present study, we shall consider the following picture of the distribution of galaxies: There is a general field of galaxies, the areal numerical density of which varies from point to point in the sky. Whether this field is composed of isolated individual galaxies, of clusters of galaxies overlapping in projection, or both is considered immaterial. In any case, superposed upon the general field there are occasional very rich clusters of galaxies which stand out conspicuously and which we shall assume to be physical associations. There will generally be a few galaxies belonging to the general field which will be indistinguishable from the bona fide cluster members. However, their number will be relatively small if we consider only the very richest aggregates. In the present investigation, criteria have been set up which are intended to exclude those associations which have a nonnegligible chance of being optical only, or which are insufficiently rich to insure identification.

To be useful for statistical analysis, it is essential that those clusters which meet the adopted criteria be identified completely. As each Sky Survey plate was taken, it was carefully inspected, either by Dr. A. G. Wilson or by the writer. A card file was kept of interesting objects, including clusters of galaxies, noted on the photographs. Since nearly half of the survey fields had to be photographed more than once to obtain plates which met the standards set for the Sky Survey, duplicate inspections were made of a large part of the sky. As the data were collected for the catalogue of clusters, the acceptable red plate of each survey field was again carefully inspected by the writer. The list of clusters found on each plate was then compared with the earlier records of the original inspections of that plate and all duplicate plates of the same field. The criteria for the definition of a cluster of galaxies were so set that no more than about two per cent of the clusters identified on one of the original inspections, and which meet the criteria, were missed on the final inspection. The adopted criteria are described in the following paragraphs.

Richness criterion: A cluster must contain at least fifty members that are not more than two magnitudes fainter than the third brightest member. The third rather than first brightest member was chosen as the reference point to reduce possible errors in the counts caused by confusion of the brightest members of clusters with field galaxies.

Compactness criterion: A cluster must be sufficiently compact that its fifty or more members are within a given radial distance r of its center. The actual length of r is arbitrary so long as it is the same for all clusters. In determining whether a cluster meets this criterion, it was assumed that the redshift of a cluster is proportional to its distance. An estimate of the redshift was made by a technique described in section E. Then the counts of galaxies in the cluster were extended to a distance on the plate $4.6x10^5/cd\lambda/\lambda$ millimeters from the center of the cluster (c in kilometers per second). For an assumed value of the Hubble constant of H = 180 km/sec$\cdot 10^6$ pc (1), this corresponds to a distance in space of $8.2x10^5$pc. It should be pointed out that the counts are not particularly sensitive to the estimate of the redshift, nor to the linearity of the redshift law. In practice, it was found that the circle on the plate to which the counts were made was always considerably larger than the main concentration of the cluster, and counting to a radius fifty per cent larger or smaller would not substantially affect the counts (after correction for the general field).

Distance criterion: A cluster must be sufficiently distant so that counts of its members do not extend over more than one plate, or at most part of an adjacent plate. The Virgo Cluster, for example, spreads over several survey fields and would be very difficult to catalogue in a manner comparable to the more distant clusters. The adopted lower limit of distance is the distance corresponding to a redshift of 6000 km/sec. The Coma Cluster ($cd\lambda/\lambda$ = 6600 km/sec) would thus be among the nearest clusters included in the catalogue.*

The upper limit on distance is set by the requirement that two magnitude intervals beyond the third brightest member of a cluster be visible. Since it is not desirable to extend counts to within less than half a magnitude of the plate limit (20.0) it was decided to set as an upper limit on distance clusters whose third brightest members average about magnitude 17.5. The corresponding redshift for such clusters is 60,000 km/sec. The range of depth in space included within these distance limits (corresponding to H = 180 km/sec$\cdot 10^6$pc) is 3.3×10^7 to 33×10^7pc.

Galactic latitude criterion: In fields at moderately low galactic latitudes the density of stars is high enough so that clusters may not be completely identified. As each plate was inspected, it was noted whether or not it was thought that visible clusters were being completely identified. Those areas of the sky in the neighborhood of the Milky Way, where the star fields are moderately dense, were excluded for the purpose of statistical analysis. Interstellar obscuration, of course, also prevents complete identification of clusters. The magnitudes of partially obscured clusters, and

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*It is number 1656 in the catalogue (Table 6).

consequently their distances, are overestimated. Distant clusters are reduced in brightness so as to either be invisible or to appear beyond the range of distances considered in the study. However, at the latitudes down to which the catalogue is actually extended, the effect of a moderately rich star field in camouflaging visible clusters is more important than is the effect of interstellar obscuration in actually hiding clusters. How galactic absorption actually affects the results of the investigation will be discussed in section M.

The precise galactic latitudes at which the catalogue is considered incomplete vary with longtitude and are based on the judgements made of the star densities at the times when the various plates were inspected. In Table 1 are tabulated the galactic latitudes above which (in the northern galactic hemisphere) or below which (in the southern galactic hemisphere) the identification of clusters is considered complete for the purposes of the statistical investigation of Part II.

Table 1

Galactic Latitudes Above Which (in the Northern Hemisphere) or Below Which (in the Southern Hemisphere) Identification of Visible Clusters is Considered Complete

North Galactic Hemisphere			South Galactic Hemisphere		
Longitude		Latitude	Longitude		Latitude
0°	to 10°	$+40^\circ$	0°	to 80°	-35°
10	60	+35	80	160	-30
60	150	+25	160	200	-25
150	210	+30	200	340	*
210	360	+40	340	360	-35

*Area of the celestial sphere not covered by the Palomar Sky Survey.

In the preparation of the catalogue, all survey fields, including those in the Milky Way, were inspected. All clusters which looked as if they might satisfy the completeness criteria were examined. Many clusters which for one reason or another did not fulfill the various requirements to be included in the statistical study were nevertheless included in the catalogue to enhance its value as a finding list. All such entries, which are not suitable for the statistical sample, are so noted in the catalogue. In particular, the catalogue contains many clusters which do not meet the richness or the galactic latitude requirements.

C. Magnitude Estimates

Magnitudes of galaxies in clusters were estimated by comparing them with calibrated galaxy images on 4x5-inch sheets of cut film. The films are negative reproductions of arbitrary galaxy fields on survey plates. The film copies were made with a very low density sky background, and with the same scale as the originals. The procedure was to superpose the appropriate film on a survey plate, and looking through both the film and plate, match up the image of the unknown galaxy on the plate with one of the calibrated images on the film. A six to ten power magnifying lens was used for optical aid.

The galaxy images on the films were calibrated by the similar technique of superposing the films on survey plates containing images of galaxies of known magnitude. A total of sixty galaxy images on three sheets of film were so calibrated. The images on the films thus served as "step scales" to compare images of galaxies of unknown with those of known magnitudes. The tacit assumption in this procedure is that all survey plates are identical to each other (as regards image quality) and to the plates from which the calibration was made. Fortunately, the acceptable survey plates were taken under fairly well standardized conditions, and only in a very few cases does the quality of plates vary sufficiently to affect the magnitudes so determined by more than a few tenths. Quantitative estimates of the consistency of the magnitudes can be made, and are described in section G.

Unfortunately, there were not available photored magnitudes of standard galaxies covering a sufficient luminosity range. Magnitudes of a number of galaxies therefore had to be determined before calibration of the images on the films was possible. For this purpose, forty-seven galaxies of various apparent luminosities were arbitrarily chosen in the field near SA 57.

It was not important for this program whether or not the standard magnitudes had a zero point error. There were two purposes for which magnitude estimates were required. First, an estimate of the magnitude of, say, the tenth brightest member of each cluster was to be used as a distance criterion. The procedure assumes a certain constancy of the bright end of the luminosity function in clusters, as discussed in the introduction. No attempt was actually made to interpret distances directly from magnitudes. Rather, since the catalogue includes most of the clusters for which measured redshifts are available, it was possible to scale the magnitudes of the tenth brightest cluster members to approximate redshifts (see section E). Thus, if the pertinent part of the luminosity function of clusters is constant, and if the magnitude determinations are self consistent, there will exist a one to one relation between the magnitudes of the tenth brightest members of clusters and their redshifts (as well as distance if a specific redshift--distance relation is assumed). This will hold regardless of any zero point error in the magnitude standards, or even of any scale error.

The second purpose for which magnitudes were needed was to determine in each cluster a two magnitude interval beyond the third brightest member for the purpose of making a count of the population of the cluster which is independent of its distance. For this purpose also a zero point error is immaterial, although a scale error would obviously introduce a systematic bias in the counts between near and distant clusters.

The determination of galaxian magnitudes by photographic techniques is difficult and involved. The aperture effect introduced by the contribution of light from the outer unobserved parts of a galaxy (1) is particularly troublesome. However, since the aperture effect appears largely as a shift in the zero point, and since high precision was not required, the following photographic technique was employed to find magnitudes for the standard galaxies:

Four red plates of the field containing SA 57 and the 47 standard galaxies were taken with the 48-inch telescope. The plate-filter combinations, sky transparency, exposure times, and development were all matched to those of the red survey plates. One of the four plates was taken in focus, and the other three were respectively 0.75 mm, 1.75 mm, and 5.0 mm out of focus. The faintest galaxies appear so nearly stellar on the Schmidt plates that they could be compared directly with standard stars in SA 57 on the in-focus plate. On the extrafocal Schmidt plates images of brighter and nearer galaxies appear indistinguishable from the stellar images provided the plates are far enough out of focus. Of course the farther out of focus a plate is, the lower its limiting magnitude is. Therefore, on the plates with the largest extrafocal images the brightest galaxies were compared with standard stars in SA 57, and on the plates with intermediate sized extrafocal images the galaxies of intermediate magnitudes were similarly compared with stars. To facilitate comparison of densities of extrafocal images, film strips with varying density spots were used; on the in-focus plate, a flyspanker was used.

The principal source of error in this technique is that the outer extremities of the galaxies will not be included in the extrafocal images. The effect is minimized if the extrafocal images are large compared with the angular extent of the galaxies. Measures for most of the galaxies could be made on two or three of the plates. Especially for the nearer and brighter galaxies, the measured magnitudes were systematically larger for smaller extrafocal image sizes. However, in the case of most of the galaxies, magnitude determinations on at least two of the plates would be in fair agreement. The plan adopted was to average the two results obtained from the in-focus plate and the plate 0.75 mm out of focus for galaxies fainter than 16th magnitude, from the plates 0.75 mm and 1.75 mm out of focus for galaxies between 15th and 16th magnitudes, and from the plates 1.75 mm and 5.0 mm out of focus for galaxies brighter than 15.0 magnitudes. The results are considered least reliable for galaxies brighter than about 14th magnitude; the images of these galaxies were so large that it was felt that the magnitudes obtained were too large.

The results are given in Table 2. The second and third columns, headed x and y, are the plate coordinates of the galaxy images, measured respectively horizontally and vertically in centimeters from the northeast corner of the exposed part of the plate. The field has the same center as Sky Survey plate Number 1393 (1855: $\alpha = 13^h\ 0^m$, $\delta = +30^o$). The center of SA 57 on this field is x = 15.3 and y = 16.3. The next four columns list the magnitudes which were used in the final averages as determined from the plates respectively 5.0 mm, 1.75 mm, and 0.75 mm out of focus, and in focus. The last column gives the adopted magnitudes for the standard galaxies.

Table 2

Magnitudes of 47 Standard Galaxies Near Selected Area 57

			Out of Focus:				
Number	x	y	5.0mm	1.75mm	0.75mm	In Focus	Adopted
1	25.2	23.8	12.0	12.4			12.2
2	25.8	23.8	12.8	12.7			12.8
3	19.5	17.6	12.8	12.7			12.8
4	20.8	22.7	13.0	12.8			12.9
5	28.4	26.2	13.1	13.2			13.2
6	25.0	22.5	13.5	13.2			13.4
7	24.2	24.7	13.5	13.5			13.5
8	23.0	23.6	13.7	13.6			13.6
9	23.6	24.3	13.5	13.7			13.6
10	13.8	18.7	13.5	13.7			13.6
11	27.6	22.2	13.9	13.7			13.8
12	25.7	18.6	13.6	13.9			13.8
13	17.2	20.7	13.7	13.9			13.8
14	18.3	16.8	13.8	14.3			14.0
15	24.5	18.1	14.0	14.1			14.0

Table 2
(Continued)

Number	x	y	Out of Focus: 5.0mm	1.75mm	0.75mm	In Focus	Adopted
16	27.9	24.2	14.0	14.7			14.4
17	27.9	24.4	14.4	14.9			14.6
18	24.6	23.3		14.9	15.0		15.0
19	12.7	14.4		14.7	15.3		15.0
20	26.7	23.1		15.1	15.4		15.2
21	28.0	24.8		15.1	15.6		15.4
22	12.1	13.9		15.2	15.5		15.4
23	9.5	12.6		15.4	15.3		15.4
24	10.0	14.6			15.5		15.5
25	14.9	18.0			15.5		15.5
26	25.7	23.8		15.4	15.6		15.5
27	12.8	20.2		15.4	15.7		15.6
28	25.7	17.6		15.8	16.0		15.9
29	8.9	16.0			16.1		16.1
30	22.4	17.1			16.7	16.1	16.4
31	27.2	22.8			16.7	16.0	16.4
32	18.4	15.0			16.7		16.7
33	13.6	19.2			16.6	16.9	16.8
34	7.9	19.6			16.9	16.8	16.8
35	14.8	25.7			16.9	16.9	16.9
36	15.2	23.6			17.3	16.9	17.1
37	25.5	17.6			17.6	17.8	17.7
38	14.4	22.5			17.5	18.0	17.8
39	13.6	15.7			17.2	18.3	17.8
40	14.6	26.8			17.7	18.4	18.0
41	17.5	24.5			18.0	18.0	18.0
42	12.0	16.2			17.8	18.1	18.0
43	18.2	22.9			17.9	18.4	18.2
44	18.7	26.9			18.0	18.6	18.3
45	17.6	25.4				18.4	18.4
46	18.0	23.1				18.6	18.6
47	14.8	26.4				18.6	18.6

The standard error of the adopted magnitudes, computed from those cases where two values were averaged, is 0.21 magnitudes. This describes the internal consistency of the results, but not, of course, the real error of the magnitudes. Photographic magnitudes and colors for three of the measured galaxies, numbers 1, 2, and 7, are given by Pettit (27). While Pettit does not give photographic minus photored colors, these can be estimated by assuming the color equation given in section A, namely,

$$(P - R) = 1.6(P - V). \qquad (1)$$

The red magnitudes so determined from Pettit's measures of the three galaxies in common average about 1.0 magnitudes brighter than the values given in Table 2. This was an expected result for such bright galaxies because of the comparatively large aperture effect. In section G it will be described how the entire range of magnitudes was roughly checked against magnitude measures by Sandage. The systematic error noted for bright galaxies is much smaller or absent for galaxies fainter than 15th magnitude. Consequently, counts of galaxies in the nearest clusters may have been extended over a range of less than two magnitudes beyond the 3rd brightest member. This source of error, which is discussed in section G, applies to very few clusters and does not affect the results of the investigation of Part II in a significant way. Other than at the bright end, the sequence of magnitude standards is considered satisfactory.

At the time the calibration of the step scale images on the films was made, it happened that four pairs of survey plates of this same field containing the 47 standard galaxies were available. These were plates which had not met the standards set for the Sky Survey and had thus been rejected for the final survey collection. In none of the four cases, however, was the cause for rejection one which affected the quality of images on the red plates. Therefore, the images of the standard galaxies on each of the four plates were used for the calibration. Furthermore, each of the sixty step scale images on the films was calibrated by interpolation between three pairs of standard galaxies on each of the four survey plates. The final calibration of each step scale image is thus the average of twelve independent estimates, and is considered accurate (except for a zero point error) to within 0.1 magnitudes. Actual estimates of magnitudes made from the calibrated images may, of course, have considerably greater errors; indeed the survey plates are not all homogeneous to within 0.1 magnitudes.

D. The Luminosity Function of Clusters

In two respects the results of the investigation depend upon the bright end of the luminosity function of clusters of galaxies. (i) The magnitude of the tenth brightest member of a cluster is used as a distance criterion for the cluster. (ii) The number of galaxies not more than two magnitudes fainter then the third brightest member of the cluster is used as a richness criterion for the cluster.

The validity of (i) requires that the tenth brightest members of all rich clusters have the same absolute magnitude. The requirement will be fulfilled if there exists an intrinsic upper limit to the luminosities of galaxies, and if all of the clusters considered contain galaxies sufficiently luminous to reach this limit. The low dispersion observed by Humason, Mayall, and Sandage in the luminosities of the third, fifth, and tenth brightest members of clusters of measured redshifts is the only observational evidence that such an upper limit to galaxian luminosities does exist. Unfortunately, the redshift list does not include clusters as rich as the richest ones entered in the present catalogue. The validity of (i), therefore, can not be completely verified until more comprehensive data are available on the luminosity function of clusters.

The validity of (ii) depends on the form of the bright end of the cluster luminosity function. If, for example, the numbers of galaxies of various magnitudes in each cluster increase linearly with increasing magnitude, clusters of all richnesses would have the same number of members in the magnitude interval counted. If, on the other hand, there is an upper limit to luminosities of galaxies, as discussed in the last paragraph, differences in populations of different clusters can be expected to be reflected in the counts through the interval of the brightest two magnitudes.

Fortunately, it was possible to check whether the counts of the brightest galaxies in clusters do indeed indicate the total richnesses of the clusters. Five clusters were selected for which counts of members not more than two magnitudes fainter than their third brightest members range from 34 to 140. The bright ends of the apparent luminosity functions for these clusters were determined approximately with the step scale of calibrated galaxy images. The results are shown in figure 2. The ordinates are the integrated luminosity functions, that

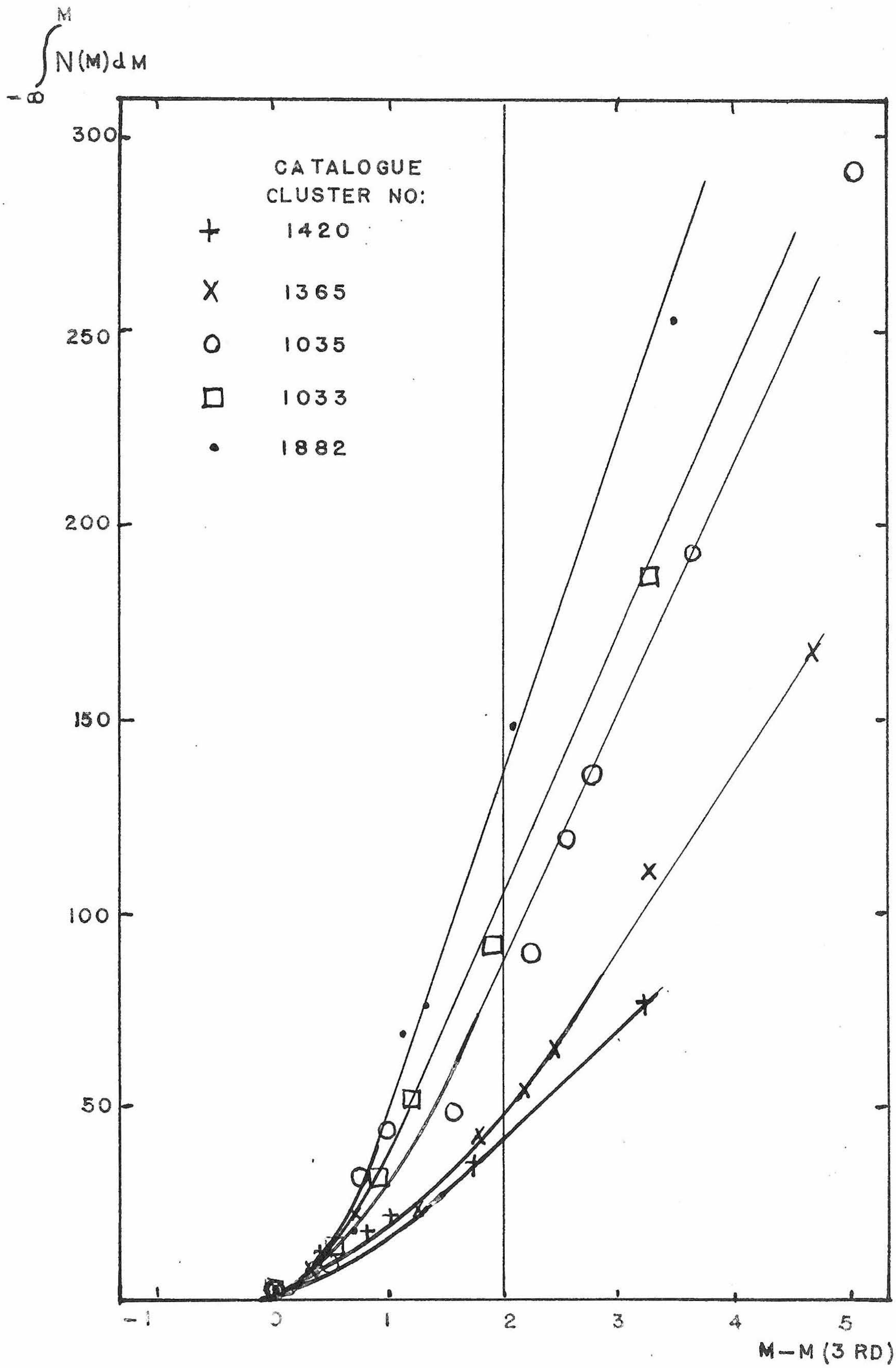

FIGURE 2. INTEGRATED LUMINOSITY FUNCTION

is the numbers of galaxies brighter than m, and the abscissas are the magnitudes all adjusted to the same scale by subtracting the magnitude of the third brightest member for each cluster. The interval through which counts were made for the catalogue is that indicated by the vertical line.

It is seen in figure 2 that the curves for richer clusters have steeper slopes both in and beyond the magnitude range to be counted. It can therefore be concluded that counts of galaxies in the two-magnitude interval beyond the third brightest member do actually indicate differences between clusters of different richnesses. However, it must not be assumed that there exists a proportionality between the counts in the adopted magnitude range and the true total population of the cluster. The relation between the bright end of the luminosity function and the total population of a cluster is not known at present.

It must further be remembered that the curves in figure 2 have been arbitrarily shifted to the same magnitude for the third brightest members of the clusters. This in no way assures that the third brightest members of clusters all have the same absolute magnitudes. Figure 2 indicates only that richer clusters will yield larger counts in their brighter magnitude intervals.

Finally, it should be noted from figure 2 that it is not possible that the third brightest and tenth brightest galaxies both have exactly the same absolute magnitudes in different clusters. However, it is seen that when the third brightest members of clusters are matched, their tenth brightest members show a fairly small dispersion of magnitudes. Thus these approximate data on the luminosity functions for five clusters do not invalidate the use of the tenth brightest members as approximate distance indicators.

E. Relation Between Magnitudes and Redshifts

The magnitude of the tenth brightest member of a cluster, as described in an earlier section, is used here as a distance criterion. The results of the investigation do not depend in any critical way upon a knowledge of the actual distance to a cluster. It is sufficient that clusters can be ordered in distance with the assumption that an approximate one to one relation exists between the distance of a cluster and the magnitude of its tenth brightest member.

As it happens, however, it is possible to use a redshift-magnitude relation, determined for the clusters for which Humason and Sandage have measured redshifts, to estimate the redshifts of the catalogued clusters from the magnitudes of their tenth brightest members. When the Hubble constant is finally determined, or if one assumes the provisional value of the Hubble constant that was determined by Humason and Sandage (1), the redshifts can be translated into distances.

In the preparation of the catalogue it was necessary that relative distances be approximately known for clusters, so that counts of their memberships could be extended to the same radius in space. For this purpose, a provisional redshift estimate was made for each cluster at the time the inspection of the plate for the cluster catalogue was made, and the counts of that cluster were extended to a distance on the plate $4.6 \times 10^5/c d\lambda/\lambda$ mm from the cluster center (section B). As explained earlier, an accurate knowledge of the redshift for this purpose is not necessary.

Eighteen rich clusters with measured redshifts were available. On the Schmidt plates the tenth brightest members of these clusters were measured with the calibrated step scales. The velocity-magnitude relation for these data was plotted (figure 3) and was used to estimate redshifts for the other clusters. The point at log $cd\lambda/\lambda = 4.365$ and $m = 16.6$ was apparently a bad magnitude estimate and is rediscussed in section G.

The curvature of the log $cd\lambda/\lambda$-magnitude relation of figure 3 is not significant but reflects the systematic errors in the magnitude scale determined by the photographic extrafocal technique (section C).

F. Inspection of Plates

The red plate for each Sky Survey field was inspected and searched for clusters of galaxies, using a 3.5X magnifying lens. All rich clusters which were recognized and which appeared as possible candidates for inclusion in the statistical sample were marked in ink on the cover glass of the plate. Next the records were consulted of earlier routine inspections of the same plate or of other plates of the same field made by either the writer or A. G. Wilson. All but one or two per cent of those clusters which finally met the criteria for the statistical sample and which were found on one of the earlier inspections were also found in the final cluster search. If, as very occasionally happened, a cluster noted in the older records was missed in the final inspection, that cluster was also marked on the cover glass of the plate.

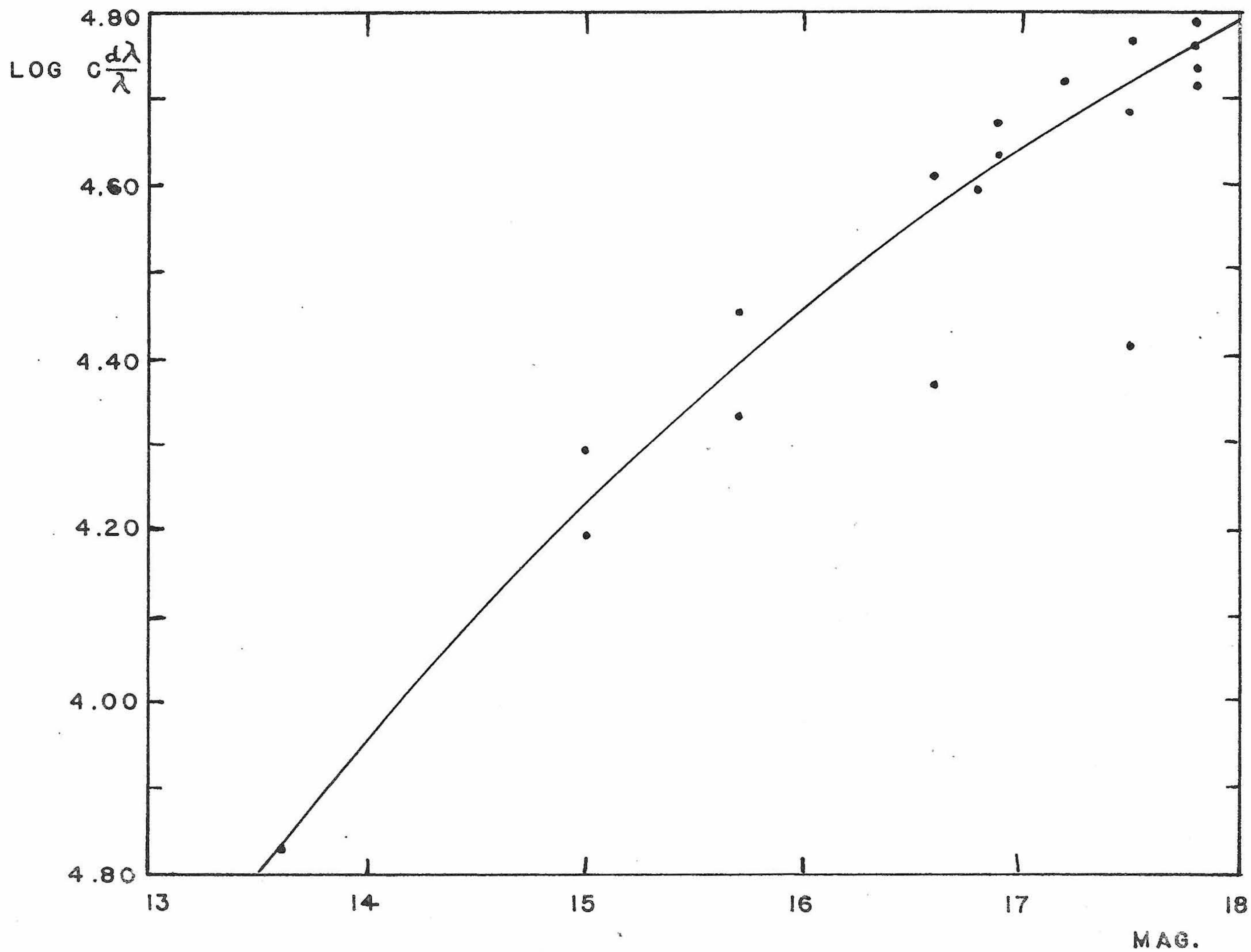

FIGURE 3. LOG $c\frac{d\lambda}{\lambda}$ VS MAG. 10TH BR. MEMBER (PRELIMINARY)

After its identification the center of each cluster was estimated by eye and noted with an ink dot on the cover glass. No attempt was made to locate a cluster center quantitatively; the centroid of the collection of galaxies was determined purely by judgement.

As various data were gathered from the plate, they were entered on 3x5-inch filing cards, one card for each cluster. The number of clusters identified and catalogued on each plate ranged from none to over thirty, and averaged around five or six for fields far from the Milky Way. The following information was noted on the card for each cluster:

(i) The plate number of the red Sky Survey plate inspected.

(ii) The rectangular plate coordinates of the cluster center, measured in inches from the northeast corner of the plate.

(iii) The 1855 epoch right ascension and declination, entered to a tenth of a minute of time (for right ascension) and one minute of arc (for declination). The position was determined by locating the cluster center on the appropriate BD chart with a pencil mark and then measuring the position of the mark on the chart with a ruler. (For the clusters south of $\delta = -23^{\circ}$, the CD charts were used and the epochs of the positions were 1875 rather than 1855.) The writer's previous experience with this method of determining positions indicates that positions so obtained are usually accurate to within a minute of arc. A larger source of error arises in locating the center of the cluster. A check is available on the positions obtained in this way, and is discussed in section G.

(iv) The photored magnitude of the tenth brightest member, estimated with the step scale technique described in section C.

(v) The number of members in the cluster which are not more than two magnitudes fainter than the third brightest member. Using the step scale, a galaxy was identified which was, as nearly as could be estimated, exactly two magnitudes fainter than the third brightest galaxy in the cluster. From the magnitude of the tenth brightest member the redshift of the cluster was estimated (section E) and then the galaxies in the cluster were counted which were as bright as or brighter than the one identified as two magnitudes beyond the third brightest, and which were within $4.6 \times 10^5/cd\lambda/\lambda$ mm from the cluster center on the plate. A sheet of transparent celluloid upon which concentric circles of various sizes were scratched was superposed over the cluster center to facilitate extending the counts over the proper area of the plate. In each case, galaxies in a region of the plate apparently "free" of clusters were counted in a comparable area down to the same limiting magnitude. The "field" count was then subtracted from the direct count over the cluster to obtain the corrected "true" population of the cluster. The corrections for the "field" galaxies ranged up to about thirty per cent of the total uncorrected counts, the larger corrections occurring for the more distant clusters in which the counts are extended to fainter magnitudes.

(vi) A judgement as to whether or not interstellar absorption is apparent on the plate, and whether the star density in that field is so dense that complete identification of visible clusters is in question. These judgements were later used to determine the limits of galactic latitude at which the sample is considered complete, as set down in section B.

(vii) The date of the inspection.

G. Accuracy

In the course of the inspection, nearly 3,000 clusters were catalogued. However, since adjacent plates overlap by 0.6 degrees on all edges, a number of clusters occurring in the overlap regions of the plates were catalogued separtely during the inspection on two different plates. These duplications are of great value in determining the internal consistency of the measuring and counting techniques.

The filing cards containing the cluster data were first sorted in order of right ascension so that the duplications could be located and removed. 120 pairs of duplicate cards for clusters were found, including one case where a cluster occurring near the corner of a field was measured on three different plates. The number of duplicates is smaller than might be expected from the relative areas of the overlapping and nonoverlapping parts of the plates because many clusters whose centers lie in the plate overlaps were not measured on two plates. The reason is that while the center of a cluster might be on two different plates, a large fraction of its members might lie outside of the overlapping region.

For each pair of overlap duplicates the corresponding determinations of positions, magnitudes, and counts were averaged and the results entered on new cards, one for each cluster. The values obtained in the two inspections of each cluster were then used to estimate the accuracy of the positions, magnitudes, and counts of the general catalogue clusters. The accuracy estimates made are conservative ones, for the largest measuring and counting uncertainties occur for clusters near the edges of plates.

Accuracy of positions: As stated in the last section, the writer has found from experience that the position of an object can be located on the BD charts to an accuracy of about a minute of arc. In the case of a cluster of galaxies, however, a considerable uncertainty arises in locating the center of a cluster, and positions of a cluster determined on two different plates can be expected to differ from each other appreciably owing to varying judgements of the location of the centroid of the cluster on the two plates. The effect is particularly important near the edge of a plate where part of a cluster may be out of the field. For the 120 "overlap" clusters the standard deviation of the individual positions from the mean positions was computed to be 1.9 minutes of arc. Thus a position determined from the BD charts with the technique described will, in general, be within a few minutes of arc of the center of the cluster, and always somewhere within the main concentration of the cluster. The greatest deviations occur for the comparatively nearby clusters which occupy a larger area in the sky, but for these clusters the positions are less critical.

Accuracy of magnitudes: The internal consistency of magnitude estimates can also be checked from the overlap duplicates. Again, a conservative check on the estimates is obtained. Not only were the plates of the two adjacent fields often taken years apart under varying observing conditions and with different emulsion shipments, but the quality of photographic images is generally poorest near the edge of a plate. For the 120 pairs of magnitude estimates in overlap clusters the standard deviation of an individual estimate from the mean was computed to be 0.19 magnitudes.

Accuracy of counts: Counts of clusters in the overlap regions are subject to the same uncertainties as are the magnitude estimates, in addition to the handicap that some of the members of an overlap cluster may lie off the field of the plate. For the 120 pairs of counts of overlap clusters, the standard deviation of an individual count from the mean is 16.9 per cent.

Before the plate inspection began, those clusters for which measured redshifts were available were separately inspected (section E). Later, during the routine inspection, these clusters were treated on the same basis as all of the new clusters. Thus positions, magnitudes, and counts were obtained for the Humason-Sandage clusters along with all other catalogue clusters. The magnitude estimates obtained the second time could then be compared with those made before the main cataloguing began. Thus another check is available on the magnitude estimates, as well as on the redshift-magnitude relation described in section E.

Sandage (1) has also measured the magnitudes of the tenth brightest members of the redshift clusters. Sandage gives photographic and photovisual magnitudes which are not directly comparable to photored magnitudes. However, approximate photored magnitudes can be obtained from Sandage's values with the color equation given in section C (equation 1). The use of a linear color equation may not be accurate for galaxies, especially ones of large redshift, owing to the unknown ultraviolet emission. Nevertheless, photored magnitudes so obtained are sufficiently good for a rough check between magnitudes estimated here with a step scale technique, and measured by Sandage on plates taken with a jiggle-camera at the 200-inch telescope.

Table 3 gives for each of the Humason-Sandage clusters the original magnitude estimate (Abell Est. 1), the final magnitude estimate (Abell Est. 2), and the approximate photored magnitudes obtained from Sandage's measures with equation 1. The catalogue number, the Humason-Sandage designation, log $(cd\lambda/\lambda)$, and the richness designation (see next section) are also given. Figure 4 is a plot of log $(cd\lambda/\lambda)$ vs magnitude from the final (Abell Est. 2) data. The corresponding curve in figure 3 is shown as a dashed line in figure 4. Magnitudes derived from the measures of Sandage are shown as open circles.

Comparison of the second and third to last columns of Table 3 indicates that the magnitude estimates are fairly consistent with each other except for the two clusters, catalogue numbers 1020 and 568. In each case, one of the estimates was apparently a poor one, and the other one satisfactory, judging from the scatter of the respective points in figures 3 and 4.

Comparison of the last three columns of Table 3 indicates that whereas the magnitude estimates made with the step scale scatter about those derived from measures by Sandage (or perhaps are systematically slightly fainter) there is no gross inconsistency, and for magnitudes fainter than about 15.0, no significant systematic difference. Perfect agreement is not to be expected for the reasons given above. The approximate agreement with the Sandage magnitudes,

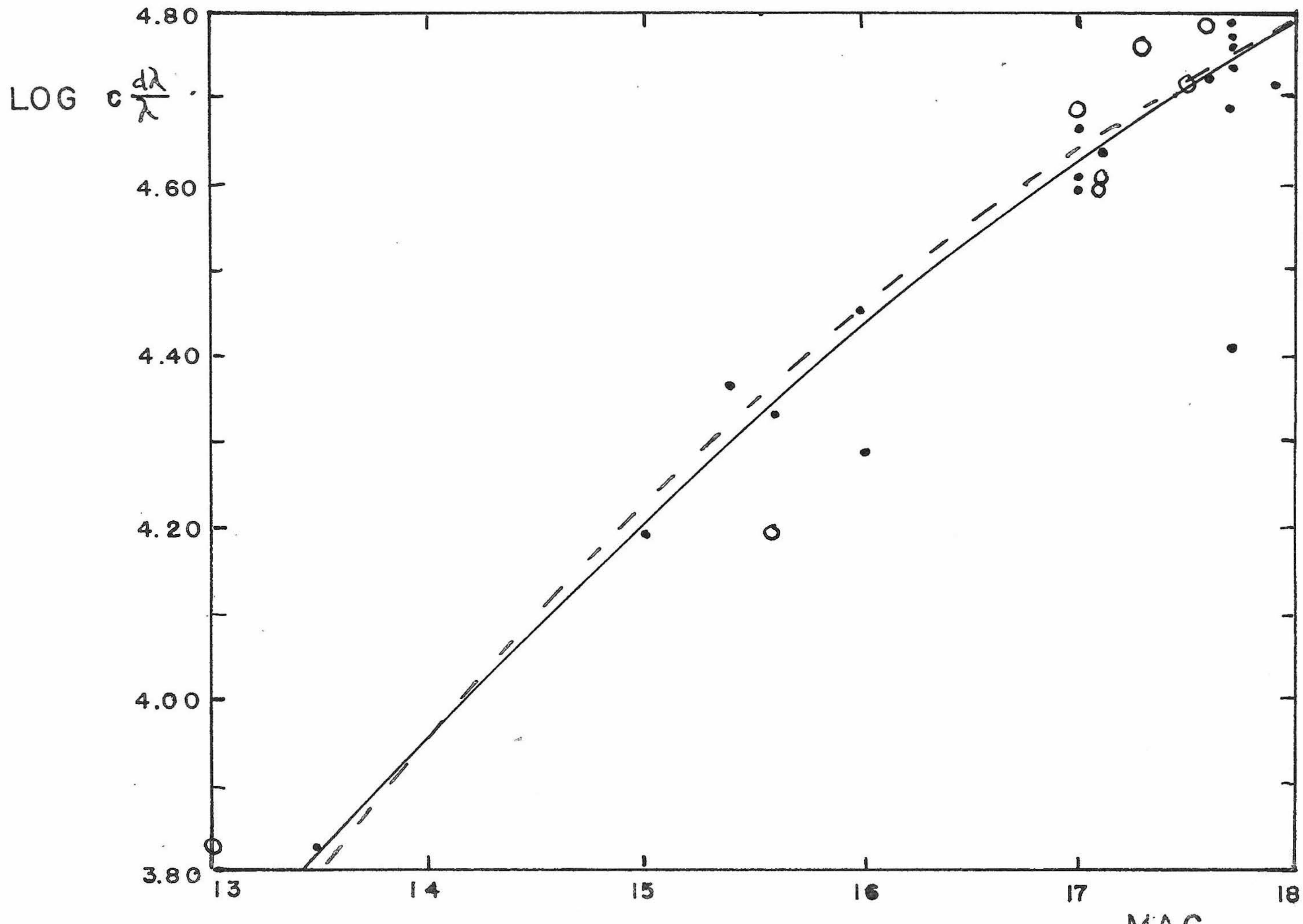

FIGURE 4. LOG $c\frac{d\lambda}{\lambda}$ vs MAG. 10TH BR. MEMBER (FINAL)

Table 3

Magnitudes of Tenth Brightest Cluster Members

Catalogue Number	Sandage-Humason Designation	$\log c\frac{d\lambda}{\lambda}$	Richness	Abell Est.1	Abell Est.2	Sandage
1656	1257+2812	3.826	2	13.6	13.5	13.0
151	0106-1536	4.196	1	15.0	15.0	15.6
1020	1024+1039	4.290	1	15.0	16.0	
2065	1520+2754	4.333	2	15.7	15.6	
568	0705+3506	4.365	0	16.6	15.4	
465	0348+0613	4.410	1	17.5	17.7	
2048	1513+0433	4.450	1	15.7	16.0	
1930	1431+3146	4.594	1	16.8	17.0	17.1
1132	1055+5702	4.608	1	16.6	17.0	17.1
1413	2253+2341	4.632	3	16.9	17.1	
2100	1534+3749	4.662	3	16.9	17.0	
31	0025+2223	4.680	2	17.5	17.7	17.0
234	0138+1840	4.714	1	17.8	17.9	17.5
1689	1309-0105	4.720	4	17.2	17.6	
1677	1304+3110	4.740	2	17.8	17.7	
801	0925+2044	4.761	2	17.8	17.7	17.3
1643	1253+4422	4.764	1	17.5	17.7	
732	0855+0321	4.785	1	17.8	17.7	17.6

and the fairly good internal consistency of the step scale estimates furnish confidence that magnitudes obtained for the catalogue are satisfactory for the purpose for which they are used.

Investigation of the scatter about the smooth curve in figure 3 indicates the standard error in redshift obtained from the redshift-magnitude relation to be 26 per cent. The standard error would be much lower except for one point (catalogue cluster number 465). Magnitude estimates for this cluster are consistently too high for the observed redshift. However, Humason (1) has measured only one galaxy in the cluster, and he states that its cluster membership is in doubt. The smooth curves in figures 3 and 4 were therefore drawn without regard to that one point.

The effect of a scale error among the bright magnitudes (13.0 to 15.0) must finally be considered. As was discussed in section C, magnitudes determined by Pettit indicate a zero point error at magnitude 13.0 of about one magnitude. Although it is not definitely established that the zero point error is less for fainter magnitudes, it seems very likely that it could be so in view of the general agreement with the Sandage magnitudes. If a zero point error decreasing with increasing magnitude is present, it is equivalent to a scale error and will result in the counts of nearby clusters being extended over too small a magnitude range. There is a possibility, therefore, that some nearby clusters sufficiently rich to meet the requirements for inclusion in a statistical sample may be omitted. However, the number of clusters whose tenth brightest members are brighter than 15.0 is very small compared with the more distant ones; increasing their number by a factor of two would not in any substantial way affect the results of Part II of this study.

H. Reduction of Data

To facilitate the reduction and processing of the material, the data for each cluster were entered from the 3x5-inch filing card to an IBM punch card. The calculations and miscellaneous processing involved in the reduction work were carried out by the writer with the IBM Model 604 Digital Calculating Punch and IBM card sorting and duplicating equipment of the Department of Engineering of the California

Institute of Technology, with the exception of the computation of galactic coordinates, which was done with the Datatron Digital Computer Model 204 of the ElectroData Corporation of Pasadena.

Epoch of positions: The positions for the clusters were for the epoch 1855, except for the clusters south of $\delta = -23^{\circ}$ which were for the epoch 1875, the epoch of the Cordoba Durchmusterung. To reduce all of the positions to a uniform epoch, positions for the southern clusters were precessed from 1875 back to 1855.

Extinction: The magnitudes of the tenth brightest members of all clusters were corrected for the effect of atmospheric extinction. It is important that extinction be taken into account because the south galactic pole lies near the southern limit of the Sky Survey, while the north galactic pole passes nearly through the Palomar zenith. The adopted procedure was to reduce all magnitudes to their value at the Palomar zenith, at the bottom of the atmosphere. The extinction, in magnitudes, is given by

$$\Delta m = -2.5 \log T(\lambda, z) = k \sec z, \tag{2}$$

where $T(\lambda,z)$ is the transmission of the atmosphere at wavelength λ and zenith distance z, and k is a constant. For $z = 0$,

$$-2.5 \log T(\lambda, 0) = k. \tag{3}$$

The atmospheric transmission at the Palomar zenith was assumed to be the same as that at the Mount Wilson zenith, for which (28)

$$T(\lambda = 6500\text{A}, 0) = 0.925. \tag{4}$$

It follows that

$$k = 2.5(0.034) = 0.085, \tag{5}$$

and

$$\Delta m = 0.085 \sec z. \tag{6}$$

Because practically all red survey plates, especially those taken far to the south, were centered within an hour of the meridian, it was assumed that the hour angle for all exposures was $\pm 30^{\text{minutes}}$. This simplification introduces little error, for the magnitudes were to be corrected only to the nearest tenth and the corrections were at most -0.1 magnitude for clusters north of $+84^{\circ}$ or south of -18° declination.

Galactic coordinates: Galactic coordinates were computed for each cluster referred to the galactic pole (1900) $\alpha = 12^{h}\ 44^{m}.0$, $\delta = +27^{\circ}\ 30'$ or (1855) $\alpha = 12^{h}\ 41^{m}.8$, $\delta = +27^{\circ}\ 45'$. The transformation equations, analogous to those used by Ohlsson (29) for a slightly different pole, are

$$\begin{aligned} \tan l &= \cos i \tan\alpha' + \sin i \sec\alpha' \\ \sin b &= -\sin i \cos\delta \sin\alpha' + \cos i \sin\delta, \end{aligned} \tag{7}$$

where i is the inclination of the galactic equator to the celestial equator ($62^{\circ}\ 15'$) and α' is the right ascension reduced by the right ascension of the ascending node of the galactic plane on the equator.

Galactic obscuration: Corrections to magnitudes for the effect of general galactic obscuration were made, following Hubble (3), on the assumption of a plane parallel distribution of the absorbing material. In particular, it was assumed that the absorption, in magnitudes, is a linear function of the cosecant of the galactic latitude, that is,

$$\Delta m(b) = \text{constant}(\csc b - 1). \tag{8}$$

Hubble, from an analysis of galaxy counts had derived the photographic absorption, $\Delta P(b)$, to be

$$\Delta P(b) = 0.25(\csc b - 1). \tag{9}$$

From the selective absorption data of Whitford (30), it is found that

$$\frac{\Delta P(b)}{(P-R)_{ex}} = 2.20, \tag{10}$$

where $(P-R)_{ex}$ is the photographic minus photored color excess, and where $\lambda4050$ and $\lambda6440$ are assumed for the blue and red effective wavelengths, respectively. Thus, where $\Delta R(b)$ is the photored absorption,

$$\Delta P(b) = 2.20(P-R)_{ex}$$

and (11)

$$\Delta R(b) = 1.20(P-R)_{ex}.$$

From equations 9 and 11,

$$(P-R)_{ex} = 0.1135(\csc b - 1), \tag{12}$$

and

$$\Delta R(b) = 0.136(\csc b-1). \tag{13}$$

All magnitudes were corrected by subtracting $\Delta R(b)$ as calculated from equation 13.

Precession constants: Ten year precession rates were computed for all of the cluster positions from the standard formulae (31) for the epoch 1900.

Richness classification: As discussed in section G, the counts of the membership of the clusters, intended as richness criteria, are approximate only. It was desirable, therefore, to group the clusters into categories according to their richness in such a manner that a negligible number of clusters would be misclassified by more than one group interval. The standard error of an individual count was estimated (section G) at about 17 per cent. It was decided to extend a group interval about three and a half times this standard error, or about 60 per cent, beyond the lower limit of the group. Then, if the counting errors are normally distributed, even a value at the upper or lower limit of a group interval would have only one chance in five thousand of being in error far enough to belong in a group more than one interval removed.

The richness groups are defined in Table 4. "Counts" refer to the number of galaxies counted in a cluster that are not more than two magnitudes fainter than the third brightest member. The group intervals are not exactly 60 per cent of their lower limits, but are rounded off, for convenience in classifying, to even numbers.

Table 4

Richness Group Intervals

Richness Group	Counts
0	30-49
1	50-79
2	80-129
3	130-199
4	200-299
5	300 or over

Distance classification: As in the richness classification, the clusters were grouped into distance classifications according to the magnitudes of their tenth brightest members. The standard statistical error in magnitude estimates was estimated (section G) at 0.19 magnitudes. Analogously to the case for richness classification, the magnitude interval in a distance group was chosen to be approximately 3.5 times the standard error in magnitude estimate, or about 0.7 magnitudes. Table 5 defines the magnitude intervals corresponding to various distance groups. Magnitudes refer to tenth brightest cluster members.

Table 5

Distance Group Intervals

Distance Group	Magnitude Range
1	13.3-14.0
2	14.1-14.8
3	14.9-15.6
4	15.7-16.4
5	16.5-17.2
6	17.3-18.0
7	18.0 or over

I. Explanation of Catalogue

Table 6 contains the completed catalogue of 2712 rich clusters of galaxies. The clusters are listed in order of right ascension. Table 6 was printed directly from the IBM cards with an IBM Model 407 Accounting Machine. Plus signs are not available on IBM tabulators; thus in Table 6 a positive quantity is indicated by the absence of a minus sign.

The first column contains the catalogue number for each cluster, running consecutively from 1 to 2712. An asterisk (*) following the number indicates that the cluster does not meet the requirements stated in section B for inclusion in the statistical sample investigated in Part II. These nonsample clusters are included in Table 6 to enhance the value of the catalogue as a finding list.

The second and third columns give the right ascension and declination. The equatorial coordinates are given for the epoch 1855, the epoch of the Bonner Durchmusterung. It was decided to list 1855 positions because then clusters can be immediately located on the BD charts from which, in turn, they can be easily identified on the National Geographic Society--Palomar Observatory Sky Survey prints, or on other photographic sky atlases. It should be pointed out, however, that clusters south of $\delta = -23^{\circ}$ must be located on the Cordoba Durchmusterung charts, which are in the epoch 1875. It was not feasible to tabulate positions in two epochs; therefore, before the southern clusters can be located on the CD charts, they must be precessed from 1855 to 1875.

Columns four and five contain ten year precession rates computed for the epoch 1900. The precessions in right ascension and declination are respectively given in minutes of time and minutes of arc, and to sufficient accuracy so that one hundred year precessions can be rounded off accurately to a tenth of a minute of time and one minute of arc.

Columns six and seven give the galactic coordinates computed for the galactic pole (1900) $\alpha = 12^h\ 44^m.0$, and $\delta = +27^\circ\ 30'$.

The eighth column gives the magnitude of the tenth brightest cluster member, estimated by the step scale technique described in section C and corrected for the effects of atmospheric extinction, and general galactic obscuration, as described in section H. Some numbers in the last place occur more frequently than others owing to step scale "rounding off" errors.

The last two columns list respectively for each cluster the distance and richness classifications, both of which are defined in section H.

Table 6

A Catalogue of Rich Clusters of Galaxies

No.	α (1855) (^{h} ^{m})	δ (1855) (° ′)	10 Yr. Prec. Δα(1900) (^{m})	10 Yr. Prec. Δδ(1900) (′)	l (°)	b (°)	Mag.	Dist	Rich.
1	00 00.1	15 43	0.512	3.34	75.6	-45.4	17.1	5	1
2	00 01.0	-20 27	0.512	3.34	35.9	-78.2	17.3	6	1
3	00 01.8	03 14	0.512	3.34	71.1	-57.6	17.0	5	1
4	00 01.9	05 59	0.512	3.34	72.6	-54.9	17.8	6	1
5*	00 02.8	32 18	0.514	3.34	80.6	-29.2	17.1	5	1
6	00 03.0	16 54	0.513	3.34	77.0	-44.4	17.5	6	2
7	00 04.2	31 37	0.515	3.34	80.8	-30.0	17.1	5	1
8	00 04.7	-12 00	0.511	3.34	59.3	-72.0	17.2	5	1
9	00 04.9	08 40	0.513	3.34	74.9	-52.5	18.0	6	1
10	00 05.4	-06 48	0.511	3.34	65.9	-67.3	17.2	5	2
11	00 05.4	-17 15	0.511	3.34	49.5	-76.6	17.2	5	2
12	00 05.9	-08 25	0.511	3.34	64.6	-68.9	17.2	5	2
13	00 06.3	-20 19	0.510	3.34	40.6	-79.0	16.6	5	2
14*	00 07.9	-24 42	0.508	3.34	20.0	-81.8	15.2	3	0
15*	00 07.9	-26 50	0.508	3.34	5.0	-82.4	17.4	6	0
16	00 09.3	05 57	0.513	3.34	75.7	-55.4	17.0	5	2
17	00 09.5	08 00	0.513	3.34	76.5	-53.4	17.6	6	1
18*	00 09.6	-03 36	0.511	3.34	70.9	-64.7	17.1	5	0
19	00 11.5	-07 00	0.511	3.34	69.5	-68.0	17.8	6	2
20	00 12.3	-23 26	0.507	3.34	31.3	-82.1	17.1	5	1
21*	00 13.0	27 50	0.519	3.34	82.3	-34.0	16.2	4	1
22	00 13.4	-26 31	0.506	3.34	9.4	-83.6	17.5	6	3
23*	00 14.3	-01 42	0.512	3.33	74.6	-63.1	17.0	5	0
24	00 15.0	22 30	0.518	3.33	82.0	-39.3	17.5	6	2
25	00 15.6	-00 58	0.512	3.33	75.7	-62.5	17.8	6	1
26*	00 15.7	36 03	0.523	3.33	84.1	-25.9	17.4	6	2
27*	00 17.5	-21 31	0.505	3.33	47.2	-81.7	16.5	5	0
28	00 17.7	07 20	0.514	3.33	79.7	-54.4	17.6	6	2
29*	00 19.3	37 46	0.527	3.33	85.1	-24.3	17.5	6	0
30	00 19.4	-13 00	0.508	3.33	69.3	-74.4	17.8	6	2
31	00 19.6	21 50	0.520	3.33	83.3	-40.1	17.7	6	2
32	00 19.6	-09 55	0.509	3.33	72.6	-71.4	18.0	6	1
33	00 19.8	-20 19	0.505	3.33	54.8	-81.0	17.9	6	1
34	00 19.9	-09 37	0.509	3.33	73.1	-71.1	18.0	6	2
35	00 20.1	-22 29	0.504	3.33	45.8	-82.8	17.1	5	1
36	00 20.3	-13 36	0.507	3.33	69.4	-75.0	17.6	6	2
37	00 20.6	-11 20	0.508	3.33	72.1	-72.8	18.0	6	1
38	00 20.9	13 08	0.517	3.33	82.3	-48.8	17.6	6	1
39	00 21.0	-12 12	0.508	3.33	71.6	-73.7	18.0	6	1
40	00 21.1	15 36	0.518	3.33	82.8	-46.4	17.5	6	1

41	00	21.3	07	03	0.515	3.33	81.1	-54.9	17.6	6	3
42	00	21.3	-24	27	0.503	3.33	34.5	-84.3	17.1	5	3
43*	00	21.4	16	47	0.518	3.33	83.1	-45.2	15.9	4	0
44	00	22.1	11	14	0.516	3.33	82.3	-50.7	17.0	5	1
45	00	22.5	-13	06	0.507	3.33	71.9	-74.7	17.8	6	2
46	00	22.9	-13	41	0.507	3.32	71.7	-75.3	17.6	6	1
47	00	23.3	-24	58	0.502	3.32	32.6	-85.0	17.3	6	1
48	00	23.7	11	45	0.517	3.32	83.1	-50.3	17.6	6	1
49	00	24.1	-12	14	0.507	3.32	74.2	-73.9	18.0	6	1
50	00	24.1	-23	02	0.502	3.32	48.8	-83.8	17.4	6	2
51*	00	24.3	-24	28	0.501	3.32	38.9	-84.9	17.4	6	0
52	00	24.5	-13	00	0.507	3.32	73.8	-74.7	18.0	6	1
53*	00	25.3	-08	22	0.508	3.32	77.9	-70.2	17.2	5	0
54*	00	26.1	29	57	0.524	3.32	85.6	-36.2	17.7	6	0
55*	00	26.6	05	32	0.515	3.32	83.1	-56.9	17.2	5	0
56	00	26.5	-08	36	0.508	3.32	78.6	-70.5	18.0	6	1
57	00	26.6	-09	49	0.508	3.32	78.0	-71.6	17.6	6	2
58	00	26.7	-07	34	0.509	3.32	79.3	-69.3	17.2	5	1
59	00	26.8	29	29	0.527	3.32	86.1	-32.7	17.5	6	1
60	00	27.3	29	14	0.527	3.32	86.2	-32.9	17.9	6	2
61	00	27.6	-24	00	0.500	3.32	48.8	-85.1	17.7	6	1
62	00	27.7	19	36	0.522	3.32	85.5	-42.5	17.1	5	1
63*	00	27.9	48	54	0.543	3.32	87.7	-13.3	16.1	4	0
64	00	28.9	18	07	0.521	3.31	85.7	-44.0	17.5	6	1
65	00	29.3	18	17	0.521	3.31	85.9	-43.9	17.5	6	2
66*	00	29.3	-05	59	0.509	3.31	81.7	-68.0	17.8	6	0
67	00	29.4	18	28	0.522	3.31	85.9	-43.7	17.5	6	2
68	00	29.5	08	21	0.516	3.31	84.9	-53.8	18.0	6	1
69	00	30.0	17	33	0.521	3.31	88.0	-44.6	17.1	5	2
70	00	30.0	-08	14	0.508	3.31	81.3	-70.3	17.3	6	1
71*	00	30.1	28	42	0.528	3.31	86.9	-33.4	15.6	3	0
72*	00	30.6	44	56	0.542	3.31	87.9	-17.3	16.3	4	0
73	00	30.8	08	38	0.517	3.31	85.4	-53.5	18.0	6	1
74*	00	31.7	-23	37	0.499	3.31	63.2	-84.8	15.9	4	0
75*	00	32.2	20	28	0.524	3.31	87.0	-41.7	16.5	5	0
76*	00	32.3	05	59	0.515	3.31	85.7	-56.2	15.0	3	0
77	00	32.9	28	44	0.529	3.31	87.7	-33.5	16.5	5	1
78	00	32.9	25	57	0.527	3.31	87.5	-36.3	17.9	6	1
79	00	33.0	17	21	0.522	3.31	87.0	-44.9	17.1	5	1
80	00	33.2	-25	29	0.497	3.31	49.1	-87.0	17.1	5	1

81*	00	33.4	21	29	0.525	3.31	87.4	-40.7	17.7	6	0
82	00	33.7	24	27	0.527	3.31	87.7	-57.6	17.1	5	2
83*	00	33.9	13	15	0.520	3.30	87.1	-49.0	17.8	6	0
84	00	34.2	20	37	0.529	3.30	87.6	-41.6	16.8	5	1
85	00	34.3	-10	09	0.506	3.30	83.9	-72.5	15.7	4	1
86*	00	35.3	-22	36	0.498	3.30	73.6	-84.6	15.9	4	0
87	00	35.7	-10	36	0.506	3.30	84.9	-72.8	16.6	5	1
88	00	35.7	-26	51	0.495	3.30	33.3	-88.4	15.6	3	1
89*	00	35.8	-10	14	0.506	3.30	85.1	-72.4	16.6	3	0
90	00	35.9	01	23	0.513	3.30	87.0	-60.8	17.2	5	2
91	00	35.9	-11	26	0.505	3.30	84.9	-73.6	17.6	6	1
92*	00	36.1	19	52	0.525	3.30	88.2	-42.4	17.9	6	0
93*	00	36.5	-19	16	0.500	3.30	81.6	-81.4	16.9	5	0
94*	00	37.9	-03	08	0.510	3.30	87.7	-65.4	17.2	5	0
95	00	38.4	-01	40	0.511	3.29	88.1	-63.9	17.2	5	1
96*	00	38.5	38	43	0.542	3.29	89.3	-23.5	17.4	6	1
97	00	38.7	-23	58	0.495	3.29	79.4	-86.2	17.1	5	2
98	00	38.8	19	42	0.525	3.29	89.0	-42.3	16.9	5	3
99*	00	39.6	-18	27	0.499	3.29	86.8	-80.7	17.1	5	0
100*	00	39.9	-03	19	0.510	3.29	88.9	-65.6	17.7	6	0
101	00	40.1	-01	43	0.511	3.29	89.0	-64.0	17.2	5	2
102*	00	41.2	00	35	0.512	3.29	89.7	-61.7	15.4	3	0
103	00	41.9	-06	39	0.507	3.28	90.0	-68.9	17.2	5	2
104	00	42.1	25	44	0.530	3.28	90.1	-36.5	15.9	4	1
105	00	42.2	-05	32	0.508	3.28	90.2	-67.8	17.2	5	1
106*	00	43.1	-12	29	0.503	3.28	91.2	-74.7	17.2	5	0
107	00	43.1	-20	03	0.497	3.28	92.2	-82.3	17.1	5	1
108	00	43.7	-07	21	0.507	3.28	91.3	-69.6	17.2	5	2
109	00	44.8	21	26	0.529	3.28	90.9	-40.8	17.7	6	1
110*	00	45.3	05	20	0.516	3.28	91.6	-56.9	17.2	5	0
111	00	45.3	-05	49	0.508	3.28	92.4	-68.0	17.2	5	3
112	00	46.2	-01	36	0.511	3.27	92.5	-63.0	17.2	5	1
113	00	46.2	-05	25	0.508	3.27	92.9	-67.6	17.5	6	2
114*	00	46.5	-22	29	0.494	3.27	101.7	-84.6	15.9	4	0
115	00	48.2	25	33	0.534	3.27	91.8	-35.7	17.3	6	3
116*	00	48.4	-00	08	0.512	3.27	93.6	-62.3	15.7	4	0
117*	00	48.7	-10	49	0.503	3.27	95.8	-73.0	16.0	4	0
118	00	48.7	-27	12	0.488	3.27	100.6	-88.4	16.5	5	1
119	00	49.0	-02	03	0.511	3.26	94.2	-64.2	15.0	3	1
120	00	49.9	-17	12	0.497	3.26	100.5	-79.3	17.2	5	1

121	00	50.2	-07	48	0.508	3.26	96.1	-69.9	16.0	4	1
122	00	50.4	-27	04	0.487	3.26	140.8	-88.0	17.1	6	1
123	00	51.2	-19	11	0.499	3.26	100.3	-77.2	17.2	5	1
124*	00	51.3	41	36	0.556	3.26	91.9	-20.6	17.5	6	2
125	00	52.5	13	30	0.526	3.25	93.9	-48.7	17.2	5	1
126	00	52.6	-15	00	0.498	3.25	101.7	-77.0	16.6	5	1
127	00	52.9	-24	15	0.489	3.25	128.1	-85.7	17.7	6	1
128*	00	53.3	-13	45	0.500	3.25	101.4	-75.7	17.0	5	0
129	00	53.7	-10	45	0.502	3.25	99.9	-72.8	17.8	6	2
130	00	54.1	-00	56	0.511	3.25	96.8	-63.0	17.2	5	1
131	00	55.0	-15	34	0.497	3.25	104.8	-77.4	17.2	5	1
132*	00	55.2	26	15	0.538	3.24	93.7	-35.9	17.7	6	0
133*	00	55.6	-22	35	0.490	3.24	121.9	-84.0	15.9	4	0
134*	00	55.7	-03	19	0.509	3.24	98.3	-65.3	16.0	6	0
135	00	56.2	-23	22	0.489	3.24	127.4	-84.5	17.7	6	2
136	00	56.3	24	18	0.537	3.24	94.2	-37.8	17.5	6	2
137	00	56.7	24	58	0.537	3.24	94.2	-37.2	17.5	6	2
138*	00	57.1	42	20	0.562	3.24	93.0	-19.8	17.5	6	3
139*	00	57.3	35	37	0.551	3.24	93.5	-26.3	17.5	6	2
140	00	57.3	-24	45	0.487	3.24	140.4	-85.4	17.5	6	3
141	00	58.6	-25	23	0.485	3.23	148.8	-85.6	17.7	6	3
142	00	58.7	00	11	0.512	3.23	98.9	-61.8	18.0	6	2
143	00	58.9	25	28	0.539	3.23	94.8	-36.6	17.5	6	1
144	00	59.3	-21	39	0.490	3.23	124.0	-82.7	17.9	6	1
145	00	59.4	-03	14	0.509	3.23	100.5	-65.1	17.6	6	2
146	01	00.3	-12	02	0.500	3.23	106.3	-73.7	17.6	6	1
147*	01	00.7	01	24	0.513	3.22	99.6	-60.5	15.0	3	0
148	01	00.8	-13	58	0.498	3.22	108.7	-75.5	17.2	5	1
149*	01	01.1	42	50	0.566	3.22	93.7	-19.3	17.5	6	2
150	01	01.6	12	24	0.525	3.22	97.5	-49.6	16.6	5	1
151	01	01.7	-18	12	0.495	3.22	112.7	-77.6	15.0	3	1
152*	01	02.2	13	13	0.526	3.22	97.6	-48.7	17.2	5	0
153	01	02.2	04	28	0.517	3.22	99.5	-57.4	17.6	6	2
154	01	03.3	16	54	0.531	3.21	97.3	-45.0	15.6	3	1
155	01	03.3	-23	36	0.483	3.21	157.1	-84.7	17.5	6	1
156*	01	03.7	32	41	0.551	3.21	95.3	-29.3	16.9	5	1
157	01	03.9	-15	11	0.495	3.21	113.3	-76.4	16.9	5	1
158*	01	04.1	16	07	0.530	3.21	97.7	-45.8	15.9	4	0
159	01	04.8	-15	53	0.494	3.21	115.3	-77.0	17.2	5	1
160*	01	05.2	14	45	0.529	3.21	98.3	-47.1	15.7	4	0

161*	01	06.7	36	39	0.560	3.20	95.9	-25.3	16.4	4	0
162	01	06.7	02	07	0.514	3.20	102.3	-59.5	16.6	5	1
163	01	06.8	23	38	0.541	3.20	97.2	-37.9	17.5	6	2
164	01	07.0	-04	32	0.507	3.20	105.6	-66.0	17.6	6	1
165*	01	07.3	31	50	0.552	3.20	96.3	-30.1	17.5	6	0
166	01	07.4	-17	03	0.492	3.20	120.2	-77.8	16.3	4	1
167	01	07.6	23	43	0.541	3.20	97.5	-38.2	17.5	6	1
168	01	07.7	-00	32	0.511	3.20	103.9	-62.1	15.4	3	2
169*	01	08.2	40	21	0.568	3.19	95.4	-21.6	16.7	5	1
170*	01	08.5	12	20	0.526	3.19	100.1	-49.4	16.6	5	0
171*	01	09.1	15	30	0.530	3.19	99.5	-46.2	15.9	4	0
172	01	09.3	02	29	0.515	3.19	103.5	-59.0	16.9	5	1
173*	01	10.5	38	14	0.565	3.18	96.1	-23.7	17.4	6	1
174*	01	11.7	35	03	0.560	3.18	96.9	-26.8	15.8	4	0
175	01	11.9	14	07	0.529	3.18	100.8	-47.5	17.0	5	2
176	01	12.3	-08	55	0.501	3.18	112.4	-69.8	17.6	6	1
177	01	13.0	-21	48	0.484	3.17	141.7	-80.8	17.5	6	1
178	01	14.0	19	20	0.537	3.17	100.3	-42.3	17.1	5	1
179*	01	14.0	18	44	0.536	3.17	100.4	-42.9	15.9	3	0
180*	01	14.4	02	16	0.515	3.17	106.0	-59.0	17.0	5	0
181	01	14.5	-00	27	0.512	3.17	107.4	-61.6	17.2	5	1
182*	01	14.9	-07	41	0.502	3.16	112.8	-68.5	17.6	6	0
183*	01	14.9	-22	40	0.482	3.16	147.6	-81.0	16.5	5	0
184	01	15.0	12	18	0.528	3.16	102.5	-49.1	17.8	6	1
185	01	15.4	-22	14	0.483	3.16	145.9	-80.6	17.1	5	1
186	01	15.5	-11	11	0.498	3.16	117.1	-71.6	17.2	5	1
187	01	15.5	-19	59	0.486	3.16	136.3	-79.1	17.5	6	2
188	01	15.6	-13	32	0.495	3.16	120.7	-73.7	17.2	5	1
189	01	16.2	00	54	0.513	3.16	107.5	-60.2	15.7	4	1
190*	01	16.5	-10	37	0.498	3.16	117.1	-72.0	17.2	5	0
191	01	16.6	20	10	0.539	3.16	100.9	-41.3	17.5	6	2
192	01	16.8	03	44	0.517	3.16	106.4	-57.4	17.6	6	2
193	01	17.5	07	57	0.522	3.15	104.9	-53.3	16.0	4	1
194*	01	18.2	-02	16	0.509	3.15	110.4	-63.1	13.9	1	0
195*	01	19.1	18	26	0.537	3.14	102.1	-42.9	15.3	3	0
196	01	19.3	22	28	0.543	3.14	101.2	-39.0	17.5	6	1
197	01	19.7	-18	52	0.486	3.14	136.4	-77.6	17.1	5	1
198	01	20.0	-17	12	0.488	3.14	131.8	-76.3	17.8	6	2
199*	01	20.1	-18	33	0.486	3.14	135.7	-77.3	17.5	6	0
200	01	20.2	14	28	0.532	3.14	103.6	-46.8	17.1	5	1

201*	01	20.3	15	47	0.534	3.14	103.3	-45.5	17.1	5	0
202	01	20.5	06	32	0.521	3.14	106.6	-54.5	17.8	6	2
203	01	20.8	01	08	0.514	3.14	109.6	-59.6	17.0	5	1
204	01	21.3	-07	32	0.502	3.13	116.7	-67.7	17.5	6	1
205	01	21.5	05	28	0.519	3.13	107.6	-55.4	17.8	6	1
206*	01	21.6	-26	21	0.474	3.13	173.3	-81.0	17.5	6	0
207*	01	21.8	-03	15	0.508	3.13	113.0	-63.7	17.2	5	0
208*	01	24.1	-00	12	0.512	3.12	112.0	-60.6	16.0	5	0
209	01	24.8	-14	20	0.492	3.12	128.9	-73.3	17.8	6	5
210*	01	25.4	-26	44	0.471	3.11	176.5	-80.3	17.5	6	0
211	01	25.5	-04	46	0.505	3.11	116.3	-64.8	17.2	5	2
212*	01	25.8	03	45	0.517	3.10	110.8	-56.7	17.2	5	0
213	01	27.3	19	53	0.542	3.10	104.3	-41.1	17.7	6	1
214	01	27.5	-26	51	0.470	3.10	177.8	-79.8	17.9	6	1
215	01	28.5	-24	12	0.474	3.09	164.0	-78.9	17.5	6	1
216	01	29.4	-07	10	0.501	3.09	120.9	-66.5	17.2	5	1
217	01	29.4	-08	48	0.499	3.09	122.9	-68.0	17.0	5	1
218	01	29.4	-11	30	0.495	3.09	126.8	-70.3	17.8	6	1
219	01	29.7	08	25	0.525	3.09	109.5	-52.0	17.2	5	1
220	01	29.7	07	12	0.523	3.09	110.1	-53.2	17.5	6	1
221	01	30.3	17	24	0.539	3.09	106.0	-43.3	17.7	6	1
222	01	30.3	-13	44	0.491	3.09	131.3	-72.0	17.6	6	3
223	01	30.8	-13	32	0.491	3.08	131.2	-71.8	17.6	6	3
224	01	31.0	-07	42	0.500	3.08	122.4	-66.5	17.0	5	1
225	01	31.1	18	09	0.540	3.08	106.0	-42.6	15.9	4	1
226	01	31.8	-11	00	0.495	3.08	127.3	-69.6	17.6	6	1
227	01	32.0	17	27	0.539	3.08	106.5	-43.2	17.7	6	1
228*	01	32.0	-10	48	0.496	3.08	127.2	-68.4	17.6	6	0
229	01	32.1	-04	23	0.505	3.07	119.4	-63.7	16.6	5	1
230	01	32.3	-12	07	0.493	3.07	129.6	-70.4	17.6	6	2
231*	01	32.6	23	47	0.551	3.07	104.6	-37.0	17.9	6	0
232	01	32.9	-11	07	0.495	3.07	128.3	-69.5	17.6	6	1
233	01	33.0	-02	35	0.508	3.07	118.1	-62.0	17.2	5	1
234	01	33.1	18	11	0.541	3.07	106.6	-42.4	17.9	6	1
235	01	33.2	-18	10	0.483	3.07	143.7	-74.8	17.5	6	1
236	01	33.3	-12	36	0.492	3.07	131.0	-70.7	17.2	5	1
237*	01	33.5	-00	28	0.511	3.07	116.6	-60.0	16.6	5	0
238	01	34.0	-23	47	0.473	3.06	164.3	-77.6	17.5	6	1
239	01	34.2	-12	31	0.492	3.06	131.4	-70.5	17.6	6	2
240*	01	34.3	06	54	0.523	3.06	112.1	-53.1	15.6	3	0

241	01 34.6	-16 59	0.485	3.06	141.9	-73.7	17.6	6	1
242	01 34.9	-15 09	0.488	3.06	136.9	-72.3	18.0	6	1
243*	01 35.3	-10 38	0.495	3.06	129.4	-69.0	16.6	5	0
244	01 36.3	17 46	0.541	3.05	107.7	-42.6	17.6	6	1
245*	01 36.5	05 40	0.521	3.05	113.6	-56.1	16.4	4	0
246	01 37.2	05 05	0.520	3.05	114.3	-54.6	16.4	4	1
247	01 37.4	16 55	0.540	3.04	108.4	-43.4	16.9	5	1
248	01 37.5	-03 00	0.507	3.04	120.7	-61.9	17.6	6	1
249	01 38.8	19 20	0.545	3.04	107.9	-40.9	17.7	6	1
250	01 39.1	18 58	0.544	3.03	108.1	-41.3	17.7	6	1
251*	01 39.2	-08 02	0.499	3.03	127.2	-66.1	17.2	5	0
252	01 39.3	-03 26	0.506	3.03	122.0	-62.1	17.8	6	1
253	01 39.9	19 56	0.546	3.03	108.0	-40.5	17.9	6	1
254	01 39.9	-04 01	0.505	3.03	122.8	-62.5	17.6	4	2
255	01 40.0	-02 43	0.508	3.03	121.6	-61.4	17.2	5	1
256	01 40.3	-04 35	0.504	3.03	123.6	-63.0	17.0	5	1
257	01 41.2	13 16	0.534	3.02	111.3	-46.5	16.9	6	1
258*	01 42.0	22 45	0.552	3.02	107.6	-37.4	17.7	6	0
259*	01 43.1	-12 43	0.490	3.01	136.7	-69.2	17.2	5	0
260*	01 43.5	32 27	0.574	3.01	104.7	-28.0	15.8	6	1
261	01 44.1	-02 58	0.507	3.00	123.7	-61.1	17.2	5	1
262*	01 44.4	35 26	0.582	3.00	104.0	-25.1	13.5	1	0
263*	01 44.8	36 51	0.586	3.00	103.7	-23.7	17.8	6	1
264	01 45.1	-26 30	0.463	3.00	178.6	-75.9	17.7	6	1
265	01 45.2	-07 45	0.499	3.00	129.8	-65.0	17.6	6	2
266*	01 45.3	-04 52	0.504	2.99	126.3	-62.6	17.2	5	0
267*	01 45.4	00 20	0.513	2.99	121.2	-58.0	16.6	5	0
268*	01 46.0	-01 51	0.509	2.99	123.4	-59.9	16.6	5	0
269	01 46.2	-05 03	0.503	2.99	126.9	-62.6	17.2	5	1
270	01 46.5	-03 33	0.506	2.99	125.4	-61.3	17.6	6	1
271*	01 46.6	01 03	0.514	2.99	121.1	-57.3	16.6	5	0
272*	01 46.9	33 14	0.578	2.98	105.3	-27.1	16.8	5	1
273	01 47.4	-24 16	0.467	2.98	170.4	-74.9	17.7	6	1
274	01 47.5	-07 00	0.500	2.98	129.9	-64.1	16.3	4	3
275	01 48.0	13 57	0.537	2.98	112.1	-45.3	17.1	5	1
276*	01 48.4	40 39	0.599	2.97	103.4	-19.9	16.3	4	0
277	01 48.6	-08 06	0.498	2.97	131.9	-64.8	15.6	3	1
278*	01 48.9	31 31	0.574	2.97	106.3	-28.6	15.6	3	0
279	01 48.9	00 21	0.513	2.97	122.6	-57.6	17.2	5	1
280*	01 49.2	-02 30	0.508	2.97	125.5	-60.1	17.4	6	0

281*	01	49.8	-06	34	0.500	2.96	130.4	-63.4	17.0	5	0
282*	01	49.8	-10	50	0.492	2.96	136.7	-66.7	17.8	6	0
283	01	50.1	-22	46	0.459	2.96	165.9	-73.6	17.1	5	1
284	01	50.5	-01	21	0.510	2.96	124.9	-58.9	17.5	6	1
285	01	50.6	-04	27	0.504	2.96	128.2	-61.5	17.2	5	1
286	01	51.1	-02	29	0.508	2.96	126.9	-59.8	17.2	5	2
287*	01	53.2	-08	34	0.495	2.94	134.7	-64.5	17.2	5	0
288	01	53.8	17	44	0.546	2.94	113.1	-41.3	17.5	6	1
289	01	54.0	-25	20	0.462	2.94	175.6	-73.7	17.5	6	1
290*	01	54.1	20	20	0.551	2.94	111.9	-38.8	16.5	5	0
291*	01	54.3	-02	53	0.507	2.93	128.0	-59.7	17.8	6	0
292*	01	54.5	10	26	0.547	2.93	112.9	-40.6	16.3	5	0
293	01	54.5	03	05	0.518	2.93	123.5	-54.5	17.3	6	2
294	01	54.6	04	43	0.521	2.93	121.2	-53.1	17.6	6	1
295	01	55.1	-01	47	0.509	2.93	127.2	-58.7	16.6	5	1
296	01	55.1	-03	50	0.505	2.93	129.4	-60.6	17.6	6	1
297	01	55.4	-26	17	0.459	2.93	178.1	-73.6	17.5	6	2
298	01	55.6	-10	03	0.493	2.92	138.0	-65.2	17.2	5	1
299	01	57.3	-00	22	0.511	2.91	126.6	-57.2	17.6	6	1
300	01	57.4	17	10	0.546	2.91	114.4	-41.5	17.7	6	1
301	01	58.0	-02	42	0.507	2.91	129.5	-59.1	18.0	6	1
302	01	58.8	-25	28	0.459	2.90	176.9	-72.7	17.9	6	1
303	01	58.9	-04	01	0.504	2.90	131.2	-60.0	16.6	5	1
304*	01	59.0	03	48	0.519	2.90	123.5	-53.4	17.6	6	0
305	01	59.5	-15	37	0.481	2.90	150.6	-68.3	17.8	6	1
306	02	00.1	-12	30	0.487	2.89	144.1	-66.2	17.8	6	1
307	02	00.3	09	47	0.531	2.89	119.6	-47.9	17.5	6	1
308*	02	00.7	-04	03	0.504	2.89	131.9	-59.8	17.2	5	0
309	02	00.8	02	19	0.517	2.89	125.5	-56.4	17.8	6	1
310	02	00.9	04	47	0.521	2.89	123.4	-52.3	17.6	6	1
311*	02	01.2	19	02	0.551	2.88	114.6	-39.4	16.5	5	0
312	02	02.1	04	11	0.520	2.88	124.4	-52.7	17.5	6	1
313	02	02.6	02	13	0.516	2.87	126.2	-54.3	17.6	6	1
314	02	02.6	-13	36	0.485	2.87	147.2	-66.5	17.6	6	2
315	02	02.7	-01	42	0.509	2.87	120.1	-57.6	17.5	6	2
316*	02	02.9	-14	11	0.483	2.87	148.4	-66.8	17.2	5	0
317	02	03.0	-09	14	0.494	2.87	139.8	-63.4	17.6	6	1
318	02	04.6	25	46	0.568	2.86	112.3	-32.9	16.9	5	1
319	02	04.8	-12	47	0.486	2.86	146.5	-65.5	17.6	6	1
320	02	04.9	24	43	0.565	2.86	112.8	-33.0	17.7	6	1

321	02 04.9	-00 17	0.512	2.86	129.5	-56.1	17.6	6	1
322*	02 05.9	06 50	0.528	2.85	123.6	-49.9	17.6	6	0
323	02 06.3	-03 33	0.505	2.85	133.8	-58.5	17.5	6	1
324	02 06.4	-02 13	0.508	2.85	132.1	-57.4	17.5	6	1
325	02 06.4	-25 58	0.455	2.85	179.9	-71.1	17.9	6	1
326*	02 06.5	-07 48	0.496	2.85	139.1	-61.7	17.0	5	0
327*	02 06.5	-26 48	0.453	2.85	182.0	-71.2	17.9	6	0
328*	02 06.7	-07 53	0.497	2.84	138.8	-61.5	17.3	6	0
329	02 07.4	-05 13	0.501	2.84	136.0	-59.6	17.2	5	1
330*	02 07.6	09 40	0.532	2.84	122.1	-47.2	17.2	5	0
331	02 07.8	10 42	0.534	2.84	121.4	-46.3	17.1	5	1
332	02 08.5	-14 17	0.482	2.83	150.7	-65.6	17.6	6	1
333	02 08.7	16 11	0.546	2.83	118.2	-41.3	17.6	6	2
334	02 09.0	-04 53	0.502	2.83	136.2	-59.1	17.5	6	1
335	02 09.1	-12 50	0.485	2.82	148.2	-64.7	17.6	6	1
336*	02 09.3	-02 48	0.506	2.82	133.8	-57.5	17.2	5	0
337	02 09.9	16 51	0.548	2.82	118.2	-40.6	17.6	6	1
338	02 10.5	-11 57	0.487	2.81	147.1	-63.9	17.5	6	1
339	02 10.6	-09 47	0.491	2.81	145.6	-62.6	17.0	6	1
340*	02 11.4	-13 21	0.483	2.81	149.9	-64.6	17.6	6	0
341*	02 12.1	-17 29	0.474	2.80	156.5	-66.8	17.2	6	0
342	02 12.3	02 34	0.517	2.80	129.8	-53.1	17.7	6	1
343*	02 12.4	-22 32	0.462	2.80	170.8	-68.9	17.7	6	0
344	02 13.6	20 42	0.558	2.79	117.1	-36.7	17.4	6	2
345	02 13.6	12 56	0.540	2.79	121.7	-43.6	17.5	6	1
346	02 14.2	25 44	0.571	2.78	114.7	-32.1	16.9	5	1
347*	02 16.5	41 13	0.622	2.76	108.9	-17.8	13.3	1	0
348	02 16.8	-09 16	0.492	2.76	143.0	-61.0	18.0	6	1
349*	02 17.5	36 11	0.604	2.76	110.7	-22.2	17.3	6	1
350	02 18.0	-10 29	0.489	2.75	147.3	-61.6	17.5	6	1
351*	02 18.2	-09 23	0.491	2.75	145.7	-60.8	16.9	5	0
352	02 19.8	-02 50	0.506	2.73	137.8	-55.7	17.6	6	1
353	02 20.8	-22 43	0.458	2.73	172.9	-67.1	17.7	6	1
354	02 21.1	00 47	0.514	2.73	134.0	-52.8	17.6	6	1
355*	02 21.2	-12 35	0.483	2.73	151.8	-62.3	18.0	6	0
356	02 21.5	03 50	0.521	2.72	131.2	-50.3	17.6	6	2
357*	02 21.6	12 36	0.541	2.72	124.2	-43.0	16.8	5	0
358*	02 23.2	-13 51	0.480	2.71	154.7	-62.6	15.6	3	0
359	02 23.4	02 11	0.517	2.71	133.4	-51.4	18.0	6	2
360	02 23.7	06 21	0.527	2.71	129.7	-48.0	17.8	6	2

361*	02	24.0	02	15	0.517	2.70	133.5	-51.2	17.6	6	0
362	02	24.4	-05	31	0.499	2.70	142.3	-57.0	17.7	6	1
363	02	25.0	08	49	0.533	2.69	128.0	-45.7	17.1	5	2
364	02	27.4	08	03	0.531	2.67	129.4	-46.0	17.1	5	2
365*	02	28.3	-02	04	0.507	2.67	139.4	-53.8	17.4	6	0
366	02	28.5	-06	05	0.498	2.66	144.4	-56.7	17.6	6	1
367	02	29.9	-20	02	0.463	2.65	168.5	-64.2	16.9	5	1
368*	02	31.0	-27	08	0.442	2.64	185.0	-65.8	17.5	6	0
369	02	32.4	-04	10	0.502	2.63	143.1	-54.7	17.8	6	1
370*	02	32.5	-02	13	0.507	2.63	140.9	-53.2	17.6	6	0
371	02	34.1	-21	51	0.483	2.61	154.4	-59.3	17.0	5	1
372*	02	34.4	41	14	0.634	2.61	111.7	-16.3	15.7	4	0
373*	02	34.9	27	23	0.584	2.61	118.6	-28.8	17.7	6	1
374	02	35.9	03	38	0.521	2.60	135.7	-48.3	17.8	6	2
375*	02	36.1	28	27	0.580	2.59	118.3	-27.5	17.5	6	0
376*	02	36.8	36	15	0.615	2.59	114.5	-20.5	15.4	3	0
377*	02	37.3	27	13	0.584	2.58	119.3	-28.4	17.7	6	1
378	02	37.7	-03	43	0.503	2.58	144.2	-55.4	17.6	6	1
379	02	38.0	02	48	0.519	2.58	137.1	-48.6	17.6	6	1
380	02	38.0	-26	55	0.440	2.58	184.9	-64.2	16.9	5	1
381	02	38.6	-01	16	0.509	2.57	141.6	-51.5	17.6	6	2
382	02	39.5	03	47	0.521	2.56	136.7	-47.7	17.2	5	1
383	02	40.8	-04	07	0.502	2.55	145.5	-53.1	17.6	6	2
384	02	40.9	-02	54	0.505	2.55	144.1	-52.3	18.0	6	1
385*	02	41.1	-22	26	0.455	2.55	175.6	-62.5	17.9	6	0
386*	02	43.3	-17	46	0.466	2.53	166.9	-60.4	17.2	5	0
387*	02	43.9	27	31	0.588	2.52	120.5	-27.5	17.6	6	0
388	02	44.3	-04	22	0.501	2.52	146.8	-52.6	17.6	6	2
389	02	44.9	-25	31	0.442	2.51	182.5	-62.5	15.9	4	2
390*	02	45.9	-15	34	0.471	2.50	165.5	-58.8	18.0	6	0
391	02	46.2	-03	05	0.504	2.50	145.8	-51.4	17.8	6	1
392*	02	46.7	04	21	0.523	2.50	138.1	-44.0	17.4	6	0
393	02	46.8	03	20	0.521	2.49	139.1	-46.7	17.1	5	1
394	02	47.0	-15	15	0.472	2.49	163.2	-58.4	17.0	6	1
395	02	47.5	-10	59	0.483	2.49	156.6	-56.1	17.6	6	2
396*	02	48.2	41	01	0.642	2.48	114.2	-15.3	16.6	5	0
397*	02	48.9	15	22	0.563	2.47	129.5	-37.0	15.1	3	0
398	02	49.4	-16	17	0.468	2.47	165.5	-58.4	17.8	6	1
399	02	50.0	12	26	0.545	2.46	132.0	-39.2	15.6	3	1
400	02	50.0	05	27	0.526	2.46	137.9	-44.6	15.9	1	1

401	02 51.0	13 00	0.547	2.49	131.8	-33.6	15.6	3	2
402*	02 51.1	-22 43	0.449	2.45	177.5	-60.4	17.9	6	0
403	02 51.7	02 55	0.520	2.45	140.8	-46.2	17.5	6	2
404*	02 51.8	40 50	0.663	2.45	114.9	-13.1	16.8	5	0
405*	02 51.8	37 11	0.627	2.45	116.8	-18.3	17.5	6	1
406*	02 52.2	-20 12	0.456	2.44	173.0	-59.4	17.7	6	0
407*	02 52.7	35 16	0.620	2.44	118.0	-19.8	16.7	2	0
408*	02 53.6	31 51	0.607	2.43	120.1	-22.6	17.4	6	1
409	02 55.8	01 19	0.516	2.41	143.5	-46.6	17.0	6	1
410	02 56.3	03 14	0.521	2.40	141.7	-45.2	16.9	5	1
411	02 57.1	00 27	0.513	2.39	144.7	-47.0	17.6	6	1
412*	02 58.9	-00 45	0.510	2.37	146.5	-47.5	17.5	6	0
413	02 59.1	01 42	0.517	2.37	143.9	-45.6	17.5	6	1
414*	02 59.2	-15 02	0.470	2.37	165.4	-55.7	17.5	6	0
415	02 59.9	-12 37	0.477	2.36	161.9	-54.9	16.3	4	1
416	03 00.5	-17 18	0.463	2.36	169.3	-56.4	17.7	6	1
417*	03 00.7	-15 08	0.470	2.36	165.9	-55.5	17.6	6	0
418	03 01.4	-14 15	0.472	2.35	164.7	-54.9	17.0	6	1
419*	03 02.1	-24 13	0.441	2.34	181.7	-58.4	15.7	4	0
420	03 02.4	-12 05	0.478	2.34	161.6	-53.6	15.8	5	1
421	03 02.8	09 16	0.538	2.33	137.7	-39.7	17.1	5	1
422	03 03.3	-11 36	0.479	2.33	161.1	-53.2	17.6	6	1
423	03 04.4	-12 40	0.476	2.32	162.9	-53.5	16.6	5	2
424	03 06.9	-03 12	0.503	2.31	150.7	-48.0	17.5	5	1
425	03 09.0	-12 17	0.477	2.27	163.3	-52.3	17.8	6	1
426*	03 09.1	40 59	0.654	2.27	117.7	-13.3	12.5	0	2
427*	03 09.2	33 55	0.622	2.27	121.4	-19.1	17.7	6	1
428*	03 09.4	-19 39	0.453	2.26	174.6	-55.4	16.5	5	0
429*	03 10.5	36 17	0.633	2.25	120.6	-17.0	17.7	6	2
430*	03 14.8	-19 52	0.465	2.20	169.6	-52.7	17.7	6	0
431	03 14.9	-17 05	0.461	2.20	171.4	-53.2	17.4	6	1
432	03 16.9	-06 20	0.494	2.18	157.1	-47.5	17.8	6	2
433	03 17.4	-07 19	0.490	2.18	158.4	-47.9	17.8	6	1
434	03 18.0	-09 55	0.482	2.17	161.9	-48.3	17.6	5	1
435	03 18.8	-06 09	0.494	2.16	157.2	-47.0	17.8	6	1
436*	03 18.9	08 39	0.538	2.16	142.0	-37.4	17.1	5	0
437*	03 19.5	-03 15	0.502	2.15	154.0	-45.1	16.5	5	0
438	03 21.6	-10 21	0.481	2.13	163.1	-48.7	17.2	5	1
439*	03 21.9	24 18	0.590	2.13	130.4	-25.2	17.0	5	0
440	03 22.3	-11 07	0.478	2.12	164.2	-48.9	17.2	5	1

441	03	23.6	-07	28	0.489	2.11	159.8	-46.8	17.6	6	1
442	03	23.5	-13	25	0.471	2.11	167.5	-49.8	17.6	6	1
443	03	24.4	-06	45	0.492	2.10	159.1	-46.2	17.9	6	1
444*	03	27.8	02	49	0.521	2.08	149.6	-39.7	17.5	6	0
445	03	29.2	-03	22	0.502	2.04	156.2	-43.3	17.5	6	1
446*	03	29.9	-02	55	0.503	2.04	155.8	-42.9	17.5	6	0
447	03	30.8	-05	35	0.493	2.02	159.0	-44.2	17.7	6	2
448	03	31.8	-11	36	0.476	2.01	166.6	-47.1	17.6	6	2
449*	03	32.3	74	44	1.164	2.01	100.7	16.1	16.2	4	1
450*	03	33.1	23	02	0.588	2.00	133.4	-24.5	16.4	4	0
451*	03	34.8	-02	54	0.503	1.98	156.8	-41.9	17.5	6	0
452*	03	35.3	01	14	0.516	1.94	153.1	-38.7	17.9	6	0
453	03	36.3	-20	30	0.444	1.94	179.7	-49.3	17.9	6	2
454	03	38.4	-13	27	0.469	1.94	170.0	-46.3	17.5	6	1
455	03	38.8	07	25	0.536	1.93	147.3	-34.6	17.9	6	1
456	03	39.0	-21	12	0.442	1.93	180.8	-49.4	17.5	6	1
457	03	39.2	-20	36	0.444	1.93	180.0	-49.1	17.9	6	1
458	03	39.6	-24	45	0.428	1.92	186.2	-50.2	17.2	5	2
459	03	39.7	-20	44	0.443	1.92	180.3	-49.1	17.7	6	1
460	03	39.9	-14	09	0.466	1.92	171.2	-46.5	17.9	6	1
461*	03	40.1	26	42	0.604	1.92	132.1	-20.7	17.5	6	2
462	03	41.7	-18	07	0.452	1.90	176.8	-47.7	17.5	6	2
463*	03	42.8	-22	02	0.438	1.88	182.6	-48.8	17.9	6	0
464	03	42.9	-18	16	0.451	1.88	177.1	-47.5	17.7	6	2
465	03	43.2	05	52	0.531	1.88	149.6	-34.8	17.7	6	1
466*	03	43.6	24	48	0.597	1.87	134.1	-21.6	17.5	6	1
467*	03	44.0	-22	43	0.435	1.87	183.6	-48.7	17.5	6	0
468*	03	46.3	20	59	0.563	1.86	137.1	-24.3	17.4	6	0
469	03	45.7	-22	37	0.435	1.85	183.6	-48.3	17.9	6	2
470*	03	48.0	-05	07	0.495	1.82	161.6	-40.4	16.9	5	0
471	03	52.8	-14	04	0.465	1.76	173.0	-43.7	17.6	6	1
472	03	57.1	-17	30	0.452	1.71	177.9	-44.1	17.5	6	2
473*	03	57.9	-17	52	0.450	1.70	178.5	-44.0	17.7	6	0
474	04	01.3	-17	05	0.453	1.65	177.9	-43.0	17.1	5	1
475	04	02.6	-09	47	0.479	1.63	169.2	-39.7	17.9	6	1
476	04	04.5	-11	36	0.472	1.61	171.7	-40.0	17.6	6	1
477	04	04.8	-02	15	0.504	1.61	161.5	-35.3	17.5	6	1
478*	04	05.4	10	07	0.547	1.60	149.8	-27.9	17.4	6	2
479*	04	07.1	-03	48	0.499	1.58	163.4	-35.6	17.5	6	0
480*	04	07.6	00	38	0.514	1.57	159.0	-33.1	17.6	6	0

481*	04 08.6	-10 19	0.476	1.56	170.8	-38.5	17.9	6 0
482	04 09.2	-02 30	0.504	1.55	162.4	-34.9	17.5	6 1
483	04 09.2	-11 34	0.471	1.56	172.7	-39.1	17.9	6 1
484	04 09.3	-08 02	0.484	1.55	168.3	-37.3	16.9	5 1
485*	04 10.0	04 27	0.527	1.54	155.8	-30.4	17.7	6 0
486	04 15.3	-05 17	0.494	1.47	166.3	-34.7	17.5	6 1
487	04 16.7	-24 36	0.421	1.46	189.1	-42.1	17.0	5 1
488	04 17.5	-05 37	0.492	1.44	167.0	-34.3	17.6	6 1
489*	04 19.2	-04 56	0.495	1.42	166.5	-33.6	17.7	6 0
490*	04 20.6	-21 03	0.435	1.40	185.0	-40.1	17.0	5 0
491	04 22.3	-05 22	0.493	1.38	167.4	-33.2	17.7	6 1
492*	04 22.5	75 50	1.316	1.38	102.3	19.1	17.7	6 1
493*	04 23.3	73 30	1.198	1.37	104.2	17.7	17.0	5 2
494	04 23.8	-08 04	0.483	1.36	170.5	-34.2	17.3	6 2
495*	04 24.0	-26 41	0.410	1.36	192.4	-41.0	17.0	5 0
496	04 26.9	-13 34	0.463	1.32	176.9	-35.9	15.3	3 1
497*	04 28.9	10 21	0.549	1.29	153.5	-23.2	17.0	5 0
498*	04 29.2	20 55	0.590	1.29	144.7	-16.6	16.7	5 1
499*	04 30.9	-20 43	0.434	1.27	185.6	-37.8	17.8	6 0
500	04 32.7	-22 26	0.427	1.24	187.8	-37.9	15.8	4 1
501*	04 34.2	08 07	0.541	1.22	156.3	-23.4	17.4	6 1
502*	04 34.8	69 32	1.058	1.21	108.0	15.9	16.8	5 0
503	04 35.0	-17 29	0.447	1.21	182.3	-35.7	17.7	6 1
504*	04 35.4	06 32	0.536	1.21	157.9	-24.1	17.4	6 1
505*	04 35.6	79 46	1.663	1.20	99.4	22.1	15.2	3 0
506	04 36.4	-10 00	0.476	1.19	174.2	-32.3	17.5	6 2
507	04 36.8	-18 46	0.441	1.19	184.0	-35.8	17.4	6 1
508	04 38.4	01 45	0.518	1.16	162.8	-26.1	17.4	6 2
509	04 40.2	02 02	0.519	1.14	162.0	-25.5	17.4	5 1
510	04 40.5	-21 17	0.431	1.14	187.2	-35.8	17.6	6 1
511*	04 40.7	-25 41	0.411	1.13	192.5	-37.2	17.0	5 0
512	04 41.1	-18 35	0.442	1.13	184.2	-34.7	17.0	5 1
513*	04 41.3	-09 59	0.475	1.13	174.8	-31.2	17.5	6 0
514	04 41.4	-20 42	0.433	1.12	186.7	-35.4	15.2	3 1
515*	04 41.8	05 55	0.534	1.12	158.5	-23.1	16.8	5 1
516	04 43.2	-09 03	0.479	1.10	174.2	-30.4	17.5	6 1
517	04 43.6	-09 30	0.477	1.09	174.6	-30.5	17.6	6 2
518	04 44.5	-10 58	0.471	1.08	176.3	-30.9	17.5	6 2
519*	04 46.3	00 27	0.514	1.06	165.2	-25.1	17.0	5 0
520*	04 46.7	02 43	0.522	1.05	163.1	-23.8	17.4	6 3

521	04	47.3	-10	30	0.473	1.04	176.2	-30.1	17.6	6	1
522	04	50.0	-06	23	0.488	1.00	172.3	-27.6	17.0	5	1
523*	04	51.1	08	33	0.544	0.99	158.5	-19.7	16.7	5	2
524	04	51.5	-19	57	0.435	0.98	186.8	-33.0	16.7	5	1
525*	04	51.7	07	56	0.542	0.98	159.1	-19.9	17.2	5	0
526*	04	52.1	05	14	0.531	0.98	161.6	-21.3	16.4	4	1
527*	04	52.2	73	30	1.251	0.97	105.5	19.3	15.7	4	0
528*	04	52.4	-09	14	0.476	0.97	175.5	-28.4	17.5	6	0
529*	04	52.9	05	58	0.534	0.96	161.0	-20.7	17.0	5	2
530*	04	53.2	-01	05	0.508	0.96	167.6	-24.4	18.2	7	2
531	04	54.1	-03	46	0.498	0.95	170.3	-25.5	17.0	5	1
532*	04	55.1	11	45	0.557	0.93	156.2	-17.1	17.5	6	0
533*	04	55.4	-22	50	0.422	0.93	190.4	-33.1	15.8	4	0
534*	04	57.4	73	20	1.228	0.90	105.9	19.5	17.0	5	1
535*	05	00.2	-02	47	0.502	0.86	170.2	-23.7	17.4	6	1
536	05	00.9	-09	26	0.476	0.85	176.7	-26.6	17.0	5	2
537*	05	06.3	73	44	1.254	0.78	105.8	20.3	17.5	6	2
538	05	08.7	-15	52	0.450	0.74	184.2	-27.6	17.6	6	1
539*	05	08.8	06	18	0.536	0.74	163.0	-17.2	14.4	2	1
540	05	19.6	-25	50	0.406	0.59	195.8	-28.8	17.6	6	1
541*	05	20.0	64	18	0.962	0.56	113.1	16.6	17.5	6	2
542*	05	23.9	63	56	0.967	0.52	115.6	16.8	17.5	6	1
543	05	24.5	-22	32	0.421	0.52	192.7	-26.7	16.9	5	1
544	05	25.1	-26	04	0.404	0.51	198.5	-27.8	17.5	6	2
545*	05	25.6	-11	59	0.467	0.50	181.8	-22.1	17.0	5	4
546*	05	27.7	66	23	1.016	0.47	113.6	18.3	17.3	6	1
547*	05	30.8	-14	31	0.455	0.42	185.2	-22.2	17.0	5	2
548*	05	41.2	-25	41	0.406	0.27	197.5	-24.2	13.7	1	1
549*	05	42.1	65	40	1.003	0.26	115.0	19.3	17.3	6	0
550*	05	46.9	-21	07	0.426	0.30	193.4	-21.4	16.7	5	2
551*	05	48.5	-17	47	0.441	0.17	190.3	-19.7	17.5	6	1
552*	05	48.7	76	19	1.425	0.16	104.6	23.8	17.8	6	1
553*	06	01.5	48	38	0.765	-0.02	132.2	14.3	15.3	3	0
554*	06	03.5	67	29	1.049	-0.05	114.0	21.9	17.0	5	0
555*	06	10.8	-17	13	0.443	-0.16	192.0	-16.6	17.4	6	1
556*	06	13.5	67	07	1.039	-0.20	114.7	22.7	16.7	5	0
557*	06	14.4	69	18	1.100	-0.21	112.5	23.5	17.0	5	0
558	06	20.5	73	42	1.270	-0.30	108.0	25.1	17.0	5	2
559*	06	24.0	69	49	1.115	-0.35	112.2	24.4	15.8	4	0
560*	06	27.7	68	00	1.059	-0.40	114.2	24.3	17.6	6	1

561*	06 28.1	69 09	1.092	-0.41	113.0	24.6	17.0	5	0
562	06 36.1	69 26	1.098	-0.52	112.9	25.4	17.0	5	1
563	06 42.2	69 12	1.088	-0.61	113.2	25.8	17.0	5	2
564*	06 44.7	70 00	1.112	-0.65	112.4	26.2	16.2	4	1
565	06 50.5	71 58	1.180	-0.73	110.3	26.9	16.5	5	1
566*	06 50.8	63 30	0.948	-0.73	119.6	25.6	16.4	4	2
567*	06 52.1	33 02	0.653	-0.75	151.0	16.7	16.9	5	1
568*	06 58.0	35 16	0.664	-0.84	149.3	18.7	15.4	3	0
569*	06 55.2	48 51	0.759	-0.84	135.5	23.1	13.8	1	0
570	07 01.5	70 35	1.121	-0.89	112.0	27.7	18.0	6	2
571	07 02.0	72 08	1.178	-0.89	110.2	27.8	17.5	6	2
572*	07 02.4	54 55	0.817	-0.90	129.3	25.3	17.0	5	0
573	07 02.5	67 47	1.037	-0.90	115.1	27.5	17.6	6	1
574	07 03.6	71 13	1.142	-0.92	111.3	27.9	17.4	6	2
575*	07 06.7	79 28	1.659	-0.96	101.9	25.4	17.0	5	0
576*	07 09.5	56 00	0.827	-1.00	128.3	26.5	14.4	2	1
577	07 10.0	79 13	1.627	-1.00	102.2	28.5	17.5	6	2
578*	07 10.4	67 16	1.019	-1.01	115.8	28.2	17.0	5	0
579*	07 11.6	37 01	0.672	-1.03	148.5	21.8	17.6	6	2
580*	07 15.8	41 42	0.700	-1.08	144.0	24.0	16.8	5	1
581*	07 17.6	11 23	0.554	-1.11	173.9	13.1	17.3	6	1
582*	07 18.0	42 16	0.703	-1.12	143.5	24.6	16.4	4	0
583	07 18.6	43 20	0.710	-1.12	142.4	25.0	17.6	6	2
584*	07 19.6	26 59	0.619	-1.14	159.2	19.9	17.3	6	1
585*	07 20.9	41 09	0.694	-1.15	144.8	24.3	17.0	5	0
586*	07 23.0	31 56	0.642	-1.18	154.5	22.4	17.4	6	3
587*	07 23.1	39 45	0.685	-1.19	146.4	24.8	16.6	5	1
588	07 23.3	70 16	1.092	-1.19	112.4	29.5	17.1	5	1
589	07 27.9	63 49	0.932	-1.25	119.9	29.7	17.1	5	1
590*	07 27.9	35 36	0.660	-1.25	151.1	24.5	17.8	6	1
591	07 31.8	44 18	0.712	-1.30	142.0	27.5	16.8	5	1
592*	07 34.7	09 43	0.547	-1.34	177.3	16.1	15.0	3	1
593	07 35.0	73 11	1.187	-1.35	109.0	30.3	17.4	6	3
594*	07 36.8	11 25	0.553	-1.37	176.0	17.4	17.5	6	1
595*	07 37.7	52 26	0.776	-1.38	133.1	30.0	15.6	3	0
596	07 40.0	73 00	1.172	-1.41	109.2	30.7	17.2	5	2
597*	07 42.5	35 44	0.656	-1.44	151.9	27.4	17.0	5	1
598*	07 42.5	18 02	0.577	-1.44	170.2	21.4	17.4	6	1
599	07 42.6	69 14	1.041	-1.45	113.6	31.2	17.2	5	1
600*	07 43.1	64 08	0.926	-1.45	119.5	31.4	16.5	5	0

601*	07 44.0	34 42	0.651	-1.46	159.1	27.4	17.6	6	1
602*	07 44.3	29 44	0.626	-1.47	158.5	26.0	15.8	4	0
603*	07 46.5	34 08	0.647	-1.50	153.9	27.7	16.0	5	1
604*	07 46.6	61 45	0.882	-1.50	122.3	31.9	17.1	5	0
605*	07 47.4	27 47	0.617	-1.51	160.8	26.0	16.7	5	0
606*	07 47.6	36 20	0.658	-1.51	151.6	28.5	17.7	6	1
607*	07 47.7	39 43	0.677	-1.51	147.6	29.4	16.9	5	0
608	07 49.0	64 10	0.921	-1.53	119.5	32.0	17.1	5	1
609	07 49.2	63 56	0.917	-1.53	119.8	32.1	17.1	5	1
610*	07 50.4	27 31	0.615	-1.55	161.3	26.5	16.4	4	0
611*	07 51.5	36 29	0.658	-1.56	151.4	29.3	17.9	6	1
612*	07 51.6	35 13	0.651	-1.56	153.1	29.0	16.5	5	1
613	07 52.3	45 33	0.712	-1.57	141.4	31.3	17.5	6	1
614*	07 52.7	18 22	0.577	-1.58	170.9	23.7	17.0	5	0
615*	07 53.6	32 08	0.635	-1.59	156.6	28.6	17.7	6	1
616	07 53.9	47 13	0.723	-1.59	139.5	31.8	17.1	5	1
617	07 54.2	77 46	1.412	-1.60	103.6	30.9	17.7	6	2
618	07 54.7	67 58	0.995	-1.60	115.0	32.4	17.3	6	1
619*	07 55.3	-01 49	0.506	-1.61	190.4	15.3	16.8	5	1
620	07 55.4	46 06	0.715	-1.61	140.8	31.9	17.4	6	2
621	07 56.1	70 27	1.060	-1.62	112.0	32.2	17.3	6	2
622	07 56.9	48 26	0.731	-1.63	138.1	32.5	17.4	6	1
623*	07 58.3	-00 35	0.510	-1.65	189.7	16.6	16.9	5	1
624	07 58.4	77 18	1.371	-1.65	104.1	31.2	17.8	6	1
625	08 00.0	82 49	2.042	-1.67	97.8	29.9	16.7	5	2
626	08 00.0	49 38	0.739	-1.67	136.8	33.1	17.1	5	1
627	08 00.0	35 09	0.648	-1.67	153.6	30.7	17.4	6	1
628*	08 00.7	35 39	0.650	-1.68	153.1	30.9	15.9	4	0
629	08 01.2	66 52	0.962	-1.69	116.2	33.1	17.1	5	1
630*	08 01.3	40 45	0.678	-1.69	147.3	32.1	16.9	5	0
631*	08 01.8	36 24	0.653	-1.69	152.3	31.3	17.1	5	0
632*	08 02.0	05 21	0.530	-1.70	184.7	20.2	17.2	5	1
633	08 02.4	64 11	0.908	-1.70	119.4	33.5	17.1	6	2
634*	08 02.7	58 29	0.824	-1.70	126.2	33.8	14.9	3	0
635*	08 02.9	17 09	0.571	-1.71	173.2	25.5	17.0	5	0
636*	08 04.5	73 12	1.144	-1.73	108.7	32.4	16.8	5	0
637*	08 04.5	48 49	0.730	-1.73	137.8	33.8	17.5	6	0
638*	08 05.0	13 52	0.559	-1.73	176.7	24.6	17.0	5	0
639	08 05.8	66 22	0.991	-1.74	114.3	33.9	17.7	6	3
640	08 06.0	30 01	0.522	-1.75	159.8	30.5	17.5	6	1

641*	08	06.9	23	16	0.594	-1.76	167.2	28.6	17.5	6	0
642	08	07.0	30	26	0.623	-1.76	159.4	30.9	17.7	6	2
643*	08	08.6	52	57	0.762	-1.78	132.9	34.7	17.1	5	0
644*	08	10.4	-07	09	0.489	-1.80	197.2	15.8	16.2	4	0
645	08	11.0	57	02	0.801	-1.81	127.9	35.0	17.7	6	1
646*	08	11.8	47	34	0.716	-1.82	139.5	34.9	16.8	5	0
647*	08	12.6	08	00	0.538	-1.83	183.4	23.8	17.8	6	1
648	08	13.1	33	00	0.633	-1.83	156.9	32.8	17.7	6	1
649*	08	13.7	49	20	0.728	-1.84	137.3	35.3	17.3	6	0
650*	08	14.1	19	02	0.576	-1.85	172.4	28.7	17.5	6	0
651*	08	14.1	16	34	0.567	-1.85	175.0	27.7	17.6	6	0
652*	08	14.3	56	30	0.792	-1.85	128.5	35.5	17.9	6	0
653*	08	14.3	01	41	0.517	-1.85	189.7	21.2	17.0	5	1
654	08	14.6	39	23	0.664	-1.85	149.4	34.6	17.1	5	1
655	08	15.0	47	36	0.715	-1.86	139.5	35.4	17.1	5	3
656	08	15.1	48	45	0.723	-1.86	138.1	35.5	17.5	6	1
657*	08	15.1	16	25	0.566	-1.86	175.2	27.9	17.4	6	2
658*	08	15.6	16	09	0.566	-1.86	175.6	27.9	17.0	5	1
659*	08	15.7	19	53	0.579	-1.86	171.7	29.3	16.8	5	1
660	08	15.9	37	19	0.653	-1.87	151.9	34.3	17.7	6	1
661	08	16.3	53	37	0.762	-1.87	132.1	35.8	17.4	6	1
662*	08	17.0	08	56	0.541	-1.88	183.0	25.2	17.4	6	0
663*	08	17.2	35	18	0.642	-1.88	154.4	34.1	17.7	6	0
664*	08	17.2	04	55	0.528	-1.88	187.0	22.4	17.4	6	2
665	08	17.4	66	22	0.932	-1.89	116.5	34.8	17.5	6	5
666*	08	17.7	38	48	0.660	-1.89	150.2	34.9	17.9	6	0
667*	08	18.0	45	12	0.697	-1.89	142.5	35.8	17.5	6	0
668	08	18.4	35	15	0.641	-1.90	154.5	34.4	17.5	6	1
669	08	18.8	56	48	0.792	-1.90	128.1	36.1	17.9	6	1
670	08	19.1	67	22	0.951	-1.91	115.3	34.8	17.5	6	2
671*	08	19.5	30	54	0.621	-1.91	159.7	33.6	14.9	3	0
672*	08	19.8	32	50	0.630	-1.91	157.3	34.1	17.6	6	0
673*	08	20.2	15	39	0.563	-1.92	176.6	28.7	17.1	5	0
674*	08	21.9	18	55	0.574	-1.94	173.3	30.3	17.7	6	0
675*	08	22.1	38	54	0.658	-1.94	150.3	35.7	17.7	6	0
676*	08	22.2	37	39	0.652	-1.94	151.8	35.6	17.7	5	0
677	08	23.0	36	16	0.645	-1.95	153.5	35.5	17.9	6	1
678	08	23.7	51	13	0.736	-1.96	135.1	37.0	17.1	5	1
679*	08	24.8	36	28	0.645	-1.97	153.4	35.9	17.9	6	0
680	08	26.0	37	22	0.649	-1.99	152.3	36.3	17.7	6	1

681*	08	26.3	44	21	0.687	-1.99	143.7	37.2	17.1	5	0
682*	08	27.3	52	21	0.743	-2.00	133.6	37.5	17.1	5	0
683*	08	27.6	31	44	0.622	-2.01	159.2	35.9	17.1	5	0
684	08	27.7	73	19	1.106	-2.01	108.1	34.0	17.1	5	2
685*	08	27.7	44	45	0.688	-2.01	143.2	37.4	17.1	5	0
686	08	28.8	76	14	1.363	-2.02	102.5	32.5	17.7	6	2
687	08	29.3	42	39	0.675	-2.03	145.9	37.6	17.7	6	1
688	08	29.4	16	22	0.564	-2.03	176.8	31.0	17.5	6	1
689*	08	29.4	15	30	0.561	-2.03	177.8	30.7	17.2	5	0
690	08	30.4	29	21	0.611	-2.04	162.2	35.5	16.9	5	1
691*	08	31.4	42	33	0.673	-2.05	146.0	37.9	17.1	5	0
692*	08	32.2	27	15	0.602	-2.06	164.8	35.3	16.2	4	0
693*	08	32.2	01	35	0.517	-2.06	192.2	25.0	17.4	6	0
694*	08	32.3	32	24	0.624	-2.06	158.5	36.8	17.5	6	0
695	08	32.4	32	48	0.625	-2.06	158.2	36.7	17.1	5	1
696	08	33.4	16	41	0.564	-2.07	176.9	32.0	17.4	6	1
697	08	33.6	36	52	0.643	-2.08	153.2	37.7	17.9	6	1
698	08	33.8	42	04	0.669	-2.08	146.7	38.3	17.9	6	1
699	08	35.9	28	19	0.605	-2.10	163.8	36.4	16.5	5	1
700*	08	36.7	37	29	0.644	-2.11	152.6	38.4	18.3	7	0
701*	08	38.3	38	40	0.649	-2.13	151.1	38.8	17.7	6	0
702	08	38.4	25	31	0.594	-2.13	167.4	36.1	17.1	5	1
703*	08	38.5	05	40	0.529	-2.13	189.1	28.4	17.8	6	1
704*	08	38.8	79	51	1.469	-2.13	100.5	32.3	17.5	6	0
705*	08	38.8	30	32	0.613	-2.13	161.4	37.5	17.1	5	0
706	08	39.5	29	16	0.608	-2.14	162.9	37.4	17.5	6	1
707*	08	39.7	80	27	1.927	-2.14	99.8	32.1	17.5	6	0
708	08	39.7	38	04	0.646	-2.14	151.9	39.0	17.9	6	1
709*	08	42.2	13	17	0.552	-2.17	181.6	32.6	17.5	6	0
710*	08	42.9	37	07	0.640	-2.18	153.3	39.6	17.9	6	0
711*	08	42.9	00	31	0.519	-2.18	194.4	26.9	17.3	6	1
712	08	43.5	26	11	0.599	-2.19	167.0	37.4	17.7	6	1
713*	08	44.4	18	46	0.569	-2.20	175.8	35.2	16.8	5	0
714	08	45.2	42	28	0.665	-2.20	146.4	40.5	16.8	5	1
715	08	45.6	35	57	0.633	-2.21	154.9	39.9	17.9	6	1
716*	08	45.8	49	01	0.704	-2.21	137.7	40.6	17.1	5	0
717*	08	46.0	83	26	1.961	-2.21	96.6	31.0	16.7	5	0
718*	08	46.9	79	47	1.434	-2.22	100.4	32.7	17.1	5	0
719	08	47.0	78	34	1.333	-2.22	101.7	33.2	17.6	6	2
720	08	47.0	16	11	0.560	-2.22	179.0	34.8	17.7	6	1

721*	08	47.8	61	51	0.821	-2.23	121.1	39.0	17.7	6	0
722*	08	48.3	31	19	0.613	-2.24	160.9	39.7	16.9	5	0
723	08	48.6	82	03	1.694	-2.24	98.0	31.7	17.1	5	1
724	08	49.0	39	08	0.646	-2.25	150.8	41.0	16.7	5	1
725*	08	49.2	63	10	0.837	-2.25	119.5	38.9	17.4	6	0
726*	08	49.5	31	41	0.614	-2.25	160.5	40.0	16.7	5	0
727	08	49.8	39	59	0.650	-2.26	149.7	41.2	16.7	5	1
728*	08	49.8	10	32	0.542	-2.26	185.5	33.1	17.5	6	0
729	08	49.9	58	49	0.783	-2.26	128.9	39.9	17.1	5	1
730	08	50.0	51	54	0.721	-2.26	133.9	41.0	17.5	6	1
731*	08	50.1	-03	08	0.503	-2.26	199.2	26.3	17.6	6	0
732	08	50.3	03	44	0.523	-2.26	192.6	30.0	17.7	6	1
733	08	50.5	56	11	0.757	-2.26	128.3	40.5	17.7	6	1
734	08	52.5	16	50	0.561	-2.28	178.9	36.3	17.7	6	1
735*	08	52.7	62	20	0.822	-2.29	120.4	39.4	17.5	6	0
736	08	52.7	52	47	0.726	-2.29	132.6	41.3	17.5	6	2
737*	08	53.1	80	30	1.481	-2.29	99.8	32.6	16.9	5	0
738	08	54.0	78	37	1.314	-2.30	101.4	33.5	17.5	4	2
739	08	54.6	47	49	0.690	-2.31	139.2	42.1	17.5	6	1
740*	08	56.1	42	54	0.661	-2.32	145.9	42.5	17.1	5	0
741	08	57.3	37	53	0.636	-2.33	152.7	42.5	17.8	6	1
742	08	58.8	60	53	0.796	-2.35	121.9	40.5	17.7	6	1
743	08	58.9	10	52	0.542	-2.35	186.4	35.3	17.5	6	1
744*	08	59.2	17	15	0.561	-2.35	179.2	38.0	16.6	5	0
745*	08	59.2	05	22	0.527	-2.35	192.3	32.7	17.4	6	0
746	08	59.3	52	08	0.715	-2.36	133.3	42.4	17.7	6	1
747	08	59.4	61	43	0.805	-2.36	120.8	40.3	17.6	6	1
748	09	00.1	78	22	1.161	-2.36	103.7	34.8	17.4	6	2
749*	09	00.9	07	34	0.533	-2.37	190.2	34.2	17.7	6	0
750	09	01.2	11	37	0.544	-2.37	185.9	36.1	17.2	5	3
751*	09	01.4	84	02	2.009	-2.38	95.7	31.0	17.6	6	0
752	09	01.4	36	02	0.626	-2.38	155.3	43.1	17.8	6	1
753*	09	01.4	-06	19	0.495	-2.38	203.9	26.9	17.3	6	0
754*	09	01.8	-09	04	0.487	-2.38	208.5	25.3	15.2	3	2
755*	09	02.5	49	34	0.695	-2.39	136.7	43.2	17.1	5	0
756	09	02.5	49	05	0.692	-2.39	137.4	43.3	17.5	6	1
757*	09	02.9	48	19	0.687	-2.39	138.4	43.4	15.6	3	0
758	09	03.1	43	09	0.658	-2.39	145.5	43.8	17.9	6	1
759*	09	03.4	42	30	0.654	-2.40	146.4	43.8	17.5	6	0
760*	09	03.4	-04	53	0.499	-2.40	203.0	28.1	17.6	6	1

761*	09	03.7	-10 00	0.485	-2.40	207.6	25.2	17.0	5	1
762*	09	03.8	74 34	1.086	-2.40	105.1	35.7	16.2	4	0
763	09	04.4	16 36	0.558	-2.41	180.5	38.8	16.5	5	1
764	09	05.3	64 26	0.833	-2.42	117.2	40.1	17.4	6	2
765	09	05.7	74 26	1.063	-2.42	105.6	36.0	16.9	5	2
766*	09	05.8	-04 08	0.501	-2.42	202.7	29.0	17.1	5	0
767	09	06.4	83 02	1.764	-2.43	96.6	31.7	17.1	5	1
768	09	06.7	80 00	1.378	-2.43	99.7	33.3	17.7	6	1
769	09	06.7	03 55	0.523	-2.43	194.9	33.6	16.5	5	1
770*	09	06.8	61 02	0.788	-2.43	121.4	41.4	17.7	6	0
771	09	07.2	61 47	0.796	-2.44	120.4	41.2	17.7	6	1
772	09	07.5	37 14	0.628	-2.44	153.9	44.4	17.7	6	1
773	09	07.8	52 19	0.709	-2.44	132.9	43.7	17.5	6	2
774*	09	08.0	06 08	0.528	-2.44	192.8	35.0	16.9	5	0
775	09	08.7	06 29	0.529	-2.45	192.5	35.3	17.4	6	1
776	09	08.8	00 12	0.513	-2.45	199.0	32.1	17.9	6	1
777	09	10.6	78 52	1.274	-2.47	100.7	34.1	17.5	6	4
778*	09	10.8	-07 43	0.492	-2.47	206.8	27.9	17.8	6	1
779*	09	11.0	34 23	0.615	-2.47	157.9	46.9	13.8	1	0
780*	09	11.5	-11 40	0.481	-2.48	210.4	25.6	16.6	5	0
781	09	11.7	31 03	0.602	-2.48	162.5	44.5	17.6	6	2
782	09	11.8	52 35	0.707	-2.48	132.3	44.2	17.6	6	2
783	09	11.9	61 51	0.791	-2.48	120.1	41.7	17.7	6	1
784	09	12.0	55 35	0.729	-2.48	128.2	43.5	17.5	6	1
785*	09	13.2	60 06	0.779	-2.49	122.2	42.4	17.6	6	0
786*	09	13.6	75 26	1.081	-2.50	104.2	36.0	15.9	4	0
787	09	13.6	75 02	1.065	-2.50	104.6	36.2	15.9	4	2
788	09	14.0	72 56	0.993	-2.50	106.9	37.2	17.0	5	1
789*	09	14.1	61 39	0.785	-2.50	120.2	42.0	17.5	6	0
790*	09	14.2	-13 02	0.478	-2.50	212.0	25.3	17.3	6	1
791	09	14.4	13 03	0.546	-2.51	186.0	39.6	17.5	6	1
792	09	15.6	43 26	0.651	-2.52	145.0	46.0	17.5	6	1
793	09	15.7	50 56	0.692	-2.52	134.4	45.1	17.1	5	1
794	09	16.0	09 17	0.536	-2.52	190.5	38.3	17.5	6	1
795	09	16.1	14 40	0.551	-2.52	184.1	40.7	17.5	6	3
796	09	16.9	61 07	0.775	-2.53	120.8	42.5	17.4	6	1
797	09	18.3	18 18	0.560	-2.55	180.1	42.6	16.5	5	1
798	09	19.3	81 36	1.485	-2.55	97.7	32.9	17.9	6	1
799*	09	19.5	59 23	0.754	-2.55	122.8	43.4	17.7	6	0
800	09	19.5	38 26	0.626	-2.55	152.2	46.9	17.7	6	2

801	09	19.8	21	12	0.568	-2.56	176.5	43.9	17.7	6	2
802	09	21.1	67	41	0.859	-2.57	132.5	40.2	17.3	6	1
803*	09	21.3	12	46	0.544	-2.57	187.3	41.0	17.5	6	0
804	09	21.4	63	12	0.793	-2.57	117.5	42.2	17.4	6	1
805*	09	21.4	04	45	0.524	-2.57	196.4	37.2	17.5	6	0
806*	09	21.7	56	40	0.728	-2.58	126.2	44.5	17.5	6	0
807	09	21.8	-05	49	0.498	-2.58	206.9	31.2	17.9	6	1
808*	09	22.4	08	20	0.539	-2.58	192.6	39.2	17.4	6	0
809*	09	22.6	77	57	1.173	-2.58	101.2	35.1	16.9	5	0
810*	09	23.4	-01	32	0.508	-2.59	203.1	34.1	17.4	6	0
811	09	23.5	78	11	1.183	-2.59	101.0	35.0	17.4	6	1
812*	09	23.6	38	32	0.624	-2.59	152.1	47.7	17.8	6	0
813*	09	23.6	-13	56	0.477	-2.59	214.4	26.4	17.5	6	1
814	09	23.8	76	35	1.100	-2.59	102.6	35.9	17.1	5	2
815	09	23.8	29	42	0.592	-2.59	165.1	46.9	17.7	6	1
816*	09	24.0	-12	46	0.480	-2.60	213.5	27.3	17.4	6	1
817	09	24.1	18	00	0.557	-2.60	181.2	43.7	17.1	5	1
818*	09	24.5	74	30	1.021	-2.60	104.6	37.0	16.5	5	0
819*	09	24.5	10	18	0.537	-2.60	190.6	40.6	16.5	5	0
820	09	26.5	-02	17	0.507	-2.62	204.4	34.3	17.5	6	1
821*	09	26.7	-04	03	0.502	-2.62	206.2	33.3	17.7	6	0
822*	09	26.7	-12	47	0.481	-2.62	214.0	27.8	17.5	6	1
823*	09	26.8	-25	13	0.447	-2.62	223.9	19.2	17.3	6	1
824*	09	27.0	24	34	0.575	-2.62	172.6	46.5	17.5	6	0
825*	09	27.1	66	05	0.823	-2.62	114.0	41.3	18.2	7	1
826*	09	27.2	54	10	0.703	-2.63	129.3	46.0	17.7	6	0
827	09	27.3	-02	19	0.506	-2.63	204.6	34.4	17.5	6	1
828*	09	27.7	12	51	0.543	-2.63	188.1	42.5	17.7	6	0
829*	09	27.8	62	48	0.779	-2.63	117.9	43.0	17.1	5	0
830	09	27.8	08	10	0.532	-2.63	193.6	40.3	17.7	6	1
831*	09	27.9	-02	24	0.506	-2.63	204.8	34.3	17.5	6	0
832*	09	28.0	16	31	0.553	-2.63	183.6	44.0	17.1	5	0
833*	09	28.4	11	31	0.540	-2.64	189.8	42.0	16.7	5	0
834*	09	28.7	67	20	0.839	-2.64	112.4	41.0	16.3	4	0
835	09	29.5	13	31	0.545	-2.65	187.5	43.1	17.7	6	1
836	09	29.7	79	06	1.217	-2.65	99.8	34.7	17.3	6	1
837	09	29.7	09	11	0.534	-2.65	192.8	41.2	17.5	6	1
838*	09	29.8	-04	22	0.502	-2.65	207.0	33.7	15.3	3	0
839*	09	30.3	80	33	1.325	-2.65	98.4	33.8	17.9	6	0
840*	09	30.5	79	22	1.232	-2.66	99.6	34.6	17.3	6	0

841*	09	31.2	-03	33	0.504	-2.66	206.5	34.5	16.5	5	0
842*	09	31.5	-20	17	0.462	-2.66	221.0	23.5	16.7	5	0
843	09	31.6	57	16	0.721	-2.67	124.8	45.6	17.5	6	1
844	09	32.6	-00	18	0.511	-2.67	203.6	36.7	17.6	6	1
845	09	32.7	65	04	0.799	-2.67	114.8	42.5	17.4	6	2
846	09	32.9	23	09	0.569	-2.68	175.2	47.4	17.0	5	1
847	09	32.9	03	07	0.519	-2.68	200.1	38.7	17.5	6	2
848*	09	33.1	75	32	1.028	-2.68	103.3	37.0	16.9	5	0
849*	09	33.2	22	01	0.566	-2.68	176.8	47.1	17.2	5	0
850	09	33.2	13	14	0.543	-2.68	188.4	43.8	17.5	6	2
851*	09	33.4	47	40	0.658	-2.68	138.2	48.6	18.4	7	1
852	09	33.5	30	05	0.589	-2.68	165.1	49.0	17.8	6	1
853*	09	34.3	16	03	0.550	-2.69	185.0	45.2	17.5	6	0
854	09	34.3	09	36	0.534	-2.69	193.0	42.4	17.7	6	1
855*	09	34.3	-08	38	0.492	-2.69	211.8	31.9	17.4	6	1
856*	09	35.2	57	13	0.716	-2.70	124.6	46.1	17.1	5	0
857*	09	35.4	-21	58	0.459	-2.70	223.0	22.9	16.9	5	2
858*	09	35.8	06	33	0.527	-2.70	196.8	41.2	16.6	5	0
859	09	35.9	09	31	0.534	-2.70	193.4	42.7	17.1	5	1
860	09	36.1	02	46	0.518	-2.70	201.0	39.2	17.4	6	1
861*	09	36.1	00	43	0.514	-2.70	203.2	38.0	17.4	6	0
862	09	36.7	10	14	0.535	-2.71	192.6	43.2	17.7	6	1
863*	09	36.9	-11	50	0.485	-2.71	215.2	30.2	17.7	6	0
864	09	37.1	72	53	0.909	-2.71	106.0	39.3	17.4	6	1
865*	09	37.5	44	10	0.638	-2.72	143.3	49.9	16.6	5	0
866*	09	37.6	58	49	0.726	-2.72	122.3	45.8	17.5	6	0
867*	09	37.7	01	13	0.515	-2.72	202.9	38.6	17.5	6	0
868*	09	38.3	-07	59	0.494	-2.72	212.0	33.1	17.6	6	3
869*	09	38.7	03	02	0.519	-2.73	201.2	39.9	17.4	6	0
870	09	39.0	10	17	0.535	-2.73	193.0	43.7	17.7	6	1
871	09	39.7	66	28	0.806	-2.73	112.7	42.4	17.1	5	1
872	09	40.0	77	57	1.110	-2.74	100.6	35.6	17.6	6	1
873	09	40.0	71	59	0.905	-2.74	106.6	39.4	17.4	6	3
874	09	40.3	58	43	0.722	-2.74	122.2	46.1	17.7	6	1
875*	09	41.0	71	37	0.894	-2.75	106.9	39.7	17.4	6	0
876	09	41.5	29	58	0.585	-2.75	165.6	50.7	17.6	6	1
877	09	41.6	76	04	1.022	-2.75	102.3	37.0	17.7	6	1
878	09	42.1	06	27	0.526	-2.75	198.0	42.5	16.8	5	1
879	09	42.3	29	39	0.583	-2.76	166.3	50.8	17.2	5	1
880	09	42.4	-03	30	0.504	-2.76	208.6	36.7	17.4	6	1

881*	09	43.2	72	24	0.907	-2.76	106.0	39.4	17.7	6	0
882*	09	43.6	08	56	0.532	-2.77	195.4	44.1	17.1	5	0
883	09	43.7	06	11	0.526	-2.77	198.6	42.6	16.8	5	1
884*	09	43.9	05	25	0.524	-2.77	199.5	42.3	17.1	5	0
885	09	44.0	63	10	0.758	-2.77	116.3	44.5	17.7	6	1
886	09	44.1	58	35	0.716	-2.77	122.1	46.6	17.5	6	1
887*	09	44.7	41	02	0.620	-2.78	148.0	51.6	17.6	6	0
888	09	44.8	77	38	1.077	-2.78	100.7	36.2	17.7	6	1
889	09	45.3	23	28	0.566	-2.78	175.9	50.2	17.6	6	1
890*	09	45.7	-04	10	0.503	-2.78	209.9	36.9	17.2	5	0
891	09	45.9	29	06	0.580	-2.79	167.2	51.5	17.6	6	1
892*	09	46.1	01	15	0.515	-2.79	204.5	40.3	17.1	5	0
893	09	47.0	36	40	0.603	-2.79	155.0	52.3	17.8	6	1
894*	09	47.2	36	51	0.603	-2.80	154.7	52.3	17.8	6	0
895	09	47.3	50	11	0.658	-2.80	133.6	50.2	18.0	6	1
896*	09	47.5	41	42	0.620	-2.80	146.8	52.0	17.0	5	0
897*	09	47.9	28	53	0.579	-2.80	167.7	51.9	17.6	6	0
898	09	48.3	49	57	0.656	-2.80	133.9	50.4	18.0	6	1
899	09	48.4	55	58	0.691	-2.81	125.2	48.3	17.2	5	1
900*	09	48.5	19	17	0.554	-2.81	182.4	49.6	17.5	6	0
901*	09	49.0	-09	16	0.492	-2.81	215.3	34.2	17.7	6	1
902*	09	49.3	-09	30	0.492	-2.81	215.5	34.1	17.7	6	0
903*	09	49.7	20	19	0.556	-2.82	181.1	50.2	17.2	5	0
904	09	49.8	60	47	0.726	-2.82	118.8	46.2	17.4	6	1
905*	09	50.4	57	42	0.701	-2.82	122.7	47.3	17.8	6	0
906*	09	50.5	66	05	0.781	-2.82	112.3	43.5	17.4	6	0
907*	09	51.2	-10	22	0.490	-2.83	216.7	33.8	17.5	6	1
908*	09	51.3	23	07	0.563	-2.83	177.0	51.5	18.4	7	1
909	09	51.6	75	32	0.971	-2.83	102.4	37.9	17.7	6	2
910	09	51.6	67	52	0.803	-2.83	110.3	42.8	17.5	6	4
911*	09	53.4	-14	42	0.482	-2.84	220.0	31.1	17.3	6	0
912*	09	53.7	00	36	0.513	-2.85	206.7	41.5	15.9	4	0
913	09	54.5	21	11	0.557	-2.85	180.3	51.5	18.0	6	1
914	09	56.2	71	57	0.863	-2.87	105.6	40.4	17.7	6	2
915	09	56.4	51	38	0.657	-2.87	130.7	51.0	17.2	5	1
916*	09	57.0	-18	41	0.474	-2.87	224.6	28.8	17.3	6	0
917	09	57.3	63	13	0.737	-2.87	115.1	45.7	17.4	6	1
918	09	57.5	74	27	0.920	-2.87	103.1	38.9	17.1	5	1
919	09	57.5	00	00	0.512	-2.87	208.1	41.8	17.1	5	1
920	09	57.6	55	59	0.680	-2.88	124.4	49.4	17.2	5	1

921*	09 57.9	08 08	0.528	-2.88	198.9	46.7	16.7	5	0
922	09 58.3	71 44	0.854	-2.88	105.7	40.7	17.9	6	2
923	09 58.3	26 37	0.569	-2.88	172.1	53.8	17.2	5	1
924	09 58.5	36 22	0.595	-2.88	155.4	54.6	17.2	5	1
925	09 58.6	27 30	0.572	-2.88	170.0	54.1	17.7	6	1
926	09 56.7	22 24	0.558	-2.88	178.9	52.8	17.8	6	1
927	09 58.9	51 02	0.651	-2.89	131.3	51.6	17.4	6	1
928	09 59.1	12 13	0.536	-2.89	193.9	49.0	17.2	5	1
929*	09 59.2	33 43	0.602	-2.89	151.3	54.6	17.6	6	0
930*	09 59.6	-04 56	0.502	-2.89	213.9	39.0	16.5	5	1
931*	09 59.8	-12 43	0.487	-2.89	220.5	33.6	17.4	6	0
932	10 00.1	20 18	0.553	-2.89	182.4	52.5	17.5	6	1
933*	10 00.2	01 14	0.514	-2.89	207.4	43.1	15.9	4	0
934	10 00.7	17 58	0.548	-2.90	186.0	51.8	17.0	5	1
935*	10 00.9	56 42	0.680	-2.90	123.1	49.5	17.2	5	0
936*	10 00.9	30 16	0.577	-2.90	166.0	54.9	17.2	5	0
937	10 01.1	14 41	0.541	-2.90	190.9	50.5	17.2	5	1
938*	10 01.5	19 07	0.550	-2.90	184.4	52.4	16.6	5	0
939*	10 01.6	-10 37	0.492	-2.91	219.1	35.5	17.7	6	0
940*	10 02.1	-15 56	0.481	-2.91	223.5	31.7	17.5	6	0
941	10 02.2	04 24	0.520	-2.91	204.3	45.5	17.1	5	1
942*	10 03.5	20 00	0.551	-2.92	183.3	53.2	17.0	5	0
943	10 03.8	34 20	0.586	-2.92	158.9	55.7	17.2	5	2
944	10 03.8	-01 20	0.510	-2.92	210.8	42.2	17.1	5	1
945*	10 04.3	69 49	0.805	-2.92	107.2	42.3	17.2	5	0
946*	10 04.4	24 34	0.561	-2.92	176.0	54.7	17.6	6	0
947	10 04.7	63 48	0.730	-2.93	113.8	46.1	16.8	5	1
948*	10 04.8	73 02	0.864	-2.93	104.0	40.2	17.1	5	0
949*	10 04.8	07 08	0.525	-2.93	201.5	47.5	16.8	5	0
950	10 05.4	50 33	0.642	-2.93	131.5	52.7	17.6	6	1
951	10 05.4	35 27	0.588	-2.93	156.9	56.1	17.6	6	1
952	10 05.8	20 30	0.552	-2.93	182.8	53.8	16.9	5	1
953*	10 06.1	-15 14	0.483	-2.94	223.8	32.8	17.9	6	1
954*	10 06.2	00 36	0.513	-2.94	209.3	43.9	16.5	5	0
955*	10 06.2	-23 44	0.466	-2.94	230.1	26.3	17.4	6	1
956	10 06.4	47 54	0.629	-2.94	135.5	53.9	17.2	5	1
957	10 06.5	-00 12	0.512	-2.94	210.3	43.5	15.9	4	1
958	10 07.5	41 44	0.606	-2.95	145.7	55.7	18.0	6	1
959	10 07.6	60 17	0.696	-2.95	117.7	48.4	17.8	6	1
960	10 08.0	66 57	0.758	-2.95	109.9	44.4	17.2	5	2

961	10	08.1	34	21	0.583	-2.95	158.9	56.6	17.2	5	2
962*	10	08.5	64	12	0.727	-2.95	112.9	46.2	17.1	5	0
963	10	08.5	39	45	0.598	-2.95	149.1	56.3	17.2	5	3
964	10	08.8	25	32	0.562	-2.95	174.7	55.8	17.2	5	1
965	10	09.5	50	37	0.638	-2.96	130.9	53.7	17.3	6	1
966*	10	09.5	-24	40	0.465	-2.96	231.4	26.0	17.4	6	1
967*	10	09.6	44	10	0.612	-2.96	141.4	55.5	17.0	5	0
968	10	10.1	69	00	0.780	-2.96	107.6	43.2	17.5	6	2
969	10	10.3	31	06	0.574	-2.97	164.8	57.0	17.6	6	1
970*	10	10.4	-09	39	0.494	-2.97	220.5	37.4	16.5	5	1
971	10	11.1	41	42	0.603	-2.97	145.5	56.4	16.6	5	1
972	10	11.3	40	17	0.598	-2.97	148.0	56.7	17.2	5	1
973	10	11.8	08	48	0.528	-2.98	200.9	49.9	17.6	6	2
974	10	11.9	14	47	0.539	-2.98	192.6	52.9	17.4	6	1
975	10	12.2	65	22	0.752	-2.98	111.1	45.7	16.8	5	2
976*	10	12.4	-13	12	0.488	-2.98	223.6	35.4	17.7	6	1
977	10	12.5	33	58	0.580	-2.98	159.6	57.5	17.2	5	1
978	10	13.2	-03	48	0.502	-2.98	217.4	40.9	15.6	3	1
979*	10	13.2	-07	10	0.500	-2.98	218.6	39.9	15.2	3	0
980	10	13.3	50	51	0.635	-2.99	130.1	53.8	17.5	6	1
981	10	13.5	68	51	0.770	-2.99	107.5	43.6	17.9	6	2
982	10	13.5	35	22	0.583	-2.99	156.9	57.7	17.6	6	1
983	10	13.6	60	33	0.689	-2.99	116.7	48.8	17.7	6	2
984*	10	13.6	12	56	0.535	-2.99	195.6	52.4	17.8	6	0
985	10	13.7	52	47	0.643	-2.99	127.2	53.0	17.0	5	1
986	10	13.8	14	52	0.538	-2.99	192.8	53.4	17.7	6	1
987	10	14.1	07	08	0.523	-2.99	203.5	49.4	17.2	5	1
988*	10	14.3	33	03	0.576	-2.99	161.3	57.9	18.0	6	0
989*	10	14.4	09	56	0.529	-2.99	199.9	51.1	17.2	5	0
990	10	14.5	49	54	0.629	-2.99	131.5	54.3	17.4	6	1
991	10	14.5	19	37	0.547	-2.99	185.5	55.5	17.2	5	1
992	10	14.6	21	14	0.550	-2.99	182.8	56.0	17.8	6	1
993*	10	14.6	-04	14	0.505	-2.99	216.2	42.2	14.9	3	0
994	10	14.9	20	04	0.548	-3.00	184.8	55.7	17.5	6	1
995	10	15.1	38	01	0.589	-3.00	151.9	57.6	17.2	5	1
996	10	15.1	15	53	0.540	-3.00	191.5	54.1	17.6	6	1
997	10	15.4	38	15	0.589	-3.00	151.5	57.8	17.2	5	1
998	10	15.5	68	42	0.764	-3.00	107.5	43.8	17.5	6	2
999*	10	15.6	13	35	0.536	-3.00	195.1	53.2	15.6	3	0
1000	10	15.8	50	55	0.633	-3.00	129.8	54.1	17.6	6	1

1001	10	15.9	-05	53	0.502	-3.00	218.1	41.3	17.7	6	1
1002	10	16.0	50	36	0.691	-3.00	130.2	56.3	17.6	6	1
1003*	10	16.1	48	52	0.622	-3.00	133.5	55.1	16.6	5	0
1004	10	16.4	51	48	0.636	-3.01	128.3	53.8	17.2	5	1
1005	10	16.6	68	58	0.764	-3.01	107.1	43.7	17.5	6	2
1006	10	17.0	67	47	0.749	-3.01	108.3	44.5	17.7	6	1
1007	10	17.1	33	40	0.576	-3.01	160.1	58.5	17.6	6	1
1008*	10	17.4	-04	38	0.504	-3.01	217.2	42.5	17.7	6	0
1009	10	17.6	-05	04	0.504	-3.01	217.7	42.2	17.7	6	1
1010	10	17.7	39	48	0.592	-3.01	146.5	58.0	17.2	3	1
1011*	10	17.7	13	00	0.534	-3.01	194.3	53.3	17.8	6	0
1012*	10	17.9	32	01	0.572	-3.01	163.3	58.7	17.8	6	0
1013	10	18.6	-05	30	0.503	-3.02	216.4	42.1	17.7	6	1
1014	10	18.7	66	11	0.728	-3.02	109.8	45.7	17.1	5	2
1015	10	19.4	35	17	0.579	-3.02	157.0	56.9	17.5	6	1
1016*	10	19.4	11	43	0.532	-3.02	198.5	53.0	15.4	3	0
1017*	10	19.8	65	52	0.723	-3.03	110.0	46.0	17.9	6	0
1018	10	20.1	18	12	0.548	-3.03	188.5	56.2	17.6	6	1
1019	10	20.2	31	35	0.570	-3.03	164.2	59.1	17.8	6	1
1020	10	20.2	11	09	0.531	-3.03	199.5	52.9	16.0	4	1
1021	10	20.3	38	24	0.586	-3.03	150.9	58.7	16.6	5	1
1022*	10	20.7	10	25	0.529	-3.03	200.6	52.6	17.2	5	0
1023*	10	20.7	-06	02	0.502	-3.03	219.4	42.0	17.1	5	0
1024	10	20.8	04	30	0.519	-3.03	208.3	49.2	17.0	5	1
1025	10	21.6	63	36	0.699	-3.04	112.3	47.7	16.9	5	2
1026	10	21.6	40	50	0.592	-3.04	146.3	56.5	17.2	5	1
1027	10	21.8	54	09	0.648	-3.04	124.2	53.3	17.2	5	1
1028	10	22.1	41	53	0.595	-3.04	144.3	58.3	17.0	5	1
1029	10	22.2	78	03	0.949	-3.04	98.5	37.3	17.1	5	2
1030*	10	22.4	31	45	0.569	-3.04	165.2	59.6	17.8	6	0
1031*	10	22.6	39	29	0.580	-3.04	148.7	59.0	17.2	5	0
1032*	10	22.8	04	46	0.520	-3.05	208.4	49.3	15.7	4	0
1033	10	23.2	35	50	0.578	-3.05	155.8	59.4	17.2	5	2
1034	10	23.4	19	28	0.544	-3.05	187.1	57.3	17.5	6	1
1035	10	23.6	40	58	0.591	-3.05	149.8	58.8	15.4	3	2
1036*	10	23.9	32	37	0.570	-3.05	162.1	59.9	17.3	6	0
1037*	10	25.1	65	32	0.752	-3.06	105.8	43.8	17.7	6	0
1038	10	25.5	05	00	0.517	-3.06	211.2	49.2	17.6	6	1
1039*	10	25.3	-04	03	0.506	-3.06	218.7	44.3	17.5	5	0
1040*	10	25.7	46	14	0.605	-3.06	136.1	57.5	17.2	5	0

1041	10	25.7	-08	09	0.499	-3.06	222.5	41.3	17.1	5	1
1042	10	26.5	12	33	0.532	-3.07	198.8	55.0	17.2	5	1
1043	10	26.6	17	02	0.539	-3.07	191.8	57.1	17.2	5	1
1044	10	26.6	06	25	0.522	-3.07	207.3	51.5	17.0	6	1
1045	10	26.8	31	27	0.566	-3.07	164.5	60.5	17.2	5	1
1046	10	27.1	68	43	0.737	-3.07	106.4	44.5	17.5	6	2
1047	10	27.3	05	10	0.520	-3.07	209.1	50.9	17.2	5	1
1048*	10	27.4	44	42	0.599	-3.07	138.0	58.4	17.2	5	0
1049	10	28.2	68	30	0.733	-3.08	106.5	44.7	17.7	6	2
1050	10	28.2	45	34	0.600	-3.08	137.0	58.2	17.2	5	2
1051	10	28.3	46	58	0.605	-3.08	134.5	57.0	17.5	6	1
1052	10	28.3	28	49	0.560	-3.08	169.9	60.7	17.8	6	1
1053	10	28.6	31	31	0.565	-3.08	164.4	60.9	17.2	5	1
1054	10	28.8	43	23	0.594	-3.08	140.8	59.1	17.2	5	1
1055*	10	29.0	37	55	0.579	-3.08	151.3	60.5	17.2	5	0
1056	10	29.4	42	34	0.591	-3.08	142.3	59.4	17.0	5	1
1057	10	29.5	13	10	0.532	-3.08	198.6	55.9	17.2	5	1
1058*	10	29.6	35	08	0.572	-3.08	156.9	61.0	17.2	5	0
1059	10	29.9	-05	14	0.504	-3.09	220.9	44.2	17.7	6	1
1060*	10	30.0	-26	47	0.469	-3.09	237.0	26.9	12.7	0	1
1061	10	30.5	67	58	0.721	-3.09	106.8	45.3	17.7	6	2
1062	10	30.9	16	38	0.537	-3.09	193.3	57.8	17.2	5	1
1063	10	31.0	19	25	0.542	-3.09	189.4	59.0	17.2	5	1
1064	10	31.3	02	02	0.515	-3.09	212.8	49.6	17.1	5	1
1065*	10	31.7	57	39	0.644	-3.10	118.2	52.4	17.2	5	0
1066	10	31.9	05	56	0.521	-3.10	209.3	52.3	16.6	5	1
1067	10	32.2	41	00	0.584	-3.10	144.9	60.4	16.6	5	1
1068	10	32.4	40	43	0.584	-3.10	145.5	60.5	17.0	5	1
1069*	10	32.6	-07	52	0.501	-3.10	224.8	42.6	15.1	3	0
1070	10	33.9	78	54	0.928	-3.11	97.3	37.0	17.5	6	2
1071*	10	34.1	43	51	0.590	-3.11	139.3	59.3	17.2	5	0
1072*	10	34.2	58	10	0.643	-3.11	117.2	52.4	17.2	5	0
1073	10	34.2	37	24	0.574	-3.11	152.0	61.6	17.2	5	2
1074	10	34.6	47	24	0.600	-3.11	132.9	58.4	17.3	6	1
1075	10	35.3	-08	59	0.499	-3.12	225.6	42.2	17.1	5	1
1076	10	35.8	58	56	0.645	-3.12	116.0	52.0	17.2	5	1
1077	10	36.0	47	16	0.598	-3.12	132.9	58.7	17.5	6	2
1078	10	36.1	01	24	0.514	-3.12	215.8	50.0	17.0	5	1
1079*	10	36.1	-06	38	0.503	-3.12	223.8	44.1	17.1	5	0
1080*	10	36.5	01	51	0.515	-3.12	215.4	50.4	17.0	5	0

1081	10	36.6	36	20	0.570	-3.12	154.0	62.3	17.2	5	2
1082*	10	36.6	33	05	0.564	-3.12	160.9	62.6	17.6	6	0
1083*	10	36.9	60	25	0.651	-3.12	114.1	51.1	17.6	6	0
1084	10	37.3	-06	20	0.503	-3.13	223.9	44.6	17.4	6	1
1085*	10	37.5	21	02	0.542	-3.13	186.5	61.0	16.6	5	0
1086*	10	37.5	-15	45	0.490	-3.13	231.5	37.1	17.5	6	1
1087*	10	37.7	44	40	0.589	-3.13	137.3	60.2	17.8	6	0
1088*	10	37.7	-18	46	0.486	-3.13	233.8	34.7	17.0	5	0
1089*	10	38.6	19	24	0.539	-3.13	189.8	60.6	17.7	6	0
1090*	10	38.7	-17	35	0.488	-3.13	233.1	35.7	17.1	5	0
1091*	10	38.8	-16	15	0.490	-3.13	232.2	36.9	17.7	6	0
1092	10	38.9	02	07	0.515	-3.13	215.7	51.0	17.6	6	1
1093	10	39.3	09	50	0.525	-3.14	205.9	56.1	17.8	6	1
1094	10	39.6	28	17	0.553	-3.14	173.6	63.1	18.0	6	2
1095	10	39.7	15	59	0.536	-3.14	196.2	59.4	17.6	6	2
1096	10	40.2	28	49	0.554	-3.14	170.4	63.3	17.8	6	1
1097*	10	40.4	32	14	0.560	-3.14	162.8	63.4	16.0	4	0
1098*	10	40.6	-03	11	0.508	-3.14	221.8	47.5	16.9	5	0
1099	10	40.7	35	44	0.566	-3.14	155.1	63.2	17.0	5	1
1100*	10	41.0	23	00	0.544	-3.14	183.0	62.4	15.7	4	0
1101	10	41.2	45	08	0.587	-3.15	135.9	60.4	17.8	6	2
1102	10	41.3	07	57	0.523	-3.15	209.1	55.3	17.5	6	1
1103*	10	41.5	14	13	0.531	-3.15	199.6	59.0	17.6	6	0
1104*	10	41.5	-16	23	0.490	-3.15	232.9	37.1	17.4	6	0
1105	10	41.6	10	18	0.525	-3.15	205.9	56.8	16.8	5	1
1106*	10	41.9	44	46	0.586	-3.15	136.5	60.7	17.8	6	0
1107	10	42.0	04	25	0.518	-3.15	213.9	53.2	17.0	5	1
1108*	10	42.1	17	00	0.535	-3.15	194.9	60.4	17.2	5	0
1109	10	42.3	18	32	0.537	-3.15	192.1	61.1	17.2	5	1
1110	10	43.2	43	10	0.581	-3.16	139.3	61.6	17.8	6	1
1111	10	43.3	-01	48	0.510	-3.16	221.2	49.0	17.8	6	2
1112*	10	43.4	56	20	0.622	-3.16	118.1	54.5	17.5	6	0
1113	10	43.4	09	25	0.524	-3.16	207.6	56.6	17.6	6	1
1114	10	43.6	20	56	0.540	-3.16	187.7	62.3	17.1	5	1
1115	10	43.9	09	49	0.525	-3.16	207.1	57.0	17.6	6	1
1116*	10	44.5	13	00	0.529	-3.16	202.4	58.9	17.2	5	0
1117	10	44.8	40	31	0.573	-3.16	144.4	62.8	17.2	5	1
1118*	10	45.0	38	20	0.569	-3.16	149.0	63.5	17.6	6	0
1119	10	45.1	11	29	0.527	-3.16	205.0	58.2	17.5	6	1
1120	10	45.2	31	35	0.556	-3.16	164.2	64.5	18.0	6	2

1121	10	45.2	09	48	0.524	-3.16	207.5	57.2	17.7	6	2
1122*	10	45.3	38	41	0.569	-3.17	148.2	63.4	17.7	6	0
1123	10	45.4	76	18	0.804	-3.17	98.6	39.5	16.9	5	2
1124	10	45.7	72	32	0.737	-3.17	101.4	42.0	17.3	6	2
1125	10	46.2	11	01	0.526	-3.17	206.0	58.2	17.6	6	1
1126	10	46.2	17	38	0.534	-3.17	194.7	61.6	16.0	4	1
1127	10	46.5	15	27	0.531	-3.17	198.7	60.6	17.3	6	1
1128*	10	46.6	09	48	0.524	-3.17	207.9	57.5	17.0	5	0
1129*	10	46.9	12	36	0.528	-3.17	203.7	59.2	17.8	6	0
1130*	10	47.5	-09	56	0.500	-3.18	229.7	48.3	17.1	5	0
1131	10	48.0	11	46	0.526	-3.18	205.3	58.9	17.2	5	1
1132	10	49.5	57	34	0.618	-3.18	115.6	54.3	17.0	5	1
1133	10	49.6	50	38	0.594	-3.18	125.2	58.8	17.4	6	1
1134	10	49.7	-01	22	0.511	-3.19	222.6	50.3	17.6	5	2
1135	10	49.9	41	50	0.572	-3.19	140.9	63.2	15.9	5	1
1136	10	49.9	09	25	0.523	-3.19	209.4	57.9	17.6	6	1
1137	10	50.0	10	34	0.524	-3.19	208.0	58.5	17.2	5	1
1138	10	50.6	33	46	0.556	-3.19	158.9	65.4	17.5	6	1
1139*	10	50.6	02	17	0.515	-3.19	218.9	53.2	15.0	3	0
1140*	10	50.7	34	43	0.558	-3.19	156.6	65.3	17.8	6	0
1141	10	51.9	13	01	0.527	-3.19	204.3	60.4	17.2	5	2
1142*	10	53.3	11	20	0.525	-3.20	207.5	59.7	15.4	3	2
1143	10	53.4	51	08	0.591	-3.20	123.7	59.0	17.2	5	1
1144*	10	53.6	59	33	0.620	-3.20	112.6	53.2	17.2	5	0
1145*	10	53.9	17	31	0.532	-3.20	196.6	63.2	15.7	4	0
1146*	10	54.3	-21	57	0.487	-3.20	239.6	39.9	17.0	5	4
1147	10	54.7	12	47	0.526	-3.21	205.5	60.9	17.6	6	1
1148	10	55.0	-00	17	0.512	-3.21	222.1	52.0	17.6	6	1
1149*	10	55.5	00	25	0.521	-3.21	212.5	58.3	16.0	4	0
1150*	10	56.0	74	29	0.733	-3.21	99.1	41.3	16.5	5	0
1151*	10	56.3	36	44	0.558	-3.21	151.3	66.0	17.5	6	0
1152	10	56.4	13	20	0.527	-3.21	205.1	61.5	17.6	6	1
1153	10	56.4	02	07	0.514	-3.21	220.9	54.1	17.5	6	2
1154	10	56.5	50	37	0.586	-3.21	123.9	59.7	17.8	6	1
1155*	10	56.5	35	59	0.556	-3.21	153.1	66.5	16.8	5	0
1156	10	56.6	48	12	0.580	-3.21	127.8	61.2	17.8	6	1
1157	10	56.9	14	25	0.528	-3.22	203.3	62.2	17.2	5	1
1158*	10	57.0	23	01	0.538	-3.22	185.4	65.9	17.6	6	0
1159	10	57.9	13	20	0.526	-3.22	205.5	61.8	17.2	5	1
1160*	10	58.0	-18	11	0.492	-3.22	238.3	37.6	17.4	6	1

1161*	10	58.4	-21 20	0.469	-3.22	240.3	34.9	17.3	6	2
1162	10	58.8	04 44	0.517	-3.22	218.5	56.4	17.6	6	1
1163*	10	58.8	-20 46	0.490	-3.22	240.1	35.5	17.0	5	1
1164	10	59.0	02 51	0.515	-3.22	220.9	55.0	17.7	6	1
1165*	10	59.2	-23 57	0.486	-3.22	242.0	32.7	17.5	6	1
1166	10	59.7	69 32	0.667	-3.23	102.5	45.7	17.1	5	1
1167	10	59.8	49 40	0.580	-3.23	124.7	60.7	17.3	6	1
1168	10	59.8	16 42	0.529	-3.23	199.8	64.0	16.8	5	1
1169	10	59.9	44 44	0.569	-3.23	133.3	63.5	16.6	5	1
1170	11	00.0	08 48	0.521	-3.23	213.4	59.4	17.6	6	2
1171*	11	00.0	03 44	0.516	-3.23	220.2	55.9	16.2	4	0
1172*	11	00.7	-06 23	0.506	-3.23	230.6	48.0	17.2	5	0
1173	11	01.1	42 22	0.564	-3.23	137.8	64.9	16.8	5	1
1174	11	01.2	44 04	0.567	-3.23	136.3	64.1	17.0	5	2
1175	11	01.3	35 56	0.550	-3.23	157.5	67.6	17.8	6	1
1176*	11	01.5	07 25	0.519	-3.23	215.9	58.8	17.7	6	0
1177*	11	01.7	22 29	0.535	-3.23	187.5	66.8	15.7	4	0
1178	11	01.9	35 23	0.552	-3.23	153.9	67.5	17.8	6	2
1179*	11	02.1	24 45	0.538	-3.24	181.9	67.5	16.6	5	0
1180	11	02.2	65 45	0.625	-3.24	107.1	52.6	17.8	6	1
1181*	11	02.3	-19 00	0.493	-3.24	239.9	37.4	17.6	6	1
1182	11	02.4	32 36	0.547	-3.24	161.2	68.0	17.5	6	2
1183	11	02.6	12 48	0.525	-3.24	207.8	62.4	17.2	5	1
1184*	11	02.8	51 05	0.580	-3.24	121.9	60.1	17.8	6	0
1185	11	03.0	29 28	0.543	-3.24	169.5	68.3	14.3	2	1
1186	11	03.6	76 11	0.733	-3.24	97.5	40.1	16.5	5	2
1187	11	03.6	40 22	0.558	-3.24	141.7	66.2	15.6	3	1
1188	11	03.6	22 19	0.534	-3.24	188.3	67.1	17.5	6	2
1189*	11	03.6	01 55	0.514	-3.24	223.5	55.1	17.0	5	0
1190	11	03.7	41 38	0.560	-3.24	138.8	65.7	16.8	5	2
1191	11	03.7	01 33	0.514	-3.24	223.9	54.8	17.5	6	2
1192*	11	03.9	60 03	0.606	-3.24	110.4	53.7	17.6	6	0
1193	11	04.2	43 14	0.563	-3.24	139.4	65.0	17.2	5	1
1194	11	04.3	31 30	0.545	-3.24	164.0	68.5	17.3	6	1
1195	11	04.4	-04 09	0.508	-3.24	229.8	50.4	17.6	6	1
1196	11	04.6	54 40	0.587	-3.24	116.5	57.8	17.8	6	1
1197*	11	04.7	37 16	0.553	-3.24	148.8	67.5	17.2	5	0
1198	11	04.9	31 10	0.544	-3.25	164.9	68.7	17.5	6	2
1199	11	05.0	20 52	0.532	-3.25	192.0	66.9	17.6	6	1
1200	11	05.0	-02 23	0.510	-3.25	228.4	51.9	17.0	5	1

1201	11	05.4	14	13	0.525	-3.25	206.2	63.8	17.0	5	2
1202	11	05.5	48	18	0.571	-3.25	125.7	62.3	17.0	5	1
1203	11	05.9	41	05	0.557	-3.25	139.6	66.3	16.6	5	1
1204	11	05.9	18	23	0.529	-3.25	197.9	66.1	17.8	6	1
1205	11	05.9	03	18	0.515	-3.25	222.7	56.5	18.9	5	1
1206	11	06.2	-04	50	0.508	-3.25	231.0	50.1	17.6	6	1
1207	11	06.6	68	29	0.642	-3.25	102.5	46.9	17.1	5	1
1208	11	06.6	05	09	0.517	-3.25	220.6	58.0	17.6	6	2
1209	11	06.9	13	41	0.525	-3.25	207.7	63.8	17.2	5	1
1210	11	07.3	17	33	0.528	-3.25	200.1	66.0	17.3	6	1
1211	11	07.9	-11	26	0.502	-3.25	236.6	44.6	17.5	6	2
1212*	11	08.7	58	15	0.592	-3.26	111.5	55.5	17.2	5	0
1213	11	08.7	30	04	0.541	-3.26	167.9	69.5	16.5	2	1
1214	11	09.6	-04	49	0.508	-3.26	232.1	50.6	17.5	6	1
1215	11	10.2	04	27	0.516	-3.26	222.8	58.1	16.7	5	2
1216	11	10.4	-03	41	0.509	-3.26	231.4	51.6	16.0	4	1
1217*	11	10.4	-24	26	0.490	-3.26	245.0	33.4	17.4	6	1
1218*	11	10.6	52	31	0.574	-3.26	118.1	60.0	16.0	4	0
1219	11	10.8	17	30	0.527	-3.26	201.2	66.7	17.5	6	1
1220	11	11.0	38	18	0.549	-3.26	145.1	68.3	17.3	6	1
1221	11	11.2	63	29	0.605	-3.27	106.0	51.4	17.6	6	1
1222	11	12.4	47	58	0.563	-3.27	124.6	63.4	16.6	5	1
1223*	11	12.7	46	43	0.560	-3.27	126.7	64.2	17.2	5	0
1224	11	13.0	37	14	0.546	-3.27	147.4	69.1	17.8	6	1
1225*	11	13.1	54	34	0.576	-3.27	114.9	58.7	15.4	3	0
1226*	11	13.2	34	31	0.543	-3.27	154.8	69.9	17.2	5	0
1227	11	13.5	48	50	0.565	-3.27	122.5	62.9	16.6	5	2
1228	11	13.7	35	08	0.543	-3.27	153.0	69.9	13.8	1	1
1229	11	14.0	46	57	0.560	-3.27	126.0	64.2	17.8	6	1
1230	11	14.0	23	03	0.531	-3.27	188.2	69.7	17.2	5	1
1231*	11	14.2	50	31	0.566	-3.27	120.1	61.8	17.0	5	0
1232	11	14.5	18	42	0.527	-3.28	199.6	68.1	17.4	6	1
1233*	11	14.6	-18	09	0.498	-3.28	242.8	39.5	17.6	6	1
1234	11	14.8	22	12	0.530	-3.28	190.9	69.6	17.3	6	2
1235	11	15.3	20	26	0.528	-3.28	195.6	69.0	17.0	5	2
1236*	11	15.3	01	16	0.513	-3.28	228.3	56.4	17.2	5	0
1237	11	15.5	43	39	0.553	-3.28	131.8	66.5	17.3	6	1
1238	11	15.5	01	54	0.513	-3.28	227.7	56.9	16.0	4	1
1239*	11	15.6	60	57	0.589	-3.28	107.6	53.8	17.5	6	0
1240	11	15.6	43	55	0.553	-3.28	131.2	66.3	17.2	5	2

1241	11	15.6	28 01	0.535	-3.28	174.1	71.0	17.6	6	1
1242	11	15.6	17 46	0.526	-3.28	202.1	67.0	17.2	5	1
1243	11	16.1	19 00	0.527	-3.28	199.4	68.5	17.3	6	1
1244*	11	16.2	46 13	0.556	-3.28	126.7	65.0	17.6	6	0
1245*	11	16.2	33 06	0.540	-3.28	158.9	70.8	17.2	5	0
1246	11	16.2	22 14	0.529	-3.28	191.1	69.9	17.6	6	3
1247	11	16.4	20 49	0.528	-3.28	194.9	69.4	17.2	5	1
1248*	11	16.4	-03 25	0.510	-3.28	233.2	52.7	17.0	5	0
1249	11	16.6	68 50	0.620	-3.28	101.1	47.1	17.2	5	1
1250	11	17.0	42 27	0.550	-3.28	133.9	67.4	17.8	6	1
1251	11	17.1	18 18	0.526	-3.28	201.4	68.4	17.5	6	1
1252	11	17.1	-08 00	0.506	-3.28	237.1	46.8	17.2	5	1
1253*	11	17.3	43 18	0.551	-3.28	132.1	66.9	17.3	6	0
1254	11	17.9	71 53	0.636	-3.28	99.0	44.4	15.3	3	1
1255	11	18.1	76 17	0.678	-3.29	96.4	60.4	16.7	5	1
1256	11	18.1	-15 31	0.501	-3.29	242.3	42.2	17.7	6	1
1257*	11	18.3	36 08	0.541	-3.29	149.4	70.5	15.0	3	0
1258	11	18.4	26 14	0.532	-3.29	170.9	71.4	17.2	5	1
1259	11	18.7	06 04	0.516	-3.29	223.9	60.7	18.0	6	2
1260	11	18.9	02 52	0.514	-3.29	227.9	58.2	17.5	6	2
1261	11	19.3	49 08	0.557	-3.29	120.9	63.4	17.2	5	1
1262	11	19.5	11 26	0.520	-3.29	216.2	64.7	17.3	6	1
1263	11	19.5	-09 00	0.506	-3.29	238.6	48.2	17.7	6	1
1264	11	19.6	17 57	0.525	-3.29	203.0	68.7	17.1	5	2
1265	11	20.2	42 09	0.547	-3.29	133.7	68.0	17.8	6	1
1266*	11	20.3	37 23	0.541	-3.29	145.5	70.4	17.2	5	0
1267*	11	20.3	27 40	0.532	-3.29	175.5	72.0	15.4	3	0
1268	11	20.8	24 40	0.529	-3.29	185.0	71.6	17.2	5	1
1269	11	21.5	34 57	0.538	-3.29	152.2	71.4	17.5	6	1
1270*	11	21.6	54 53	0.565	-3.29	112.7	59.2	15.4	3	0
1271	11	21.6	-08 48	0.506	-3.29	239.2	48.0	17.7	6	1
1272	11	22.0	24 36	0.529	-3.30	185.5	71.8	17.8	5	2
1273	11	22.0	-06 15	0.508	-3.30	237.5	50.9	17.6	6	1
1274	11	22.1	20 42	0.526	-3.30	196.9	70.3	17.2	5	1
1275*	11	22.2	37 29	0.540	-3.30	144.7	70.7	15.7	4	0
1276	11	22.3	33 50	0.537	-3.30	155.4	71.9	17.6	6	1
1277	11	22.5	13 43	0.521	-3.30	213.2	66.8	17.8	6	1
1278	11	22.6	21 17	0.526	-3.30	195.4	70.9	17.3	6	3
1279*	11	22.7	68 02	0.602	-3.30	100.9	48.0	16.5	5	0
1280	11	22.7	35 29	0.538	-3.30	150.3	71.5	17.5	6	1

1281	11	22.7	36	11	0.537	-3.30	154.3	71.9	17.6	6	1
1282	11	22.9	40	48	0.543	-3.30	136.0	69.2	17.6	6	1
1283	11	23.0	61	34	0.578	-3.30	105.7	53.7	17.2	5	1
1284	11	23.1	35	51	0.538	-3.30	149.2	71.5	17.5	6	1
1285	11	23.1	-13	46	0.503	-3.30	242.6	44.3	17.0	5	1
1286	11	23.2	23	10	0.527	-3.30	190.1	71.7	17.6	6	1
1287*	11	23.3	67	35	0.598	-3.30	101.1	48.4	17.0	5	0
1288	11	23.3	06	47	0.516	-3.30	224.8	62.0	17.6	6	2
1289*	11	23.4	61	34	0.578	-3.30	105.7	53.7	17.0	5	0
1290	11	23.5	34	24	0.536	-3.30	153.5	72.0	17.5	6	1
1291	11	24.0	56	50	0.563	-3.30	110.0	57.8	15.4	3	1
1292	11	24.0	36	38	0.539	-3.30	146.7	71.3	17.5	6	2
1293	11	24.1	39	52	0.541	-3.30	137.9	69.9	17.8	6	1
1294*	11	24.2	55	03	0.562	-3.30	111.9	59.3	18.0	6	0
1295	11	24.3	-06	44	0.508	-3.30	238.6	50.6	17.1	5	1
1296*	11	24.4	-04	22	0.509	-3.30	236.8	52.9	17.0	5	0
1297*	11	24.5	77	02	0.661	-3.30	95.6	39.9	16.1	4	0
1298	11	24.6	45	37	0.547	-3.30	125.4	66.5	17.0	5	1
1299	11	24.6	34	47	0.536	-3.30	152.1	72.1	17.5	6	2
1300*	11	24.7	-19	06	0.500	-3.30	246.1	39.6	17.6	6	1
1301*	11	24.8	75	52	0.647	-3.30	96.1	41.0	16.5	5	0
1302	11	24.9	67	13	0.593	-3.30	101.2	48.8	16.7	5	2
1303	11	25.0	37	36	0.538	-3.30	143.7	71.1	18.0	6	1
1304	11	25.0	36	16	0.537	-3.30	147.5	71.7	17.9	6	2
1305*	11	25.2	35	35	0.536	-3.30	149.5	72.0	17.2	5	0
1306*	11	25.3	47	25	0.549	-3.30	122.1	65.3	17.6	6	0
1307	11	25.3	15	20	0.521	-3.30	211.1	60.4	16.8	5	1
1308*	11	25.5	-03	11	0.510	-3.30	236.3	54.0	15.7	4	0
1309	11	25.7	-11	03	0.506	-3.30	242.0	47.0	17.0	5	2
1310	11	26.0	40	29	0.540	-3.30	135.5	69.8	17.8	6	1
1311*	11	26.0	-23	15	0.498	-3.30	249.4	35.8	17.4	6	1
1312	11	26.3	50	52	0.552	-3.31	116.6	62.8	17.6	6	1
1313	11	26.6	17	53	0.523	-3.31	205.7	70.1	17.2	5	1
1314*	11	26.9	48	51	0.550	-3.31	117.8	63.7	13.9	1	0
1315*	11	27.5	72	44	0.613	-3.31	97.5	45.9	16.5	5	0
1316*	11	27.8	38	12	0.537	-3.31	141.2	71.3	17.6	6	0
1317	11	27.8	-12	44	0.505	-3.31	243.7	45.7	16.5	5	2
1318	11	28.4	55	46	0.557	-3.31	110.1	59.0	15.0	3	1
1319	11	28.5	40	53	0.538	-3.31	134.1	70.0	17.8	6	2
1320*	11	28.5	-05	01	0.509	-3.31	238.8	52.8	17.6	6	0

1321*	11	28.7	48	53	0.547	-3.31	118.7	64.6	17.8	6	0
1322*	11	28.8	64	02	0.574	-3.31	102.8	51.9	17.2	5	0
1323	11	28.9	-07	14	0.508	-3.31	240.6	50.8	17.2	5	1
1324	11	29.1	57	54	0.560	-3.31	107.9	57.3	17.0	5	1
1325	11	29.2	08	00	0.516	-3.31	225.6	65.8	17.2	5	1
1326	11	29.3	40	59	0.538	-3.31	133.6	70.1	17.8	6	2
1327	11	29.4	27	20	0.527	-3.31	177.3	74.0	17.5	6	1
1328	11	29.8	38	11	0.535	-3.31	140.7	71.7	17.2	5	1
1329	11	30.1	71	56	0.601	-3.31	97.7	44.7	16.5	5	1
1330*	11	30.5	50	20	0.547	-3.31	116.1	63.7	17.8	6	0
1331	11	30.6	64	26	0.572	-3.31	102.3	51.6	17.6	6	2
1332*	11	30.7	-08	33	0.508	-3.31	242.1	49.8	16.0	4	0
1333*	11	31.4	50	41	0.546	-3.32	115.4	63.5	17.4	6	0
1334*	11	31.5	-03	31	0.510	-3.32	238.8	54.4	15.7	4	0
1335	11	31.5	68	37	0.583	-3.32	99.2	47.5	17.2	5	1
1336*	11	31.8	33	13	0.530	-3.32	155.8	74.0	16.0	4	0
1337	11	31.9	10	55	0.517	-3.32	222.2	66.5	17.2	5	1
1338*	11	32.9	19	03	0.521	-3.32	205.2	72.0	16.9	5	0
1339*	11	33.1	73	53	0.602	-3.32	96.4	43.0	17.4	6	0
1340*	11	33.1	45	41	0.539	-3.32	122.6	67.5	17.2	5	0
1341	11	33.1	11	12	0.517	-3.32	222.4	66.9	17.6	6	1
1342	11	33.2	10	53	0.517	-3.32	223.0	66.7	17.2	5	1
1343*	11	33.3	61	28	0.560	-3.32	104.0	54.4	17.2	5	0
1344	11	33.3	-09	56	0.508	-3.32	243.9	48.8	16.5	5	1
1345	11	33.7	11	30	0.517	-3.32	222.2	67.2	17.2	5	1
1346	11	33.7	06	30	0.515	-3.32	229.6	63.3	16.8	5	1
1347*	11	33.7	-24	43	0.500	-3.32	251.1	35.0	17.0	5	1
1348	11	33.9	-11	34	0.507	-3.32	245.0	47.4	17.0	5	2
1349	11	34.2	56	10	0.549	-3.32	108.4	59.1	16.9	5	1
1350*	11	34.2	25	24	0.524	-3.32	185.0	74.7	17.6	6	0
1351	11	34.6	59	21	0.553	-3.32	105.4	36.4	17.8	6	2
1352*	11	34.6	-20	40	0.503	-3.32	249.7	38.9	17.8	6	1
1353	11	34.7	25	46	0.524	-3.32	183.7	74.9	17.6	6	1
1354	11	34.7	10	58	0.517	-3.32	223.5	67.0	17.2	5	1
1355	11	35.0	42	43	0.535	-3.32	127.8	69.8	17.6	6	1
1356	11	35.0	11	15	0.517	-3.32	223.2	67.2	17.2	5	1
1357*	11	35.1	62	06	0.557	-3.32	103.2	53.9	16.9	5	0
1358	11	35.3	09	02	0.516	-3.32	226.9	65.6	17.0	5	1
1359*	11	35.6	62	28	0.557	-3.32	102.8	53.6	17.2	5	0
1360	11	35.6	11	50	0.517	-3.32	222.5	67.8	17.2	5	1

1361	11	36.0	47	10	0.537	-3.32	219.1	66.7	17.4	6	1
1362*	11	36.1	08	18	0.515	-3.32	228.3	65.1	16.0	4	0
1363*	11	36.2	44	33	0.535	-3.32	123.6	68.7	17.2	5	0
1364	11	36.2	-00	58	0.512	-3.32	238.5	57.2	16.0	4	1
1365	11	36.8	31	43	0.526	-3.32	160.4	75.4	15.7	4	1
1366	11	36.9	68	14	0.568	-3.32	99.0	48.4	16.8	5	1
1367	11	37.0	20	39	0.521	-3.32	202.2	73.6	13.5	1	2
1368	11	37.2	52	04	0.540	-3.32	112.0	62.9	16.9	5	1
1369*	11	37.2	43	10	0.533	-3.32	126.8	69.8	17.2	5	0
1370	11	37.4	50	09	0.538	-3.32	114.3	64.5	17.6	6	1
1371	11	38.0	16	21	0.518	-3.33	214.4	71.4	16.6	5	1
1372	11	38.0	12	20	0.517	-3.33	222.0	68.5	17.2	5	1
1373	11	38.0	-01	36	0.511	-3.33	239.8	56.9	17.2	5	2
1374	11	38.2	50	33	0.538	-3.33	113.6	64.2	17.4	6	1
1375*	11	38.7	-07	27	0.509	-3.33	244.3	51.6	16.6	5	0
1376	11	38.8	-00	17	0.512	-3.33	239.1	58.2	16.6	5	1
1377	11	39.2	56	33	0.543	-3.33	106.8	59.1	15.0	3	1
1378	11	39.3	24	19	0.521	-3.33	190.2	75.6	17.5	6	1
1379*	11	39.6	08	46	0.515	-3.33	229.3	66.0	17.0	5	0
1380	11	40.0	26	13	0.522	-3.33	182.8	76.2	16.6	5	1
1381	11	40.2	76	02	0.589	-3.33	94.9	41.1	17.0	5	2
1382	11	40.3	72	13	0.572	-3.33	96.5	44.7	15.9	4	1
1383	11	40.4	55	26	0.540	-3.33	107.6	60.3	15.7	4	1
1384	11	40.5	29	22	0.520	-3.33	194.2	75.5	17.2	5	1
1385	11	40.6	12	22	0.516	-3.33	224.0	69.0	17.2	5	1
1386	11	40.9	-01	09	0.512	-3.33	240.7	57.6	17.2	5	1
1387	11	41.1	52	26	0.536	-3.33	110.5	62.9	17.0	5	1
1388	11	41.5	23	12	0.520	-3.33	195.1	75.7	17.3	6	1
1389*	11	41.9	-00	35	0.512	-3.33	240.6	58.2	16.6	5	0
1390*	11	42.1	13	04	0.516	-3.33	223.5	69.8	16.0	4	0
1391	11	42.4	-11	30	0.508	-3.33	247.9	48.2	18.0	6	2
1392*	11	43.1	00	13	0.512	-3.33	240.5	59.1	16.6	5	0
1393*	11	43.2	47	49	0.530	-3.33	115.7	66.9	17.8	6	0
1394	11	43.3	43	12	0.527	-3.33	123.5	70.6	17.3	6	1
1395*	11	43.5	-07	41	0.510	-3.33	246.2	51.9	17.5	6	0
1396*	11	43.6	55	40	0.535	-3.33	106.6	60.2	17.2	5	0
1397*	11	43.6	34	20	0.523	-3.33	148.5	75.9	17.7	6	0
1398	11	43.6	-06	52	0.510	-3.33	245.7	52.6	17.8	6	1
1399	11	43.7	-02	18	0.511	-3.33	242.7	56.9	16.0	4	2
1400*	11	43.8	55	35	0.535	-3.33	106.3	60.0	17.2	5	0

1401	11	44.3	38	05	0.524	-3.33	135.6	74.2	17.0	5	3
1402*	11	44.8	61	14	0.539	-3.33	102.0	55.2	17.2	5	0
1403	11	44.8	29	12	0.520	-3.33	170.0	77.4	17.6	6	1
1404*	11	44.9	-02	31	0.512	-3.33	243.0	57.2	18.8	5	0
1405	11	45.0	28	06	0.520	-3.33	175.1	77.5	17.6	5	1
1406	11	45.5	68	42	0.548	-3.33	97.6	48.2	17.2	5	1
1407	11	46.1	-00	57	0.512	-3.33	242.7	58.3	17.0	5	1
1408	11	46.3	16	12	0.516	-3.34	219.1	72.7	16.9	5	1
1409	11	46.5	49	53	0.528	-3.34	111.8	65.3	17.2	5	1
1410*	11	46.5	38	32	0.523	-3.34	133.4	74.2	17.6	6	0
1411	11	47.8	00	16	0.512	-3.34	242.8	59.6	17.5	6	1
1412	11	47.9	74	17	0.554	-3.34	94.9	42.9	15.9	4	2
1413	11	47.9	24	11	0.517	-3.34	193.4	77.4	17.1	5	3
1414	11	48.0	17	06	0.516	-3.34	217.0	73.6	17.2	5	1
1415	11	48.2	58	41	0.531	-3.34	103.0	57.7	17.0	5	1
1416	11	48.4	11	35	0.514	-3.34	229.6	69.6	17.6	6	1
1417	11	48.6	35	25	0.520	-3.34	142.6	76.3	17.5	6	1
1418*	11	48.6	-17	51	0.508	-3.34	252.7	42.6	17.4	6	0
1419	11	48.8	00	34	0.512	-3.34	242.7	60.0	17.0	5	1
1420	11	49.1	26	54	0.517	-3.34	181.1	78.3	17.2	5	1
1421	11	49.3	68	47	0.539	-3.34	97.1	48.2	17.2	5	1
1422*	11	49.7	-06	14	0.511	-3.34	247.7	53.8	17.8	6	0
1423	11	49.9	34	28	0.519	-3.34	145.6	77.0	16.5	5	1
1424	11	50.1	05	51	0.513	-3.34	238.4	64.9	18.6	5	1
1425	11	50.7	27	12	0.517	-3.34	179.8	78.7	17.2	5	1
1426	11	50.8	-12	12	0.510	-3.34	251.1	48.2	17.2	5	1
1427	11	50.9	31	31	0.517	-3.34	158.1	78.3	17.0	5	1
1428	11	50.9	10	40	0.514	-3.34	232.3	69.1	17.8	6	1
1429*	11	51.6	36	34	0.518	-3.34	137.1	76.2	17.6	6	0
1430	11	52.0	50	36	0.521	-3.34	109.1	65.3	17.6	6	2
1431	11	51.9	30	59	0.517	-3.34	160.4	78.7	17.2	5	1
1432*	11	52.1	68	55	0.532	-3.34	96.7	48.2	17.7	6	0
1433	11	52.2	26	41	0.516	-3.34	182.7	78.9	17.1	5	1
1434*	11	52.8	-06	23	0.511	-3.34	249.0	53.9	17.2	5	0
1435*	11	52.9	11	30	0.513	-3.34	232.4	70.1	17.0	5	0
1436	11	53.0	57	04	0.523	-3.34	103.1	59.4	15.4	3	1
1437	11	53.0	04	09	0.513	-3.34	241.6	63.7	17.2	5	3
1438	11	53.2	30	30	0.516	-3.34	162.6	79.0	17.5	6	1
1439*	11	53.3	51	16	0.520	-3.34	108.0	64.8	17.2	5	0
1440*	11	53.3	-22	35	0.509	-3.34	255.7	38.3	17.6	6	0

1441	11	53.4	38	23	0.517	-3.34	136.9	76.6	17.2	5	1
1442	11	53.9	16	01	0.514	-3.34	224.0	73.8	17.0	5	1
1443	11	54.0	23	54	0.515	-3.34	197.6	78.6	17.8	6	1
1444	11	54.2	30	50	0.515	-3.34	160.6	79.1	17.6	6	2
1445	11	54.3	00	39	0.512	-3.34	245.2	60.6	17.6	6	2
1446	11	54.4	58	50	0.521	-3.34	101.5	57.9	17.0	5	2
1447	11	54.6	24	38	0.515	-3.34	193.7	79.0	17.4	6	1
1448	11	55.5	-06	02	0.512	-3.34	250.0	54.4	16.6	5	1
1449	11	55.6	29	23	0.515	-3.34	168.1	79.7	17.2	5	1
1450*	11	55.6	-22	31	0.510	-3.34	256.3	38.3	17.6	6	2
1451	11	55.8	-20	43	0.511	-3.34	255.9	40.3	17.3	6	3
1452*	11	56.2	52	33	0.517	-3.34	105.8	63.8	15.7	4	0
1453*	11	56.2	-03	51	0.512	-3.34	249.0	56.5	17.8	6	0
1454	11	56.4	51	50	0.517	-3.34	106.4	64.3	17.2	5	1
1455	11	56.4	28	48	0.514	-3.34	171.3	80.0	17.2	5	2
1456	11	56.4	09	03	0.512	-3.34	242.5	64.9	17.0	5	1
1457*	11	56.7	55	14	0.516	-3.34	105.0	63.2	17.2	5	0
1458*	11	56.7	-04	16	0.512	-3.34	249.5	56.2	17.3	6	0
1459	11	56.8	09	19	0.512	-3.34	244.3	63.3	17.0	5	1
1460	11	57.1	54	06	0.516	-3.34	104.2	62.4	18.0	6	1
1461*	11	57.2	43	20	0.515	-3.34	117.1	72.0	16.4	5	0
1462	11	57.3	15	52	0.513	-3.34	226.8	74.3	17.2	5	1
1463	11	57.3	04	45	0.512	-3.34	243.3	64.7	17.2	5	1
1464	11	57.4	27	32	0.513	-3.34	178.7	80.2	18.0	6	1
1465	11	57.5	32	56	0.514	-3.34	148.8	79.1	17.8	6	1
1466	11	57.5	23	26	0.513	-3.34	200.9	79.1	17.2	5	1
1467*	11	58.1	73	25	0.519	-3.34	94.3	44.0	17.4	6	0
1468	11	58.2	52	14	0.514	-3.34	105.4	64.2	16.0	4	1
1469	11	58.3	-06	19	0.512	-3.34	251.2	54.4	17.2	5	2
1470	11	59.6	72	27	0.513	-3.34	94.3	44.9	17.4	6	2
1471*	12	00.1	53	25	0.512	-3.34	103.8	63.2	17.8	6	0
1472	12	00.3	31	37	0.512	-3.34	154.3	80.2	17.8	6	2
1473	12	00.5	31	25	0.512	-3.34	155.3	80.3	17.8	6	1
1474	12	00.5	15	46	0.512	-3.34	229.8	74.7	16.0	4	1
1475	12	00.7	25	13	0.512	-3.34	193.1	80.3	17.8	6	1
1476	12	00.9	31	47	0.512	-3.34	153.1	80.3	17.6	6	1
1477	12	01.6	64	53	0.509	-3.34	97.0	52.3	18.0	6	1
1478	12	02.1	31	16	0.511	-3.34	155.4	80.7	17.8	6	2
1479*	12	02.6	-16	02	0.513	-3.34	256.6	45.2	17.7	6	0
1480	12	03.4	31	40	0.510	-3.34	152.5	80.8	17.0	5	2

1481	12 03.5	18 41	0.511	-3.34	229.4	75.8	17.0	5	1
1482*	12 03.5	-04 47	0.512	-3.34	252.7	56.2	17.2	5	0
1483*	12 03.6	36 08	0.510	-3.34	131.7	78.4	17.0	6	0
1484	12 04.0	72 54	0.499	-3.34	93.9	44.6	17.4	6	1
1485*	12 04.0	-03 05	0.512	-3.34	252.1	57.9	17.6	6	0
1486*	12 04.5	31 23	0.509	-3.34	153.6	81.1	17.2	5	0
1487	12 04.5	30 48	0.509	-3.34	157.2	81.3	17.8	6	2
1488	12 05.0	-11 01	0.513	-3.34	235.8	50.2	17.8	6	2
1489	12 05.2	28 18	0.509	-3.34	174.0	81.9	17.8	6	2
1490	12 05.2	19 26	0.510	-3.34	222.9	78.2	17.5	6	1
1491*	12 05.5	08 42	0.511	-3.34	244.1	69.1	17.2	5	0
1492	12 05.7	34 59	0.508	-3.34	134.5	79.4	17.2	5	1
1493	12 05.8	06 51	0.511	-3.34	246.1	67.4	17.2	5	1
1494	12 05.9	24 45	0.509	-3.34	198.4	81.4	17.6	6	1
1495	12 06.1	30 03	0.509	-3.34	161.5	81.9	17.0	5	2
1496	12 06.2	60 05	0.502	-3.34	98.2	57.1	16.0	4	1
1497	12 06.3	27 28	0.509	-3.34	180.0	82.2	17.8	6	2
1498	12 06.9	32 28	0.508	-3.34	145.9	81.1	17.6	6	1
1499	12 06.9	15 34	0.510	-3.34	234.6	73.4	16.6	5	1
1500*	12 07.0	75 12	0.486	-3.34	93.0	42.3	15.6	3	0
1501	12 07.0	64 02	0.498	-3.34	96.4	53.3	17.2	5	1
1502	12 07.7	-07 26	0.513	-3.34	255.6	53.9	17.2	5	1
1503*	12 07.9	20 15	0.509	-3.34	222.8	79.2	17.2	5	0
1504	12 08.0	28 20	0.508	-3.34	175.6	82.5	17.6	6	2
1505	12 08.3	19 30	0.509	-3.34	225.3	78.7	17.5	6	1
1506	12 08.5	32 35	0.507	-3.34	144.1	81.3	18.0	6	1
1507*	12 08.7	60 47	0.497	-3.34	97.8	56.5	15.8	4	0
1508	12 08.8	18 18	0.509	-3.34	229.5	77.9	17.2	5	1
1509*	12 09.0	36 26	0.506	-3.34	126.5	78.9	17.0	5	0
1510	12 09.2	28 00	0.507	-3.34	176.1	82.8	18.0	6	2
1511*	12 09.3	-18 27	0.515	-3.34	259.4	43.1	17.4	6	0
1512	12 09.6	46 02	0.502	-3.34	107.1	70.6	17.8	6	1
1513*	12 10.2	73 38	0.478	-3.34	93.1	43.9	17.1	5	0
1514	12 10.6	21 28	0.508	-3.34	219.9	80.5	17.6	6	3
1515	12 11.4	28 47	0.506	-3.34	169.9	83.2	17.6	6	2
1516	12 11.5	06 03	0.511	-3.34	250.3	67.1	16.6	5	1
1517*	12 11.7	-04 13	0.513	-3.34	256.0	57.2	16.6	5	0
1518*	12 12.0	64 19	0.488	-3.34	95.4	53.1	17.0	5	0
1519	12 12.0	27 44	0.506	-3.34	178.4	83.4	17.5	6	1
1520*	12 12.1	-12 28	0.515	-3.34	258.9	49.1	16.6	5	0

1921	12	12.1	-12	54	0.515	-3.34	259.5	48.7	16.8	5 1
1922	12	12.7	50	05	0.497	-3.34	102.0	67.1	17.9	6 1
1923*	12	13.9	06	57	0.511	-3.33	251.1	68.2	17.2	5 0
1924	12	14.4	08	39	0.510	-3.33	260.0	69.6	17.2	5 2
1925	12	14.6	-00	21	0.512	-3.33	256.8	61.2	18.0	6 3
1926	12	14.6	14	33	0.508	-3.33	245.2	75.4	16.6	5 1
1927*	12	15.5	19	02	0.508	-3.33	244.0	74.1	17.2	5 0
1928	12	15.9	59	43	0.480	-3.33	96.1	57.7	17.8	6 1
1929*	12	16.4	62	02	0.482	-3.33	95.3	35.5	18.0	6 0
1930	12	16.4	02	54	0.511	-3.33	255.2	64.6	17.8	6 3
1931	12	17.1	58	31	0.489	-3.33	96.3	58.9	17.8	6 1
1932	12	17.1	21	36	0.506	-3.33	226.3	81.7	17.3	6 1
1933	12	17.1	01	43	0.512	-3.33	254.2	63.3	18.0	6 2
1934*	12	17.2	62	19	0.480	-3.33	95.0	58.2	17.0	5 0
1935	12	17.9	-14	52	0.517	-3.33	261.5	47.0	16.6	5 1
1936	12	18.8	77	56	0.427	-3.33	91.6	39.7	16.9	5 1
1937*	12	19.0	-25	02	0.521	-3.33	265.5	36.9	17.6	6 1
1938	12	19.3	57	42	0.482	-3.33	96.0	59.8	18.0	6 1
1939	12	19.5	63	22	0.474	-3.33	94.3	54.2	17.2	5 2
1940	12	19.8	05	02	0.510	-3.33	256.0	66.7	17.6	6 2
1941	12	20.1	09	39	0.509	-3.33	253.3	71.7	16.8	4 1
1942	12	20.6	50	15	0.488	-3.33	98.8	67.1	17.2	5 1
1943*	12	20.6	31	11	0.500	-3.33	142.1	84.2	17.2	5 0
1944	12	21.0	64	14	0.470	-3.33	93.8	59.4	17.2	5 1
1945	12	21.2	66	13	0.469	-3.33	94.7	65.1	17.8	6 1
1946	12	21.3	65	25	0.467	-3.33	93.5	52.7	18.0	6 2
1947	12	21.5	27	34	0.501	-3.33	181.1	85.4	17.2	5 1
1948	12	21.7	20	14	0.504	-3.33	237.6	81.2	17.5	4 3
1949*	12	21.8	29	45	0.500	-3.33	154.5	85.2	17.3	6 0
1950	12	22.3	48	31	0.488	-3.33	99.0	65.5	17.8	6 5
1951	12	22.5	37	28	0.495	-3.33	111.4	79.5	17.2	5 1
1952	12	22.5	12	33	0.507	-3.33	252.8	74.1	16.6	5 1
1953	12	23.5	11	23	0.507	-3.32	254.4	73.1	17.8	6 2
1954	12	23.7	16	44	0.505	-3.32	248.2	78.2	17.6	4 1
1955	12	24.5	-17	36	0.517	-3.32	263.5	49.4	17.2	5 1
1956*	12	25.7	-21	13	0.522	-3.32	265.0	40.9	17.6	6 0
1957	12	26.0	63	39	0.461	-3.32	93.0	54.0	18.0	6 2
1958*	12	26.5	-12	47	0.518	-3.32	264.3	49.3	17.2	5 0
1959	12	26.7	67	55	0.448	-3.32	92.2	49.8	17.2	5 1
1960*	12	26.8	15	59	0.505	-3.32	252.8	77.7	18.1	7 2

1561*	12	26.9	70 10	0.440	-3.32	91.9	47.5	17.4	6	0
1562	12	27.2	41 59	0.488	-3.32	100.9	75.5	17.5	6	1
1563	12	27.3	54 52	0.474	-3.32	94.6	62.8	17.6	6	1
1564*	12	27.5	02 39	0.511	-3.32	261.6	64.7	16.6	5	0
1565	12	28.2	42 10	0.487	-3.32	100.0	75.3	17.6	6	2
1566	12	28.5	65 11	0.452	-3.32	92.3	52.5	16.9	6	2
1567*	12	28.9	27 33	0.497	-3.31	183.3	87.1	17.2	5	0
1568	12	29.0	54 13	0.473	-3.31	94.2	63.4	17.8	6	1
1569*	12	29.0	17 24	0.503	-3.31	253.4	79.2	17.2	5	0
1570	12	29.1	20 37	0.501	-3.31	247.2	82.3	17.8	6	1
1571	12	29.2	84 09	0.236	-3.31	90.4	33.6	17.6	6	3
1572	12	29.2	-13 54	0.519	-3.31	265.4	48.2	17.3	6	1
1573*	12	29.3	-14 09	0.519	-3.31	265.4	45.0	17.3	6	0
1574*	12	29.4	-09 55	0.517	-3.31	265.8	52.2	16.8	5	0
1575*	12	30.1	27 37	0.497	-3.31	182.3	87.4	17.8	6	0
1576	12	30.3	64 00	0.452	-3.31	92.1	53.7	18.0	6	3
1577	12	30.4	00 31	0.512	-3.31	263.8	62.6	17.8	6	1
1578*	12	31.1	43 52	0.485	-3.31	96.9	73.7	17.1	5	0
1579*	12	31.3	66 39	0.441	-3.31	91.6	51.1	17.6	6	0
1580	12	32.0	78 44	0.387	-3.31	90.6	39.0	17.5	6	2
1581	12	32.4	03 33	0.510	-3.31	264.3	65.7	17.2	5	1
1582	12	32.7	52 54	0.470	-3.31	93.2	64.8	17.8	6	2
1583	12	32.9	-15 10	0.521	-3.31	266.8	47.0	17.8	6	1
1584	12	33.2	-17 47	0.522	-3.31	267.1	44.4	16.9	5	1
1585*	12	33.7	-15 42	0.521	-3.31	267.2	46.5	16.9	5	0
1586*	12	33.8	10 45	0.506	-3.30	263.3	72.9	18.0	6	0
1587*	12	34.0	28 21	0.494	-3.30	160.3	88.2	17.6	6	0
1588*	12	34.1	-04 00	0.514	-3.30	266.3	58.2	17.2	5	0
1589*	12	34.4	19 24	0.500	-3.30	258.1	81.5	16.6	5	0
1590	12	34.5	73 57	0.396	-3.30	90.7	43.8	16.8	5	1
1591	12	34.8	50 43	0.471	-3.30	92.9	67.0	17.6	6	2
1592*	12	34.9	30 36	0.492	-3.30	117.3	86.5	18.0	6	0
1593*	12	35.0	34 07	0.489	-3.30	102.5	83.5	17.2	5	0
1594	12	35.0	28 18	0.494	-3.30	159.0	88.4	17.8	6	1
1595	12	35.0	-15 38	0.521	-3.30	267.4	46.5	17.7	6	1
1596*	12	35.2	20 33	0.499	-3.30	257.9	87.6	17.8	6	0
1597	12	35.3	73 02	0.400	-3.30	90.7	44.7	17.5	6	1
1598*	12	35.3	29 55	0.492	-3.30	123.1	87.4	18.0	6	0
1599*	12	35.4	03 37	0.510	-3.30	265.1	65.9	17.2	5	0
1600*	12	35.4	-16 29	0.522	-3.30	267.8	45.7	17.7	6	0

1601	12 36.2	09 47	0.506	-3.30	268.3	72.0	17.2	5	1
1602	12 36.3	28 06	0.493	-3.30	163.7	88.7	17.8	6	1
1603	12 36.3	-14 46	0.521	-3.30	268.0	47.8	17.2	5	1
1604*	12 36.3	-22 19	0.527	-3.30	268.3	39.9	17.6	6	1
1605	12 36.4	-20 08	0.525	-3.30	268.3	42.1	17.0	5	1
1606	12 37.1	-11 12	0.519	-3.30	268.2	51.0	17.0	5	1
1607	12 37.7	76 37	0.395	-3.30	90.3	40.8	16.7	5	2
1608*	12 38.6	34 12	0.487	-3.29	95.9	83.5	17.2	5	0
1609	12 39.5	27 14	0.492	-3.29	222.9	89.2	16.8	5	1
1610	12 40.1	30 30	0.489	-3.29	96.8	86.9	17.2	5	1
1611	12 40.1	19 43	0.488	-3.29	267.1	82.0	17.9	6	1
1612*	12 40.1	-00 54	0.513	-3.29	269.1	61.3	17.6	6	0
1613	12 40.4	36 22	0.483	-3.29	91.9	81.4	17.6	6	1
1614	12 40.5	70 29	0.402	-3.29	90.2	47.0	17.5	6	1
1615	12 41.0	49 41	0.466	-3.29	90.4	68.1	18.0	6	1
1616*	12 41.1	55 51	0.453	-3.29	90.2	61.9	16.0	4	0
1617	12 41.2	60 00	0.443	-3.29	90.1	57.7	17.6	6	3
1618	12 41.7	11 40	0.504	-3.29	269.9	73.9	17.5	6	1
1619	12 42.2	39 19	0.489	-3.28	87.1	88.4	17.8	6	1
1620*	12 42.3	-00 48	0.513	-3.28	270.3	61.4	17.2	5	0
1621	12 42.5	63 29	0.430	-3.28	89.9	54.3	18.5	5	1
1622	12 42.9	50 38	0.461	-3.28	89.6	67.1	18.0	6	2
1623	12 43.0	48 32	0.465	-3.28	89.4	69.2	17.5	6	1
1624	12 43.0	09 27	0.505	-3.28	271.0	71.7	17.8	6	1
1625*	12 43.3	-20 00	0.527	-3.28	270.5	42.2	17.0	4	0
1626*	12 43.5	32 08	0.486	-3.28	85.3	85.6	17.8	6	0
1627*	12 43.8	14 08	0.501	-3.28	272.1	76.4	18.0	6	0
1628	12 44.0	29 25	0.486	-3.28	74.1	88.3	17.4	6	1
1629	12 44.2	04 44	0.508	-3.28	271.8	67.0	17.9	6	1
1630	12 44.6	05 22	0.508	-3.28	271.7	67.6	16.7	5	1
1631*	12 45.2	-16 39	0.523	-3.28	271.2	47.8	15.4	3	0
1632	12 46.0	29 37	0.487	-3.27	63.9	87.9	17.2	5	2
1633*	12 46.2	-25 26	0.533	-3.27	271.2	38.4	17.6	6	1
1634	12 46.3	-05 54	0.517	-3.27	272.1	56.3	17.6	6	1
1635	12 46.8	-06 09	0.519	-3.27	272.1	54.1	17.2	5	1
1636	12 47.4	63 37	0.420	-3.27	88.9	54.1	17.8	5	2
1637	12 47.4	51 37	0.454	-3.27	87.9	66.1	17.0	5	1
1638*	12 47.5	19 47	0.496	-3.27	279.6	81.9	16.0	4	0
1639*	12 47.7	10 57	0.503	-3.27	275.0	73.1	17.5	6	0
1640	12 48.4	63 21	0.419	-3.27	88.7	54.4	17.8	6	1

1641	12 48.8	29 14	0.486	-3.27	44.5	87.9	17.6	6	1
1642	12 48.9	07 11	0.506	-3.27	275.0	69.4	17.3	6	1
1643	12 49.2	44 52	0.465	-3.26	85.6	72.6	17.7	6	1
1644	12 49.4	-16 33	0.526	-3.25	272.7	45.6	15.7	4	1
1645	12 49.7	-14 06	0.524	-3.26	272.9	48.1	17.8	6	1
1646*	12 49.8	62 57	0.415	-3.26	88.4	54.8	16.9	5	0
1647	12 50.3	20 53	0.494	-3.26	286.2	82.9	17.0	6	1
1648*	12 51.2	-25 51	0.536	-3.26	272.6	35.4	16.9	5	1
1649*	12 51.2	10 33	0.503	-3.26	277.5	72.7	17.2	5	0
1650	12 51.3	-00 59	0.513	-3.26	276.9	61.2	17.0	5	2
1651	12 51.9	-05 25	0.515	-3.26	274.9	58.7	16.0	6	1
1652	12 52.1	-12 43	0.523	-3.26	273.5	49.5	17.4	6	1
1653	12 52.3	12 08	0.501	-3.25	279.5	74.2	17.7	6	1
1654*	12 52.4	30 48	0.482	-3.25	53.5	80.2	16.9	5	0
1655	12 52.5	66 10	0.395	-3.25	88.3	52.5	18.0	6	3
1656	12 52.6	28 46	0.484	-3.25	23.4	87.4	13.5	1	2
1657	12 52.8	20 23	0.493	-3.25	285.4	82.6	17.5	6	1
1658	12 53.7	-02 40	0.515	-3.25	275.9	59.5	17.2	5	1
1659*	12 54.2	04 28	0.508	-3.25	277.8	66.3	17.5	6	0
1660	12 54.6	51 07	0.447	-3.25	86.9	66.5	17.8	6	1
1661	12 54.8	29 52	0.482	-3.25	37.5	88.5	17.6	6	2
1662	12 55.2	05 06	0.504	-3.24	280.3	71.1	17.2	5	1
1663	12 55.3	-01 45	0.514	-3.24	276.8	60.3	17.0	5	1
1664*	12 55.9	-23 27	0.535	-3.24	274.2	38.7	17.3	6	2
1665	12 56.2	27 28	0.484	-3.24	353.5	88.8	17.7	6	3
1666	12 56.4	52 41	0.441	-3.24	84.8	64.9	16.8	5	1
1667	12 56.4	32 56	0.477	-3.24	57.9	84.2	17.6	6	2
1668	12 56.7	20 03	0.492	-3.24	294.6	81.6	16.8	5	1
1669*	12 57.1	19 52	0.492	-3.24	294.7	81.4	17.0	6	0
1670	12 57.2	21 07	0.491	-3.24	298.0	82.5	17.6	6	1
1671	12 57.7	-21 53	0.534	-3.24	274.8	40.2	17.4	5	1
1672	12 57.9	34 21	0.474	-3.24	65.4	82.6	17.2	5	1
1673*	12 58.1	52 18	0.440	-3.23	84.0	65.3	16.9	5	0
1674	12 58.2	58 17	0.372	-3.23	87.7	59.4	17.2	5	3
1675	12 58.4	35 20	0.472	-3.23	66.1	81.6	17.2	5	1
1676*	12 58.5	48 34	0.448	-3.23	82.0	68.9	17.5	6	0
1677	12 59.0	31 41	0.477	-3.23	47.6	84.6	17.7	6	2
1678	12 59.2	63 02	0.400	-3.23	86.6	54.6	17.4	6	1
1679	12 59.7	32 35	0.475	-3.23	52.4	83.8	17.5	6	2
1680*	13 00.0	40 35	0.463	-3.23	74.9	76.6	17.0	5	0

1681	13	00.3	72	39	0.327	-3.23	88.1	45.0	17.1	5	1
1682	13	00.3	47	20	0.449	-3.23	80.8	70.1	17.5	6	1
1683	13	01.5	72	39	0.323	-3.22	87.9	45.0	17.1	5	1
1684	13	01.9	11	12	0.500	-3.22	288.9	72.8	17.2	5	1
1685*	13	02.1	35	32	0.470	-3.22	62.3	81.1	17.2	5	0
1686	13	03.7	22	39	0.487	-3.21	315.4	82.9	18.0	6	1
1687*	13	03.9	39	11	0.409	-3.21	84.6	58.3	17.5	6	0
1688*	13	04.0	-03	55	0.516	-3.21	280.5	57.9	17.6	6	0
1689	13	04.1	-00	34	0.513	-3.21	281.5	61.1	17.6	6	4
1690	13	04.2	20	10	0.490	-3.21	303.2	80.9	17.2	5	1
1691	13	04.7	38	59	0.460	-3.21	70.3	76.9	19.4	3	1
1692*	13	04.8	-00	10	0.512	-3.21	282.1	61.5	17.2	5	0
1693*	13	04.9	49	16	0.440	-3.21	79.9	68.0	17.2	5	0
1694	13	04.9	34	47	0.469	-3.21	56.4	81.4	17.2	5	1
1695	13	06.2	62	27	0.390	-3.20	85.1	55.1	17.8	6	1
1696*	13	06.3	50	20	0.435	-3.20	80.0	66.7	17.7	6	0
1697	13	06.5	47	02	0.444	-3.20	77.6	70.1	17.5	6	2
1698	13	06.6	-06	15	0.519	-3.20	280.9	55.5	17.6	6	1
1699	13	07.1	-21	17	0.537	-3.20	277.8	40.6	17.4	6	1
1700	13	07.8	29	30	0.475	-3.20	18.6	84.0	17.2	5	1
1701*	13	07.9	61	47	0.391	-3.20	84.5	59.7	17.0	5	0
1702	13	08.1	45	54	0.445	-3.19	75.8	71.1	17.0	6	1
1703	13	08.9	52	36	0.426	-3.19	80.4	64.8	18.0	6	2
1704	13	09.1	65	22	0.368	-3.19	85.4	52.1	17.8	6	3
1705	13	09.3	73	39	0.285	-3.19	87.3	44.0	17.7	6	1
1706	13	09.8	42	10	0.452	-3.19	70.3	74.5	17.2	5	2
1707	13	09.9	59	00	0.401	-3.19	83.1	58.4	17.6	6	1
1708	13	10.5	47	16	0.439	-3.18	75.9	69.7	17.8	6	1
1709*	13	10.9	-20	42	0.538	-3.18	279.0	41.0	16.4	4	0
1710*	13	11.4	44	25	0.445	-3.18	72.4	72.3	17.2	5	0
1711*	13	11.5	11	49	0.498	-3.18	295.0	72.6	17.2	5	0
1712	13	11.7	35	03	0.464	-3.18	50.7	80.7	18.0	6	1
1713	13	13.3	58	31	0.396	-3.17	82.2	58.0	17.2	5	1
1714	13	13.9	34	14	0.464	-3.17	45.3	80.6	18.0	6	1
1715	13	14.2	38	30	0.456	-3.17	59.9	77.3	17.0	5	1
1716	13	14.2	34	49	0.469	-3.17	47.0	80.2	17.8	6	1
1717	13	14.4	42	12	0.448	-3.17	67.9	74.1	17.2	5	1
1718	13	14.6	67	37	0.339	-3.17	86.2	49.8	17.9	6	2
1719*	13	14.7	37	09	0.458	-3.17	55.7	78.3	18.0	6	0
1720*	13	14.7	03	51	0.507	-3.17	289.6	64.8	17.6	6	0

1721*	13	15.2	20	09	0.486	-3.16	316.9	79.2	17.8	6	0
1722	13	15.3	70	22	0.305	-3.16	66.0	46.6	17.7	6	2
1723*	13	15.5	37	58	0.456	-3.16	59.5	77.6	17.0	3	0
1724	13	15.6	23	46	0.480	-3.16	334.3	81.4	17.5	6	1
1725	13	16.1	-16	03	0.533	-3.16	281.8	45.4	17.7	6	1
1726	13	16.2	17	51	0.489	-3.16	310.4	77.3	17.2	5	1
1727*	13	16.3	-22	38	0.542	-3.16	280.3	39.3	17.4	6	0
1728*	13	16.3	12	02	0.496	-3.16	298.0	72.3	17.6	6	0
1729	13	16.5	-32	37	0.515	-3.16	286.8	58.9	17.2	5	1
1730	13	16.6	22	13	0.482	-3.16	326.8	80.6	17.6	6	1
1731	13	17.1	58	56	0.390	-3.15	81.4	58.2	17.2	5	2
1732	13	17.2	-19	29	0.538	-3.15	281.3	42.0	17.5	4	1
1733	13	17.7	02	57	0.508	-3.15	290.6	63.8	18.0	4	2
1734*	13	18.1	55	58	0.402	-3.15	79.5	61.0	17.3	6	0
1735	13	18.9	13	09	0.494	-3.15	302.5	73.0	17.8	6	1
1736*	13	18.9	-26	22	0.549	-3.15	280.2	35.2	14.8	2	0
1737	13	19.3	20	19	0.421	-3.14	75.8	66.3	17.3	6	1
1738	13	19.5	56	22	0.389	-3.14	80.5	58.7	16.6	5	2
1739	13	19.5	30	12	0.468	-3.14	18.8	81.4	17.6	6	1
1740	13	19.7	42	25	0.443	-3.14	64.8	73.4	17.6	6	1
1741	13	20.1	72	14	0.274	-3.14	85.9	48.2	17.1	5	1
1742*	13	20.1	14	30	0.493	-3.14	305.5	73.9	17.8	6	0
1743	13	20.3	04	22	0.506	-3.14	293.1	64.9	17.8	6	1
1744	13	20.4	60	04	0.379	-3.14	81.2	57.0	17.2	5	1
1745*	13	21.0	54	35	0.404	-3.13	77.8	62.2	18.4	7	2
1746*	13	21.2	38	13	0.455	-3.13	47.9	78.1	17.2	5	0
1747	13	21.3	53	25	0.408	-3.13	74.8	63.4	18.0	6	1
1748	13	22.6	19	10	0.485	-3.13	319.8	77.9	17.4	6	1
1749	13	23.0	30	23	0.469	-3.12	33.6	78.3	16.0	5	1
1750*	13	23.4	-31	06	0.514	-3.12	290.8	59.5	15.9	4	0
1751*	13	23.8	-05	00	0.519	-3.12	288.8	58.7	17.6	6	0
1752*	13	24.2	32	31	0.461	-3.12	30.1	79.7	17.2	5	0
1753	13	24.5	05	36	0.504	-3.12	296.4	65.7	17.3	6	1
1754	13	24.6	-10	55	0.527	-3.12	286.6	50.0	17.0	3	1
1755	13	24.7	16	43	0.488	-3.12	314.2	75.2	17.5	6	1
1756*	13	25.4	62	56	0.353	-3.11	81.6	54.1	17.6	6	0
1757*	13	25.6	-22	32	0.546	-3.11	283.0	38.6	17.0	5	1
1758	13	26.6	51	16	0.410	-3.11	73.3	65.0	18.0	6	3
1759	13	27.0	21	00	0.480	-3.10	329.2	77.7	17.6	6	3
1760	13	27.1	20	58	0.480	-3.10	329.1	77.7	17.2	5	3

1761	13	27.3	58	24	0.378	-3.10	78.6	58.9	17.9	6	2
1762	13	28.7	29	51	0.475	-3.09	342.4	78.8	17.6	6	1
1763	13	29.0	41	43	0.427	-3.09	38.3	73.0	17.7	6	3
1764*	13	29.3	60	40	0.361	-3.09	79.0	56.1	17.2	5	0
1765	13	29.7	31	11	0.495	-3.09	306.5	70.0	17.8	6	2
1766	13	30.5	35	13	0.456	-3.08	30.5	70.2	17.5	6	1
1767	13	30.0	59	54	0.363	-3.08	78.8	56.7	15.7	4	1
1768*	13	30.9	-13	13	0.532	-3.08	287.9	47.3	17.2	5	0
1769	13	32.5	28	31	0.465	-3.07	6.9	78.6	17.2	5	1
1770	13	33.8	42	02	0.432	-3.07	56.8	73.2	17.6	6	1
1771*	13	34.1	-25	33	0.555	-3.06	286.9	35.2	16.8	5	1
1772	13	34.4	-10	22	0.528	-3.06	290.9	49.8	17.0	5	1
1773	13	34.2	02	59	0.507	-3.06	299.4	62.2	15.6	3	1
1774	13	34.9	40	43	0.435	-3.06	53.4	73.0	17.6	6	2
1775	13	35.2	27	06	0.466	-3.05	360.8	78.1	15.7	4	2
1776*	13	35.8	58	46	0.363	-3.05	76.9	57.6	17.2	5	0
1777	13	36.0	72	21	0.227	-3.05	64.3	44.8	17.6	6	1
1778*	13	36.5	-10	25	0.329	-3.05	291.0	49.6	16.6	5	0
1779*	13	37.3	48	21	0.409	-3.04	66.2	68.8	17.6	6	0
1780	13	37.3	01	37	0.506	-3.04	301.2	62.9	16.6	5	1
1781*	13	37.9	30	35	0.437	-3.04	16.4	77.4	13.4	3	0
1782	13	37.9	14	26	0.488	-3.04	317.2	71.4	17.5	6	1
1783*	13	38.0	56	20	0.374	-3.04	74.5	59.7	18.3	4	0
1784	13	38.3	04	29	0.502	-3.04	304.8	64.9	17.3	6	1
1785	13	38.4	38	53	0.437	-3.04	47.0	75.8	17.2	5	2
1786	13	39.3	45	43	0.416	-3.03	61.4	68.7	17.6	6	1
1787	13	39.3	37	32	0.440	-3.03	42.6	74.4	17.8	6	1
1788	13	39.7	54	30	0.380	-3.03	72.4	61.2	17.7	6	1
1789*	13	39.9	40	23	0.422	-3.03	56.3	72.6	17.8	6	0
1790	13	40.3	54	48	0.378	-3.02	72.4	60.9	17.7	5	1
1791*	13	40.8	-24	44	0.556	-3.02	286.5	35.6	17.0	5	1
1792	13	41.4	31	34	0.453	-3.02	20.0	76.5	17.8	6	1
1793	13	41.8	33	01	0.450	-3.02	23.8	76.0	16.4	4	1
1794*	13	42.1	-25	37	0.558	-3.01	286.5	34.7	17.0	3	1
1795	13	42.3	27	19	0.482	-3.01	2.7	76.6	16.0	4	2
1796	13	42.5	-11	12	0.531	-3.01	292.7	48.4	17.2	5	1
1797	13	42.8	25	44	0.466	-3.01	355.1	76.2	17.0	5	1
1798*	13	42.9	58	19	0.355	-3.01	75.0	57.6	17.8	6	0
1799	13	43.0	36	10	0.441	-2.01	36.8	74.6	17.2	5	1
1800*	13	43.0	28	48	0.459	-3.01	8.1	76.5	15.4	3	0

1801	13 43.3	08 03	0.502	-3.01	306.8	63.8	17.8	6	1
1802*	13 43.3	-26 00	0.559	-3.01	286.8	34.3	17.0	5	1
1803	13 43.4	71 36	0.221	-3.01	83.1	45.4	17.5	6	1
1804	13 43.6	49 50	0.396	-3.01	66.3	64.9	17.6	6	1
1805	13 44.0	50 06	0.395	-3.00	74.6	57.8	17.8	6	1
1806	13 44.0	22 02	0.473	-3.00	341.3	74.8	18.0	6	1
1807	13 44.7	-09 02	0.528	-3.00	294.7	50.2	18.0	6	1
1808*	13 45.0	10 08	0.494	-3.00	313.2	67.9	17.2	5	0
1809	13 46.0	03 53	0.502	-2.99	307.8	62.3	15.8	4	1
1810	13 46.3	36 59	0.437	-2.99	35.3	73.6	17.2	5	1
1811	13 46.7	71 45	0.209	-2.99	82.9	45.1	17.5	6	1
1812*	13 46.8	38 26	0.433	-2.98	42.4	72.7	17.0	5	0
1813*	13 47.1	36 15	0.439	-2.98	35.7	73.8	16.0	4	0
1814	13 47.1	15 55	0.484	-2.98	324.7	70.6	17.2	5	1
1815	13 47.1	04 49	0.504	-2.98	307.0	62.2	17.8	6	1
1816*	13 47.6	-25 39	0.560	-2.98	288.0	34.3	17.6	6	1
1817	13 47.7	29 18	0.455	-2.98	10.8	75.5	17.2	5	1
1818*	13 47.7	27 37	0.459	-2.98	3.3	75.4	17.2	5	0
1819	13 48.3	25 05	0.465	-2.97	353.7	74.8	17.2	5	1
1820	13 49.1	11 30	0.491	-2.97	317.5	67.4	17.6	6	1
1821	13 49.5	31 32	0.449	-2.97	18.5	74.8	17.5	6	1
1822*	13 50.4	-24 41	0.560	-2.96	289.1	35.0	17.6	6	2
1823	13 50.9	45 38	0.406	-2.96	57.2	67.5	17.3	6	1
1824	13 51.1	27 33	0.458	-2.96	3.3	74.7	17.2	5	1
1825*	13 51.2	21 27	0.472	-2.96	341.7	73.0	15.7	4	0
1826	13 51.3	31 18	0.449	-2.95	17.4	74.5	17.5	6	2
1827	13 51.4	22 25	0.469	-2.95	345.2	73.4	16.6	5	1
1828	13 51.9	19 06	0.476	-2.95	335.9	71.9	16.8	5	1
1829	13 52.0	39 00	0.427	-2.95	42.1	71.6	17.8	6	1
1830	13 52.1	48 07	0.395	-2.95	60.9	65.5	17.5	6	1
1831	13 52.5	28 42	0.455	-2.95	7.7	74.6	15.4	3	1
1832	13 52.7	30 15	0.451	-2.95	13.4	74.3	17.2	5	1
1833	13 52.8	05 20	0.502	-2.94	310.2	61.9	17.8	5	1
1834	13 53.2	50 15	0.385	-2.94	63.7	63.7	17.2	5	1
1835*	13 53.7	03 34	0.505	-2.94	308.5	60.4	17.6	6	0
1836*	13 53.9	-10 55	0.535	-2.94	296.8	47.6	15.7	4	0
1837	13 54.0	-10 28	0.532	-2.94	297.1	48.0	15.7	4	1
1838	13 54.2	41 45	0.417	-2.93	48.2	69.7	18.0	6	3
1839	13 55.0	-04 09	0.520	-2.93	301.8	53.9	17.4	6	1
1840*	13 55.1	31 17	0.447	-2.93	16.9	73.7	17.2	5	0

1841	13	55.2	24	01	0.464	-2.93	351.4	73.1	17.3	6	1
1842	13	55.3	18	30	0.476	-2.93	335.2	70.8	17.2	5	1
1843*	13	55.4	14	19	0.485	-2.93	325.6	68.3	17.3	6	0
1844*	13	55.5	11	13	0.491	-2.93	319.9	66.1	17.2	5	0
1845*	13	55.6	-08	25	0.528	-2.92	298.9	49.7	17.2	5	0
1846*	13	55.6	-24	41	0.562	-2.92	290.5	34.6	17.6	6	2
1847	13	56.0	23	26	0.465	-2.92	349.7	73.7	17.6	6	1
1848	13	56.4	74	30	0.112	-2.92	83.9	42.0	17.7	6	1
1849*	13	56.6	16	08	0.481	-2.92	330.0	69.2	16.6	5	0
1850	13	56.6	09	50	0.493	-2.92	318.1	64.9	17.5	6	1
1851	13	57.0	72	50	0.160	-2.92	82.6	43.6	17.2	5	1
1852	13	57.0	18	20	0.480	-2.92	330.9	69.3	16.6	5	1
1853*	13	57.6	-19	05	0.550	-2.91	293.3	39.7	17.3	6	1
1854	13	57.9	31	47	0.444	-2.91	18.4	73.0	17.5	6	1
1855	13	59.4	47	47	0.390	-2.90	58.2	64.9	17.6	6	1
1856	13	59.4	25	49	0.459	-2.90	358.1	72.6	17.2	5	1
1857*	14	00.2	-24	05	0.562	-2.89	291.9	34.8	17.6	6	1
1858*	14	00.4	-03	38	0.519	-2.89	304.2	53.3	17.6	6	0
1859*	14	00.6	60	48	0.312	-2.89	73.6	54.4	17.8	6	0
1860	14	00.6	14	40	0.483	-2.89	328.5	67.5	17.2	5	1
1861	14	00.9	29	31	0.451	-2.89	7.2	72.6	17.2	5	1
1862	14	00.9	07	15	0.498	-2.89	316.1	62.2	17.2	5	1
1863	14	01.0	27	58	0.453	-2.89	5.4	72.5	17.2	5	2
1864	14	01.0	06	09	0.500	-2.89	314.7	61.4	17.0	5	1
1865*	14	01.7	59	22	0.322	-2.88	72.2	55.6	17.8	6	0
1866	14	02.6	07	25	0.497	-2.87	317.0	62.1	17.2	5	1
1867	14	02.7	31	51	0.441	-2.87	18.1	72.0	17.5	6	1
1868	14	02.8	28	19	0.451	-2.87	6.6	72.1	17.5	6	1
1869*	14	02.9	30	09	0.446	-2.87	12.6	72.1	17.2	5	0
1870*	14	03.6	07	21	0.497	-2.87	317.3	61.9	17.2	5	0
1871*	14	04.6	-12	50	0.538	-2.86	299.0	44.7	17.1	5	0
1872*	14	04.9	62	39	0.289	-2.86	74.5	52.5	17.2	5	0
1873*	14	05.2	28	50	0.448	-2.85	8.3	71.6	16.3	4	0
1874	14	05.3	30	26	0.444	-2.85	13.4	71.5	17.4	6	1
1875	14	05.5	14	43	0.482	-2.85	330.5	66.6	17.6	6	1
1876	14	05.7	-13	24	0.540	-2.85	299.0	44.1	17.1	5	1
1877	14	06.0	60	28	0.307	-2.85	72.3	54.3	17.8	6	1
1878	14	06.4	29	54	0.445	-2.85	11.7	71.4	17.5	6	1
1879	14	06.5	64	17	0.270	-2.85	75.6	51.0	17.8	6	1
1880	14	06.5	23	05	0.462	-2.85	351.0	70.3	17.2	5	1

1881	14 07.0	07 32	0.497	-2.84	318.9	61.8	17.0	5	1
1882	14 07.2	00 20	0.511	-2.84	310.4	55.8	17.2	5	3
1883*	14 07.5	-22 35	0.561	-2.84	294.5	35.6	17.1	5	0
1884*	14 07.6	62 04	0.390	-2.84	73.5	52.9	17.8	6	0
1885	14 08.0	44 21	0.397	-2.83	49.8	66.1	17.0	5	1
1886	14 08.2	27 49	0.450	-2.83	5.2	70.9	17.2	5	1
1887*	14 09.6	18 16	0.473	-2.82	339.5	67.7	17.2	5	0
1888*	14 10.1	14 33	0.481	-2.82	331.8	65.6	17.5	6	0
1889	14 10.3	31 24	0.439	-2.82	16.1	70.4	17.3	6	2
1890*	14 10.4	03 52	0.494	-2.81	322.1	61.8	15.3	3	0
1891	14 11.1	28 43	0.446	-2.81	8.1	70.3	17.0	5	1
1892	14 11.5	79 23	-0.135	-2.81	84.9	37.4	16.5	5	1
1893	14 12.0	78 01	0.059	-2.80	82.4	41.4	17.5	6	1
1894	14 12.0	44 03	0.395	-2.80	48.0	65.7	17.0	5	1
1895	14 12.3	71 35	0.140	-2.80	80.4	44.1	17.7	6	2
1896*	14 12.7	38 28	0.415	-2.80	35.5	68.2	17.2	5	0
1897*	14 13.3	-08 07	0.529	-2.79	305.0	47.9	17.0	5	0
1898	14 14.0	25 50	0.453	-2.79	.0	69.4	17.0	5	1
1899*	14 14.5	18 22	0.471	-2.78	341.2	66.8	16.0	4	0
1900	14 15.0	36 42	0.420	-2.78	30.4	68.4	17.2	5	1
1901*	14 15.2	41 00	0.404	-2.78	40.8	66.7	16.8	5	0
1902	14 15.8	37 58	0.415	-2.77	33.5	67.9	17.2	5	2
1903	14 16.4	28 02	0.446	-2.77	6.4	69.1	17.0	5	1
1904	14 16.8	49 14	0.367	-2.76	56.1	61.8	15.6	3	2
1905	14 16.8	17 09	0.474	-2.76	339.2	65.7	18.0	6	2
1906*	14 16.9	18 06	0.471	-2.76	341.3	66.1	16.6	5	0
1907	14 17.1	50 22	0.361	-2.76	57.9	61.0	17.2	5	1
1908	14 17.4	27 08	0.448	-2.76	3.8	68.9	17.1	5	1
1909	14 17.5	25 36	0.452	-2.76	359.8	68.5	16.8	5	1
1910*	14 17.8	25 53	0.451	-2.75	.6	68.5	17.8	6	0
1911	14 18.5	39 37	0.407	-2.75	36.9	66.8	17.2	5	2
1912	14 19.2	27 24	0.448	-2.74	4.8	68.4	17.0	5	1
1913	14 20.0	17 20	0.472	-2.74	340.5	65.1	16.0	4	1
1914	14 20.1	38 29	0.410	-2.74	34.0	66.9	17.2	5	2
1915	14 20.4	32 50	0.429	-2.73	19.5	68.2	17.6	6	1
1916	14 20.7	-07 31	0.529	-2.73	307.8	47.4	17.8	6	1
1917	14 21.3	20 41	0.464	-2.73	348.1	66.3	18.0	6	2
1918	14 21.5	63 49	0.280	-2.72	73.0	50.5	17.5	6	3
1919*	14 22.5	06 03	0.498	-2.72	322.4	57.7	17.6	6	0
1920	14 22.7	56 26	0.316	-2.71	65.0	56.2	17.0	5	2

1921	14	22.7	23	49	0.459	-2.71	355.7	67.0	17.2	5	1
1922	14	23.3	21	19	0.461	-2.71	349.9	66.1	17.6	6	1
1923	14	23.3	20	17	0.464	-2.71	347.7	65.7	17.2	5	1
1924*	14	23.3	-21	44	0.564	-2.71	299.0	36.8	17.0	5	2
1925	14	24.0	57	31	0.306	-2.70	65.0	55.2	17.2	5	2
1926	14	24.0	25	10	0.450	-2.70	359.8	67.1	16.6	5	2
1927	14	24.6	26	19	0.447	-2.70	2.4	67.1	16.0	4	1
1928	14	24.9	05	11	0.500	-2.70	322.1	56.7	17.6	6	1
1929	14	25.6	30	11	0.435	-2.69	12.4	67.2	17.3	6	2
1930	14	26.4	32	16	0.428	-2.68	17.7	67.0	17.0	5	1
1931	14	26.5	44	55	0.380	-2.68	46.5	63.0	17.2	5	1
1932*	14	26.9	47	45	0.365	-2.68	51.5	61.4	17.2	5	0
1933	14	27.1	70	47	0.130	-2.68	78.2	44.5	17.3	6	2
1934	14	27.1	30	06	0.435	-2.68	12.2	66.9	17.4	6	3
1935*	14	27.8	-18	41	0.557	-2.67	301.9	37.0	17.5	6	1
1936	14	29.9	55	28	0.315	-2.65	62.5	56.2	17.0	5	1
1937	14	30.2	56	55	0.287	-2.65	65.6	53.6	17.2	5	2
1938	14	30.3	00	21	0.511	-2.65	318.1	52.2	17.2	5	1
1939	14	30.8	25	28	0.447	-2.64	.9	65.6	16.6	5	1
1940	14	30.9	55	47	0.312	-2.64	62.7	55.8	17.0	5	3
1941	14	31.3	31	08	0.430	-2.64	14.8	66.0	17.5	6	1
1942	14	31.3	04	18	0.502	-2.64	323.0	54.9	17.5	6	3
1943	14	31.4	30	52	0.431	-2.64	14.1	66.0	17.6	6	2
1944	14	31.6	31	03	0.430	-2.64	14.5	65.9	17.2	5	1
1945*	14	31.9	-21	40	0.566	-2.63	301.2	33.9	17.6	6	1
1946	14	32.2	40	51	0.393	-2.63	37.3	63.9	17.6	6	1
1947	14	32.3	40	04	0.397	-2.63	35.6	64.1	17.5	6	1
1948*	14	32.6	49	14	0.353	-2.63	52.9	59.8	17.2	5	0
1949	14	33.3	18	46	0.465	-2.62	346.7	62.9	17.2	5	1
1950	14	33.8	13	42	0.478	-2.62	337.4	60.4	17.2	5	1
1951	14	34.0	83	57	-0.706	-2.61	66.6	33.0	17.7	6	1
1952	14	34.8	29	16	0.434	-2.61	10.3	65.2	18.0	6	2
1953*	14	35.0	13	55	0.478	-2.61	330.1	60.3	16.6	5	0
1954	14	35.8	29	09	0.434	-2.60	10.0	65.0	17.5	6	2
1955*	14	36.4	-03	55	0.522	-2.59	315.6	48.0	17.5	6	0
1956	14	36.8	32	17	0.420	-2.59	17.4	64.8	17.6	6	2
1957	14	37.0	31	50	0.425	-2.59	16.4	64.7	17.8	6	3
1958	14	37.1	31	36	0.425	-2.59	15.8	64.7	17.8	6	2
1959	14	37.2	18	20	0.465	-2.59	346.6	61.9	17.4	6	1
1960	14	37.8	15	58	0.461	-2.58	350.0	62.4	16.6	5	1

1961	14	38.4	31	49	0.424	-2.57	18.3	64.5	17.8	6	3
1962*	14	38.5	55	50	0.303	-2.57	61.5	55.0	17.2	5	0
1963	14	38.7	32	06	0.473	-2.57	16.9	64.4	17.7	6	2
1964*	14	39.0	-08	10	0.532	-2.57	312.6	46.3	18.9	5	0
1965*	14	39.4	37	05	0.404	-2.56	28.2	63.6	17.6	6	0
1966	14	40.2	59	31	0.269	-2.56	65.8	52.3	18.0	6	2
1967	14	40.2	10	24	0.480	-2.56	333.9	57.2	17.8	6	1
1968	14	40.7	32	29	0.421	-2.55	17.8	63.9	17.8	6	1
1969	14	40.8	64	19	0.213	-2.55	70.9	48.8	17.7	6	1
1970	14	40.8	13	59	0.476	-2.55	339.7	59.1	17.2	5	1
1971*	14	41.1	15	25	0.472	-2.55	342.2	59.8	17.2	5	0
1972*	14	41.9	24	39	0.448	-2.54	.1	62.9	17.2	5	0
1973	14	42.0	28	03	0.435	-2.54	7.8	63.5	17.6	6	2
1974	14	43.7	75	27	-0.050	-2.52	80.4	40.0	17.3	6	1
1975	14	43.7	69	39	0.119	-2.52	75.7	44.6	17.1	5	1
1976	14	43.8	21	34	0.454	-2.52	354.2	61.7	16.9	5	1
1977*	14	43.8	-23	54	0.577	-2.52	302.6	30.6	17.0	3	2
1978	14	43.9	15	12	0.472	-2.52	342.5	59.1	16.8	5	1
1979	14	44.9	31	53	0.421	-2.51	16.4	63.2	17.2	5	2
1980	14	45.0	23	16	0.449	-2.51	357.8	61.9	17.2	5	1
1981*	14	45.0	-23	47	0.577	-2.51	303.0	30.5	17.0	5	0
1982*	14	45.1	31	20	0.423	-2.51	15.2	63.0	16.6	5	0
1983	14	46.0	17	21	0.466	-2.50	346.7	59.6	15.4	3	1
1984	14	46.1	28	33	0.432	-2.50	9.1	62.7	17.2	5	2
1985	14	46.1	06	32	0.495	-2.50	330.0	55.7	17.2	5	1
1986	14	46.6	22	31	0.451	-2.50	356.9	61.3	16.9	5	1
1987*	14	46.9	32	58	0.418	-2.49	18.7	62.6	17.6	6	0
1988*	14	46.9	21	23	0.454	-2.49	354.3	60.9	17.2	5	0
1989	14	47.2	06	18	0.496	-2.49	330.0	52.4	17.2	5	1
1990	14	47.5	28	41	0.431	-2.49	9.5	62.4	17.2	5	3
1991	14	47.9	19	14	0.460	-2.48	350.4	60.0	15.4	3	1
1992*	14	48.4	45	48	0.359	-2.48	44.4	59.2	17.8	6	0
1993	14	48.6	02	27	0.506	-2.48	325.7	50.8	17.5	6	1
1994	14	48.5	-05	15	0.528	-2.48	317.7	45.0	17.7	6	1
1995*	14	49.0	52	39	0.266	-2.47	63.5	52.1	18.4	7	2
1996*	14	49.0	-23	20	0.577	-2.47	304.1	30.4	17.4	6	0
1997*	14	49.3	20	40	0.455	-2.47	353.4	60.2	17.0	5	0
1998*	14	49.6	02	06	0.507	-2.47	325.6	50.1	17.5	6	0
1999	14	49.8	54	55	0.298	-2.47	58.5	54.3	15.7	4	1
2000	14	50.3	55	04	0.295	-2.46	58.6	54.2	16.6	5	1

2001	14 50.6	23	21	0.447	-2.46	358.7	60.7	17.2	5	1
2002	14 51.2	68	58	0.119	-2.45	74.3	44.7	17.7	6	1
2003	14 52.1	20	02	0.457	-2.44	352.6	59.3	17.2	5	1
2004*	14 52.2	25	31	0.439	-2.44	3.2	60.9	17.0	5	0
2005	14 52.3	28	24	0.430	-2.44	9.1	61.3	16.0	4	2
2006	14 53.0	20	15	0.456	-2.43	353.2	59.2	17.2	5	1
2007	14 53.2	38	35	0.390	-2.43	30.1	60.6	16.9	5	1
2008	14 53.6	23	43	0.445	-2.43	359.8	60.1	17.5	6	2
2009	14 53.7	21	57	0.450	-2.43	356.4	59.6	17.2	5	1
2010	14 54.7	81	45	-0.549	-2.42	84.5	34.5	17.5	6	1
2011	14 55.1	50	20	0.327	-2.41	51.0	56.1	17.2	5	1
2012	14 55.1	17	06	0.465	-2.41	348.0	57.5	16.6	5	1
2013	14 55.4	61	05	0.231	-2.41	65.6	49.9	18.0	6	2
2014*	14 55.5	-15	28	0.555	-2.41	311.0	36.0	17.5	6	1
2015	14 55.6	56	34	0.278	-2.41	59.9	52.7	17.6	6	1
2016	14 55.7	11	47	0.480	-2.41	339.7	54.9	17.6	6	1
2017	14 56.1	25	49	0.444	-2.40	.2	59.4	16.6	5	1
2018	14 56.3	47	51	0.341	-2.40	46.8	57.1	16.6	5	1
2019*	14 56.7	27	46	0.430	-2.40	6.1	60.3	16.3	4	0
2020*	14 56.7	08	30	0.489	-2.40	335.3	52.9	16.0	4	0
2021	14 57.1	25	36	0.444	-2.39	360.0	59.3	17.0	5	1
2022	14 58.2	29	00	0.425	-2.38	10.6	60.1	15.6	3	1
2023	14 58.5	03	26	0.503	-2.38	329.4	49.4	17.2	5	1
2024	15 00.6	47	42	0.339	-2.36	46.0	58.5	18.0	6	1
2025	15 00.9	35	02	0.401	-2.35	22.6	59.6	17.2	5	1
2026	15 01.1	00	17	0.511	-2.35	326.5	46.8	16.7	5	1
2027*	15 02.1	43	20	0.362	-2.34	38.3	57.8	17.3	6	0
2028	15 02.6	08	05	0.490	-2.34	336.1	53.4	15.7	4	1
2029	15 03.8	06	19	0.494	-2.32	334.2	50.1	16.0	4	2
2030	15 03.8	00	28	0.511	-2.32	327.4	46.4	16.9	5	1
2031*	15 04.0	-10	39	0.542	-2.32	316.8	38.4	17.1	5	1
2032	15 04.2	78	23	-0.288	-2.32	81.6	36.9	17.9	6	1
2033*	15 04.3	06	52	0.493	-2.32	335.0	50.4	15.7	4	0
2034	15 04.4	34	05	0.404	-2.32	20.7	58.9	16.9	5	2
2035	15 04.5	-05	31	0.527	-2.32	321.5	42.1	17.1	5	1
2036*	15 04.8	18	37	0.458	-2.31	352.2	56.0	16.0	4	0
2037	15 05.2	72	46	-0.007	-2.31	76.7	41.1	17.5	6	1
2038*	15 05.5	15	47	0.467	-2.30	347.8	54.7	17.2	5	0
2039*	15 05.6	10	21	0.483	-2.30	339.9	52.0	17.2	5	0
2040	15 05.6	07	59	0.490	-2.30	336.7	50.7	15.7	4	1

2041*	15	03.7	69 26	0.082	-2.30	73.3	43.4	17.0	5	0
2042	15	05.7	37 06	0.390	-2.30	26.5	58.4	17.2	5	1
2043	15	06.0	16 59	0.463	-2.30	349.8	59.1	17.2	5	1
2044	15	06.0	14 52	0.469	-2.30	346.5	54.2	17.5	6	1
2045	15	06.7	-02 13	0.519	-2.29	325.3	44.1	17.1	5	1
2046	15	06.9	35 24	0.397	-2.29	23.2	58.4	16.9	5	1
2047	15	07.3	78 41	-0.300	-2.29	81.7	36.4	17.9	6	1
2048	15	08.1	04 36	0.490	-2.28	333.9	48.4	16.0	4	1
2049*	15	08.8	32 20	0.409	-2.27	17.6	58.0	17.0	5	0
2050	15	08.9	00 39	0.510	-2.27	328.8	45.6	17.1	5	1
2051	15	09.3	-00 25	0.513	-2.26	327.7	44.8	17.4	6	2
2052*	15	09.6	07 33	0.490	-2.26	337.0	49.7	15.0	3	0
2053	15	09.8	-00 09	0.512	-2.26	328.1	44.9	17.4	6	1
2054	15	10.6	55 20	0.274	-2.25	56.4	51.6	17.6	6	1
2055*	15	11.6	08 45	0.492	-2.24	336.8	48.8	16.0	4	0
2056	15	13.1	28 48	0.421	-2.22	11.0	56.8	16.9	5	1
2057*	15	13.1	-18 09	0.542	-2.22	319.4	37.3	17.1	5	1
2058	15	13.9	72 26	-0.016	-2.21	75.7	40.9	17.9	6	1
2059	15	14.2	29 22	0.418	-2.21	12.0	56.6	17.0	5	1
2060*	15	14.4	-11 39	0.347	-2.21	318.4	36.0	17.7	6	1
2061	15	15.3	31 11	0.411	-2.20	15.4	56.6	15.7	4	1
2062	15	15.8	32 37	0.405	-2.20	18.0	56.6	16.6	5	1
2063	15	16.0	09 10	0.485	-2.19	340.5	48.2	15.1	3	1
2064*	15	16.4	49 10	0.317	-2.19	46.6	52.5	16.6	5	0
2065	15	16.6	28 15	0.422	-2.19	10.2	56.0	15.6	3	2
2066	15	16.6	01 34	0.508	-2.19	331.5	44.7	17.2	5	2
2067	15	17.3	31 26	0.409	-2.18	15.9	56.2	15.7	4	1
2068	15	17.8	72 01	-0.009	-2.17	75.1	40.9	17.7	6	2
2069	15	18.0	30 25	0.413	-2.17	14.1	55.9	16.8	5	2
2070	15	18.6	35 46	0.390	-2.16	23.6	56.0	17.3	6	1
2071	15	19.2	37 32	0.381	-2.16	26.6	55.7	17.2	5	1
2072*	15	19.3	18 46	0.454	-2.16	354.6	52.9	17.0	5	0
2073	15	19.6	28 56	0.418	-2.15	11.5	55.4	16.9	5	1
2074*	15	20.4	64 17	0.157	-2.14	66.7	45.7	17.1	5	0
2075*	15	21.0	74 32	-0.107	-2.14	77.3	39.1	17.1	5	0
2076	15	21.1	44 39	0.343	-2.13	38.9	54.2	17.8	6	2
2077	15	21.5	62 34	0.182	-2.13	64.5	46.5	17.7	6	1
2078*	15	21.9	-12 31	0.550	-2.13	319.3	34.1	17.5	6	0
2079	15	22.1	29 23	0.415	-2.12	12.4	54.9	15.4	2	1
2080*	15	22.4	42 14	0.356	-2.12	34.8	54.5	17.3	6	0

2081*	15	22.6	-10	30	0.544	-2.12	321.2	33.4	17.7	6	1
2082*	15	23.4	03	57	0.500	-2.11	335.6	44.5	17.0	5	0
2083	15	23.5	31	15	0.407	-2.11	15.7	54.8	16.9	5	1
2084	15	24.5	35	48	0.387	-2.10	23.6	54.8	17.3	6	1
2085	15	24.6	07	52	0.488	-2.10	340.5	46.6	17.7	6	1
2086	15	24.7	72	53	-0.051	-2.09	75.5	40.0	17.7	6	2
2087	15	25.0	72	06	-0.026	-2.09	74.7	40.5	17.6	6	1
2088	15	25.7	39	12	0.369	-2.08	29.7	54.3	17.3	6	1
2089	15	26.6	28	31	0.417	-2.07	11.2	53.8	15.8	4	1
2090*	15	27.1	62	04	0.182	-2.07	63.4	48.3	17.1	5	0
2091	15	27.3	10	44	0.479	-2.07	344.6	47.7	17.5	6	1
2092	15	27.5	31	39	0.404	-2.06	16.5	54.0	15.7	4	1
2093	15	28.4	37	32	0.377	-2.05	26.5	53.8	17.2	5	2
2094	15	29.1	-01	33	0.517	-2.04	330.9	40.3	16.7	5	1
2095*	15	29.6	41	01	0.359	-2.04	32.4	53.0	17.8	6	0
2096	15	29.9	37	50	0.375	-2.04	27.0	53.6	17.0	5	2
2097*	15	30.1	40	05	0.363	-2.03	30.8	53.4	17.8	6	0
2098	15	30.6	70	01	0.025	-2.03	72.2	41.4	17.7	6	1
2099	15	30.7	44	14	0.340	-2.03	37.6	52.6	17.8	6	1
2100	15	31.0	38	08	0.373	-2.02	27.5	53.4	17.0	5	3
2101*	15	31.2	12	46	0.472	-2.02	348.0	47.8	17.2	5	0
2102	15	32.2	70	40	0.005	-2.01	72.7	40.9	17.7	6	1
2103*	15	32.4	-01	42	0.517	-2.01	331.4	39.6	17.1	5	0
2104*	15	32.5	-02	50	0.521	-2.00	330.3	38.8	17.4	6	2
2105	15	32.8	74	35	-0.135	-2.00	76.7	38.4	17.2	5	1
2106	15	33.3	34	09	0.391	-2.00	20.8	52.9	17.2	5	1
2107	15	33.4	22	18	0.439	-1.99	1.8	50.9	15.7	4	1
2108*	15	33.5	18	22	0.453	-1.99	356.0	49.6	15.7	4	0
2109*	15	33.8	06	30	0.492	-1.99	340.6	44.2	17.4	5	0
2110	15	33.9	31	11	0.404	-1.99	16.0	52.6	17.0	5	1
2111	15	34.0	34	53	0.387	-1.99	22.1	52.8	17.8	6	3
2112*	15	34.4	36	46	0.378	-1.98	25.2	52.7	17.8	[illegible]	0
2113*	15	34.4	05	09	0.496	-1.98	339.2	43.2	17.1	5	0
2114*	15	35.6	43	30	0.341	-1.97	36.1	51.9	17.8	6	0
2115	15	35.7	70	32	0.003	-1.97	72.4	40.8	17.8	6	2
2116	15	37.3	43	18	0.342	-1.95	35.7	51.6	17.8	6	1
2117	15	37.4	44	14	0.336	-1.95	37.2	51.4	17.8	6	1
2118*	15	37.5	42	17	0.347	-1.95	34.1	51.7	17.1	5	0
2119*	15	38.0	09	59	0.480	-1.94	345.6	45.0	17.2	5	0
2120	15	38.3	34	58	0.385	-1.94	22.2	52.0	17.8	6	1

2121	15	38.9	70	16	0.005	-1.93	71.9	40.7	17.4	6	2
2122	15	39.0	36	36	0.377	-1.93	24.9	51.8	16.6	5	1
2123*	15	39.3	-07	44	0.537	-1.92	327.1	34.3	17.5	6	0
2124	15	39.5	36	32	0.377	-1.92	24.8	51.7	15.6	3	1
2125	15	39.6	66	47	0.087	-1.92	68.0	42.6	17.6	6	4
2126*	15	40.6	26	26	0.421	-1.91	8.8	50.4	17.6	6	0
2127*	15	41.3	76	44	-0.265	-1.90	78.4	36.7	17.9	6	0
2128*	15	41.4	-02	37	0.520	-1.90	332.3	37.2	16.5	5	0
2129	15	42.0	20	30	0.444	-1.89	.2	48.9	17.8	6	1
2130	15	42.5	37	01	0.374	-1.89	25.5	51.1	17.6	6	1
2131	15	43.1	36	31	0.376	-1.88	24.8	51.0	17.5	6	1
2132*	15	43.6	70	40	-0.013	-1.87	72.0	40.2	16.9	5	0
2133	15	44.4	36	44	0.374	-1.86	25.1	50.7	17.8	6	1
2134	15	45.0	71	28	-0.040	-1.86	72.8	39.6	17.5	6	2
2135*	15	48.9	51	01	0.281	-1.81	46.8	45.0	17.6	6	0
2136	15	49.3	51	33	0.276	-1.80	47.5	47.8	17.6	6	1
2137*	15	50.5	62	29	0.151	-1.79	62.0	43.7	17.1	5	0
2138*	15	51.1	34	11	0.384	-1.78	21.2	49.3	17.5	6	0
2139	15	52.0	65	49	0.092	-1.77	66.0	42.0	17.4	6	1
2140*	15	52.3	49	05	0.294	-1.77	43.7	47.9	17.5	6	0
2141	15	52.2	35	53	0.375	-1.77	23.8	49.1	17.2	5	1
2142	15	52.5	27	39	0.413	-1.77	11.5	48.1	16.0	4	2
2143*	15	52.7	37	40	0.365	-1.76	26.8	49.1	16.6	5	0
2144	15	53.0	70	57	-0.036	-1.76	71.8	39.4	17.5	6	2
2145*	15	54.7	33	41	0.385	-1.74	20.6	48.5	16.6	5	0
2146	15	55.0	66	46	0.069	-1.73	66.9	41.3	17.7	6	1
2147	15	55.7	16	19	0.456	-1.72	356.2	43.9	13.8	1	1
2148*	15	57.2	29	52	0.419	-1.71	9.2	46.7	15.4	3	0
2149*	15	58.1	54	17	0.245	-1.69	50.8	45.8	16.1	4	0
2150	15	58.3	71	49	-0.073	-1.69	72.4	38.5	17.7	6	1
2151	15	58.7	18	09	0.449	-1.69	358.9	44.0	13.8	1	2
2152	15	58.8	16	51	0.454	-1.69	357.3	43.5	13.8	1	1
2153*	16	00.1	14	29	0.462	-1.67	354.5	42.2	16.9	5	0
2154	16	01.2	65	30	0.088	-1.66	65.0	41.3	17.6	6	1
2155	16	01.2	25	24	0.420	-1.66	8.9	45.7	17.5	6	1
2156	16	02.6	79	36	-0.147	-1.64	74.2	37.3	17.5	5	2
2157	16	03.2	48	15	0.294	-1.63	42.0	46.3	17.7	6	1
2158*	16	03.5	43	24	0.328	-1.63	35.0	46.9	16.8	5	0
2159*	16	05.0	17	22	0.451	-1.61	358.7	42.3	15.9	4	0
2160	16	05.7	30	19	0.398	-1.60	16.1	45.7	17.9	6	1

2161	16	06.6	71	58	-0.088	-1.59	72.1	37.9	17.5	6	2
2162*	16	06.7	29	55	0.399	-1.59	15.6	45.4	13.7	1	0
2163*	16	07.8	-09	46	0.532	-1.57	334.1	30.1	17.5	6	2
2164*	16	08.1	60	47	0.161	-1.57	59.8	42.4	17.5	6	0
2165*	16	08.2	27	03	0.412	-1.57	11.7	44.5	17.4	6	0
2166	16	09.0	56	21	0.216	-1.56	53.0	43.7	17.1	5	1
2167*	16	09.1	38	48	0.353	-1.55	28.3	45.9	17.6	6	0
2168	16	09.7	54	32	0.235	-1.55	50.5	44.1	16.5	5	1
2169*	16	10.0	49	30	0.281	-1.54	43.6	45.0	15.9	4	0
2170*	16	10.7	25	33	0.426	-1.53	7.2	43.1	15.9	4	0
2171	16	11.6	72	02	-0.100	-1.52	72.8	37.5	17.9	6	1
2172	16	12.0	42	46	0.329	-1.52	34.0	45.3	17.1	5	1
2173*	16	13.3	09	15	0.480	-1.50	350.3	37.0	17.1	5	1
2174	16	14.1	61	27	0.146	-1.49	59.9	41.5	17.1	5	1
2175	16	14.6	30	16	0.396	-1.48	16.5	43.8	16.2	4	1
2176	16	14.8	71	46	-0.095	-1.48	71.6	37.4	17.1	5	2
2177*	16	15.0	26	06	0.414	-1.48	11.0	42.8	17.5	6	0
2178	16	15.4	25	00	0.419	-1.47	9.5	42.4	17.1	5	1
2179	16	15.5	43	46	0.327	-1.47	34.0	44.7	17.1	5	1
2180	16	15.9	48	01	0.290	-1.47	41.3	44.3	17.1	5	1
2181	16	16.4	77	52	-0.420	-1.46	78.2	34.4	17.7	6	1
2182*	16	16.4	14	46	0.459	-1.46	357.0	38.8	17.4	6	0
2183	16	16.8	43	04	0.325	-1.45	34.4	44.4	17.1	5	1
2184*	16	17.2	50	33	0.268	-1.45	44.8	43.7	15.9	4	0
2185	16	17.7	70	57	-0.070	-1.44	70.5	37.6	17.4	6	1
2186*	16	18.2	28	53	0.401	-1.42	14.9	42.6	17.1	5	0
2187*	16	19.4	41	36	0.333	-1.42	32.3	44.0	17.1	5	0
2188*	16	19.7	34	05	0.376	-1.42	22.0	43.4	17.2	5	0
2189	16	20.6	72	47	-0.140	-1.40	72.5	36.6	17.1	5	1
2190	16	21.4	44	02	0.316	-1.39	35.7	43.6	17.7	6	1
2191*	16	21.7	28	12	0.412	-1.39	11.6	41.4	17.7	6	0
2192	16	21.9	43	00	0.323	-1.39	34.3	43.5	17.1	5	1
2193	16	21.9	22	06	0.480	-1.39	6.4	40.2	17.1	5	1
2194*	16	22.2	57	31	0.194	-1.38	53.9	41.7	16.9	5	0
2195	16	22.5	48	52	0.280	-1.38	42.2	43.1	17.4	6	1
2196*	16	22.6	41	49	0.331	-1.38	32.6	43.4	16.9	5	0
2197	16	23.3	41	14	0.334	-1.37	31.8	43.2	13.9	1	1
2198	16	23.5	44	09	0.315	-1.37	35.8	43.2	17.7	6	2
2199	16	23.6	29	51	0.343	-1.36	30.0	43.1	13.9	1	2
2200*	16	23.6	28	30	0.402	-1.36	14.7	41.6	17.1	5	0

2201	16 23.9	55 47	0.213	-1.36	51.5	41.8	17.1	5	2
2202*	16 25.3	49 09	0.276	-1.34	42.6	42.8	17.1	5	0
2203	16 25.4	73 41	-0.185	-1.34	78.3	35.9	17.1	5	2
2204*	16 25.6	05 54	0.491	-1.34	348.8	32.7	17.1	5	3
2205*	16 25.8	13 12	0.464	-1.33	356.4	36.0	16.5	5	0
2206	16 26.4	43 39	0.317	-1.33	35.2	42.7	17.7	6	1
2207	16 26.8	65 45	0.058	-1.32	64.0	38.8	17.6	6	1
2208	16 27.0	58 50	0.174	-1.32	55.4	40.7	17.1	5	1
2209*	16 27.1	73 54	-0.197	-1.32	73.5	35.7	17.9	6	0
2210*	16 27.6	05 48	0.491	-1.31	348.6	32.3	17.1	5	1
2211	16 29.2	41 15	0.332	-1.29	31.9	42.1	17.4	6	1
2212	16 29.5	49 35	0.271	-1.29	43.1	41.9	16.9	5	1
2213	16 31.8	41 35	0.329	-1.25	32.4	41.7	17.7	6	1
2214*	16 32.7	38 17	0.349	-1.24	27.9	41.2	17.6	6	0
2215	16 34.0	48 21	0.279	-1.22	41.4	41.2	17.1	5	1
2216	16 34.5	67 58	0.000	-1.22	66.4	37.4	17.4	6	1
2217	16 34.9	28 12	0.401	-1.21	15.1	39.1	17.1	5	1
2218	16 35.4	66 31	0.038	-1.21	64.6	37.7	17.7	6	4
2219	16 36.2	46 59	0.289	-1.19	39.6	40.9	17.4	6	3
2220*	16 36.4	54 03	0.225	-1.19	48.9	40.3	17.5	6	0
2221	16 36.5	43 33	0.316	-1.19	35.0	40.9	17.7	6	1
2222	16 36.5	43 05	0.317	-1.19	34.4	40.9	17.7	6	1
2223*	16 36.7	27 43	0.403	-1.19	14.6	38.6	16.5	5	0
2224*	16 36.7	13 38	0.462	-1.19	358.2	39.8	17.4	6	3
2225	16 36.8	56 02	0.203	-1.19	51.4	40.0	17.5	6	1
2226*	16 38.2	67 21	0.012	-1.17	65.5	37.2	17.6	6	0
2227	16 39.4	51 33	0.249	-1.15	43.6	40.1	17.4	6	1
2228	16 42.1	30 12	0.390	-1.11	18.1	38.0	16.9	5	1
2229*	16 42.2	65 54	0.043	-1.11	63.6	37.2	17.7	6	0
2230	16 43.2	48 52	0.271	-1.10	42.0	39.7	16.8	5	1
2231	16 43.7	58 46	0.191	-1.09	52.2	38.9	17.9	6	1
2232*	16 44.7	61 59	0.116	-1.08	58.7	37.9	18.1	7	1
2233*	16 47.9	43 25	0.312	-1.03	35.0	38.8	17.4	6	0
2234	16 48.0	58 41	0.190	-1.03	52.0	38.4	17.7	6	1
2235	16 50.1	40 16	0.332	-1.00	31.0	38.1	17.1	5	1
2236	16 52.2	71 43	-0.133	-0.97	70.2	34.7	17.1	5	1
2237	16 52.4	55 29	0.202	-0.97	50.4	37.9	17.7	6	1
2238	16 52.6	37 27	0.349	-0.97	27.6	37.3	17.4	6	1
2239*	16 52.9	59 09	0.155	-0.96	55.0	37.4	17.1	5	0
2240	16 53.9	66 59	0.009	-0.95	64.3	35.8	17.4	6	3

2241*	16	54.2	32 46	0.375	-0.95	21.9	36.1	15.6	3	0
2242*	16	54.5	54 39	0.211	-0.94	49.3	37.7	16.9	5	0
2243	16	56.6	33 17	0.361	-0.91	25.1	36.1	17.1	5	1
2244	16	57.4	34 16	0.366	-0.90	23.9	35.7	16.0	5	2
2245	16	57.4	33 45	0.369	-0.90	23.3	35.6	16.5	5	1
2246	16	59.8	64 26	0.063	-0.87	61.3	35.8	17.6	6	3
2247*	17	01.1	81 48	-0.983	-0.85	81.9	31.0	15.3	3	0
2248*	17	04.0	77 13	-0.440	-0.81	76.2	32.4	15.5	3	0
2249*	17	04.5	34 39	0.363	-0.80	24.7	34.8	15.4	3	0
2250	17	06.0	39 53	0.331	-0.78	31.1	35.0	16.5	5	1
2251*	17	06.6	25 00	0.411	-0.77	13.8	31.4	17.6	6	1
2252	17	10.2	49 34	0.257	-0.72	42.9	35.3	17.5	6	1
2253*	17	10.2	38 50	0.337	-0.72	30.0	34.1	16.5	5	0
2254*	17	11.6	19 53	0.433	-0.70	8.7	28.6	17.7	6	2
2255	17	11.6	68 16	0.060	-0.70	60.9	34.5	15.3	3	2
2256	17	12.2	78 54	-0.598	-0.69	78.0	31.5	15.3	3	2
2257*	17	12.6	32 45	0.372	-0.69	23.0	32.3	17.1	5	1
2258*	17	13.4	31 53	0.376	-0.67	22.1	31.9	17.7	6	1
2259*	17	14.4	27 49	0.397	-0.66	17.6	30.4	17.1	5	1
2260	17	15.9	72 18	-0.173	-0.64	70.3	32.8	17.1	5	2
2261*	17	17.1	32 18	0.374	-0.62	22.8	31.3	17.4	6	2
2262*	17	17.3	23 54	0.415	-0.62	13.9	28.7	17.4	6	2
2263*	17	17.4	27 05	0.400	-0.62	17.0	29.7	16.9	5	0
2264*	17	18.1	29 20	0.389	-0.61	19.5	30.2	17.7	6	0
2265*	17	18.2	77 36	-0.454	-0.61	76.4	31.5	17.4	6	0
2266*	17	19.3	32 15	0.374	-0.59	22.9	30.8	17.5	6	2
2267*	17	21.3	61 10	0.113	-0.56	57.0	33.7	17.9	6	1
2268*	17	24.0	55 28	0.193	-0.52	50.2	33.4	17.7	6	1
2269*	17	24.1	49 17	0.257	-0.52	42.8	33.0	17.9	6	0
2270*	17	24.3	55 18	0.194	-0.52	50.0	33.3	17.7	6	0
2271*	17	25.0	78 10	-0.538	-0.51	76.9	31.0	15.7	4	0
2272*	17	28.2	40 42	0.322	-0.46	32.9	31.0	16.5	5	1
2273*	17	29.3	42 30	0.310	-0.45	35.0	31.2	17.4	6	0
2274	17	30.9	77 33	-0.408	-0.42	76.2	30.8	17.2	5	2
2275*	17	32.9	53 17	0.216	-0.39	47.7	32.0	16.5	5	0
2276	17	34.1	64 08	0.056	-0.38	60.5	32.1	17.4	6	1
2277	17	34.2	71 00	-0.131	-0.38	68.5	31.6	17.5	6	1
2278*	17	35.5	39 59	0.327	-0.36	32.4	29.5	17.5	6	0
2279*	17	37.6	24 49	0.410	-0.33	16.3	24.7	17.3	6	1
2280	17	42.2	63 49	0.061	-0.26	60.1	31.2	17.9	6	1

2281*	17	42.4	64 43	0.042	-0.26	61.1	31.2	17.6	6	0
2282	17	45.2	73 52	-0.167	-0.22	69.5	30.7	17.4	6	1
2283	17	45.7	69 43	-0.089	-0.21	67.0	30.7	17.4	6	1
2284*	17	49.4	54 19	0.202	-0.15	49.2	29.7	16.9	5	0
2285*	17	49.9	42 52	0.306	-0.15	36.3	27.5	17.0	5	0
2286*	17	50.1	52 07	0.226	-0.14	46.7	29.3	16.9	5	1
2287*	17	50.2	79 38	-0.704	-0.14	78.4	29.6	17.9	6	0
2288*	17	51.2	59 44	0.131	-0.13	55.4	30.0	16.9	5	1
2289*	17	51.7	58 07	0.154	-0.12	53.6	29.8	17.5	6	1
2290*	17	53.8	73 22	-0.233	-0.09	71.2	29.9	17.1	5	0
2291*	17	53.5	51 10	0.233	-0.09	45.7	28.6	17.6	6	2
2292*	17	54.2	53 51	0.208	-0.08	48.7	28.9	17.1	5	1
2293*	17	59.8	57 29	0.161	-0.02	53.1	28.8	16.2	4	0
2294	18	01.0	85 57	-2.633	0.02	85.3	28.4	17.7	6	2
2295*	18	01.0	69 13	-0.075	0.02	66.4	29.4	16.2	4	0
2296*	18	01.3	77 42	-0.509	0.02	76.1	29.2	15.9	4	0
2297*	18	01.5	42 22	0.309	0.02	36.4	25.4	17.0	5	0
2298*	18	03.3	50 13	0.245	0.05	45.0	26.9	17.4	6	0
2299*	18	04.2	43 58	0.298	0.07	38.2	25.2	17.3	6	1
2300	18	10.7	76 30	-0.425	0.16	74.9	28.7	17.1	5	1
2301*	18	16.0	69 36	-0.085	0.23	66.9	28.1	15.8	4	0
2302*	18	17.5	57 03	0.169	0.26	53.0	26.2	17.4	6	2
2303*	18	19.0	82 52	-1.262	0.28	81.9	28.2	16.7	5	0
2304*	18	20.3	68 52	-0.061	0.30	66.1	27.6	17.0	5	0
2305	18	24.9	71 17	-0.141	0.36	68.8	27.5	17.0	5	1
2306*	18	29.4	74 38	-0.292	0.43	72.6	27.5	17.0	5	0
2307*	18	32.4	61 04	0.113	0.47	57.7	25.2	17.8	6	1
2308*	18	35.4	70 55	-0.124	0.51	68.6	26.6	16.4	4	0
2309*	18	49.1	77 33	-0.474	0.71	76.0	26.7	15.8	4	0
2310	18	50.5	73 09	-0.205	0.73	71.2	25.9	17.0	5	1
2311*	18	51.1	70 13	-0.092	0.74	68.1	25.2	16.0	4	1
2312*	18	54.1	68 11	-0.039	0.78	65.9	24.5	15.8	4	1
2313	18	58.0	78 13	-0.521	0.84	76.9	26.3	17.4	6	2
2314	19	00.1	78 49	-0.576	0.87	77.5	26.5	17.2	5	2
2315*	19	01.9	69 45	-0.070	0.85	67.8	24.2	16.3	4	1
2316	19	05.5	79 50	-0.679	0.94	78.7	26.2	17.4	6	2
2317*	19	08.9	68 59	-0.037	0.99	67.0	23.4	17.6	6	3
2318	19	12.4	77 55	-0.477	1.04	76.7	25.5	17.0	5	1
2319*	19	16.2	45 42	0.311	1.09	42.8	13.1	15.4	3	1
2320*	19	17.9	70 44	-0.088	1.11	69.2	23.2	16.9	5	2

2321*	19 33.8	73 06	-0.160	1.39	72.1	22.8	17.6	6	1
2322*	20 02.1	72 48	-0.108	1.70	72.7	20.8	17.6	6	1
2323*	20 05.3	79 47	-0.543	1.74	79.6	23.7	17.3	6	0
2324*	20 15.9	-20 47	0.582	1.87	358.7	-29.7	16.0	5	1
2325*	20 21.5	-25 24	0.598	1.93	346.1	-32.4	16.8	5	0
2326*	20 29.6	69 23	0.042	2.03	70.8	17.1	17.4	6	1
2327*	20 38.3	82 07	-0.127	2.13	82.5	23.7	16.8	5	1
2328*	20 40.0	-18 21	0.569	2.15	355.3	-34.1	16.4	4	2
2329*	20 47.9	-10 32	0.543	2.23	5.3	-32.7	17.5	6	1
2330	20 49.4	-22 36	0.580	2.25	351.8	-37.6	17.4	6	2
2331*	20 50.4	-08 19	0.536	2.26	8.0	-32.2	16.3	6	0
2332*	20 51.4	-17 30	0.564	2.27	358.0	-36.3	17.5	6	0
2333	20 52.6	-19 48	0.571	2.29	355.4	-37.4	16.8	5	1
2334	20 55.7	-25 50	0.590	2.32	346.4	-40.0	17.4	6	1
2335	20 57.7	-22 22	0.577	2.34	352.9	-39.4	17.4	6	2
2336	20 59.0	-21 45	0.575	2.35	353.7	-39.5	17.4	6	1
2337	21 09.1	-22 57	0.576	2.48	353.2	-42.1	17.4	6	1
2338	21 12.5	-26 44	0.587	2.49	348.5	-43.8	17.0	5	1
2339	21 12.9	-22 04	0.572	2.49	354.7	-42.6	17.0	5	1
2340	21 13.3	-13 24	0.547	2.50	5.4	-39.5	17.1	5	1
2341	21 13.3	-23 46	0.577	2.50	352.5	-42.2	17.0	5	2
2342	21 14.0	-13 17	0.547	2.50	5.7	-39.6	17.5	6	2
2343	21 14.8	-06 01	0.527	2.51	13.9	-36.4	17.1	5	1
2344	21 17.4	-21 25	0.569	2.53	355.0	-43.4	17.6	6	1
2345	21 19.2	-12 46	0.545	2.55	7.0	-40.6	16.9	5	2
2346*	21 20.0	-13 40	0.547	2.56	6.0	-41.1	16.5	5	0
2347	21 21.3	-23 51	0.572	2.57	354.5	-44.7	16.4	4	1
2348*	21 21.9	-11 41	0.541	2.58	8.6	-40.7	17.1	5	0
2349*	21 24.1	03 19	0.504	2.60	25.0	-33.2	17.1	5	1
2350*	21 24.4	-06 32	0.528	2.60	14.9	-38.7	17.1	5	0
2351	21 26.3	-14 03	0.547	2.62	6.5	-42.7	17.1	5	1
2352*	21 26.3	-16 29	0.553	2.62	3.4	-43.7	17.5	6	0
2353	21 26.9	-02 15	0.517	2.62	19.9	-37.0	16.8	5	1
2354	21 27.9	-15 34	0.550	2.63	4.7	-43.6	17.1	5	2
2355	21 28.0	00 45	0.510	2.63	23.2	-35.5	17.7	6	2
2356	21 28.3	-00 32	0.513	2.64	21.9	-36.3	17.1	5	2
2357	21 28.4	-23 54	0.573	2.64	353.7	-46.6	17.0	5	1
2358	21 29.1	-16 32	0.552	2.66	3.7	-44.3	17.5	6	1
2359*	21 29.2	13 48	0.479	2.64	35.3	-27.5	17.6	6	0
2360	21 29.2	-15 43	0.550	2.64	4.7	-44.0	17.7	6	1

2361	21 31.2	-14 59	0.548	2.66	5.9	-44.1	16.7	5	1
2362	21 32.8	-14 56	0.547	2.68	6.2	-44.5	16.9	5	1
2363	21 33.3	-08 59	0.533	2.68	15.6	-41.9	17.1	5	1
2364	21 33.9	-20 58	0.563	2.68	358.3	-46.9	17.4	6	1
2365	21 34.9	-19 21	0.558	2.69	.7	-46.6	17.0	5	2
2366*	21 35.2	-07 32	0.529	2.70	15.6	-41.6	15.9	4	0
2367	21 35.2	-08 45	0.532	2.70	14.2	-42.2	17.1	5	1
2368	21 36.0	-20 38	0.561	2.70	359.0	-47.3	17.5	6	1
2369	21 36.5	-19 00	0.557	2.71	1.3	-46.8	17.0	5	1
2370*	21 36.8	-20 08	0.560	2.71	359.8	-47.2	17.1	5	0
2371	21 36.9	-24 52	0.572	2.71	353.0	-48.7	17.1	5	1
2372*	21 37.2	-20 38	0.561	2.71	359.2	-47.5	16.5	5	0
2373	21 37.3	00 25	0.511	2.71	24.5	-37.6	17.3	6	1
2374	21 37.6	-08 06	0.531	2.72	15.3	-42.4	17.1	5	1
2375	21 37.9	-19 49	0.559	2.72	.6	-47.4	17.1	5	1
2376	21 38.1	-10 07	0.535	2.72	13.0	-43.5	17.1	5	1
2377	21 38.2	-10 43	0.537	2.72	12.3	-43.8	16.9	5	2
2378*	21 39.2	-20 40	0.560	2.73	359.3	-48.0	16.5	5	0
2379*	21 40.0	00 05	0.512	2.76	24.7	-38.3	17.1	5	0
2380	21 42.8	-05 24	0.524	2.76	19.3	-42.0	17.7	6	1
2381	21 43.6	01 37	0.508	2.77	27.6	-38.1	17.1	5	1
2382	21 44.1	-16 20	0.549	2.77	6.0	-47.5	16.0	4	1
2383	21 44.1	-21 53	0.562	2.77	358.1	-49.5	16.9	5	1
2384	21 44.2	-20 14	0.558	2.77	.5	-49.0	15.9	4	1
2385	21 44.9	-24 13	0.568	2.78	354.7	-50.3	17.1	5	1
2386*	21 45.2	24 28	0.456	2.78	46.6	-22.6	17.5	6	1
2387*	21 45.7	82 27	-0.417	2.78	84.3	22.2	17.0	5	2
2388*	21 46.4	07 34	0.496	2.79	33.2	-34.8	16.5	5	0
2389	21 46.3	-04 39	0.522	2.79	20.9	-42.4	17.4	5	2
2390*	21 46.7	17 00	0.475	2.79	41.2	-28.9	17.6	6	1
2391*	21 46.7	-15 36	0.547	2.79	6.9	-47.9	17.2	5	0
2392	21 46.9	-00 03	0.518	2.79	25.9	-39.8	17.7	6	1
2393	21 47.3	-04 02	0.521	2.80	21.7	-42.2	17.7	6	1
2394	21 47.6	-19 55	0.556	2.80	1.4	-49.6	17.1	5	1
2395*	21 48.1	08 05	0.495	2.80	34.0	-34.8	17.1	5	1
2396*	21 48.6	11 49	0.487	2.81	37.4	-32.4	17.5	6	1
2397	21 48.8	00 40	0.511	2.81	27.0	-39.7	17.9	6	3
2398*	21 48.9	05 51	0.500	2.81	32.1	-36.4	17.1	5	0
2399	21 49.9	-08 29	0.530	2.82	17.0	-45.2	15.6	3	1
2400	21 50.0	-12 04	0.537	2.82	12.5	-46.9	16.5	5	1

2401	21 50.8	-20 48	0.557	2.82	.5	-50.6	16.5	5	1
2402*	21 50.9	-10 28	0.534	2.82	14.7	-46.4	16.5	5	0
2403*	21 51.0	-18 54	0.553	2.83	5.3	-50.0	17.1	5	0
2404*	21 51.5	-15 07	0.544	2.83	8.7	-48.6	17.8	6	0
2405*	21 51.6	-18 32	0.552	2.83	3.9	-50.0	17.1	5	0
2406*	21 51.9	10 36	0.490	2.83	37.0	-33.8	17.7	6	1
2407	21 53.9	06 42	0.498	2.85	33.9	-36.8	17.1	5	1
2408*	21 54.0	05 29	0.501	2.85	32.8	-37.6	17.1	5	0
2409*	21 54.1	20 16	0.469	2.85	45.2	-27.2	16.8	5	2
2410	21 54.3	-10 36	0.534	2.85	15.2	-47.2	16.0	4	1
2411	21 54.9	-09 14	0.531	2.86	17.0	-46.6	17.9	6	1
2412*	21 56.1	-22 09	0.559	2.86	359.0	-52.2	15.9	4	0
2413*	21 57.0	10 37	0.491	2.87	38.1	-34.7	17.4	6	0
2414*	21 57.5	08 07	0.494	2.87	36.0	-36.5	17.1	5	0
2415*	21 57.8	-06 18	0.525	2.88	21.1	-45.6	15.9	4	0
2416	21 57.8	-25 55	0.567	2.88	353.2	-53.5	17.5	6	1
2417*	21 59.2	-25 08	0.565	2.89	354.6	-53.7	17.1	5	0
2418	22 00.8	-26 54	0.568	2.90	351.8	-54.4	17.5	6	1
2419*	22 02.4	17 06	0.478	2.91	44.5	-30.8	16.9	5	1
2420	22 02.6	-12 54	0.537	2.91	13.6	-50.1	16.8	5	2
2421*	22 02.9	-11 24	0.534	2.91	15.7	-49.4	16.8	5	0
2422	22 03.3	05 39	0.501	2.92	35.0	-39.2	17.7	6	1
2423	22 03.4	05 04	0.502	2.92	34.4	-39.7	17.7	6	1
2424*	22 05.6	12 21	0.489	2.93	41.4	-34.9	17.4	6	1
2425	22 06.3	05 14	0.502	2.94	35.2	-40.1	17.7	6	1
2426	22 06.7	-11 06	0.533	2.94	16.8	-50.1	16.8	5	2
2427*	22 07.4	-24 35	0.560	2.95	356.2	-55.3	17.7	6	0
2428	22 08.6	-10 05	0.531	2.95	18.5	-49.9	17.2	5	1
2429	22 09.9	08 21	0.497	2.96	38.9	-38.5	17.7	6	2
2430*	22 10.6	-10 01	0.530	2.97	19.0	-50.3	17.6	6	0
2431	22 10.8	08 13	0.497	2.97	39.0	-38.9	17.7	6	2
2432	22 10.8	06 44	0.500	2.97	37.7	-39.8	17.7	6	1
2433*	22 11.4	13 18	0.488	2.97	43.5	-35.1	17.1	5	0
2434	22 11.5	-14 57	0.539	2.97	12.3	-52.9	17.0	5	1
2435	22 11.8	08 24	0.497	2.98	39.4	-38.8	17.7	6	1
2436	22 13.0	-03 32	0.518	2.98	27.6	-47.1	16.9	5	1
2437*	22 13.7	12 22	0.490	2.99	43.2	-36.2	17.5	6	0
2438	22 14.1	-16 19	0.541	2.99	10.7	-54.1	17.2	5	1
2439	22 15.1	-00 10	0.512	3.00	31.8	-45.3	17.5	6	1
2440*	22 15.4	-02 20	0.516	3.01	29.8	-47.0	16.0	4	0

2441	22	18.2	-04	03	0.519	3.02	28.2	-48.4	17.2	5	1
2442	22	18.2	-07	19	0.526	3.02	24.2	-50.4	17.2	5	1
2443*	22	19.1	16	37	0.484	3.02	47.8	-33.8	16.5	5	2
2444	22	19.5	-26	35	0.555	3.03	357.4	-58.0	17.9	5	1
2445*	22	20.8	25	06	0.468	3.03	53.8	-27.1	17.6	6	1
2446	22	22.2	-05	57	0.522	3.04	26.9	-50.4	17.2	5	1
2447	22	23.2	03	20	0.507	3.05	37.4	-44.4	17.7	6	1
2448*	22	24.1	-09	12	0.527	3.05	23.1	-52.7	16.0	4	0
2449*	22	25.3	14	09	0.490	3.06	47.3	-36.6	17.1	5	0
2450	22	25.4	-09	48	0.527	3.06	22.5	-53.3	18.0	6	1
2451*	22	25.9	02	40	0.508	3.06	37.4	-45.4	17.7	6	0
2452	22	26.1	-09	33	0.527	3.06	23.0	-53.3	18.0	6	1
2453*	22	26.3	15	51	0.487	3.07	48.8	-35.4	17.1	5	0
2454	22	26.9	05	03	0.504	3.07	40.0	-43.3	17.1	5	2
2455	22	27.1	-14	27	0.535	3.07	18.0	-56.0	17.2	5	1
2456	22	27.3	-16	03	0.537	3.07	13.5	-56.8	17.2	5	1
2457	22	28.4	00	44	0.511	3.08	36.1	-47.2	16.0	4	1
2458*	22	28.6	17	47	0.484	3.08	50.8	-34.2	16.9	5	0
2459*	22	28.8	-16	25	0.537	3.08	13.2	-57.3	16.0	4	0
2460	22	30.6	17	11	0.486	3.09	50.8	-35.0	16.9	5	1
2461	22	30.9	-21	52	0.546	3.09	3.9	-59.8	17.1	5	1
2462*	22	31.3	-18	07	0.539	3.09	10.8	-58.6	16.2	4	0
2463*	22	31.4	02	58	0.508	3.09	39.1	-46.1	17.7	6	0
2464	22	31.7	-04	43	0.519	3.10	30.7	-51.4	17.6	6	2
2465	22	32.0	-06	30	0.521	3.10	28.6	-52.6	17.8	6	1
2466*	22	32.6	-21	40	0.545	3.10	4.5	-60.1	17.7	6	0
2467*	22	32.8	05	39	0.504	3.10	41.7	-44.6	17.1	5	0
2468	22	33.2	07	28	0.501	3.10	43.8	-42.0	17.7	6	1
2469	22	33.3	11	31	0.495	3.10	47.2	-39.9	17.1	5	1
2470	22	33.5	16	30	0.488	3.11	51.0	-35.9	17.1	5	1
2471	22	34.5	06	31	0.503	3.11	43.3	-44.0	17.7	6	2
2472	22	34.8	16	47	0.488	3.11	51.6	-35.9	17.9	6	1
2473	22	34.8	-14	18	0.533	3.11	17.9	-57.6	17.6	6	2
2474	22	35.2	-20	58	0.543	3.12	6.2	-60.3	17.9	6	2
2475	22	35.3	06	43	0.503	3.12	43.7	-43.9	17.9	6	1
2476	22	35.9	13	02	0.494	3.12	49.1	-39.1	17.5	6	2
2477*	22	36.2	-17	53	0.538	3.12	12.1	-59.5	16.9	5	0
2478	22	36.8	-18	28	0.538	3.12	11.2	-59.9	17.3	4	1
2479*	22	38.0	16	27	0.489	3.13	52.1	-36.6	16.5	5	0
2480	22	38.3	-18	27	0.538	3.13	11.5	-60.2	16.9	5	1

2481	22 38.9	-22 25	0.544	3.13	3.9	-61.7	17.5	6	1
2482	22 39.6	-03 47	0.517	3.14	34.0	-52.9	17.0	6	2
2483	22 40.0	04 16	0.506	3.14	42.7	-46.6	17.9	6	1
2484	22 40.8	00 39	0.511	3.14	39.3	-49.4	18.0	6	1
2485*	22 40.8	-16 53	0.535	3.14	14.8	-60.1	17.2	5	0
2486*	22 41.5	16 24	0.490	3.15	52.9	-37.1	17.1	5	0
2487*	22 41.6	-21 44	0.542	3.15	5.7	-62.1	17.3	6	0
2488	22 41.6	-24 20	0.546	3.15	.9	-62.8	17.5	6	2
2489	22 41.7	-05 12	0.520	3.15	31.9	-54.3	18.0	6	1
2490	22 41.8	-04 34	0.518	3.15	33.6	-53.2	17.2	5	1
2491*	22 42.4	18 07	0.488	3.15	54.3	-35.8	17.5	6	0
2492*	22 42.7	-20 02	0.539	3.15	9.3	-61.8	16.5	5	0
2493*	22 42.8	-26 49	0.549	3.15	355.0	-63.6	17.1	5	0
2494	22 43.1	15 45	0.491	3.15	52.9	-37.9	17.4	6	1
2495*	22 43.2	10 08	0.498	3.16	46.7	-42.5	16.5	5	0
2496	22 43.2	-17 11	0.535	3.16	14.8	-60.7	17.2	5	2
2497*	22 43.4	-20 42	0.540	3.16	8.1	-62.2	17.4	6	0
2498	22 44.8	13 36	0.495	3.16	51.8	-39.9	17.9	6	1
2499	22 45.2	-26 45	0.548	3.16	355.4	-64.1	17.1	5	1
2500	22 45.9	-26 15	0.547	3.17	356.6	-64.2	18.9	5	1
2501	22 46.8	14 42	0.494	3.17	53.1	-39.2	17.9	6	1
2502	22 47.3	-17 20	0.534	3.17	15.5	-61.7	16.6	5	1
2503*	22 47.9	28 42	0.474	3.18	61.9	-27.3	16.4	4	0
2504*	22 48.5	-15 42	0.531	3.18	18.7	-61.2	17.2	5	0
2505	22 49.0	-01 19	0.514	3.18	39.5	-52.2	17.6	6	1
2506	22 49.4	12 34	0.497	3.18	52.2	-41.4	17.1	5	1
2507	22 49.4	04 44	0.506	3.18	45.8	-47.7	17.6	6	2
2508	22 50.1	13 43	0.496	3.19	53.3	-40.9	17.5	6	1
2509	22 50.1	-22 31	0.540	3.19	5.4	-64.2	17.1	5	1
2510	22 50.8	-00 20	0.512	3.19	41.2	-51.8	17.9	6	1
2511*	22 51.4	-08 24	0.522	3.19	31.3	-57.6	16.0	4	0
2512	22 52.3	09 20	0.501	3.20	50.6	-44.4	17.1	5	1
2513*	22 52.4	25 39	0.481	3.20	61.2	-30.6	17.9	6	1
2514	22 52.5	-23 59	0.541	3.20	2.5	-65.2	17.6	6	1
2515*	22 52.5	30 17	0.475	3.20	65.6	-26.4	17.6	6	3
2516	22 52.8	17 45	0.492	3.20	56.7	-37.4	17.1	5	1
2517*	22 52.9	09 32	0.501	3.20	51.2	-44.1	17.5	6	0
2518	22 53.0	-24 57	0.542	3.20	.3	-65.5	17.2	5	1
2519*	22 53.3	-15 52	0.530	3.20	19.7	-62.2	17.2	5	0
2520	22 53.5	19 14	0.497	3.20	53.8	-41.3	17.7	6	1

2521	22	54.9	-22	46	0.538	3.21	5.6	-65.3	16.9	5	2
2522	22	54.7	13	17	0.497	3.21	54.2	-41.5	17.7	6	1
2523	22	55.9	-17	57	0.532	3.21	16.3	-63.8	17.0	5	1
2524	22	56.0	16	52	0.493	3.21	57.0	-38.5	16.5	5	1
2525*	22	56.0	-11	22	0.524	3.21	36.2	-60.3	16.0	4	0
2526	22	56.3	-24	49	0.540	3.21	1.0	-66.2	17.4	6	1
2527	22	57.4	-26	06	0.541	3.22	358.8	-66.7	17.7	6	1
2528*	22	57.9	-22	11	0.536	3.22	7.5	-65.9	16.6	5	0
2529	22	58.7	-14	02	0.527	3.22	24.5	-62.4	17.2	5	2
2530	22	58.9	18	50	0.492	3.22	59.0	-37.2	17.1	5	1
2531	22	59.2	-22	28	0.536	3.22	7.1	-66.2	17.1	5	1
2532*	22	59.6	27	44	0.482	3.23	84.0	-29.3	17.8	6	1
2533	22	59.6	-16	00	0.529	3.23	21.1	-63.6	17.2	5	1
2534	22	59.8	-23	27	0.537	3.23	4.8	-66.7	17.5	6	2
2535*	23	00.0	39	53	0.464	3.23	69.7	-18.3	16.9	5	1
2536	23	00.0	-23	13	0.537	3.23	5.4	-66.6	17.5	6	2
2537	23	00.8	-02	58	0.515	3.23	41.3	-55.4	18.0	6	1
2538	23	00.9	-20	40	0.533	3.22	11.6	-66.0	16.3	5	1
2539	23	01.0	-22	16	0.535	3.23	7.9	-66.6	16.7	5	1
2540	23	01.7	-22	37	0.536	3.23	6.4	-66.9	17.1	5	1
2541	23	02.3	-23	45	0.536	3.24	4.5	-67.3	17.1	5	2
2542	23	02.3	-25	13	0.538	3.24	.8	-67.6	17.1	5	1
2543	23	02.4	-15	42	0.528	3.24	22.5	-64.0	17.2	5	1
2544*	23	02.7	-11	36	0.523	3.24	29.9	-61.7	17.2	5	0
2545*	23	02.8	04	37	0.508	3.24	49.7	-49.8	17.6	6	0
2546	23	03.0	-23	27	0.536	3.24	5.3	-67.4	17.1	5	2
2547	23	03.1	-21	55	0.534	3.24	9.1	-66.9	16.9	5	2
2548	23	03.6	-21	13	0.533	3.24	10.9	-66.8	16.8	5	1
2549	23	03.7	-13	36	0.525	3.24	26.8	-63.1	17.0	5	1
2550	23	03.8	-22	32	0.535	3.24	7.8	-67.3	16.9	5	2
2551	23	04.0	07	06	0.505	3.24	52.2	-47.9	17.5	6	1
2552	23	04.1	02	59	0.509	3.24	46.9	-51.4	18.0	6	2
2553	23	04.6	-25	44	0.538	3.24	359.7	-68.2	17.3	6	1
2554	23	04.7	-22	16	0.534	3.24	8.6	-67.4	16.9	5	3
2555	23	05.0	-23	00	0.535	3.25	6.8	-67.7	16.9	5	1
2556	23	05.3	-22	25	0.534	3.25	8.3	-67.5	16.9	5	1
2557	23	05.4	-17	46	0.529	3.25	19.1	-65.7	17.2	5	1
2558*	23	05.5	09	32	0.503	3.25	54.6	-46.0	17.1	5	0
2559	23	05.5	-14	29	0.526	3.25	25.7	-64.0	17.0	5	1
2560	23	05.6	-16	46	0.528	3.25	21.3	-65.2	17.5	6	2

2561*	23	05.4	13	56	0.499	3.25	56.0	-42.3	17.5	6	0
2562*	23	06.6	31	39	0.480	3.25	67.4	-26.4	17.4	6	1
2563*	23	06.8	-15	04	0.526	3.25	25.0	-54.6	17.2	5	0
2564*	23	07.5	13	19	0.500	3.25	57.8	-43.0	17.1	5	0
2565*	23	08.2	-21	35	0.532	3.26	10.2	-68.0	16.9	5	0
2566	23	08.3	-21	11	0.531	3.26	12.0	-67.8	16.9	5	1
2567*	23	08.8	-06	57	0.518	3.26	39.0	-59.7	18.0	6	0
2568*	23	09.3	-23	00	0.533	3.26	7.4	-68.6	16.9	5	0
2569	23	10.3	-13	40	0.524	3.26	28.8	-64.5	16.6	5	1
2570	23	10.7	03	11	0.511	3.26	49.1	-53.7	17.5	6	1
2571	23	11.1	-03	04	0.515	3.27	44.8	-57.2	17.6	6	1
2572*	23	11.2	17	57	0.497	3.27	61.7	-39.3	15.3	3	0
2573	23	11.8	-03	15	0.515	3.27	44.8	-57.4	17.6	6	1
2574	23	11.9	01	47	0.511	3.27	50.1	-53.6	17.8	6	1
2575	23	12.2	-22	58	0.531	3.27	8.5	-69.2	17.9	6	2
2576	23	12.3	-23	19	0.532	3.27	7.4	-69.4	17.5	6	2
2577	23	13.1	-23	46	0.532	3.27	6.3	-69.7	17.5	6	1
2578	23	13.3	-05	20	0.516	3.27	42.8	-59.3	17.0	6	1
2579	23	13.5	-22	22	0.531	3.27	10.1	-69.3	17.1	5	1
2580	23	14.0	-24	02	0.532	3.27	5.7	-69.9	17.1	5	1
2581	23	14.2	-17	46	0.526	3.27	21.7	-67.5	17.6	6	1
2582	23	14.4	02	09	0.511	3.28	51.3	-53.3	17.6	6	1
2583	23	14.6	-21	14	0.529	3.28	13.4	-69.1	17.1	5	1
2584*	23	14.9	26	46	0.490	3.28	67.2	-31.6	17.1	5	0
2585	23	15.1	-27	03	0.534	3.28	357.0	-70.8	17.5	6	2
2586*	23	15.6	-21	14	0.529	3.28	13.7	-69.4	17.1	5	0
2587	23	15.9	-22	13	0.530	3.28	8.3	-70.1	17.2	5	2
2588	23	16.4	08	22	0.506	3.28	57.1	-48.4	17.8	6	1
2589*	23	16.7	16	02	0.500	3.28	62.2	-41.6	15.3	3	0
2590	23	16.9	01	18	0.511	3.28	51.4	-54.5	17.5	6	1
2591	23	16.9	-00	30	0.512	3.28	49.7	-56.0	17.6	6	1
2592*	23	17.1	17	21	0.499	3.28	63.1	-40.5	16.5	5	0
2593*	23	17.2	13	51	0.502	3.28	61.1	-43.6	15.1	3	0
2594	23	17.2	07	17	0.507	3.28	56.6	-49.4	17.0	6	1
2595*	23	17.3	-21	20	0.528	3.28	13.0	-69.8	17.2	5	0
2596*	23	17.4	-24	13	0.531	3.28	5.8	-70.7	17.1	5	0
2597*	23	17.8	-12	55	0.521	3.28	32.9	-65.4	16.6	5	0
2598*	23	18.5	27	02	0.492	3.29	68.1	-31.7	17.1	5	1
2599	23	19.0	-24	35	0.530	3.29	5.0	-71.2	17.1	5	1
2600	23	19.1	-23	12	0.529	3.29	9.0	-70.8	17.1	5	1

2601	23	19.1	-25	14	0.531	3.29	3.0	-71.3	17.7	6	1
2602	23	19.5	20	31	0.497	3.29	65.4	-37.8	17.7	6	1
2603*	23	20.3	-26	09	0.531	3.29	.3	-71.8	17.7	6	0
2604*	23	20.9	-23	20	0.528	3.29	9.1	-71.2	17.1	5	0
2605	23	21.4	-24	10	0.529	3.29	6.7	-71.6	17.1	5	1
2606	23	22.0	-22	01	0.527	3.30	13.2	-71.0	17.1	5	1
2607*	23	22.4	10	30	0.509	3.30	60.6	-47.2	17.6	6	0
2608	23	22.9	-22	28	0.527	3.30	12.1	-71.4	17.1	5	1
2609	23	22.9	-26	54	0.530	3.30	358.2	-72.9	17.4	6	1
2610	23	23.1	16	29	0.502	3.30	64.3	-41.8	17.6	6	2
2611	23	23.2	19	50	0.499	3.30	66.1	-38.8	17.2	5	1
2612	23	23.3	-19	27	0.525	3.30	20.6	-70.2	17.7	6	2
2613	23	23.7	-13	45	0.521	3.30	33.6	-67.1	17.2	5	2
2614	23	25.3	-22	23	0.526	3.30	13.0	-71.9	17.3	6	1
2615	23	25.4	-24	22	0.527	3.30	6.8	-72.5	17.7	6	2
2616	23	25.9	04	49	0.509	3.30	57.7	-52.6	17.2	5	2
2617	23	26.0	08	41	0.507	3.30	60.6	-49.2	17.0	5	2
2618*	23	26.6	22	13	0.499	3.31	68.1	-36.8	15.9	4	0
2619*	23	26.7	21	11	0.500	3.31	67.7	-37.8	16.5	5	0
2620	23	26.8	06	07	0.509	3.31	59.0	-51.6	17.8	6	2
2621	23	27.1	19	06	0.501	3.31	66.8	-39.8	17.9	6	1
2622*	23	27.7	26	38	0.496	3.31	70.3	-32.6	15.9	4	0
2623	23	27.7	04	49	0.509	3.31	58.4	-52.9	17.2	5	3
2624	23	28.3	04	49	0.509	3.31	58.6	-52.9	18.0	6	2
2625*	23	29.0	19	44	0.501	3.31	67.6	-39.4	15.6	3	0
2626*	23	29.2	20	32	0.501	3.31	68.0	-38.8	15.2	3	0
2627	23	29.4	23	07	0.499	3.31	69.3	-36.2	17.1	5	1
2628	23	29.6	-24	58	0.526	3.31	5.6	-73.6	17.7	6	2
2629	23	30.1	-23	44	0.525	3.31	9.9	-73.4	17.5	6	2
2630*	23	30.2	15	02	0.504	3.31	65.7	-43.6	15.2	3	0
2631	23	30.2	-00	20	0.512	3.31	56.8	-57.6	18.0	6	3
2632	23	30.3	-10	02	0.517	3.31	43.0	-65.6	17.8	6	3
2633	23	30.8	12	24	0.506	3.31	64.5	-46.3	17.6	6	2
2634*	23	31.1	26	14	0.498	3.31	71.0	-33.4	13.8	1	1
2635	23	31.1	-14	11	0.519	3.31	35.9	-68.7	17.3	6	2
2636	23	31.3	-10	22	0.517	3.31	43.0	-66.0	17.8	6	2
2637	23	31.8	20	40	0.502	3.32	68.9	-38.7	16.6	5	1
2638	23	33.0	-12	31	0.518	3.32	40.0	-67.9	17.2	5	2
2639	23	33.1	09	43	0.508	3.32	63.7	-49.0	17.7	6	2
2640	23	33.2	18	52	0.503	3.32	68.5	-40.5	16.7	5	1

2641	23 33.3	-25 39	0.525	3.32	3.9	-74.6	17.7	6	2
2642*	23 33.4	-11 35	0.517	3.32	41.9	-67.2	16.8	5	0
2643	23 33.7	19 39	0.503	3.32	69.0	-39.8	17.7	6	1
2644	23 33.7	-00 43	0.512	3.32	56.0	-58.4	16.6	5	1
2645	23 33.9	-09 51	0.517	3.32	45.0	-66.0	18.0	6	4
2646	23 33.9	-10 49	0.517	3.32	43.4	-66.7	17.6	6	3
2647*	23 34.0	25 00	0.500	3.32	71.2	-34.6	17.1	5	0
2648	23 34.1	-15 17	0.519	3.32	35.0	-70.0	17.6	6	1
2649	23 34.2	23 53	0.501	3.32	70.9	-35.9	16.9	5	1
2650*	23 34.3	25 16	0.500	3.22	71.4	-34.5	17.1	5	1
2651	23 34.6	20 16	0.503	3.32	69.5	-39.3	16.9	5	2
2652	23 35.8	-11 11	0.517	3.32	43.7	-67.3	17.7	6	3
2653	23 36.4	13 25	0.507	3.32	66.8	-45.9	17.7	6	1
2654	23 36.8	-08 12	0.515	3.32	48.8	-65.1	17.2	5	2
2655	23 36.9	-22 41	0.521	3.32	15.4	-74.5	17.1	5	2
2656*	23 37.4	-04 55	0.514	3.32	52.2	-62.5	16.2	4	0
2657	23 37.5	02 21	0.509	3.33	64.4	-50.7	14.9	3	1
2658	23 37.5	-13 07	0.517	3.33	41.1	-69.0	17.4	6	3
2659	23 37.6	-16 17	0.518	3.33	34.4	-71.2	17.0	5	1
2660*	23 37.7	-26 47	0.523	3.33	.2	-75.7	16.4	4	0
2661	23 39.2	-11 14	0.516	3.33	45.3	-67.9	17.8	6	3
2662	23 42.1	15 37	0.507	3.33	69.7	-44.3	17.5	6	1
2663	23 42.2	-25 32	0.520	3.33	6.0	-76.5	17.5	6	2
2664	23 42.7	-04 26	0.513	3.33	56.3	-62.3	17.7	6	2
2665*	23 43.3	05 19	0.511	3.33	64.7	-54.0	15.8	4	0
2666*	23 43.6	26 21	0.504	3.33	74.2	-34.1	13.8	1	0
2667	23 44.3	-26 49	0.520	3.33	.9	-77.2	17.9	6	3
2668	23 44.8	13 15	0.508	3.33	69.5	-46.7	17.1	5	2
2669	23 45.4	02 23	0.511	3.33	63.3	-57.0	17.8	6	1
2670	23 46.7	-11 13	0.515	3.34	49.3	-69.0	15.7	4	3
2671	23 47.6	04 37	0.511	3.34	65.9	-55.1	16.9	5	2
2672	23 47.8	25 39	0.506	3.34	75.1	-35.0	17.1	5	1
2673	23 47.9	01 08	0.512	3.34	63.6	-58.3	18.0	6	1
2674	23 48.1	00 57	0.512	3.34	69.6	-58.5	17.9	6	2
2675	23 48.2	10 26	0.510	3.34	69.5	-49.5	16.4	4	1
2676*	23 48.3	05 15	0.511	3.34	66.6	-54.6	16.8	5	0
2677*	23 48.5	23 34	0.505	3.34	77.5	-27.4	17.5	6	1
2678*	23 48.8	10 52	0.510	3.34	69.7	-49.3	16.9	5	0
2679	23 49.0	-21 11	0.516	3.34	25.8	-76.3	17.7	6	2
2680	23 49.0	-21 51	0.516	3.34	23.3	-76.7	17.7	6	2

2681	23	49.9	-25	09	0.517	3.34	9.7	-78.1	17.9	6	1
2682	23	50.0	-21	22	0.516	3.34	25.6	-78.4	17.5	6	1
2683*	23	50.1	-26	22	0.517	3.34	8.9	-78.4	18.9	5	0
2684	23	50.7	-11	20	0.514	3.34	51.4	-69.7	17.6	6	2
2685	23	51.0	-25	13	0.516	3.34	9.7	-78.4	17.9	6	1
2686	23	51.9	-21	37	0.515	3.34	25.7	-77.1	16.9	5	1
2687*	23	52.7	31	22	0.508	3.34	77.9	-29.7	16.7	5	1
2688	23	52.7	15	02	0.510	3.34	72.9	-45.6	17.5	6	3
2689	23	52.7	-16	33	0.514	3.34	42.1	-74.1	18.0	6	2
2690*	23	52.9	-25	57	0.515	3.34	6.6	-79.0	17.2	5	0
2691*	23	53.9	-03	54	0.513	3.34	62.3	-63.6	16.6	5	0
2692	23	54.6	11	15	0.511	3.34	72.1	-49.4	17.8	6	1
2693	23	54.7	-20	22	0.514	3.34	32.0	-77.0	17.5	6	1
2694	23	55.1	07	38	0.511	3.34	70.6	-52.9	17.0	5	3
2695	23	55.3	17	57	0.511	3.34	74.8	-42.9	17.7	6	2
2696*	23	55.9	00	06	0.512	3.34	66.5	-60.1	18.9	5	0
2697	23	55.9	-06	55	0.513	3.34	60.3	-66.5	17.2	5	2
2698	23	56.0	03	50	0.512	3.34	68.9	-56.9	17.0	5	2
2699	23	56.3	-16	05	0.513	3.34	45.6	-74.3	17.6	6	1
2700	23	56.4	01	16	0.512	3.34	67.5	-59.0	16.0	4	1
2701	23	56.8	-10	24	0.513	3.34	56.5	-69.7	17.6	6	1
2702*	23	57.4	30	36	0.511	3.34	78.9	-30.7	17.1	5	0
2703*	23	57.9	15	18	0.511	3.34	74.8	-45.7	17.1	5	0
2704	23	58.1	-12	41	0.513	3.34	53.7	-71.8	17.7	6	2
2705	23	58.5	15	00	0.512	3.34	74.9	-46.0	17.1	5	1
2706	23	58.6	10	20	0.512	3.34	73.2	-50.5	17.2	5	1
2707	23	58.9	-11	13	0.512	3.34	56.6	-70.7	17.6	6	1
2708	23	59.1	-17	44	0.512	3.34	43.3	-76.0	17.4	6	2
2709	23	59.2	-10	47	0.512	3.34	57.4	-70.3	17.2	5	1
2710	23	59.2	-16	11	0.512	3.34	47.4	-74.8	17.2	5	1
2711	23	59.5	24	18	0.512	3.34	77.9	-37.0	17.5	6	1
2712	23	59.5	-18	53	0.512	3.34	40.2	-76.9	17.9	6	1

PART II

The Distribution of Rich Clusters of Galaxies

J. Selection of Statistical Sample

From the catalogue of rich clusters (Table 6) those clusters were selected which meet the criteria for inclusion in a statistical sample as outlined in detail in section B. To summarize, these criteria are:

(i) The cluster must contain at least fifty members not more than two magnitudes fainter than the third brightest member.

(ii) These fifty members must be included with a radius on the plate of $4.6 \times 10^5 / c d\lambda/\lambda$ mm from the center of the cluster (c in km/sec).

(iii) The cluster must have a redshift (as estimated from the magnitude of its tenth brightest member) in the range from 6000 to 60,000 km/sec.

(iv) The cluster must not be near the galactic equator; specifically, its galactic latitude must be in the range indicated in Table 1.

A total of 1682 clusters were found in Table 6 which meet the above criteria, and these clusters were used in the statistical analysis described in the following sections.

K. Distribution of Clusters According to Richness

The distribution of the 1682 clusters according to their richness classifications is tabulated in Table 7, and illustrated by the histograms in figures 5 and 6. (Figure 6 is on a logarithmic scale.) The data indicate that the number N(n) of clusters of n members each (not more than two magnitudes fainter than the third brightest member) increases rapidly as n decreases, logN(n) being approximately inversely proportional to n. Furthermore, during the course of the plate inspections, many thousands of clusters and groups of galaxies were recognized which were not catalogued because they obviously were not sufficiently rich to insure their essentially complete identification. Thus neither the statistical sample of clusters nor a subjective impression indicates a maximum in the N(n)-n relation.

Table 7

Distribution of Rich Clusters of Galaxies
According to Richness Classification

Richness Group No.	Number of Clusters N(n)	Logarithm of Number, Log N(n)
1	1224	3.088
2	383	2.583
3	68	1.832
4	6	0.778
5	1	0.000
Total	1682	3.226

L. Distribution of Clusters According to Distance

The distribution of clusters in depth is assumed here to be equivalent to the distribution of clusters according to the magnitudes of their tenth brightest members, N(m). Since, because of step scale errors, magnitude estimates are not significant to a tenth, the

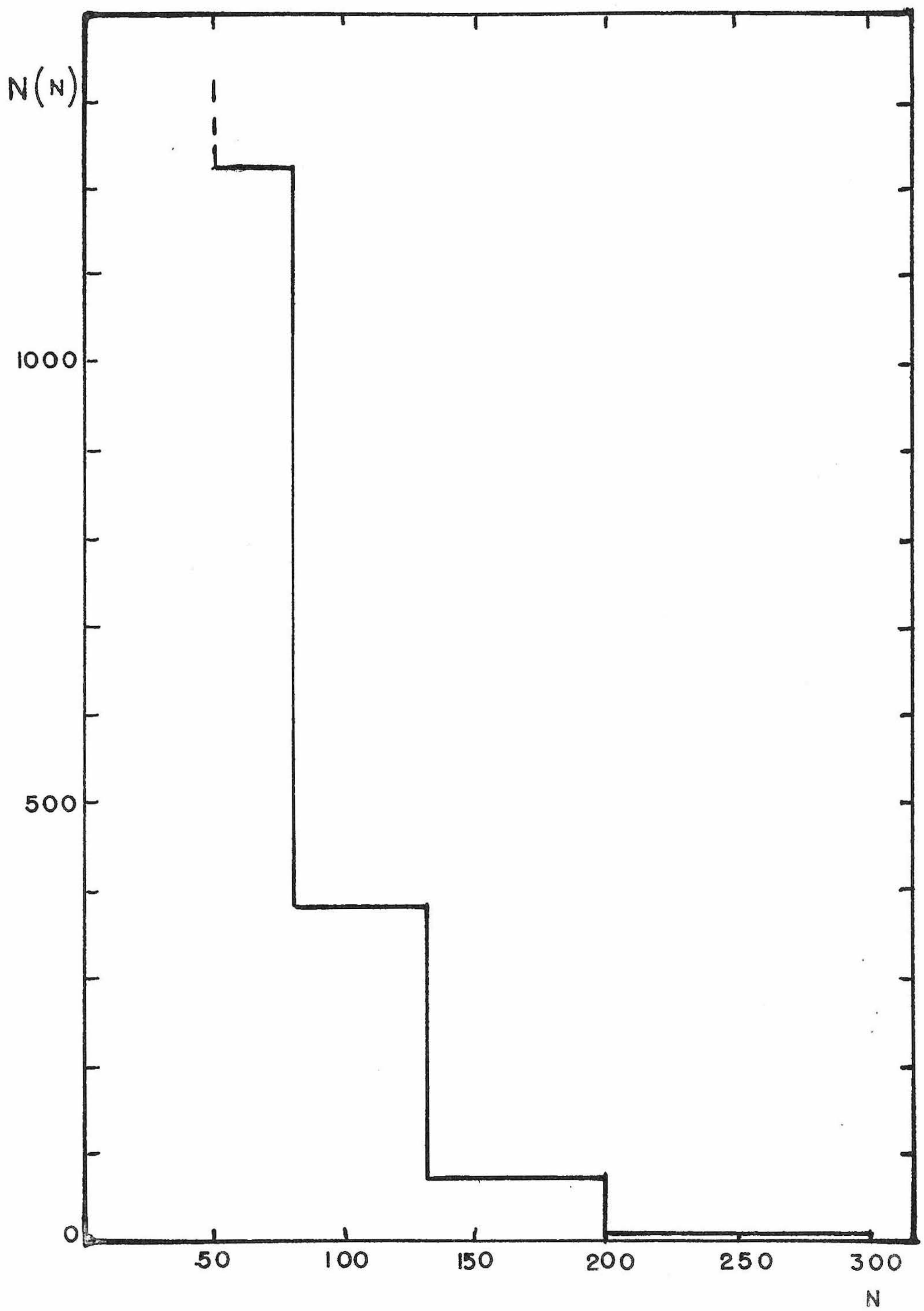

FIGURE 5. N(n) vs n

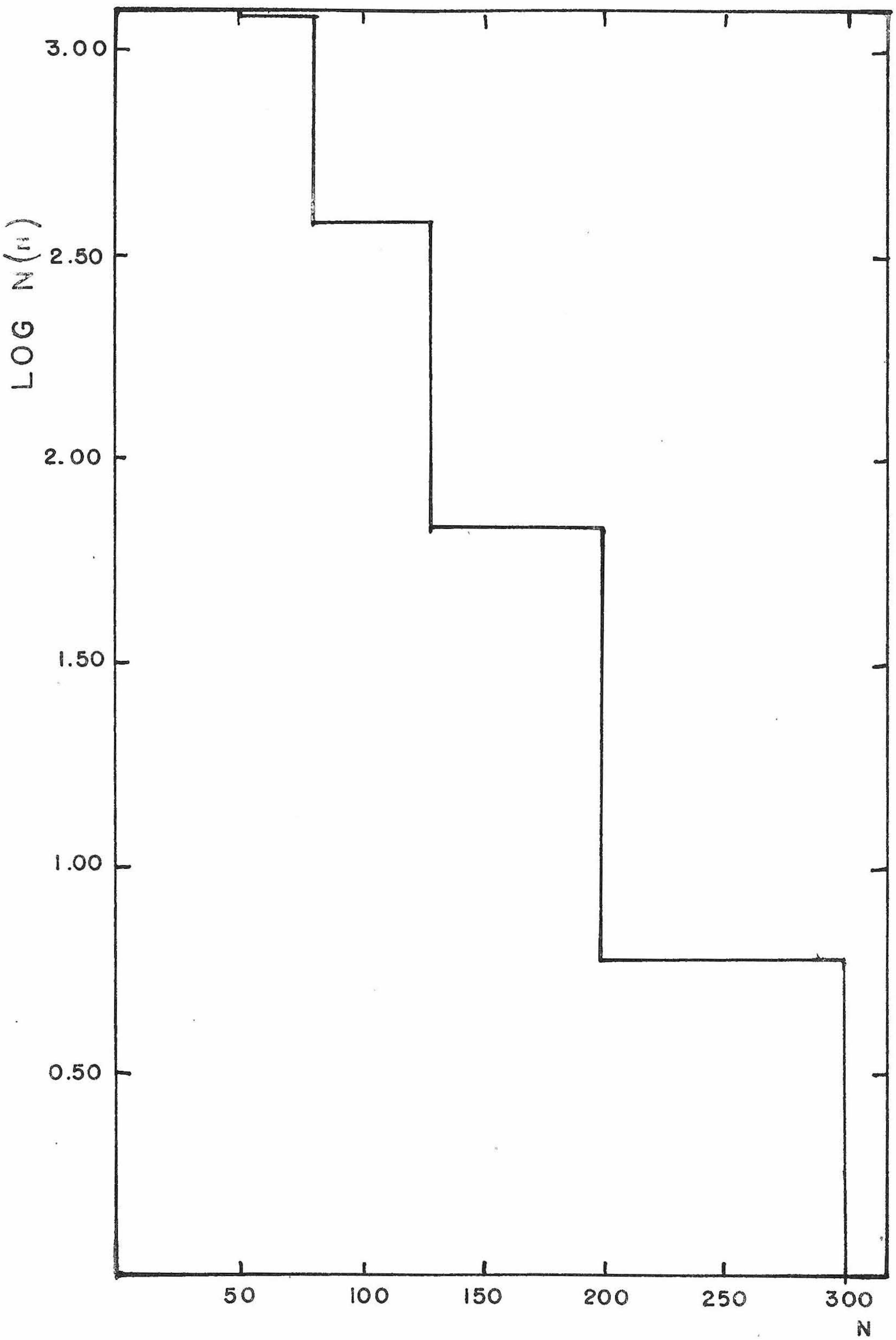

FIGURE 6. LOG N(n) VS n

magnitudes are classified for the purposes of this investigation. Thus N(m) is meant to indicate the number of clusters whose tenth brightest members lie in a magnitude class m. In Table 8 the distribution of clusters with magnitude class is given, if the magnitude classes are taken as the distance groups defined in Table 5, section H. The distribution is also illustrated in the histogram in figure 7. To obtain the distribution with a somewhat finer division of magnitudes the clusters were also grouped into intervals of 0.3 magnitudes for their tenth brightest members, and the corresponding distribution is displayed in the histogram in figure 8.

Table 8

Distribution of Clusters with Distance Group

Distance Group	Number Clusters N(m)	Log N(m)
1	9	0.954
2	2	0.301
3	33	1.518
4	60	1.778
5	657	2.818
6	921	2.964

The dashed lines in figures 7 and 8 have the slope 0.6 which would be the slope of log N(m) vs m if the cluster distribution were uniform in depth and if the tenth brightest members of all clusters were of the same absolute magnitude, and if there were no redshift (32). The crosses superimposed on the histogram in figure 7 indicate the computed mean magnitude of the clusters within each distance group. For future reference, those mean magnitudes are listed in Table 9. The values of $cd\lambda/\lambda$ corresponding to those mean magnitudes, as read off the curve in figure 4, are also given in Table 9.

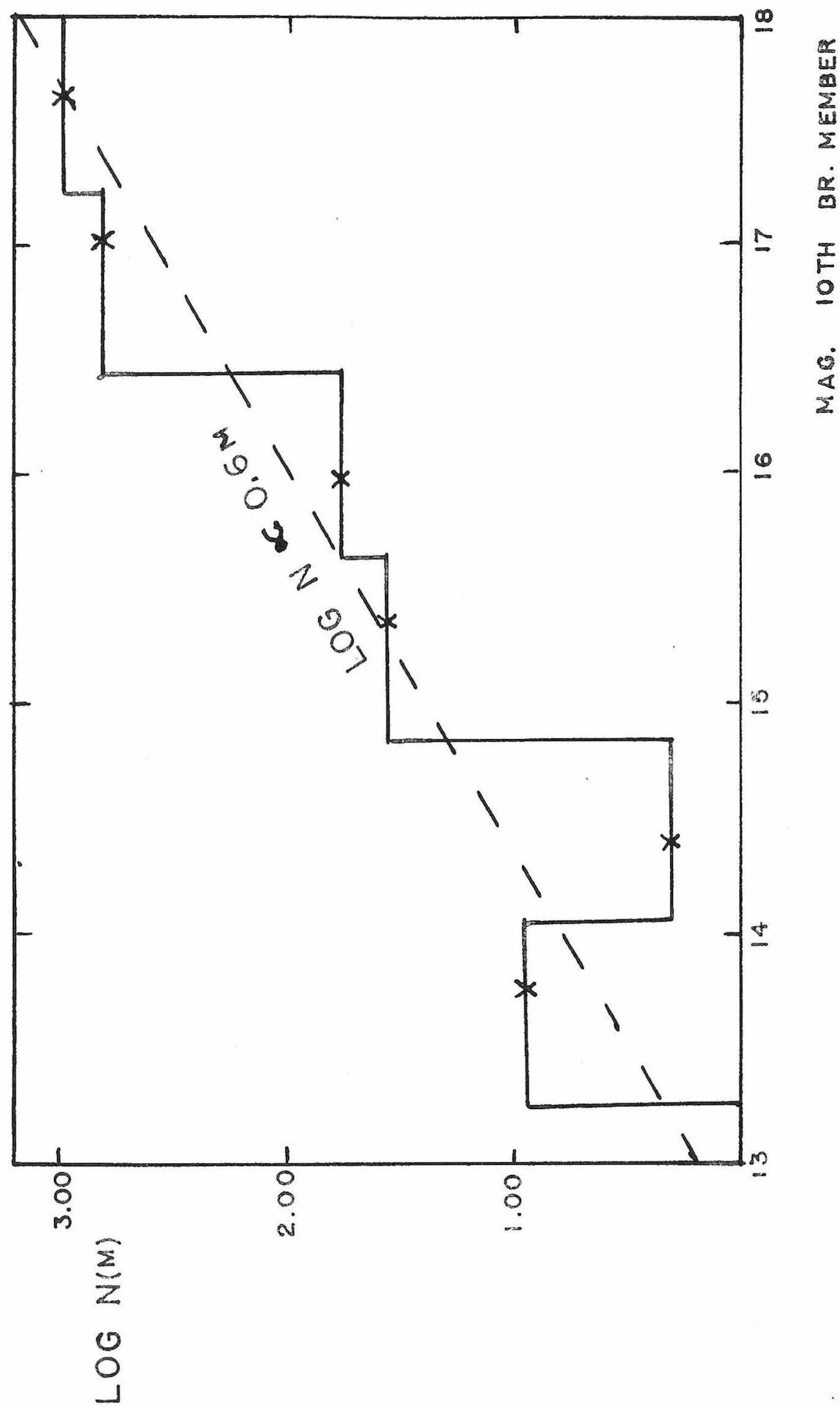

FIGURE 7. LOG N(M) VS M

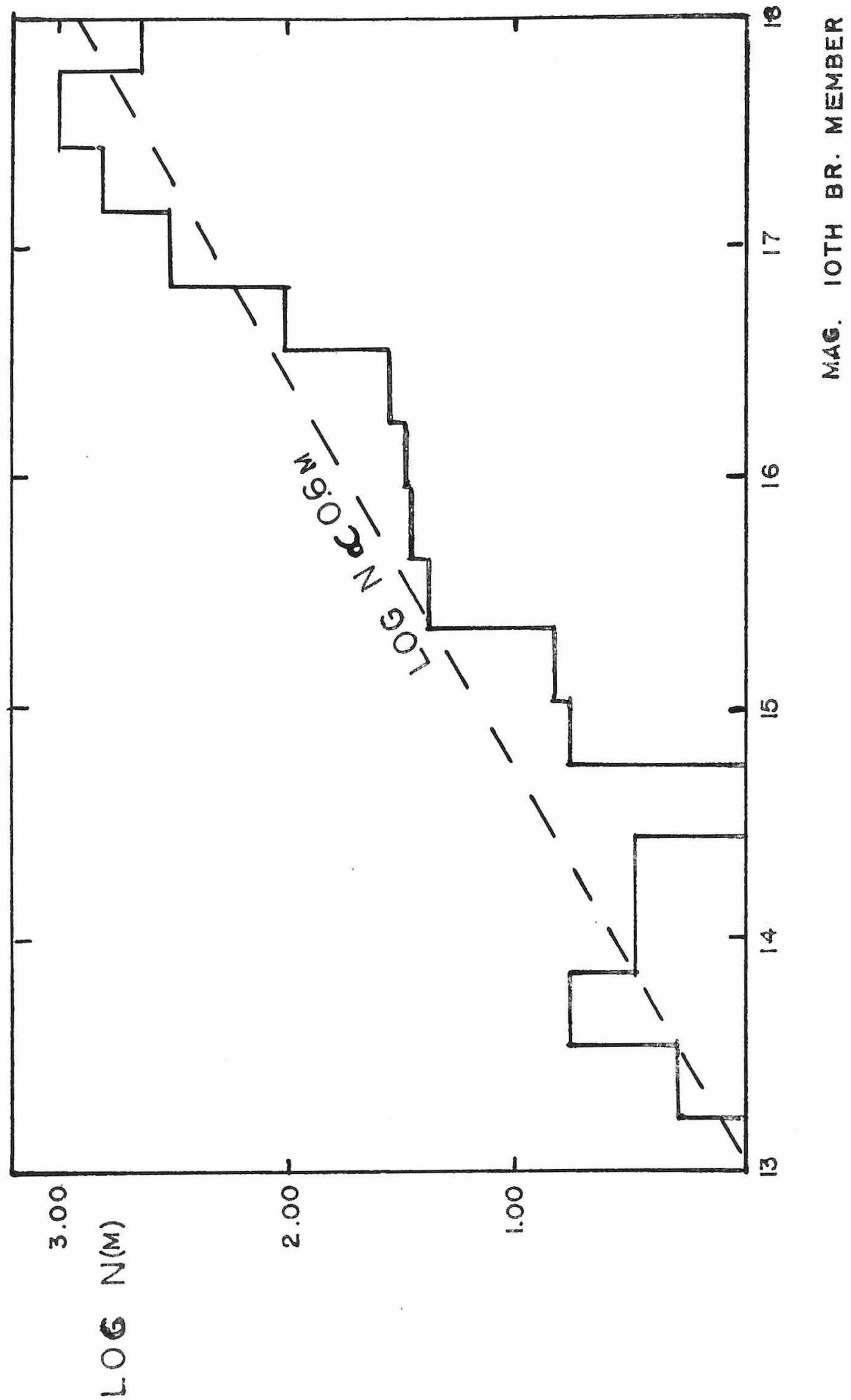

FIGURE 8. LOG N(M) VS M

Table 9

Mean Magnitudes of Clusters Within Each Distance Group

Distance Group	Magnitude	$c\frac{d\lambda}{\lambda} \times 10^{-3}$
1	13.76	8.1
2	14.40	11.4
3	15.36	20.0
4	15.96	27
5	17.02	42
6	17.64	54
1 to 4	15.54	21.6

In figures 7 and 8 it is seen that there is some departure of the observed distribution from that of perfect uniformity. It is of interest to determine whether the apparent departure from uniformity persists for all richness groups. Table 10 shows the cluster distribution among distance groups for the various richness groups. These distributions are illustrated graphically in figure 9.

Table 10

Distribution of Clusters by Distance Group and Richness Group

Distance Group	Richness Group				
	1	2	3	4	5
1	5	4	0	0	0
2	2	0	0	0	0
3	26	7	0	0	0
4	49	9	2	0	0
5	517	122	18	0	0
6	625	241	48	6	1

Inspection of Table 10 or figure 9 reveals that the departures from uniformity, especially for the faint magnitudes, are not

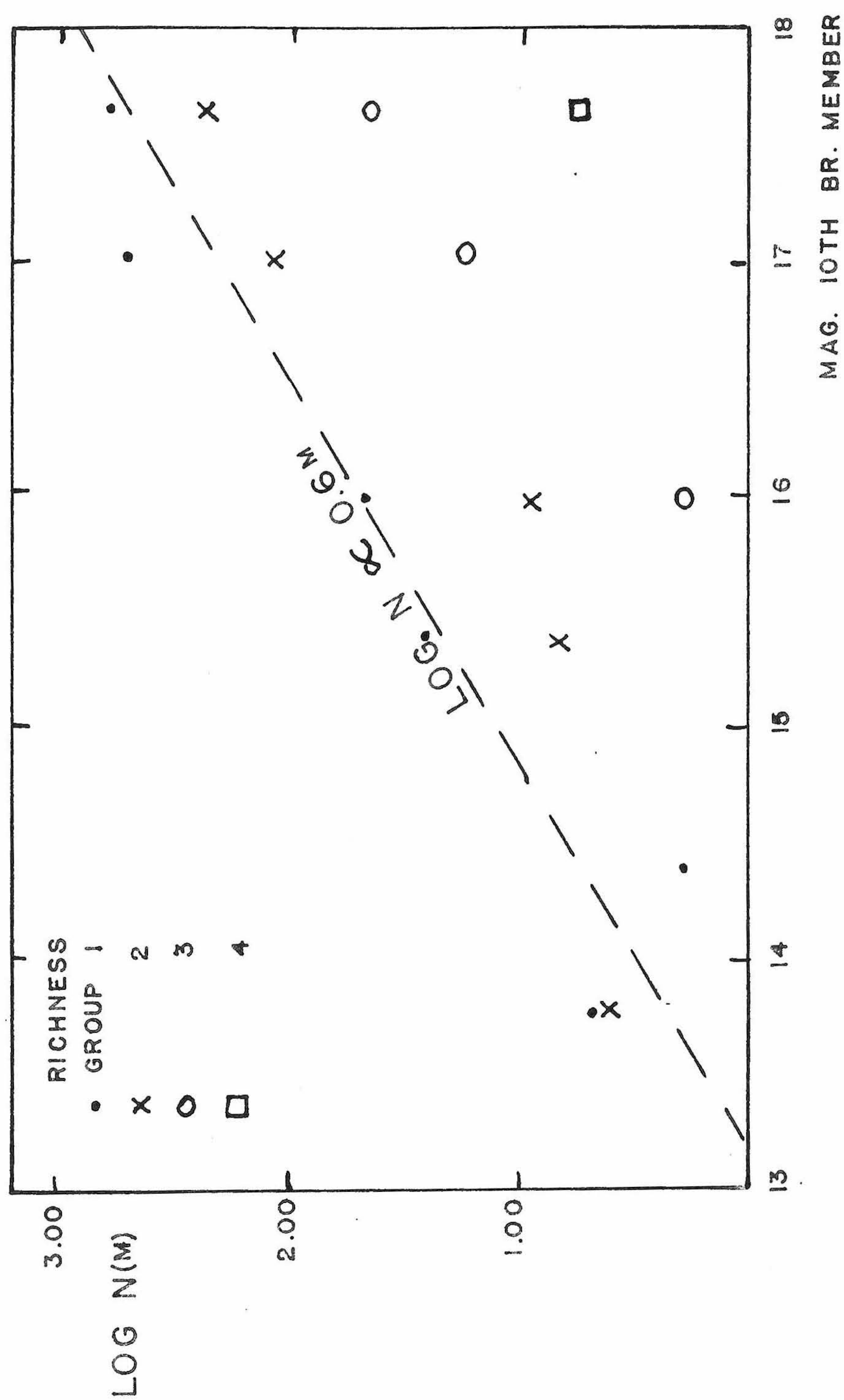

FIGURE 9. LOG N(M) VS M

important except for richness group 1. In particular, it appears that there are fewer by about a factor of two than the expected number of clusters belonging to distance group 6 and richness group 1. However, there is not a particular shortage of faint clusters in the other richness groups. Because the distribution function N(m) is, in principle, an important test of various cosmological models (33) it is important to investigate whether or not the observed departure from uniformity is really significant.

There are several possible explanations for the shortage of faint clusters in richness group 1, aside from those of cosmological significance. Firstly, it is possible that the identification of faint clusters of that richness on the Sky Survey plates was incomplete. In view of the precautions taken to avoid such incompleteness, however (see sections B and F), it would seem incredible that half or so of the clusters under consideration would have been missed. A second possibility is that interstellar obscuration dims many faint clusters sufficiently so that less than two magnitudes beyond their third brightest members are visible on the plates. One would expect such an effect to reduce the number of faint clusters in other richness groups as well. However, the numbers of clusters in richness groups 2 to 5 are comparatively smaller, and figures concerning these groups have less statistical significance. Furthermore, the form of the distribution function of clusters according to richness, N(n) (figure 5), is such that a relatively larger percentage of the clusters in richness group 1 occurs near the lower boundary of the group interval and would appear, because of obscuration, to belong to a lower group than is the case for the other richness groups.

Two further possible explanations for the shortage of faint clusters are the possibility of intergalactic obscuration, and the possibility of a large scale nonrandom distribution of cluster centers, in the latter which case one would not expect that a survey to a limited depth in space would reveal a perfect uniformity in cluster distribution.

Irregular galactic obscuration produces an obvious effect on the cluster distribution (next section). Furthermore, in several later sections evidence is presented that the cluster centers are, indeed, not randomly distributed in space. Therefore, it is considered that no particular significance can be placed upon the apparent shortage of distant clusters. Within the accuracy and sensitivity of the present observational data, there is no evidence that the distribution of matter with depth in space departs radically from uniformity.

M. Effect of Galactic Obscuration

The surface distribution of all clusters in the catalogue (Table 6) which belong in distance groups 1 to 6 inclusive and richness groups 1 to 5 inclusive, is displayed in figure 10. A dotted line irregularly outlining the Milky Way indicates the region of the sky in which clusters are not included in the statistical sample. The solid line indicates the circle of declination $\delta = -27^{\circ}$ below which the Palomar Sky Survey does not reach.

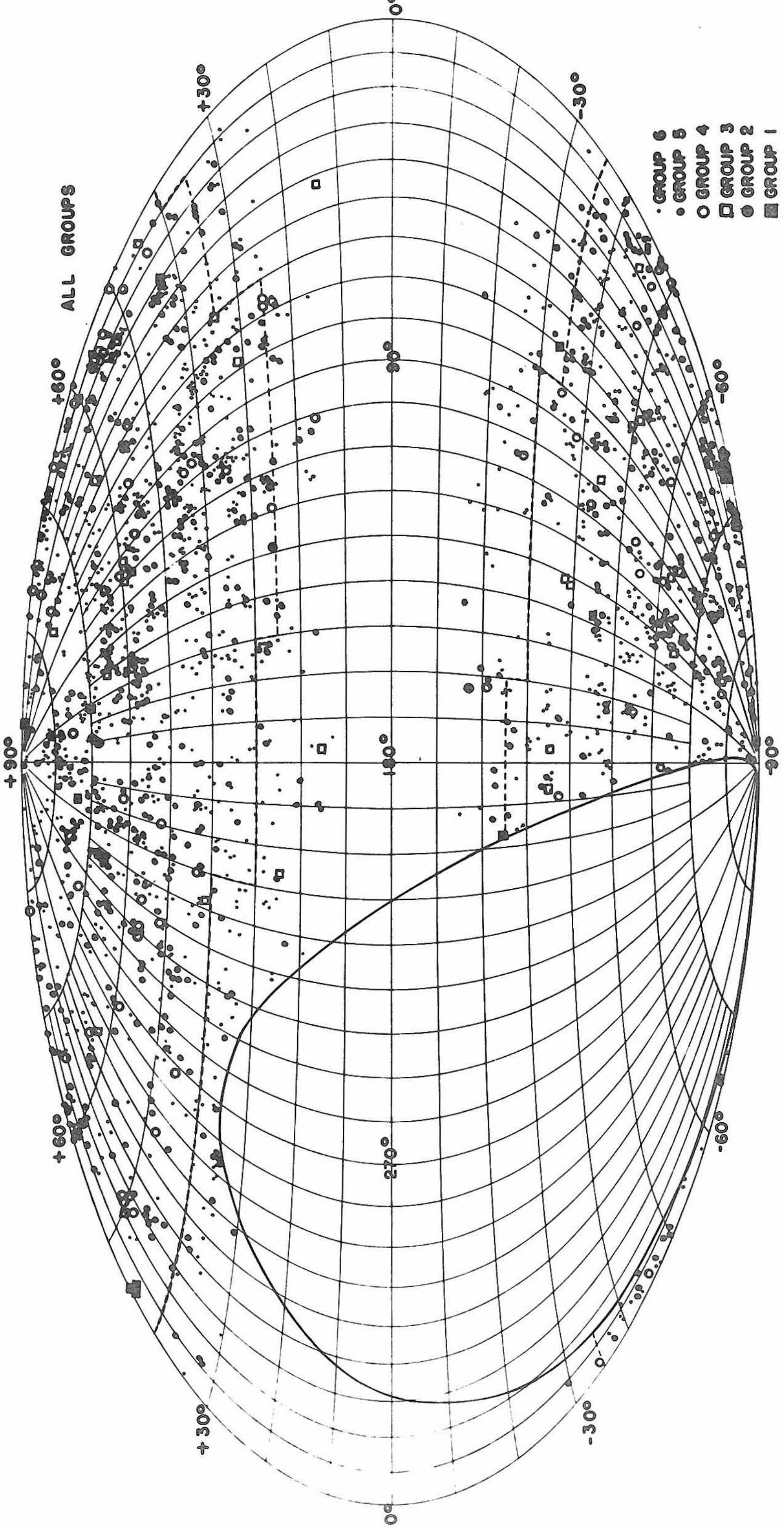

FIGURE 10. CLUSTER DISTRIBUTION

Two effects of galactic obscuration are apparent in figure 10. The gradual thinning of clusters as lower galactic latitudes are approached is the expected result from the plane parallel model of galactic obscuration. In addition, the significant shortage of clusters in the north galactic hemisphere around galactic longitude 300° indicates the presence of considerable galactic obscuration at high latitudes. In the same region Shane and Wirtanen (34) have obtained low galaxy counts, and various radio surveys (35) have also revealed relatively high radio emission. Both of these observations indicate the presence of interstellar material.

The variation of the areal density of cluster centers with galactic latitude is displayed in Table 11. The logarithms of the numbers of cluster centers per square degree are entered in the table. The effect of galactic obscuration is to hide clusters, especially the more distant ones, and to an increasing degree as the line of sight approaches the galactic equator. In no field north of $b = +40^{\circ}$ or south of $b = -40^{\circ}$ was the obscuration apparent from the appearance of the survey plate.

To investigate quantitatively the variation of the areal density of cluster centers of different groups with galactic longitude, counts were made of the numbers of cluster centers of distance groups 5 and 6 north of $b = +40^{\circ}$ and south of $b = -40^{\circ}$ and in strips of galactic longitude 20° wide. The results are illustrated in figure 11. The obscuration of faint clusters in the region around longitude 300° is very apparent.

To obtain an estimate of the amount of obscuration in the longitude

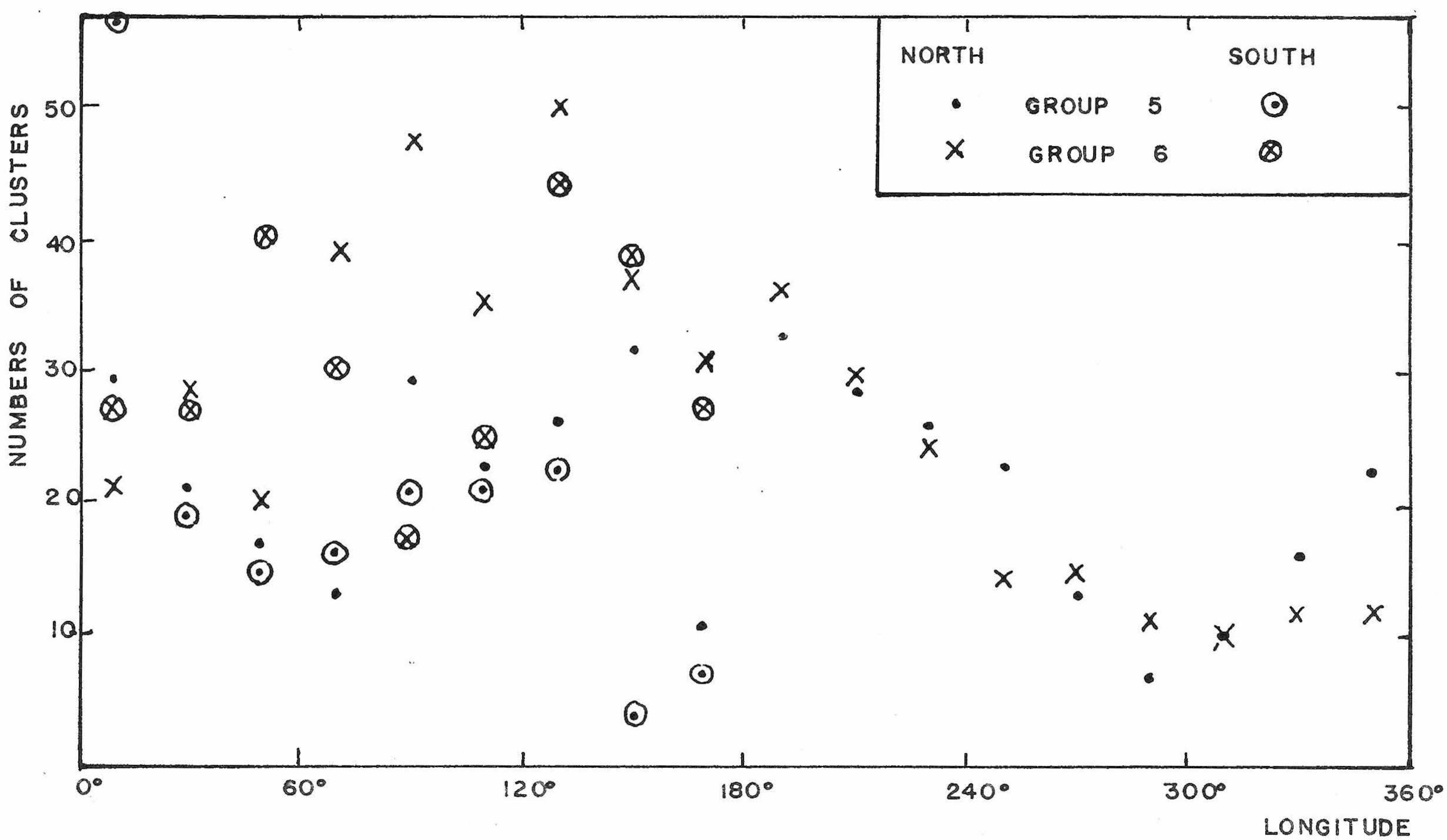

FIGURE 11. COUNTS AS FUNCTION OF GALACTIC LONGITUDE

Table 11

Density of Cluster Centers (Logarithm of Number per Square Degree) as a Function of Galactic Latitude and Distance Group

b	Distance Group: 1 and 2	3	4	5	6
$+80^\circ$ to $+90^\circ$	-2.50	$-\infty$	$-\infty$	-1.38	-0.87
+70 +80	-2.67	-2.67	-2.13	-1.21	-1.15
+60 +70	-2.88	-2.48	-2.34	-1.15	-1.13
+50 +60	$-\infty$	-2.36	-2.08	-1.27	-1.26
+40 +50	-2.71	-2.93	-2.50	-1.46	-1.28
-40° to -50°	-3.11	-2.80	-2.33	-1.42	-1.20
-50 -60	$-\infty$	-3.01	-2.41	-1.50	-1.15
-60 -70	$-\infty$	-2.40	-2.28	-1.09	-1.17
-70 -80	$-\infty$	-2.67	-2.37	-1.22	-0.90
-80 -90	$-\infty$	-2.20	$-\infty$	-1.24	-1.12

zone around 300° as compared with the less obscured areas of the sky, the distribution function N(m) was determined separately for clusters in the longitude ranges 100° to 180° and 260° to 340°, and in both cases, north of $b = +40^\circ$. Log N(m) vs m (m being the mean magnitude of a distance group, given in Table 9) is plotted for both longitude zones in figure 12. The solid lines are the least squares fits of the lines log N(m) = constant + 0.6m to the two sets of plotted points. The two lines are displaced with respect to each other by about 0.6 magnitudes. Although the numbers involved are too small to place much statistical significance to this value, the data do suggest galactic obscuration around longitude 300° and extending well north of latitude $+40^\circ$ of the order of a few tenths of a magnitude (in the photored) more than in comparable latitudes halfway around the sky.

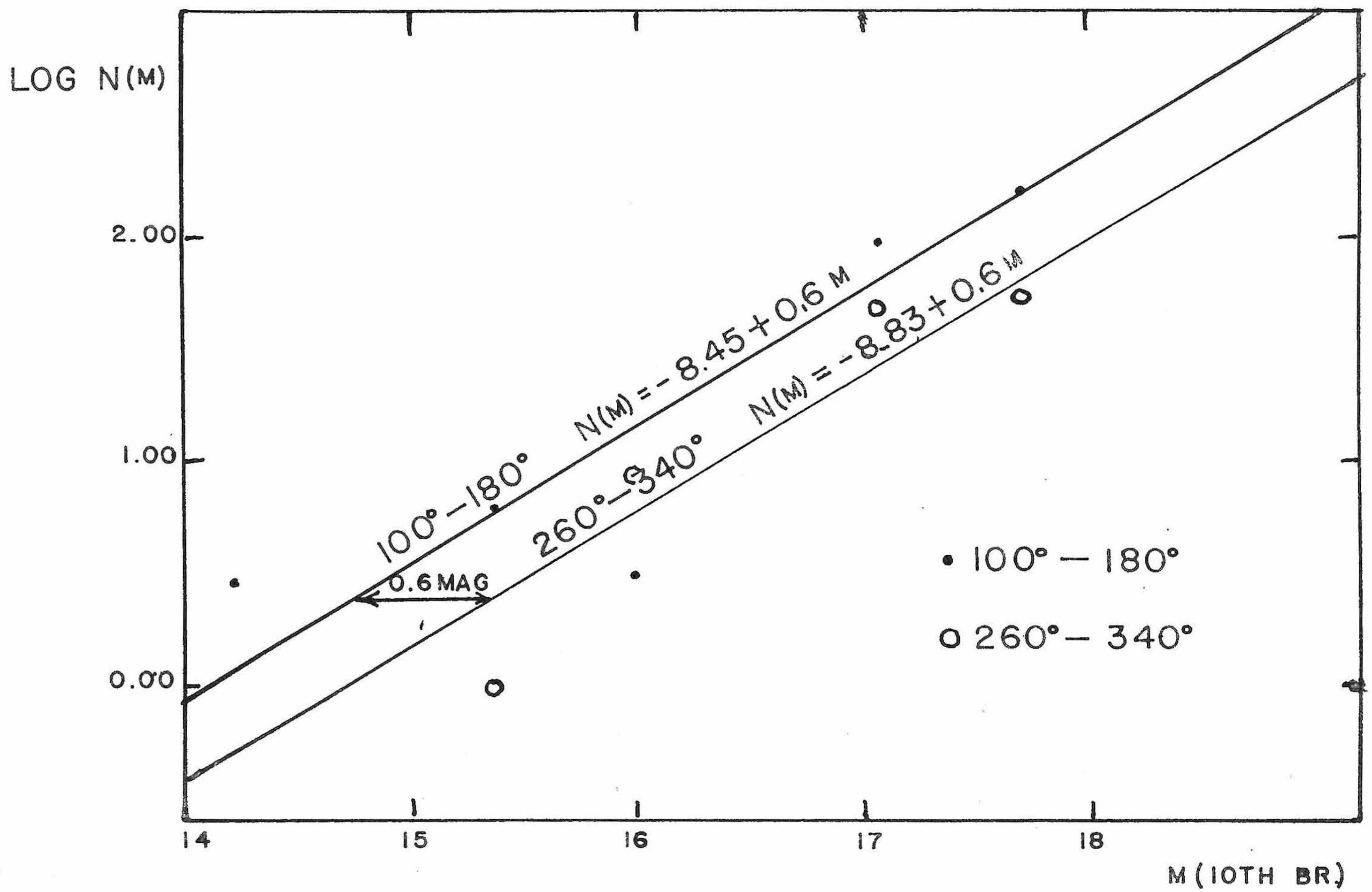

FIGURE 12. OBSCURATION AT LONGITUDE 300°

N. Distribution of Clusters in Direction in Space

Figure 10 shows the surface distribution of cluster centers of all groups used in the statistical sample. The plot is in galactic coordinates on an Aitoff Equal Area Projection of the sphere. It is noted that there are certain areas of the sky comparatively sparse in clusters, an effect which can be attributed to galactic obscuration, as discussed in the last section. In addition, however, there appears to be a relatively small scale clumpiness in the distribution of clusters which suggests that the clusters themselves may be clustered.

Shane and Wirtanen (34) have indicated several clouds of clusters of galaxies that appear to be second-order clusters on the Lick plates. On the other hand, Zwicky, who has investigated the distribution of clusters in certain areas in the sky, has also discussed this possibility of second-order clustering of galaxies. His conclusions have been stated (36):

> "The statistical investigation of the distribution of cluster centers shows that there is no systematic clustering of clusters. Any apparent superclusters such as those in Corona Borealis and in Perseus-Pisces must be considered accidental in the sense of being expected in the proper frequency in a random distribution of noninteracting objects."

It is appropriate, therefore, to investigate the actual distribution of clusters in the present sample. The procedure adopted was to superpose a rectangular grid over the Aitoff plot (figure 10) and to count the number of cluster centers in square grid cells in order to determine the distribution N(t) of cells containing t clusters each.

There is a source of error in this technique which might be of importance. Owing to the nature of the Aitoff projection, the area of the sky included in each grid cell is the same. However, although areas are preserved in the projection, linear dimensions are not. A cell near the center of the chart will cover a more or less square area in the sky, but near the edge of the chart a square cell covers an elongated area of the sky. In the extreme cases, the elongation is approximately a factor of two. If the distribution of cluster centers were strictly random, the shape of the cells would make no difference in the counted distribution. On the other hand, Neyman, Scott, and Shane have investigated the matter with galaxy counts on the 20-inch astrographic plates made at the Lick Observatory, and found that the details of a nonrandom distribution do depend upon the shape of the cells.

For several reasons this source of error is not considered important in the present investigation. The elongation of the cells is appreciable only in a relatively small fraction of the sky, and in the worst cases it reaches only a factor of two. Neyman, Scott, and Shane find that the distribution of galaxies on the Lick plates is not seriously affected by this moderate amount of cell elongation, and furthermore, the distribution is changed in the direction of appearing <u>more random</u> with elongated cells. One can intuitively understand this result for the case where the "clumps" of galaxies appear to have circular symmetry on the plates. Then elongated cells would tend to include galaxies from a larger number of such clumps, and the nonuniformities in the distribution would be slightly smoothed out. In the case under consideration of clusters of galaxies, if the distribution is completely random the cell shapes do not matter; if the distribution is nonrandom, the nonrandomness will be underestimated by the inclusion of some elongated cells. Thus any estimate of the degree of nonrandomness will be a conservative one.

The Aitoff charts used were projected from a sphere 10 cm in radius. The cell size used for the counts on figure 10 was one quarter inch squared, which corresponds to 13.2 square degrees in the sky. The counted distribution is shown in the upper histogram on figure 13. Also shown (dashed histogram) is the Poisson distribution,

$$P(t) = \frac{e^{-m} m^{t}}{t!} , \qquad (14)$$

which would be expected for a random distribution of noninteracting objects. Here the mean number of clusters per cell, m, was computed from the sample. The upper half of figure 13 exhibits the distribution of clusters over the entire part of the sky covered by the statistical sample, that is where the cluster identification was considered complete. However, owing to the obvious presence of obscuration up to at least $b = +60^{\circ}$, the cluster distribution was also determined for the part of the sky north of latitude $+60^{\circ}$ and south of -60°. The corresponding observed and theoretical random distributions are shown in the lower half of figure 13.

It is now necessary to compute the probability that cluster centers are really randomly distributed, that is the probability that the observed frequencies (solid histograms in figure 13) would be

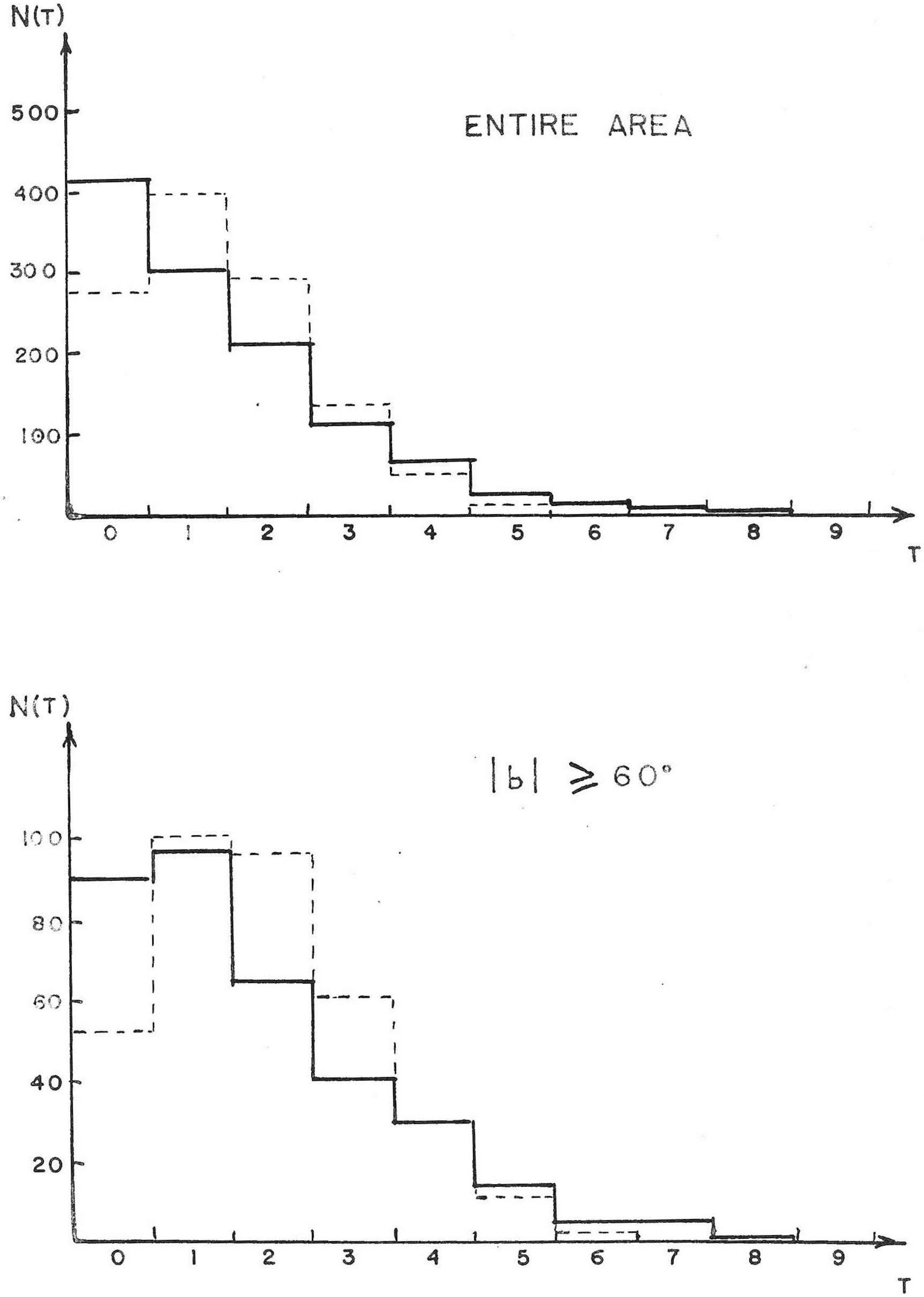

FIGURE 13. NO. CELLS N(τ) WITH τ CLUSTERS EACH

obtained in a random sampling from a population with the specified theoretical frequencies of a Poisson distribution (dashed histograms in figure 13).

The statistic χ^2 (chi squared) defined by

$$\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i)^2}{e_i} \tag{15}$$

is widely used for testing the compatibility of k pairs of observed and theoretical frequencies, where o_i and e_i are the observed and theoretical frequencies, and $\sum_i o_i = \sum_i e_i = n$ the total population. If the o_i are always obtained from a random sampling from a population with specified theoretical frequencies e_i it can be shown (37,38) that for large samples a close approximation to the distribution function of χ^2 is given by

$$f(\chi^2) = \frac{1}{2^{\frac{\nu}{2}}\Gamma(\frac{\nu}{2})} (\chi^2)^{\frac{\nu-2}{2}} e^{-\frac{\chi^2}{2}}, \tag{16}$$

where ν is the number of degrees of freedom. ν is equal to the number of pairs k of frequencies to be compared, diminished by the number of independent linear restrictions placed upon the observed frequencies o_i. In the present problem there are k-2 degrees of freedom.* Theoretical investigations (39) indicate that equation 16 is a satisfactory approximation to the distribution function of χ^2 when k and all of the e_i are equal to or greater than 5. If k is less

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*The first restriction is that only k-1 of the pairs of frequencies are independent. The second is that the mean of the Poisson distribution is estimated from the sample.

than 5, e_i should be somewhat larger.

The probability that the observed distribution of clusters is random is approximately the probability that the value of χ^2 computed from equation 15 will be obtained from a random sampling from a population with a Poisson distribution, that is,

$$P(\chi^2) = \int_{\chi^2}^{\infty} f(x)dx \; . \qquad (17)$$

The results of the test for randomness are summarized in Table 12. They indicate that whether one considers the entire area of the sample or just the galactic polar caps, the observed distribution of cluster centers is highly significantly nonrandom.

Table 12

The Probability that the Observed Clusters of Galaxies Form a Random Sampling from a Population Distributed According to a Poisson Law

Area of Sky	χ^2	Degrees of Freedom	$P(\chi^2)$
Entire Area	295.7	5	10^{-61}
$\lvert b \rvert \geq 60°$	63.2	4	10^{-12}

The nature of the distribution of cluster centers may depend strongly upon the size of the cells in which clusters are counted. For example, if the cells are made sufficiently small (and therefore numerous) the observed distribution can always be made to approach a random one. In the limiting case, there would be just 1682 cells containing one cluster center each, and an infinite number of cells containing no clusters. This would be exactly the Poisson distribution for the case $n = 1682$ and m approaching zero. On the other hand, as the size of the cells is increased until they are large compared with the scale of the "clumpiness" of the distribution, the irregularities tend to become smoothed out, and again the frequency distribution begins to appear random. If there exists a preferred size of the "clumps" of clusters, one would expect a maximum departure from randomness to occur when the size of the cells in which the counts are made corresponds roughly to the mean size of the clumps.

To determine whether such a mean size for the clumps exists, it was desirable to repeat the counts using various cell sizes. However, in the event that the clumpiness in the observed distribution of clusters is a consequence of a physical parameter in the distribution, such a parameter might be expected to impose a preferred linear dimension on the cluster clumps. In particular, such a linear dimension might be related to the mean diameter of second-order clusters of galaxies, if, indeed, they exist. Therefore, in subsequent investigations of the cluster distribution the clusters were sorted into distance groups, and each distance group was studied separately. Figures 14, 15, and 16 exhibit respectively the distributions of clusters in groups 1 to 4, group 5, and group 6. The original plots are on Aitoff charts similar to figure 10, and counts were made in rectangular grid cells superposed on the charts, as in the previous case.

As before, the probability was computed that each observed distribution could be a random sampling from a population distributed

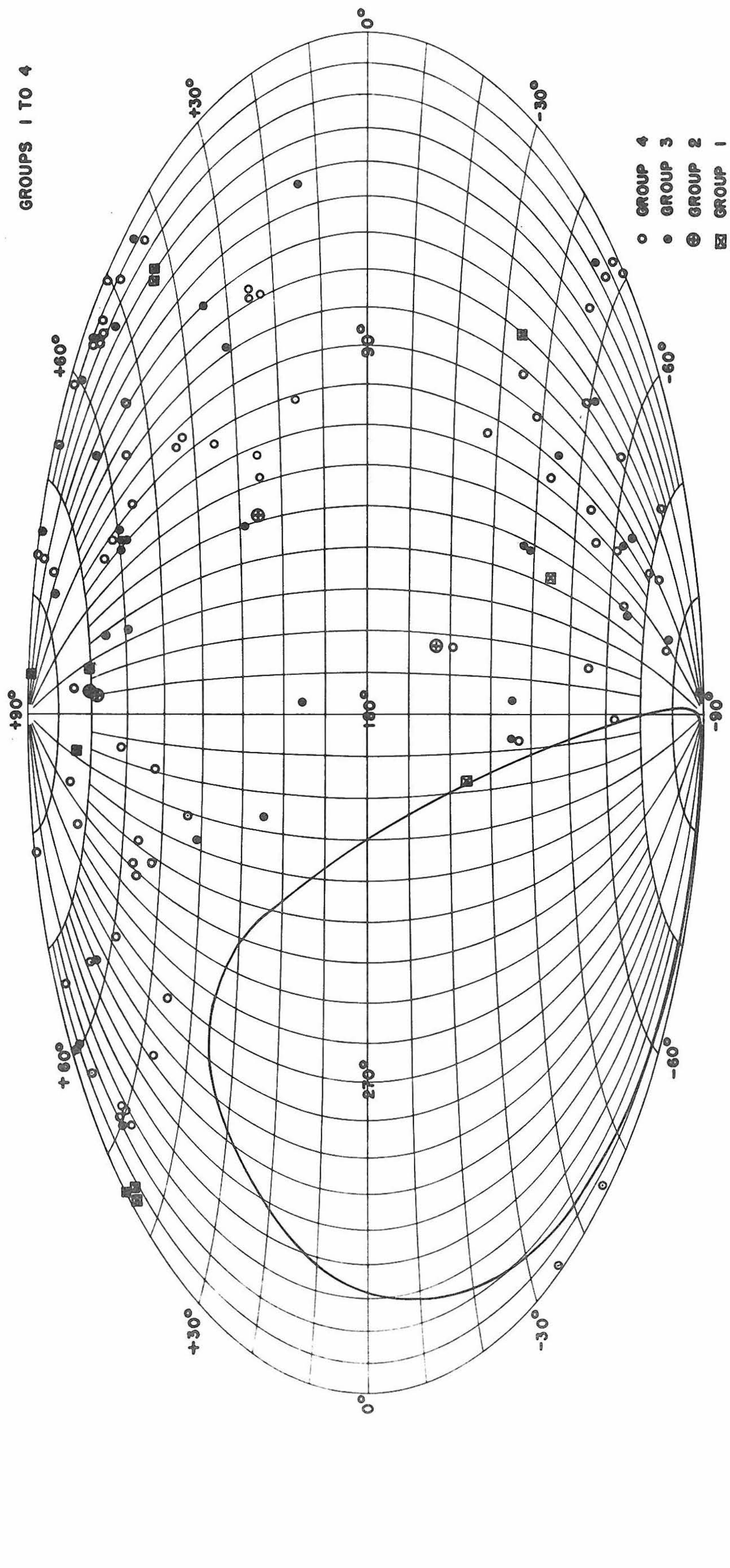

FIGURE 14. CLUSTER DISTRIBUTION

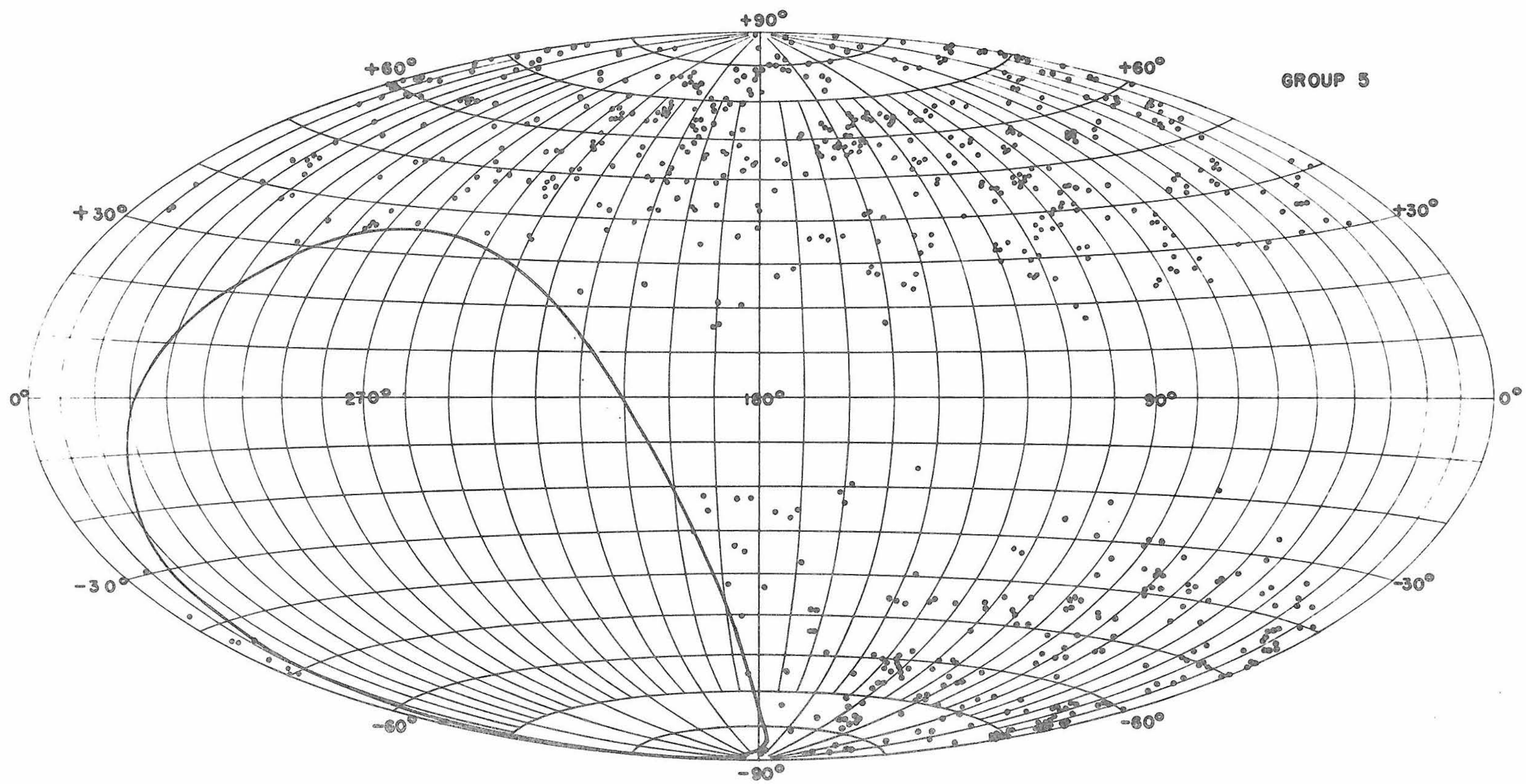

FIGURE 15. CLUSTER DISTRIBUTION

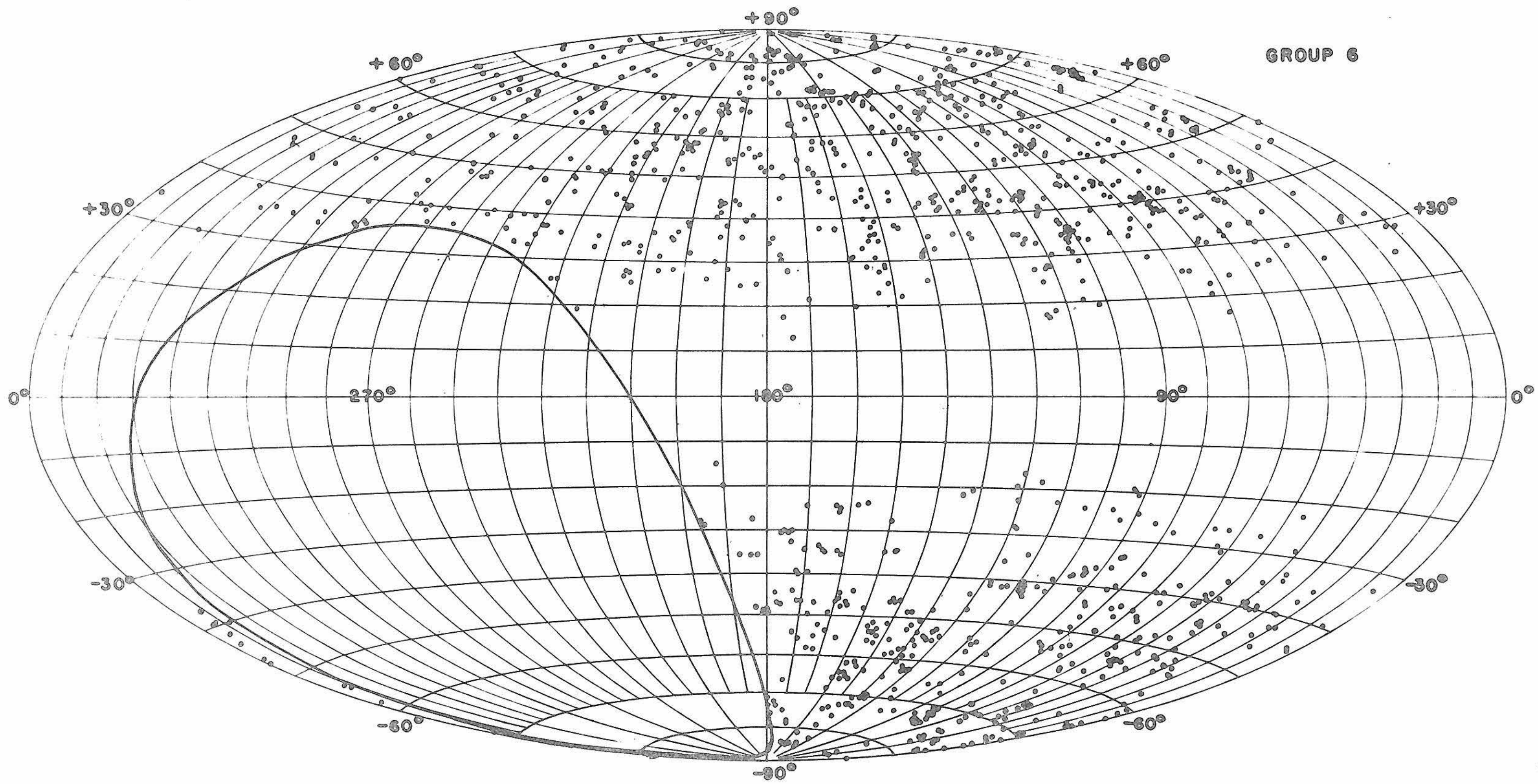

FIGURE 16. CLUSTER DISTRIBUTION

with a Poisson law, using the χ^2 distribution function (equation 16). For distance groups 5 and 6 the distribution was investigated over the whole area of the sample, and also over the regions $|b| \geq 60°$. The group 1 to 4 combination, however, contained too small a sample to obtain a meaningful distribution function in the galactic polar caps alone. The results are given in Tables 13 and 14, and in figures 17 to 21.

Table 13

Log $P(\chi^2)$, the Logarithms of the Probabilities that the Observed Distributions are Random for the Entire Area of the Sample

cell size:								
cm	0.500	0.635	1.000	1.270	1.500	1.905	2.000	2.500
square deg	8.2	13.2	32.8	52.8	73.8	119	131	205
Group 6	-32.0	-37.1	-38.7	-34.2	-27.8	-13.6	-10.1	
5	-17.8	-28.3	-20.5	-23.6	-27.4	-11.7	-10.4	
1 to 4			-1.15		-1.30		-0.672	-0.347

Table 14

Log $P(\chi^2)$, the Logarithms of the Probabilities that the Observed Distributions are Random for the Areas $|b| \geq 60°$

cell size:							
cm	0.500	0.635	1.000	1.270	1.500	1.905	2.000
square deg	8.2	13.2	32.8	52.8	73.8	119	131
Group 6	- 8.2	-15.0	- 8.7	- 2.4	- 2.4	- 2.2	- 2.1
5	- 4.7	- 6.8	- 6.3	- 8.4	- 4.1	- 0.4	- 2.1

The data in Tables 13 and 14 are plotted in figures 22 and 23. It is seen that the negative logarithms of the probabilities that the cluster distributions are random have a maximum for each distance

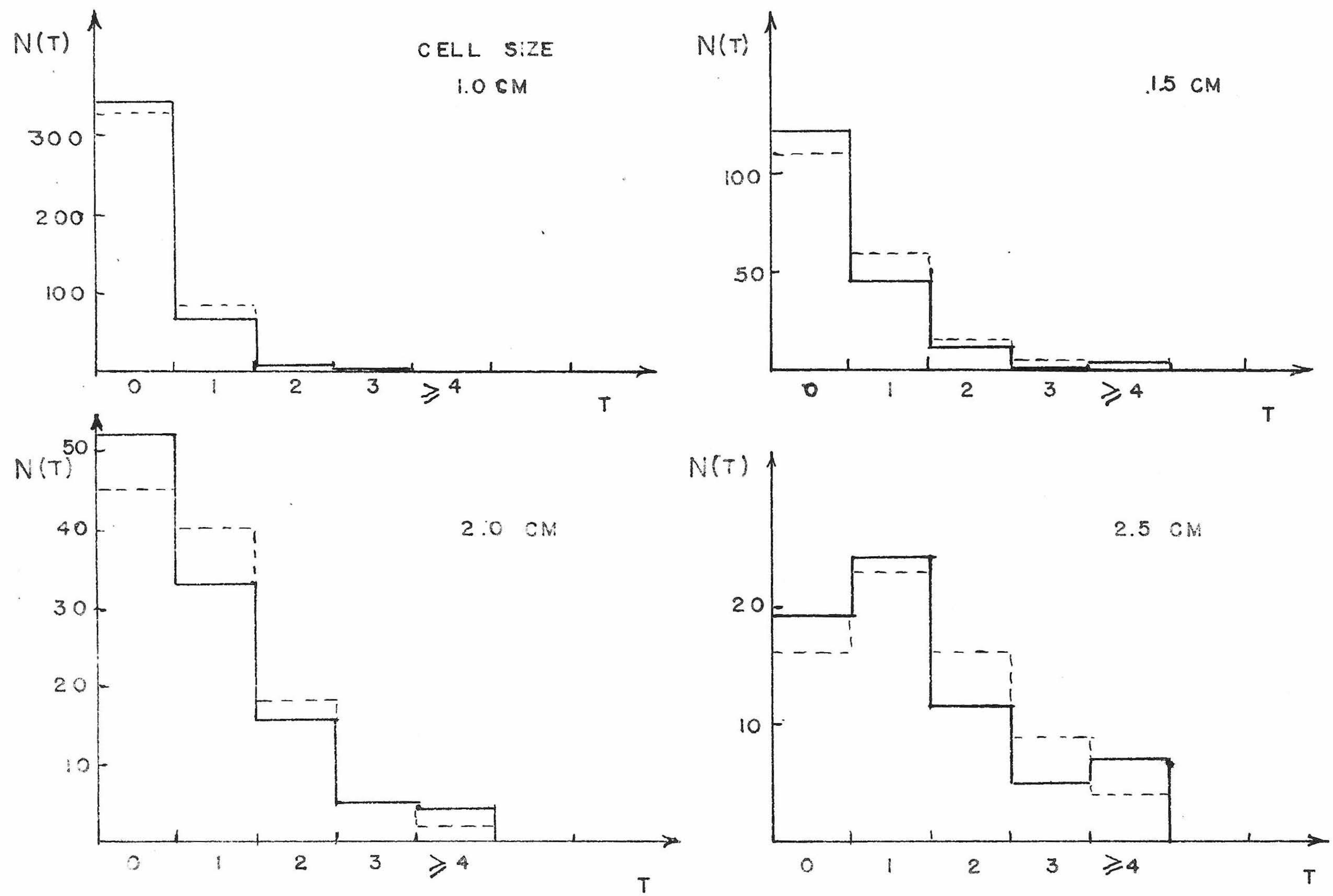

FIGURE 17. N(T) vs T GROUPS 1 — 4 (ENTIRE AREA)

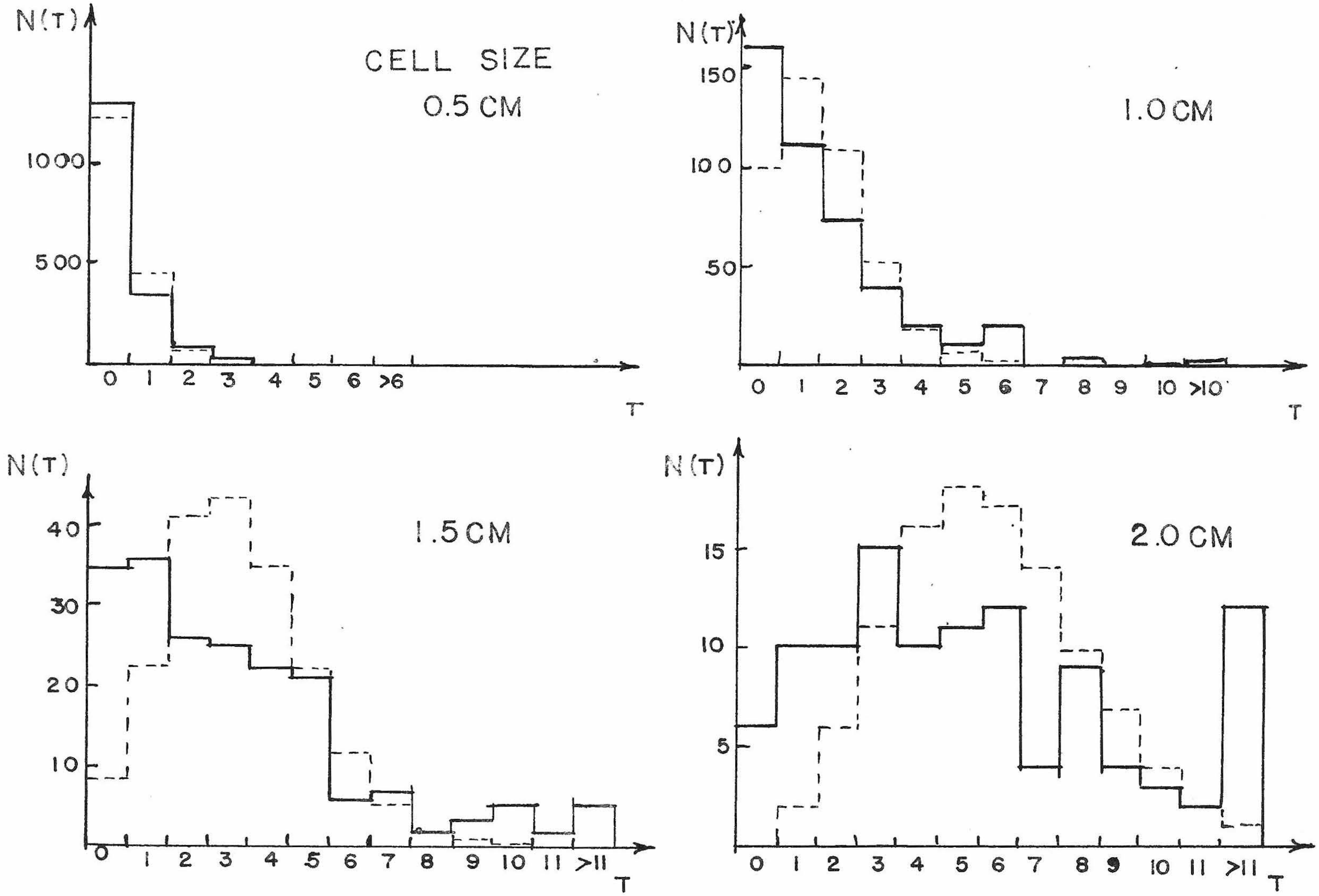

FIGURE 18. N(T) VS T GROUP 5 (ENTIRE AREA)

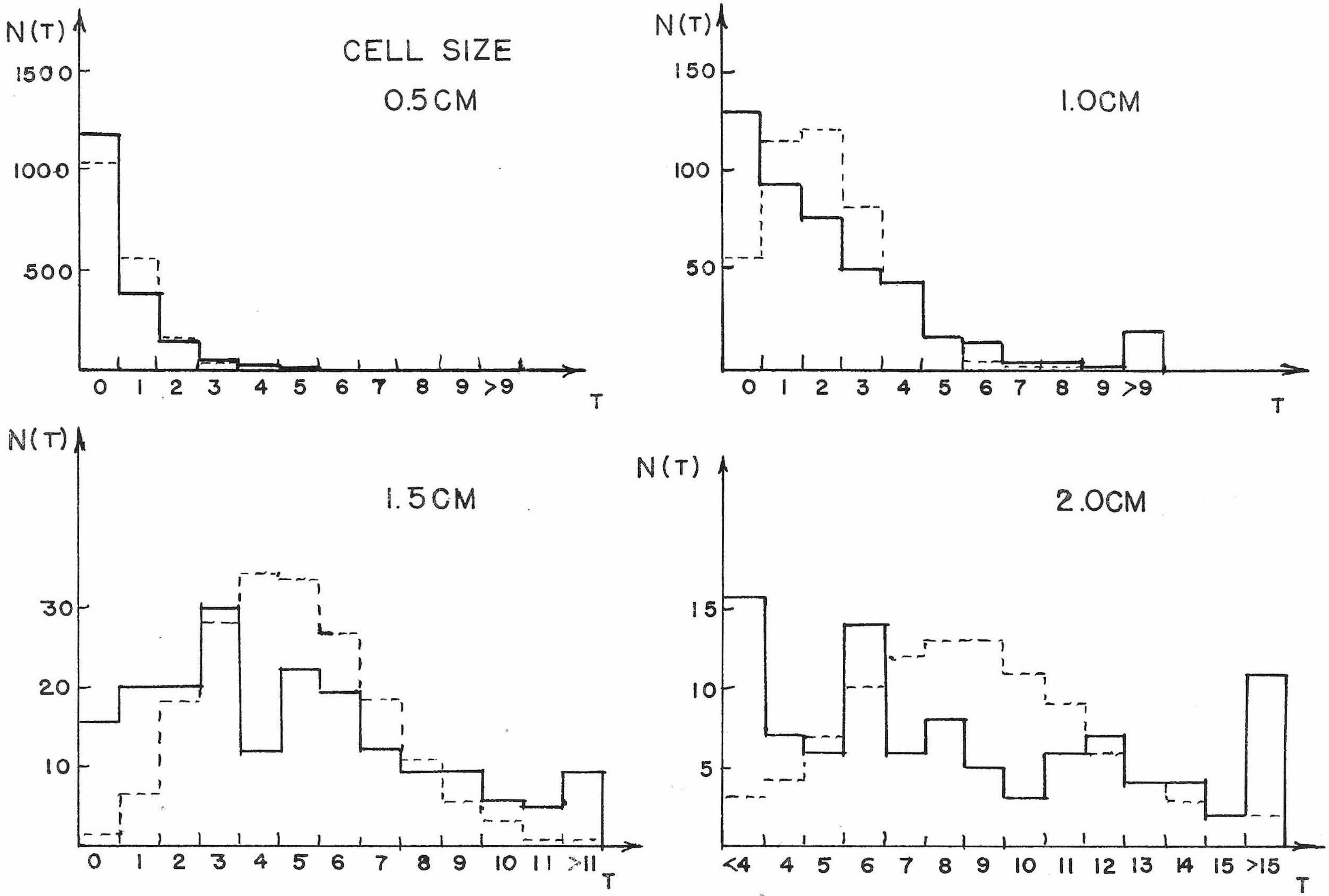

FIGURE 19. N(T) vs T GROUP 6 (ENTIRE AREA)

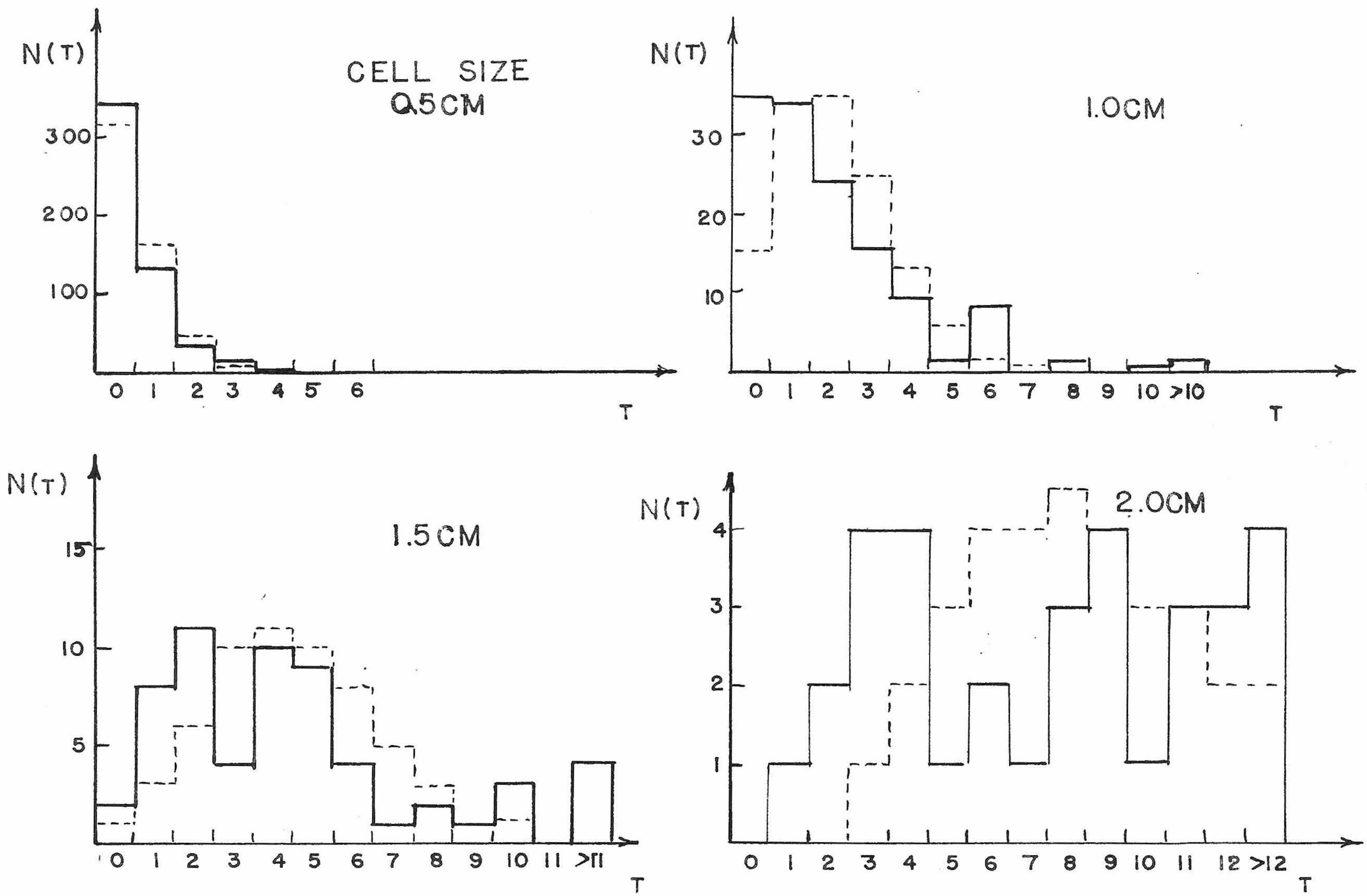

FIGURE 20. N(T) vs T GROUP 5 (|b| ≥ 60°)

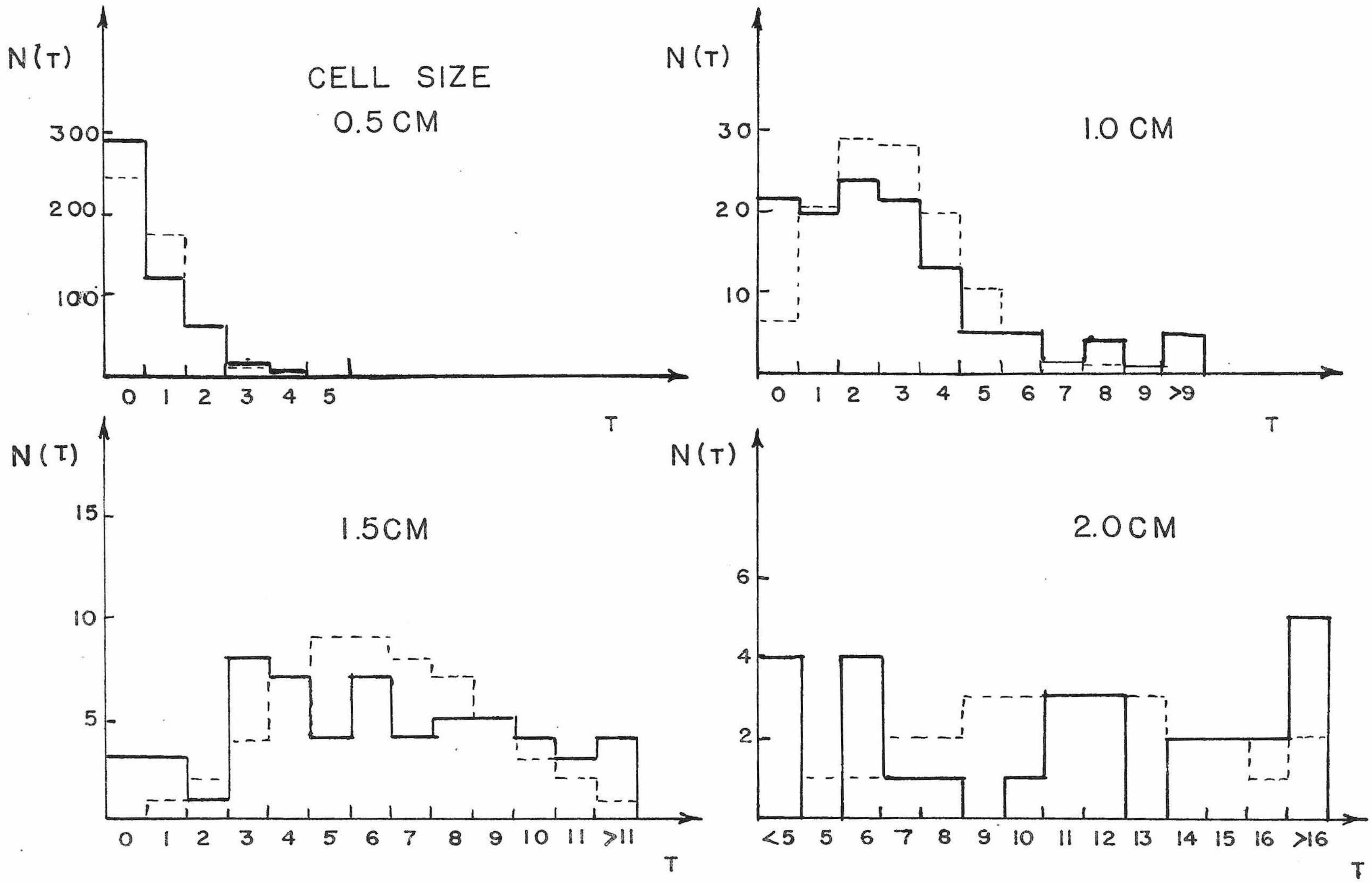

FIGURE 21 N(T) VS T GROUP 6 (|b| ≥ 60°)

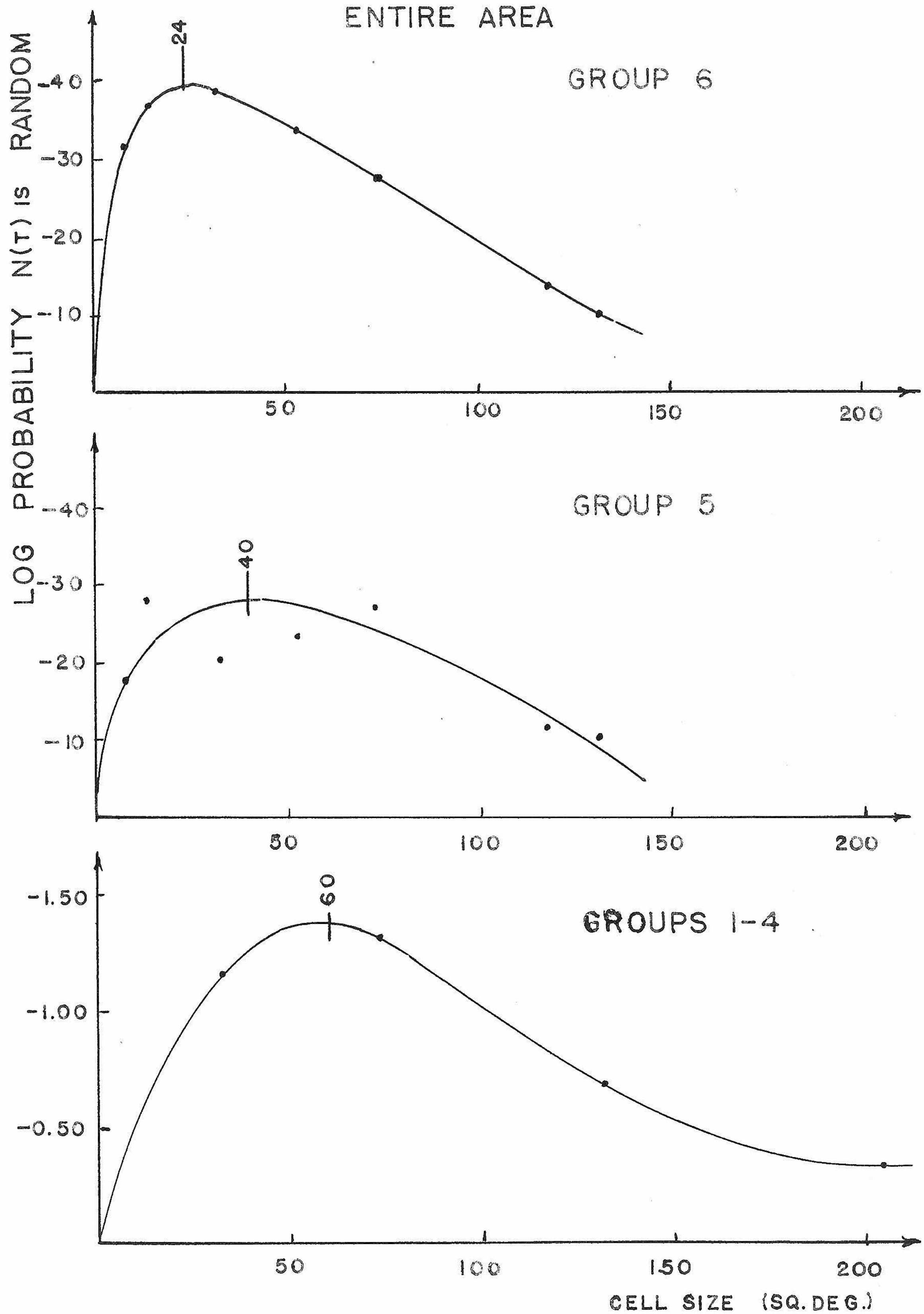

FIGURE 22. PROBABILITY THAT N(T) IS RANDOM

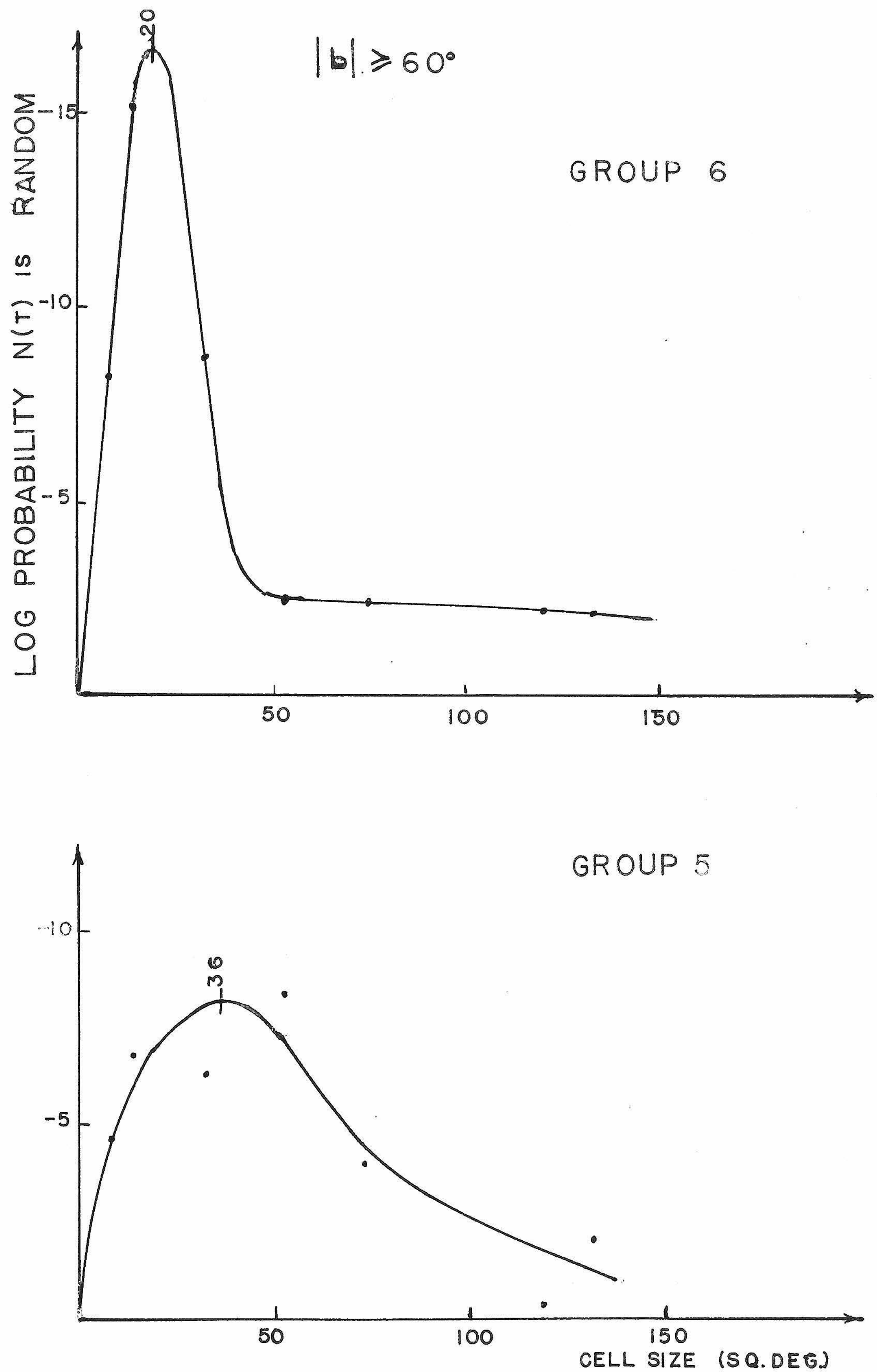

FIGURE 23. PROBABILITY N(T) IS RANDOM

group. The maximum is especially well developed for group 6, and also for the combined groups 1 to 4, although because of the small sample size the nonrandomness in the distribution of the nearer groups is only slightly significant (about at the 5 per cent level). In any case, for each group there seems to be a mean linear dimension which corresponds to the scale of the clumpiness. In Table 15 are listed the cell sizes corresponding to the maxima indicated in figures 22 and 23, and also the redshift corresponding to each distance group (from Table 9). In figure 24 the redshifts are plotted against the reciprocals of the cell sizes of maximum nonrandomness.

Table 15

Cell Sizes Corresponding to Maxima of Log $P(\chi^2)$

Group	$cd\lambda/\lambda$ $\times 10^{-3}$	Cell Area (sq. deg) Entire Area	Cell Area (sq. deg) $\lvert b\rvert \geq 60^\circ$	Cell Diam. (deg) Entire Area	Cell Diam. (deg) $\lvert b\rvert \geq 60^\circ$	1/Diam. (mean) $(\mathrm{deg})^{-1}$
6	51	24.3	20	4.93	4.47	0.213
5	39	40	36	6.33	6.00	0.162
1 to 4	20.5	60		7.75		0.129

In figure 24, except for the point corresponding to groups 1 to 4 which is the least reliable owing to the smaller sample size, it is apparent that the angular sizes of the clumps are approximately inversely proportional to the distances of the groups. The result is the expected one if it is assumed that the clumps of clusters tend to have more of less the same size everywhere in space. The clump size corresponding to H = 180 km/sec$\cdot 10^6$pc would be about 24 x 10^6pc. The result strongly suggests the existence of second-

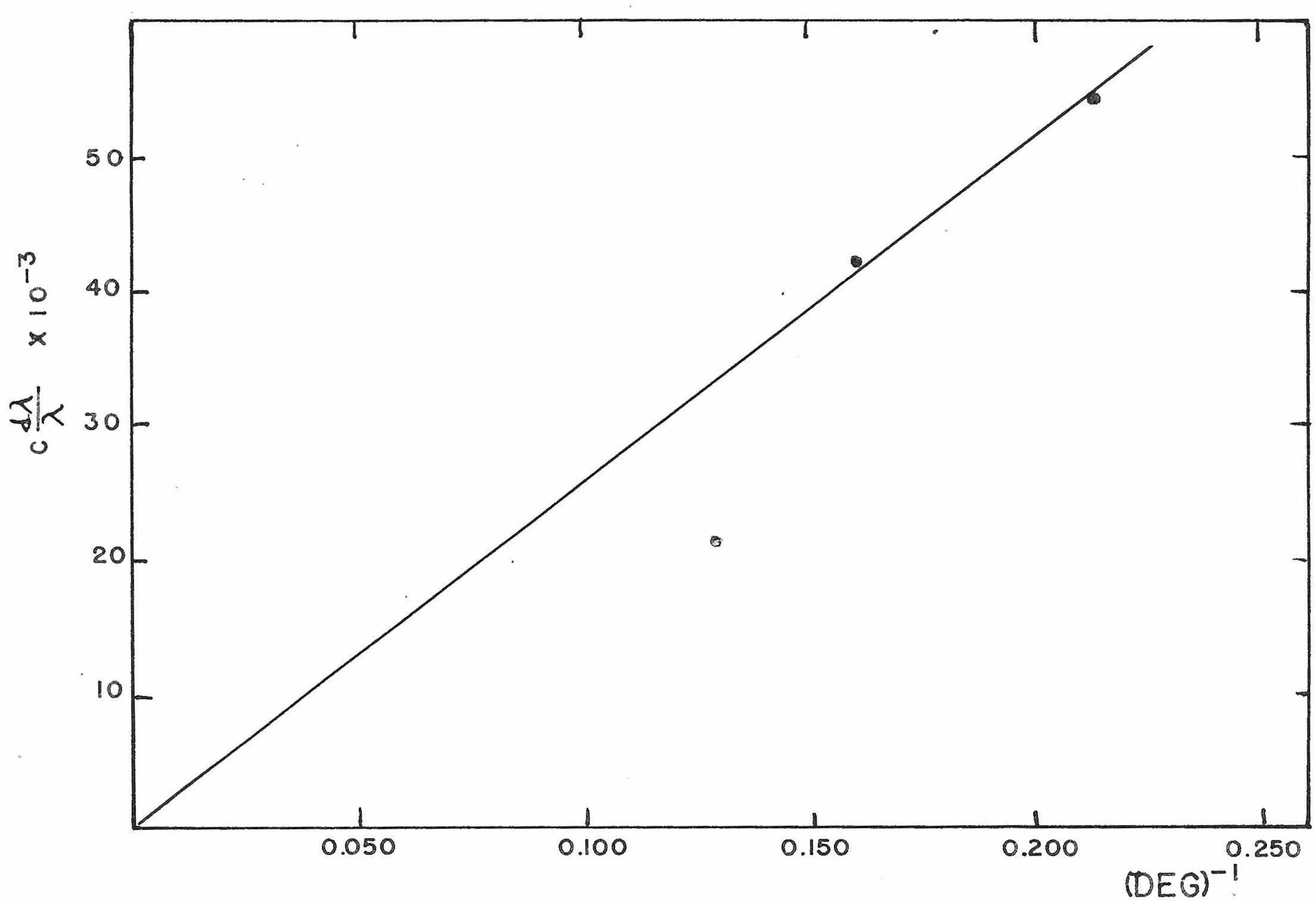

FIGURE 24. $C\frac{d\lambda}{\lambda}$ vs $(\text{CELL SIZE})^{-1}$

order clusters, that is clusters of clusters of galaxies. A visual inspection of figures 10, 14, 15, and 16 leads to the same conclusion, although less objectively.

The observed nonrandom distribution of clusters can not be accounted for by the assumption of either galactic or intergalactic obscuration. If, for example, the apparent second-order clusters of group 5 were really portions of a random distribution of clusters seen through holes in either galactic or intergalactic absorbing material, one would also expect to find clusters of group 6 appearing through those same holes, but certainly not between them. However, inspection of figure 10 shows many apparent groupings of clusters in group 6 in regions comparatively sparse in group 5 clusters, and conversely. If transparent regions in an absorbing medium permitted the observation of distant clusters but nearer clusters were absent, again a clumpy distribution of nearer clusters would be implied.

The above argument is not intended as disproof of the existence of intergalactic obscuration. Such obscuration may well be present, particularly, as Zwicky suggests (13), within certain rich clusters. The possibility was not one of the topics of investigation in the present study, and nothing can be said here regarding it. The conclusion here is simply that the assumption of dark material in intergalactic space is not sufficient to account for the observed nonrandom distribution of cluster centers, and therefore, that the observed clumpiness must indicate a real tendency toward second-order clustering of galaxies.

It is of interest to compare either figure 10 or figure 14 with figures 12 to 16 in reference 34, in which Shane and Wirtanen identify six clouds of galaxies which they suspect to be second-order clusters. In three of the cases the Shane-Wirtanen clouds (numbers 4, 5, and 6) correspond to apparent groupings of two or more clusters in the present catalogue. Two of their other examples (numbers 2 and 3) correspond to a single cluster in this catalogue. The other Shane-Wirtanen clusters in the six clouds are apparently not rich enough for inclusion in the statistical sample.

One further test was made, namely whether the mean surface density of cluster centers differs between the northern and southern galactic hemispheres. Clusters in each distance group were counted both over the entire area of the sample and within only 30° of the galactic poles. The assumption that the mean areal density of clusters is the same in both hemispheres was then checked with a χ^2 test. Table 16 gives the computed probability for each case that the assumption is correct. In no case is the probability less than 10 per cent; adopting a 5 per cent significance level, it is concluded that their is no significant difference in the density of clusters in the two galactic hemispheres. Thus there is no reason to assume that there are more clusters on one side of the galactic plane than on the other.

Table 16

Probability that the Mean Areal Density of Cluster Centers is the Same in the Northern and Southern Galactic Hemispheres

Group	1 to 4	5	6	All Groups
Entire Sample	0.2	0.1	0.6	0.1
$\lvert b\rvert \geq 60^\circ$	---	0.6	0.4	0.9

O. The Index of Clumpiness

Zwicky (13) has studied the empirical quantity k(z,n) defined by

$$k(z,n) = \frac{S_1}{S_0} , \qquad (18)$$

where S_1^2 is the sample variance of the observed distribution of n galaxies in a given solid angle divided into z equal parts or cells, and S_0^2 is the variance to be expected if the n galaxies are distributed uniformly and independently among the z cells.

Neyman, Scott, and Shane (7) have investigated an analogous quantity which they call the "index of clumpiness", K, defined as

$$K = \frac{\sigma_1}{\sigma_0} , \qquad (19)$$

where σ_1^2 is the true variance of a theoretical distribution of n galaxies among z cells, computed on the assumption of no intervening interstellar or intergalactic absorbing clouds, and on the assumption that all galaxies are clustered, and σ_0^2 is the variance of the same n galaxies distributed singly, independently from one another, and with statistical uniformity. K differs from Zwicky's k(z,n), as the authors point out, in that n is a random variable and hence k(z,n) is subject to random fluctuations. k(z,n) would be obtained in a random sampling from a population with a true index of clumpiness K. More specifically (7),

> "....if S_1^2 and S_0^2 are computed for many different but equal solid angles Ω in randomly selected directions, always with the same substantial number z of parts, then the average

> values of the S_1^2 and S_0^2 so obtained will be approximately equal to σ_1^2 and σ_1^2."

In an early paper by Neyman and Scott (4), a probability generating function is derived for the assumption that all galaxies are clustered and that the cluster centers are distributed according to a Poisson law (see section B). In the paper under discussion by Neyman, Scott, and Shane (7), the probability generating function is used to derive an expression for K. The the authors derive the following two theorems (numbered from their paper):

> "Theorem 3.--If the probability density...governing the internal structure of clusters is continuous, then, whenever the solid angle ω [$=\Omega/z$] in which galaxies are counted tends to zero, the index of clumpiness K converges to unity.
>
> "Theorem 4.--The square of the index of clumpiness, $K^2(s)$, corresponding to a rectangular solid angle $2\alpha_1 \times 2s\alpha_2$ is a nondecreasing function of s..."

The authors also show that if both dimensions of the solid angle are increased, K^2 will also grow.

These theorems, which are quite general imply that if all galaxies are clustered, and if there is no obscuring interstellar or intergalactic matter, then $k^2(z,n)$ will statistically be a nondecreasing function of the area of the cells in which galaxies are counted. Counts of galaxies made both by Shane and Wirtanen (7) at Lick and by Zwicky (13) give values of $k^2(z,n)$ which increase with increasing cell size, compatible with the assumption of complete clustering.*

---

*Zwicky originally considered the increase of k(z,n) with cell size to be evidence of intergalactic obscuration. Neyman, Scott, and Shane, however, showed that there was no necessity for the hypothesis of absorbing clouds.

The foregoing discussion refers to the distribution of individual galaxies. However, exactly the same theory applies to the analogous distribution of clusters of galaxies. Thus if one considers the hypothesis that all clusters of galaxies are members of second-order clusters, and that the second-order clusters are distributed according to a Poisson law, the square of the index of clumpiness, defined analogously to equation 19, will be a nondecreasing function of the area of the cells in which clusters are counted.

The statistic $k(z,n)$ defined analogously to equation 18, with the variance of the Poisson distribution S_0^2 [equal to the mean of the Poisson distribution (40)] estimated as the mean of the sample, was computed for distance groups 5 and 6, both for the whole area of the sample and for the galactic polar caps, and for the combined groups 1 to 4 for the whole sample area. The resulting values of $k^2(z,n)$ are given in Tables 17 and 18. The plots of $k^2(z,n)$ vs the cell size are in figures 25 and 26.

Table 17

The Square Empirical Index of Clumpiness for Clusters, $k^2(z,n)$--Entire Sample Area

Cell Size (Sq.deg)	Groups 1-4	Group 5	Group 6
8.2		1.51	1.73
13.2		1.45	1.78
32.8	1.38	2.54	2.64
52.8		2.41	2.10
73.8	1.50	3.08	3.00
119		2.21	2.89
131	1.39	3.87	3.28
205	1.47		

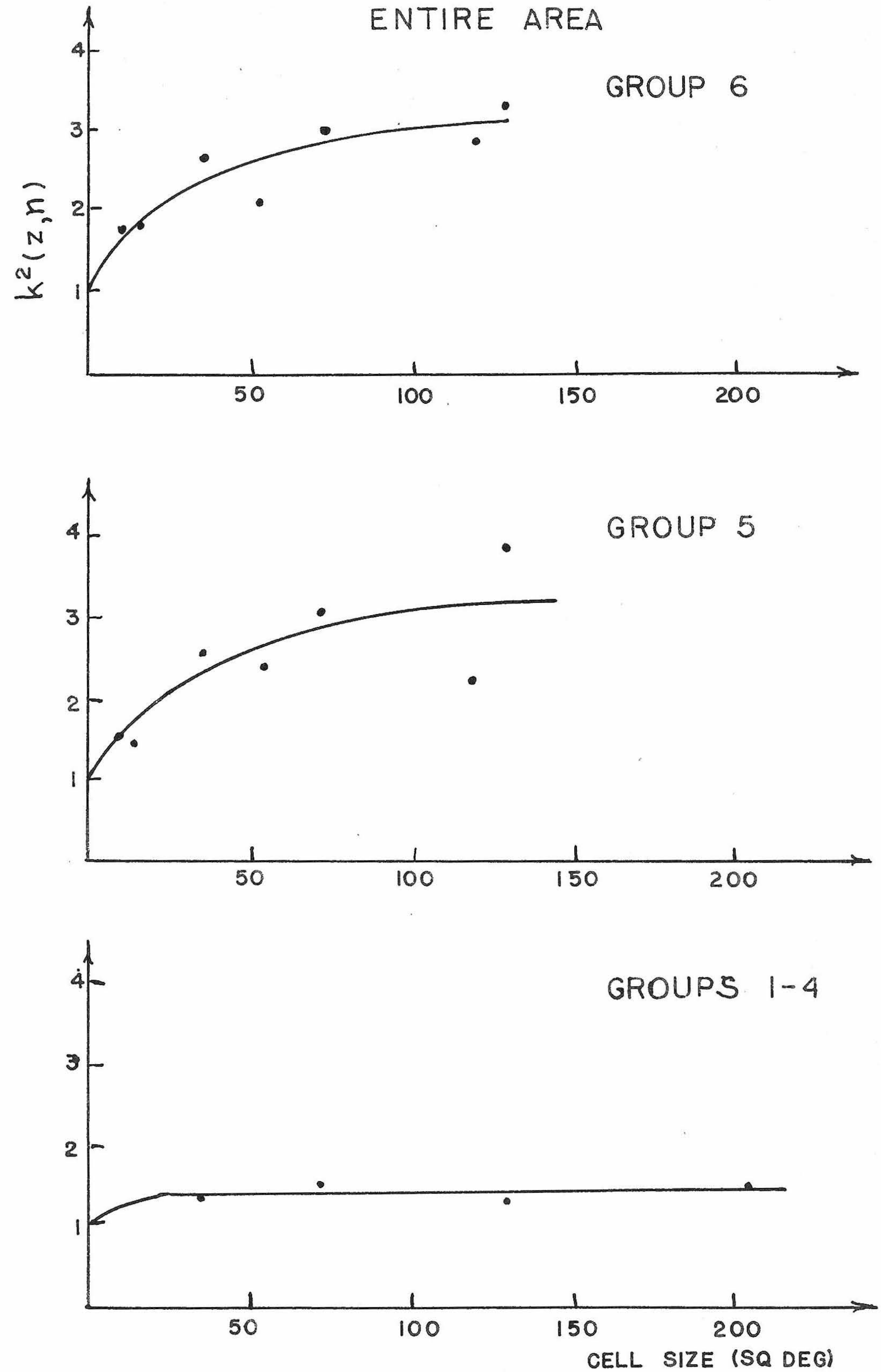

FIGURE 25. SQUARE INDEX OF CLUMPINESS

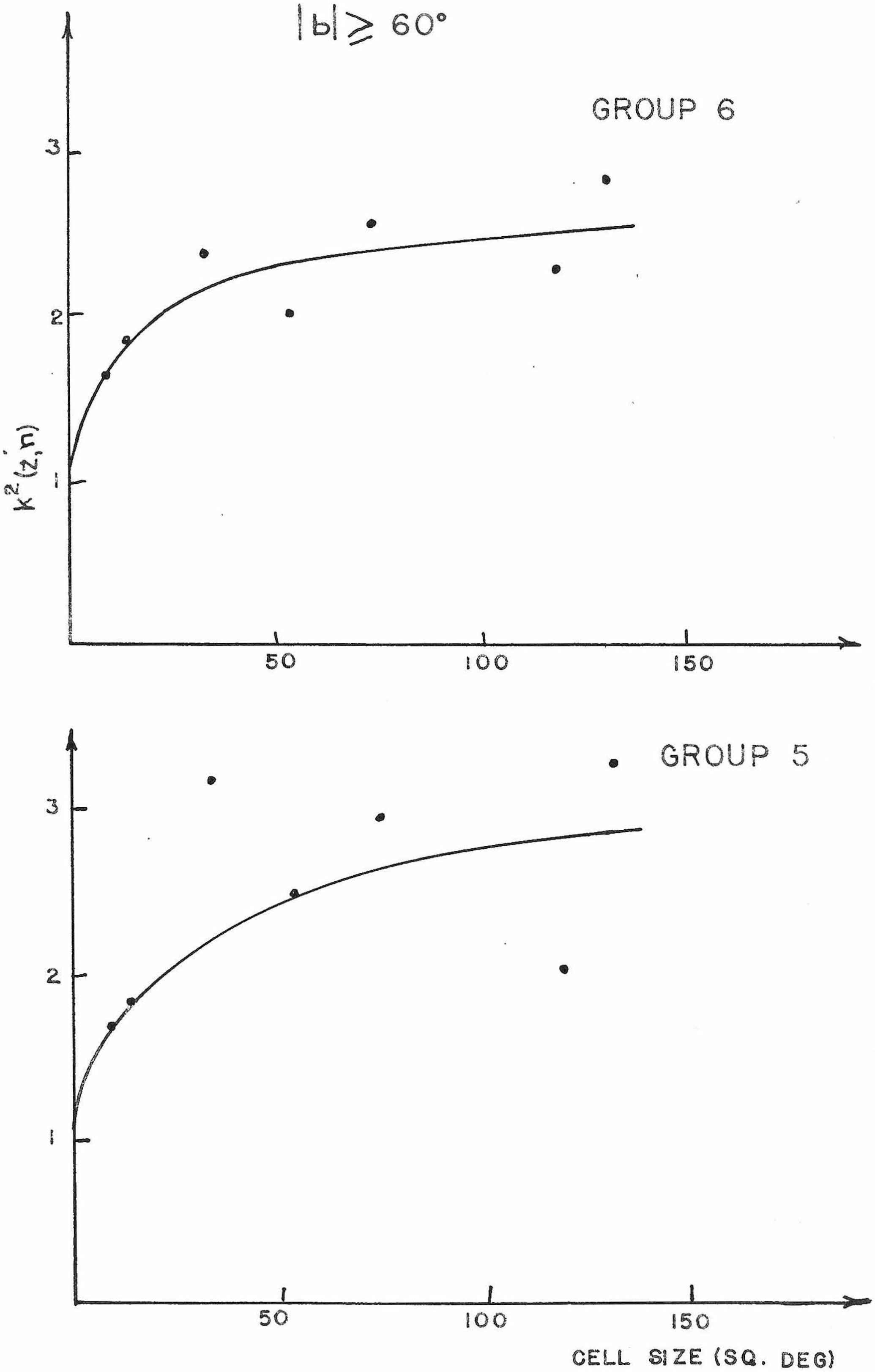

FIGURE 26. SQUARE INDEX OF CLUMPINESS

Table 18

The Square Empirical Index of Clumpiness for Clusters
$k^2(z,n)$
$|b| \geq 60^\circ$

Cell Size (Sq. deg)	Group 5	Group 6
8.2	1.71	1.65
13.2	1.82	1.83
32.8	3.18	2.36
52.8	2.46	2.03
73.8	2.95	2.56
119	2.01	2.27
131	3.27	2.84

Although there is considerable scatter about a smooth curve, which is expected for a sample of this size, there is no evidence of a maximum of $k^2(z,n)$ in any of the cases. Thus on the basis of this test the observed distribution of cluster centers is compatible with the assumption of total clustering of clusters of galaxies.

P. Correlation Coefficient of Counts

An attempt was made to determine the correlation coefficient of counts in different directions for distance groups 5 and 6. Only the region of the sky north of galactic latitude $+40^\circ$ was considered. The procedure was to divide the region into zones of galactic latitude five degrees wide. Each zone was then divided into an integral number of cells with centers as nearly as possible five degrees apart. There was a total of 296 cells in the region investigated, all with approximately the same area, 25 square degrees. In the region 462 clusters of group 6 were included and 362 of group 5.

It was desired to find the correlation coefficient, $\Gamma(\theta)$, between counts in cells θ degrees apart, defined by

$$\Gamma(\theta) = \frac{\overline{(n_i - m)(n_{i\theta} - m)}}{\overline{n_i^2}} , \tag{20}$$

where n_i and $n_{i\theta}$ are respective counts in two different cells θ degrees apart, and m is the mean number of clusters per cell for the distance group considered. If no second-order clustering exists, and if there is no interstellar nor intergalactic obscuration, one would expect no correlation between counts in different cells, and

$$\Gamma(\theta) = \delta(\theta) , \tag{21}$$

where $\delta(\theta)$ is the delta function which is unity when $\theta = 0$, and zero otherwise. However, if second-order clustering does exist $\Gamma(\theta)$ would have the value unity when $\theta = 0$ and would decrease gradually with increasing θ, the rate of decrease being determined by the angular dimensions of the second-order clusters. General large scale obscuration, if present, might introduce some correlation in the counts in cells some distance apart, so that $\Gamma(\theta)$ might not reach zero even for fairly large values of θ.

An estimate of the correlation coefficient was obtained as follows: Values of $n_i - m$ for all of the cells in each latitude zone were obtained and listed on each of two strips of paper. The products $(n_i - m)(n_{i\theta} - m)$ for $\theta = 5, 10, 15...$ degrees were conveniently computed by displacing the two strips of paper for each latitude zone by 1, 2, 3... cells, and multiplying adjacent numbers together.

All of the products from all of the latitude zones were then averaged for each value of θ and divided by $\overline{n_i^2}$ to obtain $\Gamma(\theta)$. The procedure is essentially that described by Limber (9), except that no corrections needed to be made for end point effects, for the products could be obtained in a complete circle along a latitude zone, and consequently there were no ends.

The resulting estimates of the correlation coefficient are given in Table 19 and are plotted in figure 27. The correlation coefficient for group 6 seems to approach a lower limit as θ is increased, at least over the range of θ considered. This is probably the result of the general galactic obscuration discussed in section M. Otherwise the correlation coefficients decline more or less gradually, consistently with the assumption of second-order clustering. Unfortunately however, the size of the cells counted was too large to determine the form of $\Gamma(\theta)$ significantly. It appears (see figure 27) that $\Gamma(\theta)$ declines more gradually for group 5 than for group 6, which is expected since second-order clusters in group 5 would be nearer. However, the conclusion is based on only one or two points, and the expected error of these points (judging from the scatter about a smooth curve) is as great as the observed effect.

Table 19

Correlation Coefficient $\Gamma(\theta)$ of Counts in Cells θ Degrees Apart

θ	5°	10°	15°	20°	25°	30°
Group 5	0.278	0.171	-0.010	-0.036		
Group 6	0.246	0.134	0.117	0.133	0.255	0.151

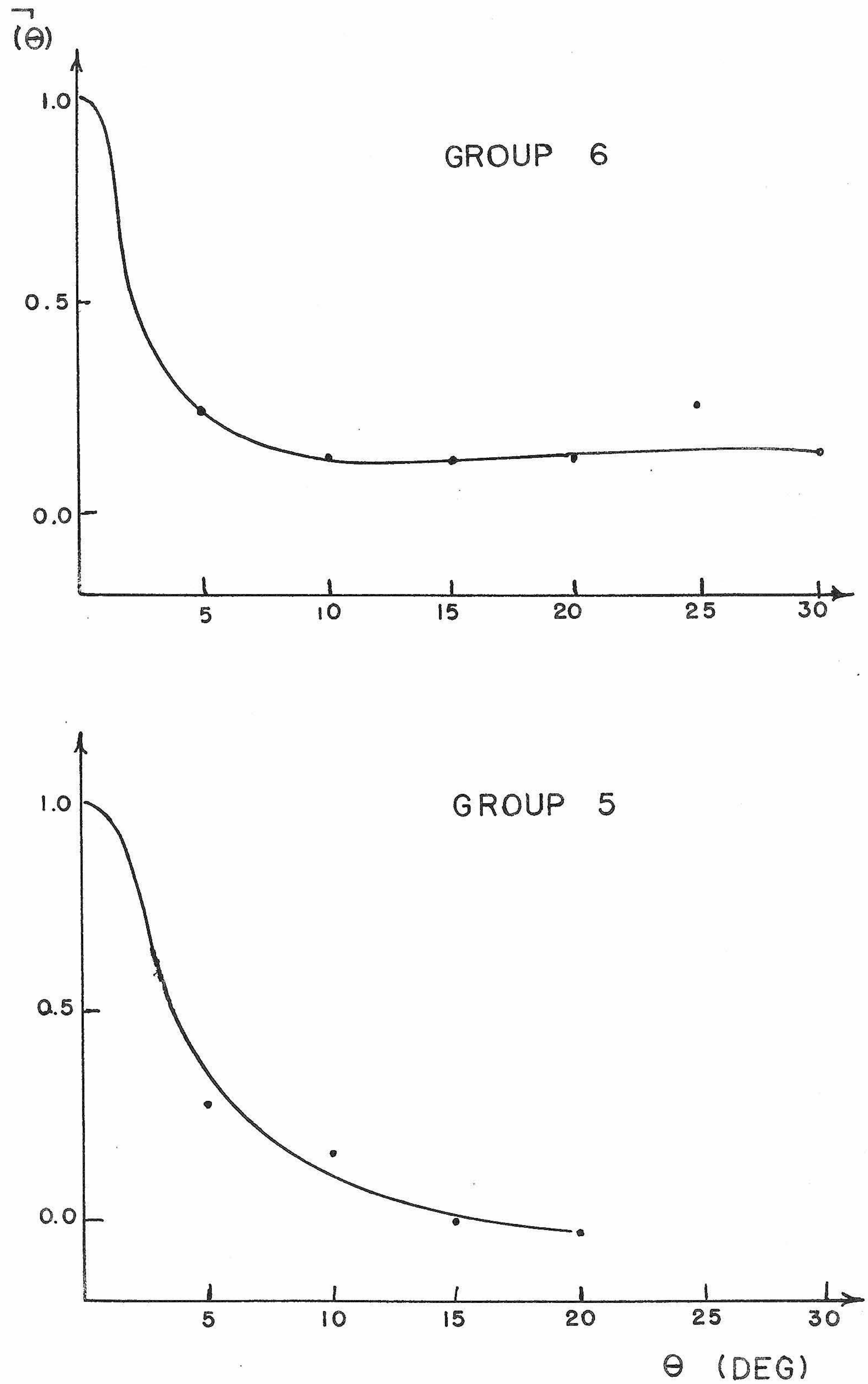

FIGURE 27. CORRELATION COEFFICIENT

It would be highly desirable to repeat the computation of correlation coefficients with a finer cell division, say 2 degrees square. Unfortunately, the computations involved are too laborious to be completed in the time available for the present investigation; the project will probably be feasible only with an electronic computer.

Q. Summary

The results of the foregoing sections can be summarized briefly as follows:

(1) The distribution function of clusters according to richness, N(n) decreases rapidly as n increases. The present data indicate no maximum in N(n), that is, no mean number of galaxies (not more than two magnitudes fainter than the third brightest member) is indicated for clusters with fifty members or more.

(2) The data allow no significant conclusion that the spatial density of cluster centers varies with distance.

(3) Galactic obscuration certainly plays a role in the observed distribution of clusters of galaxies. In particular, around galactic longitude 300° and extending in the northern galactic hemisphere to at least latitude $+60^{\circ}$ there exists galactic absorption of the order of several tenths of a magnitude (photored) greater than at corresponding latitudes around longitude 100°.

(4) There is a highly significant nonrandom distribution of cluster centers in direction. The scale of the clumpiness of the distribution varies roughly inversely proportionally with distance.

The nonrandomness can not be accounted for by either interstellar or intergalactic obscuration, although the existence of intergalactic obscuration is not specifically disproved. The data suggest strongly the existence of second-order clusters, or clusters of clusters of galaxies.

(5) There is no significant difference in the mean density of cluster centers between the northern and southern galactic hemispheres.

(6) The square of the index of clumpiness, defined as the ratio of the variances of the observed distribution to a purely random one, is approximately a nondecreasing function of the size of the cells in which clusters are counted, a result compatible with, although not confirming, the assumption that all clusters belong to second-order clusters.

(7) Estimates of the correlation coefficients of counts of clusters in cells in different directions give weak support to the assumption of the existence of second-order clusters. Unfortunately the cell division used in computing correlation coefficients was not sufficiently fine to give results of high statistical significance.

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