

## ACKNOWLEDGMENTS

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## Variables in the Andromeda Galaxy—Fields I and III

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Fields I and III are situated 15' and 50' south preceding, respectively, the nucleus of M31. Field I has 116 variables, 31 of them Cepheids and 7 novae; Field III has 336 variables, 232 of them Cepheids and 2 novae. The various relations of the Cepheids between period and luminosity, amplitude, and frequency are examined and compared with the 20 Cepheids of Field IV. The Cepheids seem to be most like those of our galaxy, and there are differences between them and those of the Small Magellanic Cloud.

## 1. INTRODUCTION

THIS is the third and final paper about the variables in the Andromeda galaxy initiated by Dr. Baade. Baade took from 80 to 100 plates with the 200-in. telescope on each of the four fields over two-year periods. The location of the fields is shown in Plate I of the previous paper (Baade and Swope 1963), and the positions of the centers together with the number of plates taken in each field and the pairs of plates blinked for variables are given in Table I.

This paper investigates the variables of Fields I and III. The first field is in an amorphous area 15' south preceding the nucleus, and the third field is in the fourth spiral arm 50' south preceding the nucleus (Baade 1963) and is rich in stars. Baade took the majority of the plates of these two fields in 1950 and 1951.

The general properties of the Cepheids of the three fields studied at Mount Wilson are also considered. In discussing the period-frequency relation, the Cepheids of Field II (Gaposchkin 1962) are included, otherwise they are omitted as there may be some question whether they are on the same magnitude system as these three fields, though the Cepheids in the center of Field II do confirm the period-luminosity and period-amplitude relations.

## 2. MAGNITUDES

The method used in deriving the magnitudes for the variables is the same in both Field I and Field III. When work on the variables was begun in 1952, no faint magnitudes were available; therefore, local comparison stars were selected around each variable or group of variables and they were measured by means

of a suitable scale of graduated exposures made from a 200-in. plate. The stars of Selected Area 68 were measured at the same time in the same way. Plates of the same emulsion were taken of the variable field and of SA 68 on the same night in series and developed together. First the SA plate was measured with the fly spanker and then the field, and again the selected area. The measures of SA 68 were reduced to one plate and those of the variable field to the corresponding plate. Seven such pairs of plates were reduced and means taken. The local variable sequences thus were on the same scale system as Selected Area 68. All the variables not too close to the plate edge were measured once on about 75 plates over the two years observed, and the Cepheids and some other interesting stars within the 8' rings were measured twice and mean taken.

In 1954 Baum (private communication) obtained faint photoelectric magnitudes for Selected Area 68. His measures were an extension of the sequence already measured photoelectrically by Stebbins, Whitford, and Johnson (1950). For the few stars that were measured by both observers there was a small systematic difference; therefore, 0<sup>m</sup>03 has been subtracted from the sequence of Stebbins *et al.* and 0<sup>m</sup>02 added to Baum's sequence. Gaposchkin (1962) has published the final SA 68 sequence in Table I, columns 1 and 2, almost as it is used in this paper.

With the new photoelectric sequence of SA 68 available, the local sequences of M31 were reduced to magnitudes by means of the transfer plates. This is not as satisfactory as using a direct photoelectric sequence, as in Field IV (Baade and Swope 1963), but no systematic differences are apparent between that





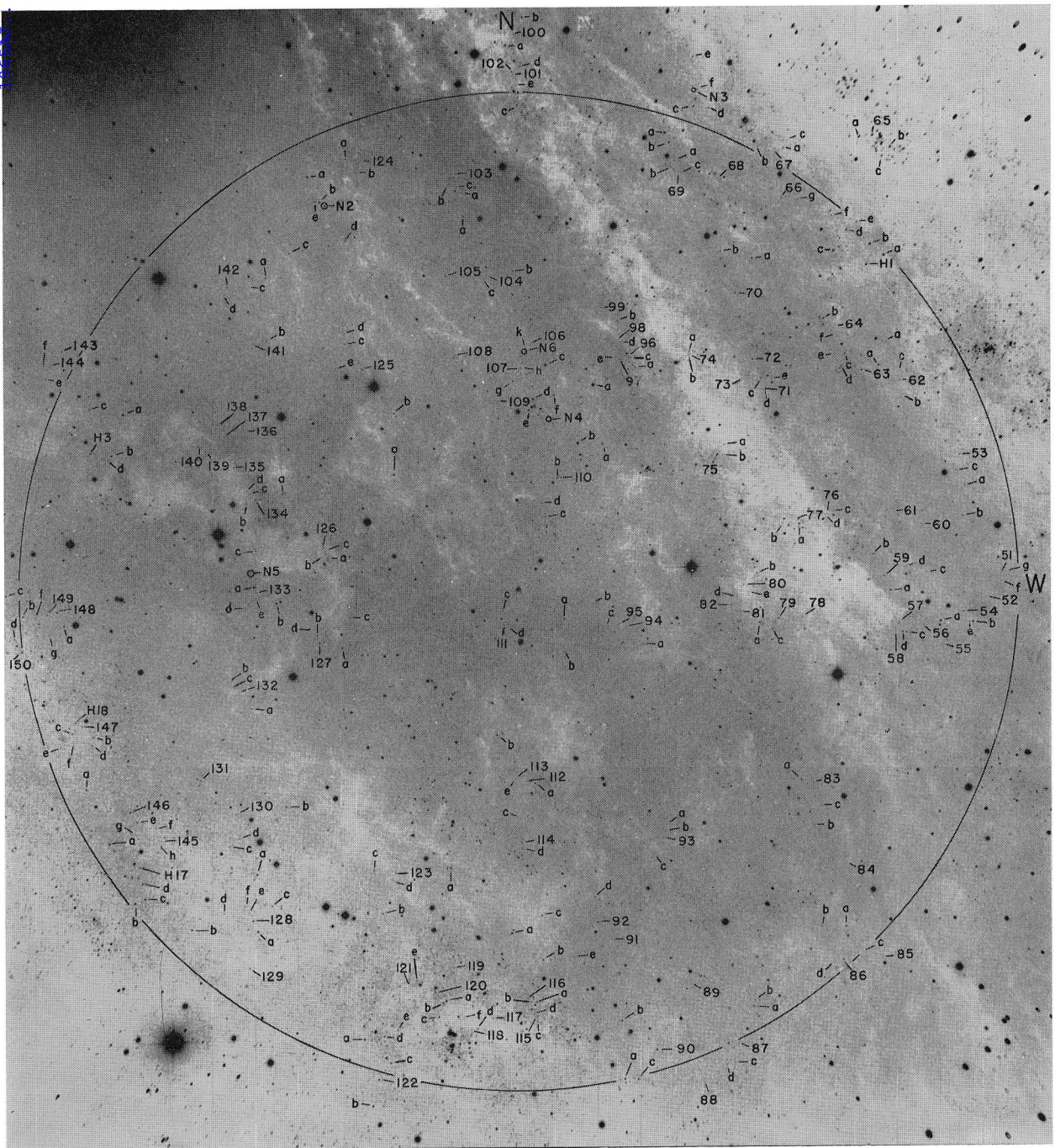


PLATE I. Field I, 106 variables, 5 novae, and their comparison stars.

his numbers, and the new variables have been numbered more or less in order of right ascension across the field. In Field I the new variables are numbered from 51 to 153, and in Field III they are numbered from 161 through 467, beginning on the west side and going to the east side of the plate.

#### 4a. THE VARIABLES OF FIELD I

Thirty pairs of plates were blinked in Field I and 109 new variables and 7 novae were found and con-

firmed. The positions of most of these variables, together with their local sequences, are shown in Plate I. There were four variables (H5, V151, 152, and 153) and two novae (1 and 7) that were bright but close to the edge of the plate. They cannot be shown on Plate I, but are shown on Plate II, together with their sequence stars, and they are listed in Table IV. There were, in addition, 32 faint variables of small amplitude close to the plate edges that have not been measured and are not listed. Table IV lists the 109 variables and

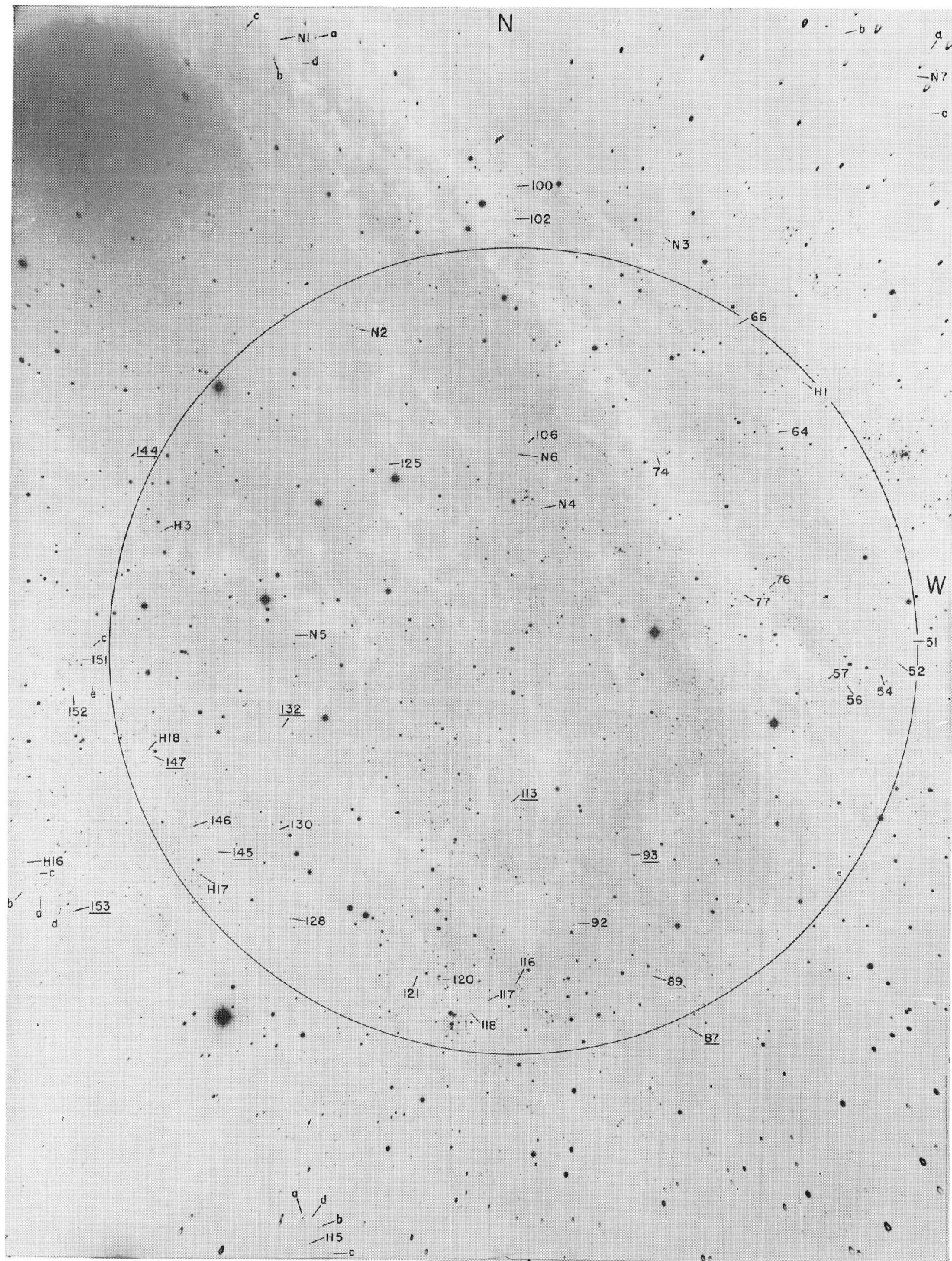


PLATE II. Field I, the distribution of the novae, Cepheids, and Population II variables (underlined).

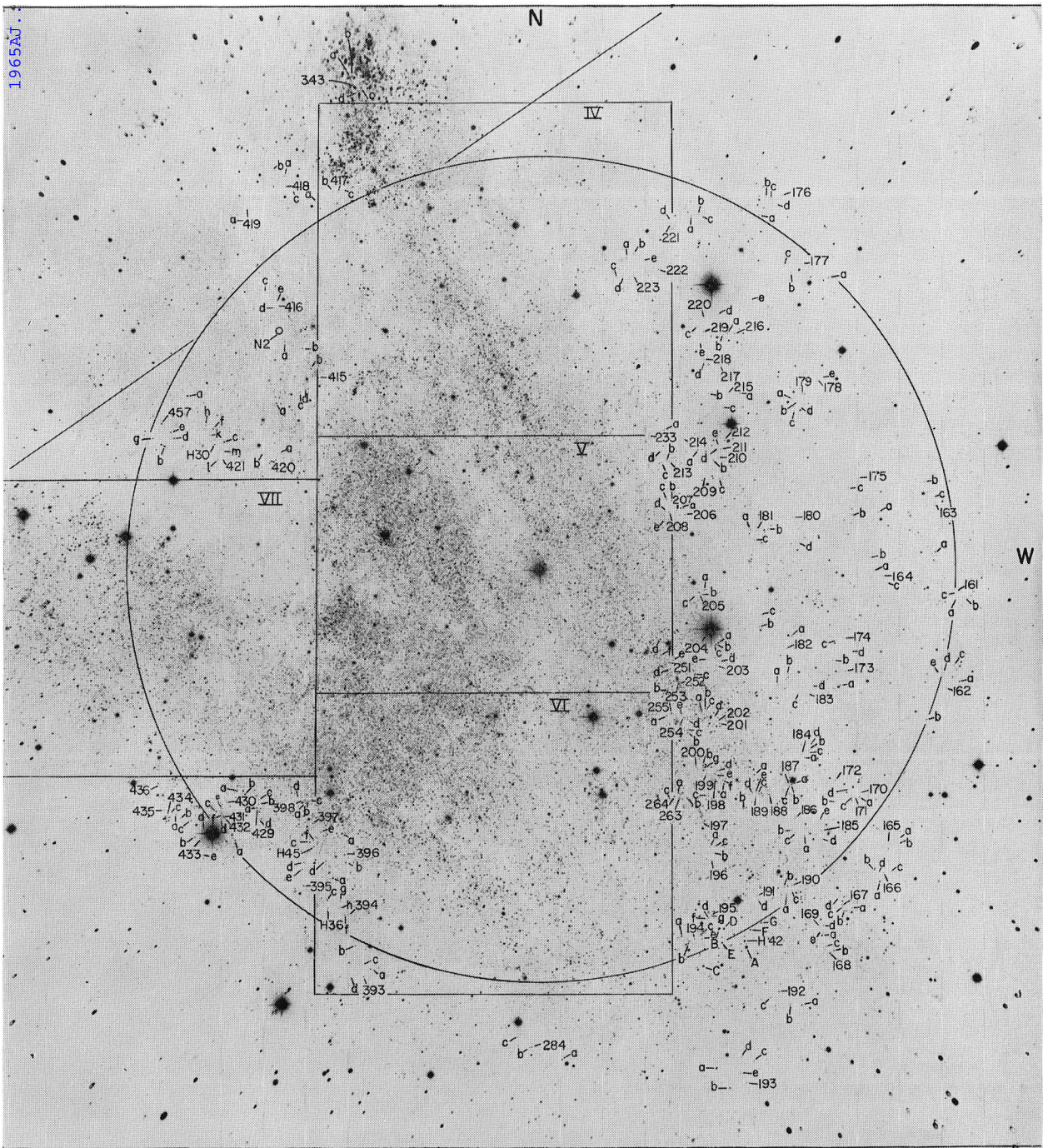


PLATE III. Field III, some variables identified together with their comparison stars and the location of Plates IV through VII.

7 novae. In column 3, where the minimum magnitude is given, the symbol “(” means that the variable is not seen and goes fainter than the magnitude given. This symbol is used this way throughout the paper. When the symbol “)” is given before a maximum magnitude in column 2, it means that the maximum is brighter than the magnitude observed. Column 4 gives the type of variation; the use of the term “short” indicates that the

variable might be a Cepheid with a period less than ten days, though it could also be irregular with rapid fluctuations of small amplitude. A more definite classification of these stars is not possible because (a) the star is superposed on or imbedded in a very dense background, (b) the variable lies toward the edge of the 8' ring and there were few suitable comparison stars available, or (c) the variable has a companion or there is a strong

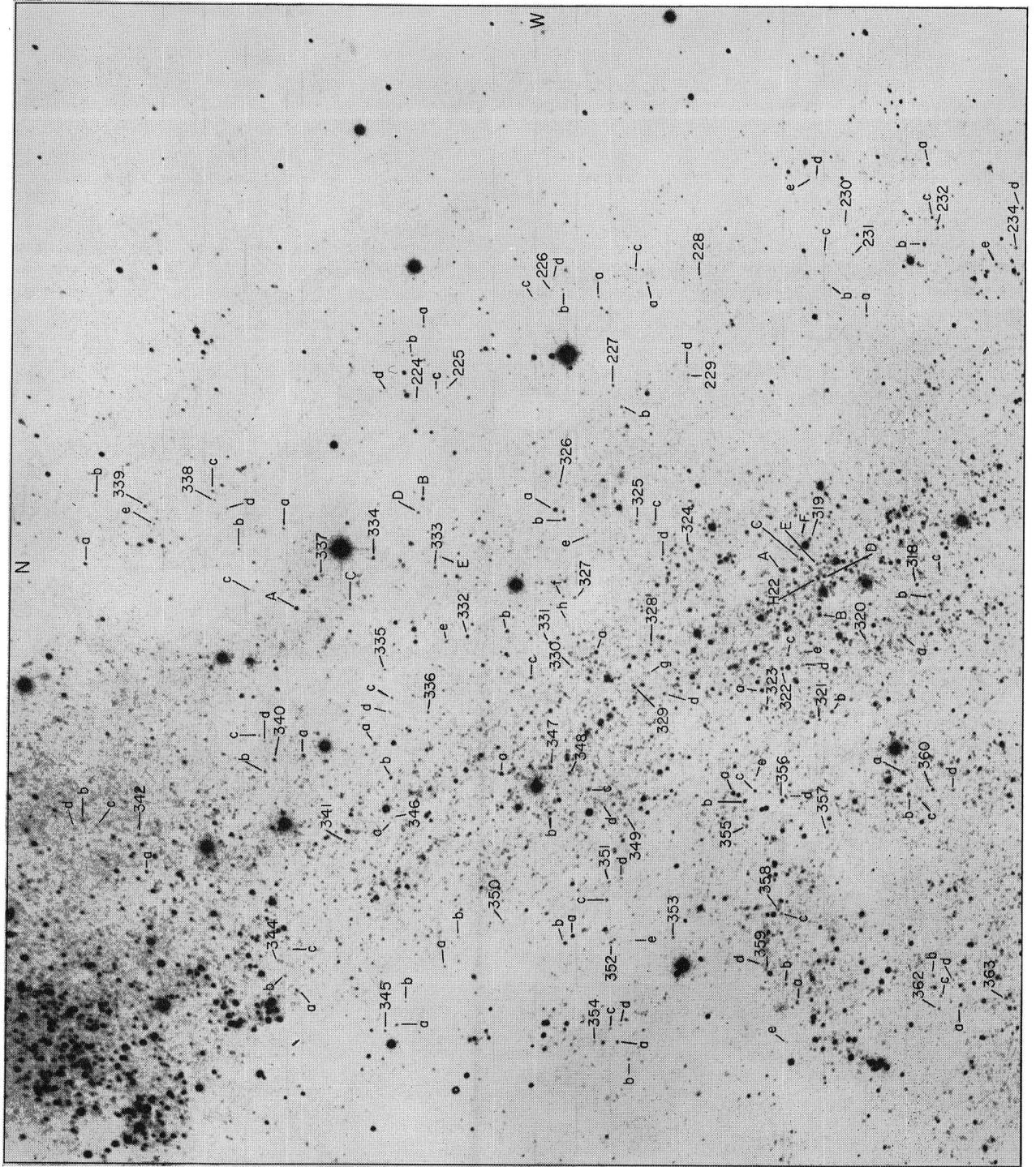


PLATE IV. Field III, north section showing variables and comparison stars.

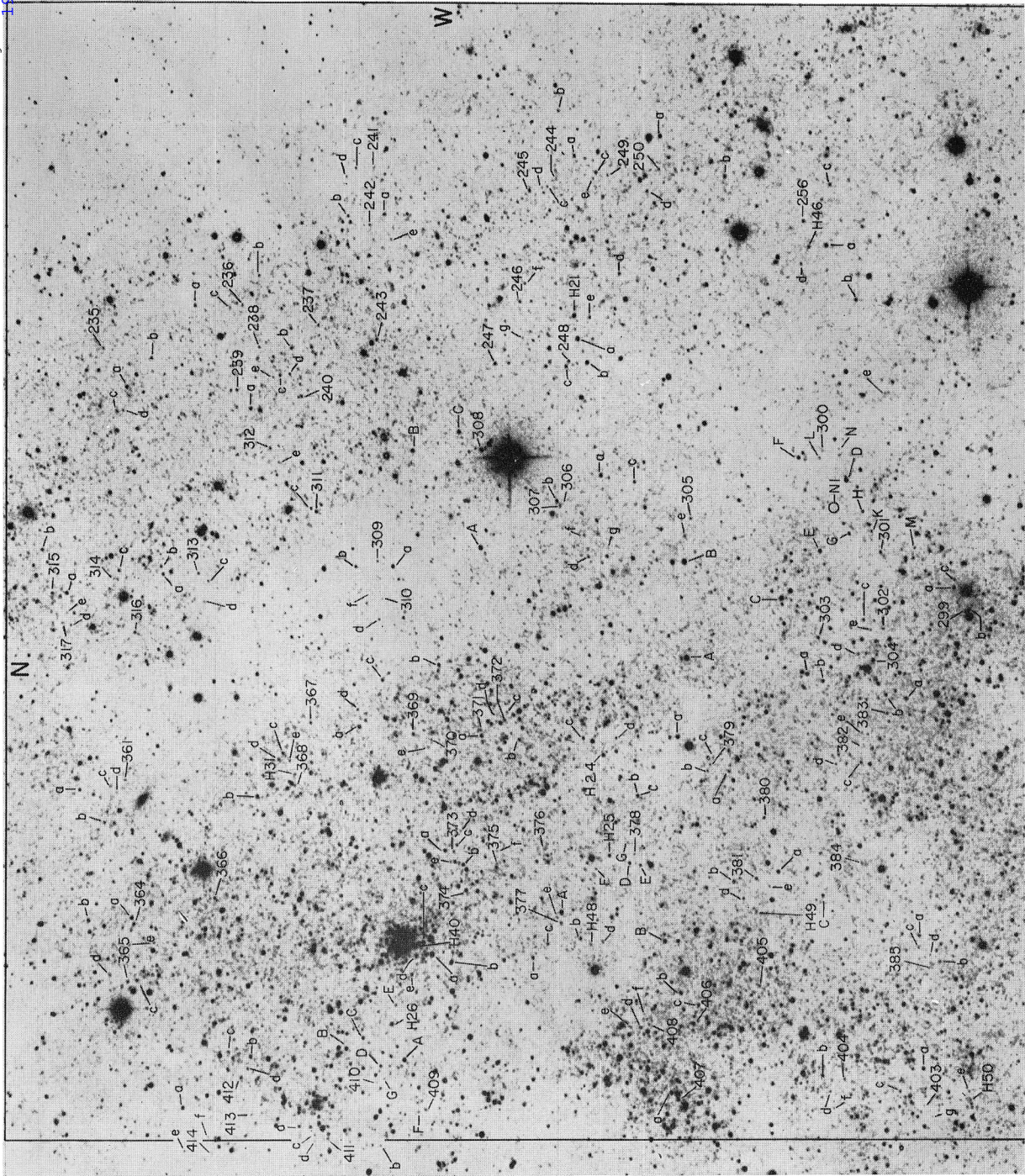


PLATE V. Field III, middle section showing variables and comparison stars.



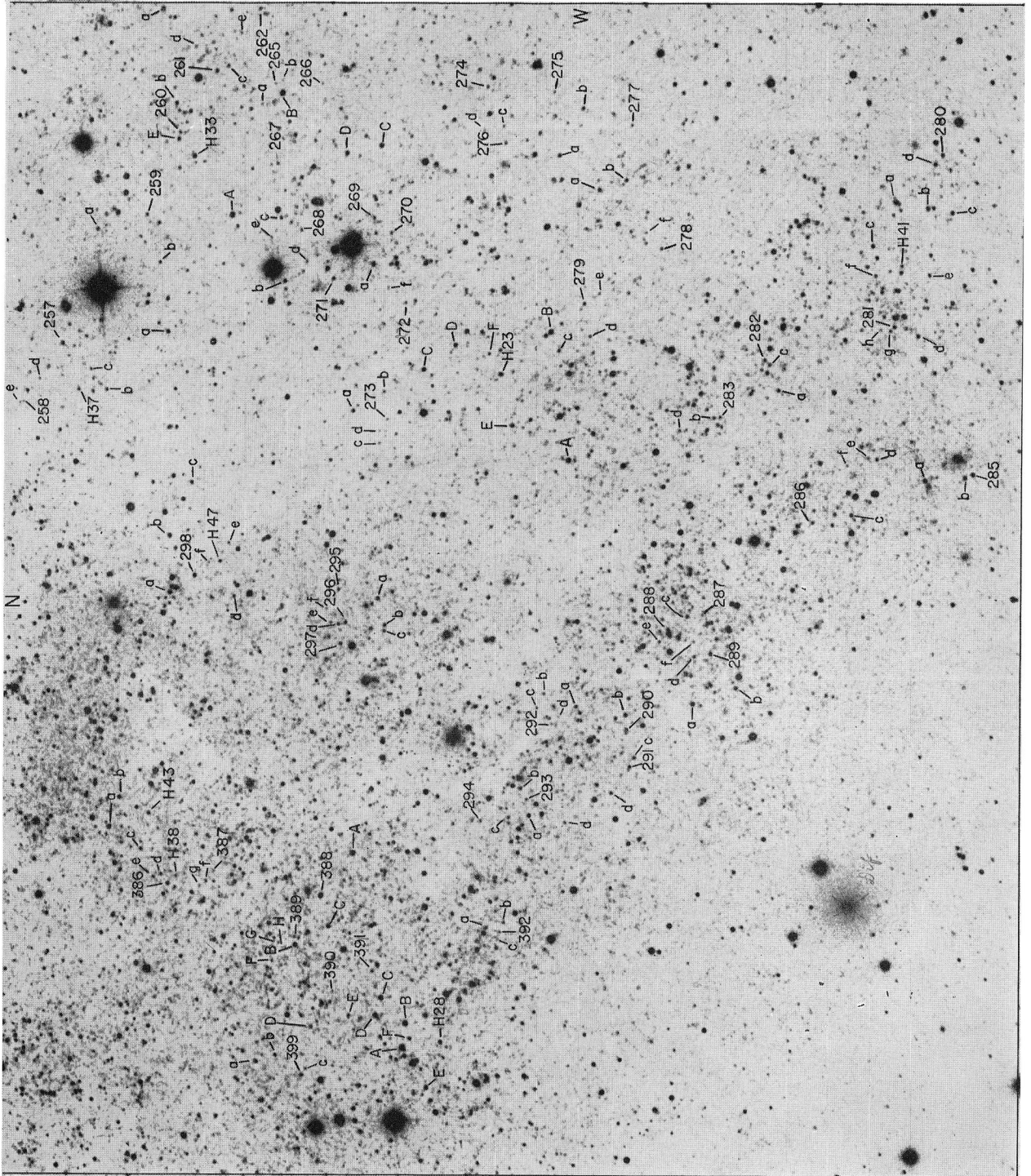


PLATE VI. Field III, south section showing variables and comparison stars.

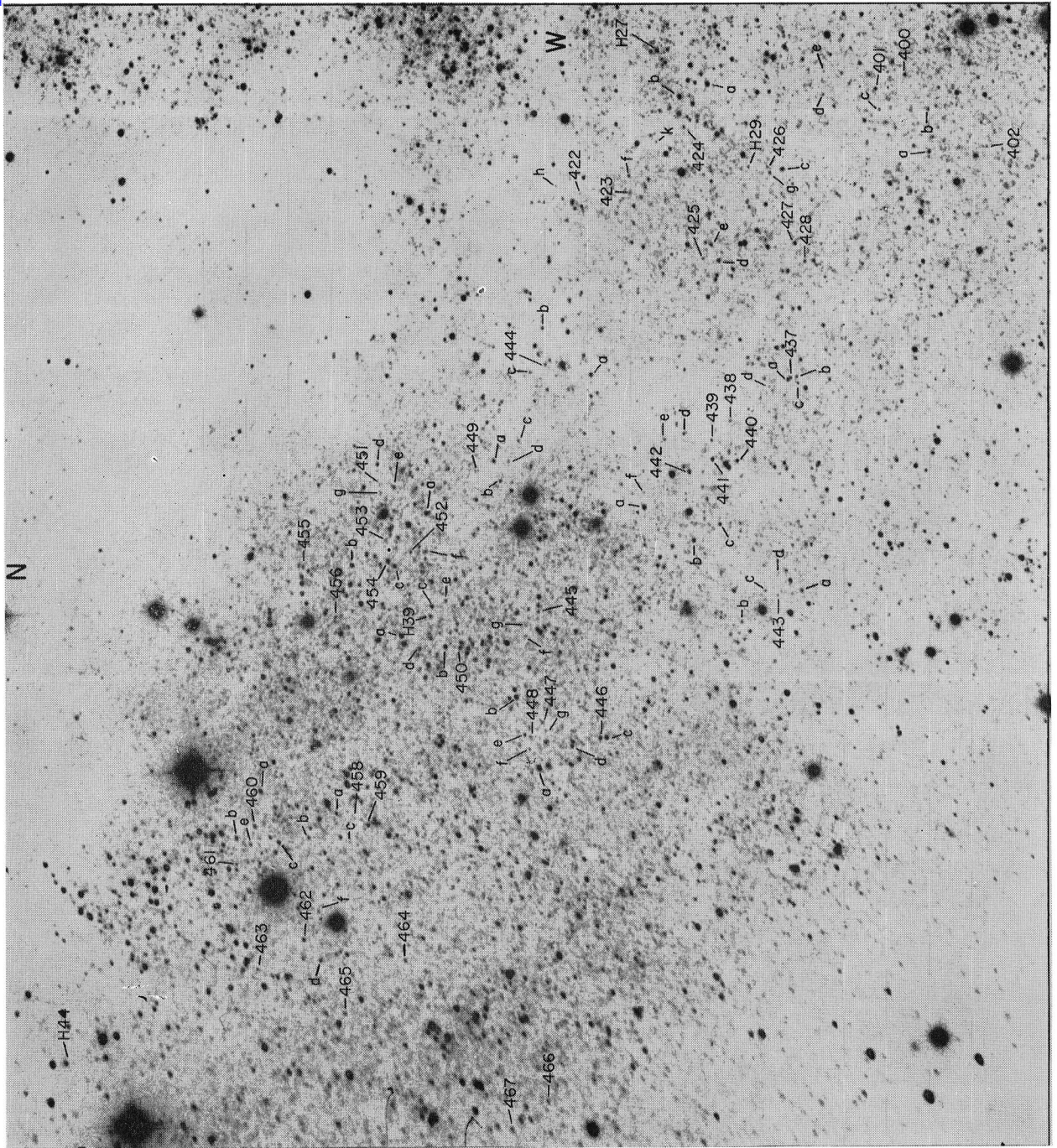


PLATE VII. Field III, following section showing variables and component stars.



Table IV. One hundred and nine variables and seven novae in Field I.

Var.									Var.								
No.	Max.	Min.	Type	Period	1/p	Relative Color	Note	Remarks	No.	Max.	Min.	Type	Period	1/p	Relative Color	Note	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
H 1	19.00	21.08	Ceph	<sup>d</sup> 31.38	0.031863	Reddish			105	21.20	22.10	Irreg			Bluish		d
H 3	19.80	21.90	Ceph	27.03	0.037002	V. Red			106	21.89	22.55	Ceph	4.64	0.21552	Bluish		d
H 5	19.47	21.15	Ceph	46.94	0.021305	Red	a		107	21.40	22.05	Irreg			V. Red		d
H 16	19.48	21.64	Ceph	41.12	0.024319	Red	a		108	21.75	(22.75)	Long	190±		-		d
H 17	19.81	21.39	Ceph	18.77	0.053270	Yellow			109	21.45	22.55	Irreg			Red		d
H 18	20.36	22.10	Ceph	18.52	0.053981	Yellow			110	20.60	21.70	Irreg			Blue		d
51	21.86	22.62	Ceph	4.60	0.21740	Yellow			111	21.30	22.65	Semireg			Red		d
52	21.57	22.87	Ceph	13.83	0.07230	Red			112	21.10	22.70	Irreg			Yellow		Cycles of 60± <sup>d</sup>
53	21.30	21.80	Short			Blue	b		113	22.03	22.93	Ceph	18.96	0.05274	-		
54	21.55	22.43	Ceph	11.58	0.08634	Red			114	21.60	22.70	Irreg			-		
55	21.45	22.40	Irreg			Yellow			115	21.45	22.75	Semireg			Yellow		Cycles of 30-100 <sup>d</sup>
56	20.83	22.43	Ceph	14.40	0.06945	Red			116	21.24	22.00	Ceph	7.66	0.13060	Reddish		
57	20.25	22.03	Ceph	14.62	0.06840	V. Red			117	21.42	22.42	Ceph	7.89	0.12670	Reddish		
58	21.60	22.30	Short			-			118	21.70	22.50	Ceph	12.28	0.08145	Red		
59	21.00	21.55	Short			Blue			119	22.10	22.70	Short			-		
60	21.55	22.55	Short			Yellow			120	20.10	21.76	Ceph	44.88	0.02228	V. Red		
61	21.95	22.45	Short			Red	c		121	21.90	22.65	Ceph	8.32	0.12020	Red		
62	21.35	(22.75)	Irreg	500:		Red			122	19.90	21.30	Irreg			Yellow		b
63	20.55	21.05	Irreg			Red			123	20.95	21.75	Irreg			Yellow		Cycles of 80± <sup>d</sup> ?
64	21.73	22.69	Ceph	4.97	0.20130	Red			124	21.75	(22.75)	Irreg			-		d
65	19.90:	20.20:	Eclip	6.49	0.15416	Yellow	a	Min. 2433572.85	125	20.68	22.04	Ceph	11.80	0.08475	Yellow		d
66	20.65	21.90	Ceph	28.16	0.03551:	Red			126	21.50	22.15	Short			Yellow		d
67	21.95	22.40	Short			Yellow	b		127	20.80	(22.75)	Irreg			Blue		
68	21.80	22.45	Short			Reddish			128	20.22	22.10	Ceph	27.24	0.03671	Red		
69	22.05	22.55	Short			V. Red			129	20.90	22.30	Irreg			Reddish		
70	20.55	21.90	Irreg			Yellow			130	20.71	22.13	Ceph	20.19	0.04953	Yellow		
71	21.75	(22.75)	Irreg			Blue			131	21.40	22.10	Short			Reddish		c
72	21.00	21.65	Short			Reddish			132	21.85	22.59	RV Tau:	21.13	0.04733	Reddish		
73	21.40	22.05	Short			Blue			133	21.70	22.60	Irreg			Yellow		d
74	22.16	22.90	Ceph	9.08	0.11014	Reddish			134	21.20	21.75	Short			Blue		d
75	22.10	22.80	Irreg			Reddish			135	21.05	22.15	Short			Reddish		
76	22.00	23.10:	Ceph	5.86	0.17050	Red			136	21.60	(22.75)	Long	260±		-		d
77	21.96	22.76	Ceph	6.48	0.15434	Red			137	21.40	22.60	Semireg			-		d
78	21.40	22.30	Short			Yellow			138	21.65	22.40	Short			-		d
79	21.10	22.05	Irreg			Blue			139	21.60	22.40	Short			-		d
80	21.50	22.05	Short			Red	c		140	21.30	22.15	Short			Red		d
81	21.20	22.25	Ceph:			Reddish			141	21.09	22.40	Semireg			Blue		d
82	20.90	22.40	Irreg			V. Red	d	Brt. 2433835+923	142	21.25	22.40	Irreg			Blue		d
83	21.75	22.80	Irreg			Yellow			143	21.35	22.62	Irreg			Yellow		b
84	21.70	22.75	Irreg			Red			144	21.75	22.55	Semireg	60.98	0.01640	-		b, d
85	21.1	(22.75)	Long	380:		Red	b		145	21.63	22.55	Ceph:	17.84	0.05605	Yellow		
86	21.20	22.90:	Irreg			Yellow	b	Long Ecl. Var. ?	146	20.71	21.89	Ceph	7.39	0.13532	Yellow		
87	21.14	22.48	Ceph:	25.63	0.03902	Yellow	b	Field II, No. 195	147	21.15	22.65	Ceph:	27.10	0.03690	Blue:		
88	22.15	(22.75)	Long	230:		V. Red	b		148	20.70	21.25	Short			Yellow		c
89	21.85	22.85	Ceph:	24.91	0.04010	-			149	21.20	22.40	Semireg			Yellow		Cycles of 70± <sup>d</sup>
90	20.55	21.15	Eclip			V. Blue		4 obs. at min.	150	20.35	21.00	Irreg			Red		b
91	21.90	(22.80)	Irreg			Red			151	21.60	(22.4)	Ceph	12.97	0.077075	Red		a
92	20.56	21.96	Ceph	14.35	0.06970	Yellow			152	21.29	22.45	Ceph	21.19	0.04719	Red		a
93	22.05	22.90:	Ceph:	26.50	0.03773	Red		Not obs'd at Min.	153	20.25	20.95	Semireg	66.67	0.01500	Yellow		a
94	21.75	(22.75)	Long	350:		Red	d										
95	21.75	22.40	Short:			Yellow	d		Nova 1	17.2	(22.9)						
96	21.75	22.65	Irreg			V. Red			Nova 2	19.2	(22.9)						
97	21.60	22.35	Short			Blue	d		Nova 3	19.7	(22.9)						
98	22.20	(22.75)	Long	185:		Red			Nova 4	18.0±	(23.0)						
99	21.65	22.40	Short			Blue	d		Nova 5	19.2	(22.9)						
100	20.0	22.0	Ceph	16.71	0.05986	Red	a		Nova 6	18.0±	(23.9)						
101	21.40	22.20	Short			Red	b		Nova 7	19.5	(22.9)						
102	21.39	22.55	Ceph	5.53	0.18085	Red	b										
103	21.40	(22.75)	Irreg			-	d										
104	21.65	22.40	Short			Yellow	d										

Notes: a Edge, magnitudes approximate  
b Edge of measured area, estimates uncertain  
c Companion or probable companion  
d Dense background

possibility that it has one. Although it has been determined that the star is a real variable, all these circumstances cause the appearance of the star to change under different seeing conditions. The term "irregular" includes a wide variety of stars—from ones with bluish color to very red ones. Their variability will be discussed in Sec. 4b. "Semiregular" variables are those stars that might be classed as Cepheids but their variation is not periodic but possibly cyclical, rather like an RV Tauri variable or "Semiregular d" as defined in the *Variable Star Catalogue* of Kukarkin, Parenago *et al.* (1958). It is hard to be more specific about these. All the stars were observed during two observing seasons of about five months each; generally, there was

one week of observations and three weeks without any plates having been taken. For irregular stars it is advantageous to have more continuous observations for a longer time. Column 6 gives the reciprocal of the period that was used in Table A to compute the phases. Column 7 gives the relative color. In Field I it is very approximate. Its chief value is to distinguish Population II variables from the Cepheids; this is discussed later in Sec. 4c. The color also distinguishes the different kinds of irregular variables. In column 8, under remarks, the letters refer to notes at the foot of the table indicating why the magnitudes may be particularly uncertain. There are also short remarks about some of the variables that are self-explanatory.

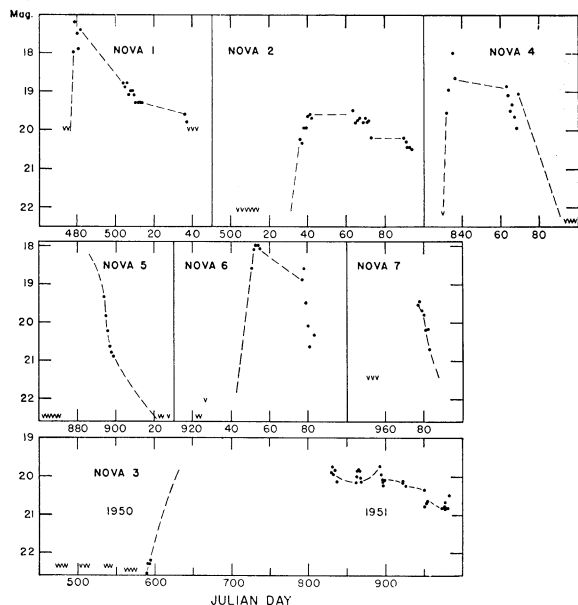


FIG. 1. Seven novae of Field I.

4b. NOVAE LONG-PERIOD AND IRREGULAR VARIABLES OF FIELD I

There are seven novae that were found in Field I during the two years it was observed for variables. They are plotted in Fig. 1. The abscissa is Julian Day and for six of the novae it has the same scale, 20 days per division; for Nova 3 the scale is 50 days per division.

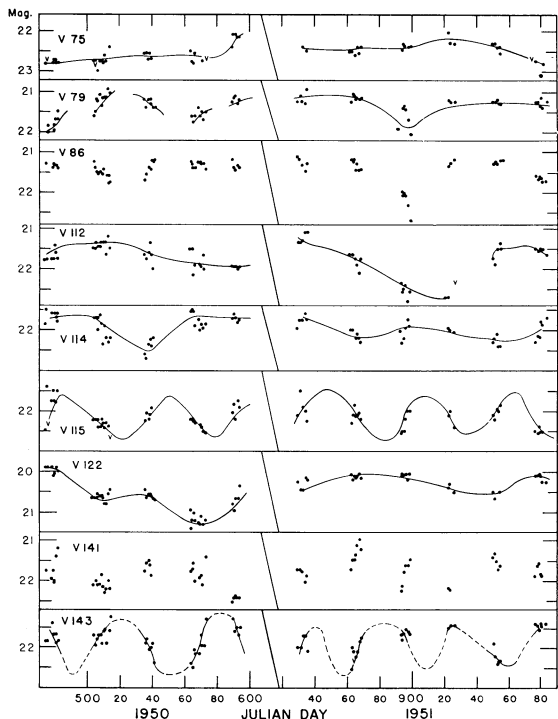


FIG. 2. Nine irregular variables of Field I.

TABLE V. Sixteen irregular variables in Field I.

Var. No.	1950		1951	
	Max.	Min.	Max.	Min.
55	21.9	22.4	21.4	21.9
62	21.5	22.0	22.3	(22.8)
70	20.7	20.8	20.9	21.8
71	22.2	(22.4)	21.7	22.0
83	21.7	22.2	22.1	22.7
84	21.9	22.6	21.6	22.4
91	22.0	22.8	...	(22.7)
96	21.7	22.1	22.2	22.6
103	22.0	(22.5)	21.4	22.0
109	22.1	22.6	21.4	22.4
110	21.0	21.7	20.7	21.3
124	21.7	22.3	...	(22.5)
127	20.8	21.1	22.0	(22.5)
133	21.7	22.2	22.2	22.6
149	21.2	22.1	21.5	21.9
150	20.4	20.9	20.7	21.0

The novae appear to be like those found by Arp (1956) except that they are not as bright. This may be due to the fact that they are not observed at maximum light or that the magnitude systems are not the same. The latter is a possibility as the plates for the Cepheids are overexposed for the bright stars and the fly spanker used to measure the magnitudes did not have an image of big enough diameter for any star above the 19th

TABLE VI. Thirty-one Cepheids in Field I in order of period.

Var. No. (1)	Period (2)	Log P (3)	Mag. of mean <sub>1</sub> (4)	Ampl (5)	Computed phase of max. (6)	Julian Day of obs'd max. 2 433 000 + (7)
H 5	46.937	1.671	20.38:	1.68	.370	482.9
120	44.883	1.652	20.81	1.66	.980	
H 16	41.120	1.614	20.45	2.16	.950	511.0
H 1	31.384	1.497	20.11	2.08	.110	
66	28.161:	1.450	21.50:	1.25:	.900	
128	27.241	1.435	21.19	1.88	.600	
H 3	27.026	1.432	20.82	2.10	.650	
152	21.191	1.326	21.87:	1.16:	.760	482.3
130	20.190	1.305	21.49	1.42	.860	
H 17	18.772	1.273	20.66	1.58	.000	
H 18	18.525	1.268	21.18	1.74	.900	
100	16.706	1.223	21.21:	2.00:	.480	509.2
57	14.620	1.165	21.25	1.78	.610	
56	14.399	1.158	21.67	1.60	.260	
92	14.347	1.157	21.34	1.40	.100	
52	13.831	1.140	22.36	1.30	.010	
151	12.974	1.103	...	1.00:	.680	514.8
118	12.277	1.089	22.11	0.80	.840	
125	11.799	1.072	21.45	1.36	.940	
54	11.582	1.064	21.99	0.88	.010	
74	9.079	0.958	22.48	0.74	.400	
121	8.319	0.920	22.22	0.75	.120	
117	7.893	0.897	21.96	1.00	.900	
116	7.657	0.884	21.64	0.76	.200	
146	7.390	0.869	21.30	1.18	.800	
77	6.479	0.812	22.46	0.80	.400	
76	5.865	0.768	22.44	1.10:	.900	
102	5.529	0.743	21.65	1.16	.400	
64	4.968	0.696	22.31	0.96	.110	
106	4.640	0.667	22.31	0.66	.890	
51	4.600	0.663	22.30	0.76	.120	

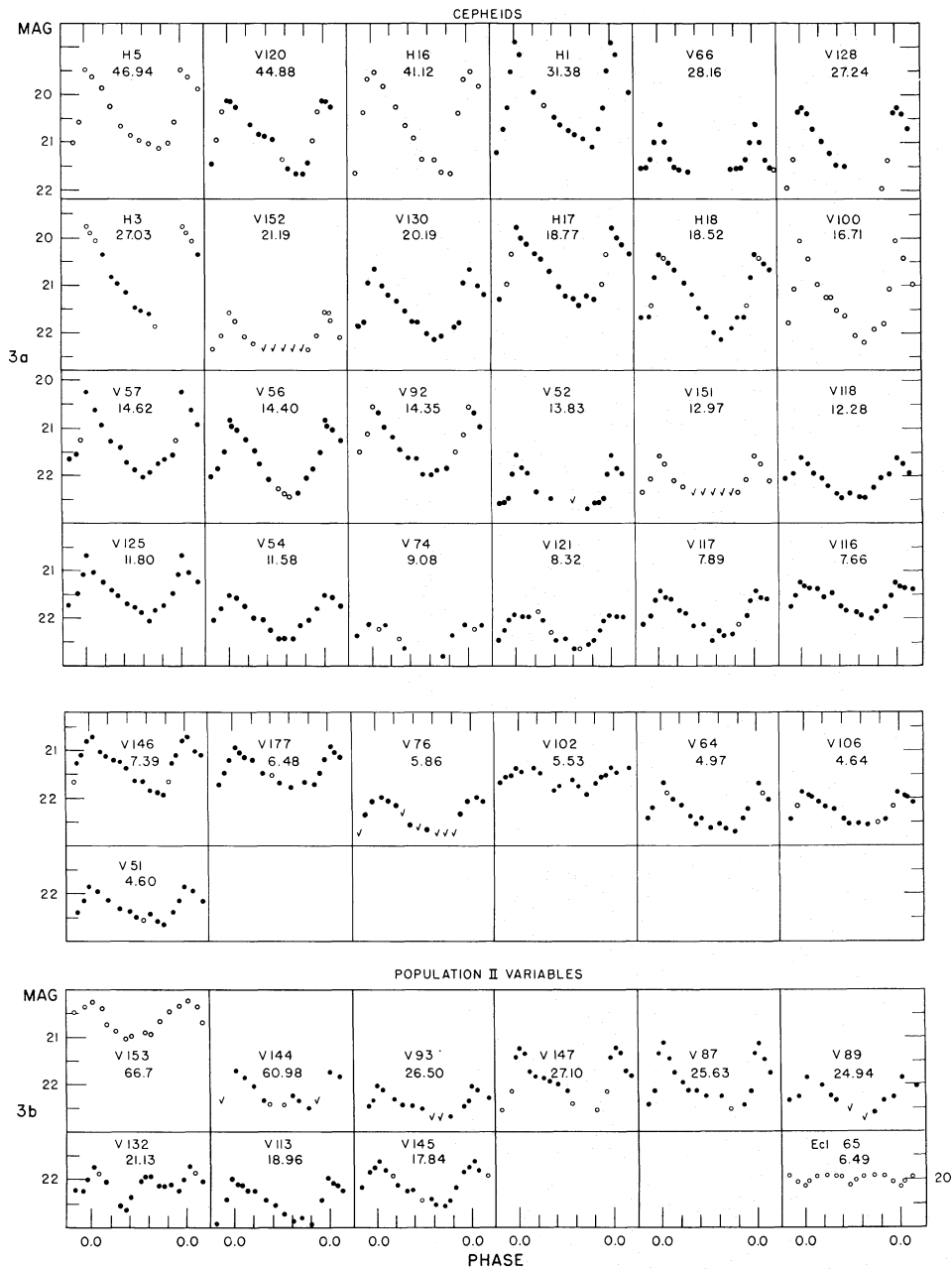


FIG. 3. Field I, (a), mean light curves of 31 Cepheids; (b), mean light curves of 9 Population II variables and 1 eclipsing variable. Solid dots are means of 3 or more observations; open circles, means of 1 or 2 observations; light curves of open circles represent variables outside 8' ring.

magnitude, and hence the bright magnitudes are extrapolated.

There are also six probable long-period variables; the very tops of their maxima are seen and, because they were observed only over two years, the periods given in the table are approximate. In addition, there are 34 variables that are called irregular or semiregular in Table IV. They were estimated by eye once; therefore, some of the scatter in magnitude is due to measuring error and some is intrinsic in the star. Sixteen of

them have slow variations that differ between observing seasons. They are listed in Table V, with the magnitude range for 1950 in the second column and that for 1951 in the third column. Of these, V62, 84, 91, 96, 109, and 150 are red stars, but V71, 110, and 127 are blue, while V55, 70, 83, 133, and 149 are yellow. Colors for V103 and 124 were not determined.

Nine variables are plotted in Fig. 2. Of these, V75 is reddish, V86, 112, 115, 122, and 143 are yellow, and V79 and 141 are blue, while for V114 the color was not

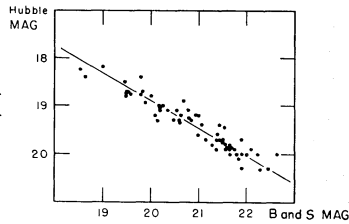


FIG. 4. Curve for converting Hubble's magnitudes to present system.

determined. Of the nine remaining variables, their type of variation is described in the remarks column and their colors are red for V63, 82, 107, 111, and 129, yellow for V105 and 142, and undetermined for V137.

#### 4c. CEPHEIDS AND POPULATION II VARIABLES OF FIELD I

Table VI lists the 31 Cepheids and Table VII the 9 Population II variables as defined in the paper on Field IV (Baade and Swope 1963), Secs. 9 and 10, in order of decreasing period. Their distribution in the field is shown in Plate II. Plate II also shows the location of the seven novae. The novae are in the northern half of the field. The Cepheids for the most part outline the spiral arm, with one or two exceptions which probably lie in front of the background stars, such as V125. The nine Population II variables are underlined in Plate II; they fall on the south following half of the plate, but mostly not along the spiral arm—with the exception of V145 and 147—but on the inner side of the arm or beyond it.

The mean light curves of the Cepheids are shown in Fig. 3(a), and in Fig. 3(b) are the light curves of the Population II variables. The solid dots represent normal points with three or more observations, and the open circles normal points of one or two observations. The light curves made up exclusively of open circles are near the edge of the field. They are H5, H16, and V100, 151, 152, and 153.

Table A gives the observations and phases for 34 of the variables. The phases are computed using: Phase =  $1/p(\text{JD} - 2433000)$  except for Hubble's variables, which are computed using Phase =  $1/p(\text{JD} - 2400000)$ .

Since there are only a few plates between Hubble's observations and those of 1950–1952, the observations on 100-in. plates are not listed, but a conversion curve (Fig. 4) has been given to convert Hubble's magnitudes (1929) to the present system. As Hubble did not give his comparison stars, a rough conversion curve was formed by taking his maximum and minimum values for each Cepheid and plotting it against the magnitudes of maximum and minimum for the same Cepheid given in Tables IV and VIII of this paper. It is rather remarkable that the agreement is as good as it is and that it is a straight line. At the bright end the difference between the magnitude systems is  $0^m.5$ , and for the faint observations the difference is about  $2^m.0$ . The converted magnitudes fit the new periods that have been only slightly altered from Hubble's original periods and there is no indication of any real change of period.

TABLE VII. Nine Population II variables in Field I.

Var. No.	Period	LogP	Mag. of mean <sub>I</sub>	Ampl.	Computed phase of max.	Julian Day of obs'd max. 2,433,000+
153	66.67	1.826	20.66	0.70:	.300	954.0
144	60.98	1.785	22.19	0.80	.050	
147	27.10	1.433	21.97	1.50:	.700	
93	26.50	1.423	22.47	0.86:	.370	
87	25.63	1.408	22.00	1.34	.890	
89	24.94	1.397	22.35	1.00:	.040	
132	21.13	1.324	22.10	0.74	.400	
113	18.96	1.278	22.46	0.90	.630	
145	17.84	1.251	22.14	0.92	.940	

The observations for the six variables near the edge of the field are not given in Table A, but the Julian Day of an observed maximum is given in the remarks of Tables VI and VII.

V132, plotted in the lower left corner of Fig. 3(b), is called a Population II variable, but it is rather anomalous. It has alternating deep and shallow minima over the two years observed, but its period seems short for an RV Tauri star. It may be an eclipsing variable—but then its color appears to be too red, unless it is also a very much reddened star.

The one eclipsing star with a period, V65, is plotted in the lower right corner of Fig. 3(b) and the Julian Day of an observed minimum is given in the remarks of Table IV.

#### 5a. THE VARIABLES OF FIELD III

In Field III Baade blinked eight pairs of plates and later Miss Swope blinked ten pairs. Of the 390 variables marked, 39 were not measured because of closeness to the plate edge, 17 were in the northeast corner overlapped by Field II and were better measured by Gaposchkin (1962). The remaining 334 variables and 2 novae and their local sequences (Table III) are marked on Plates III through VII, and they are listed in Table VIII. Of these, 237 variables were found by Baade and 97 by Miss Swope. The first 27 variables of the table were originally discovered by Hubble (1929) and retain his numbers. The periods given are essentially the same as his, but they now fit all the observations from 1920 through 1952. There is no evidence for any change of period. H47, 48, 49, and 50, for which Hubble found no periods, are also Cepheids. They were too faint to be seen on most of the 100-in. plates.

All the variables within an 8' ring of the plate center were measured and, in addition, a few stars in the south preceding spiral arm and in the following arm outside the ring have been included. Table VIII is similar to Table IV. In column 4 there are 38 variables that are called "Cepheid;" or short; their variation is similar to that described in Sec. 4a for Field I. In column 7 the relative color is given as the scale difference between the photographic and the photovisual plates, as all the variables and their comparison stars were measured on

Table VIII. Three hundred and thirty-four variables and two novae in Field III.

Var.	Max.	Min.	Type	Period	Reciprocal of period 1/p	Relative Color	Remarks	Var.	Max.	Min.	Type	Period	Reciprocal of period 1/p	Relative Color	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
H 21	20.20	21.80	Ceph	17.154	0.058294	+ 7	*	219	21.52	22.34	Ceph	5.266	0.18991	0	
22	19.90	21.70	Ceph	17.569	0.056920	+13	*	220	21.50	22.40	Ceph	5.900	0.16949	- 2	Nebulous
23	19.55	21.45	Ceph	17.557	0.056956	- 9	*	221	21.55	22.60	Ceph	5.823	0.17173	+12	
24	20.79	22.05	Ceph	17.609	0.056790	-15	*	222	21.25	22.27	Ceph	8.094	0.12355	- 6	
25	20.35	21.65	Ceph	11.831	0.084321	- 8	*	223	21.58	22.46	Ceph	3.808	0.26260	+ 3	
H 26	20.25	21.75	Ceph	26.196	0.038174	-16	*	224	22.05	22.70	Short	-	-	-	
27	19.60	21.55	Ceph	24.130	0.041442	+10:	*	225	21.70	22.46	Ceph	7.780	0.12853	- 6	
28	18.55	20.60	Ceph	26.790	0.037328	- 7	*	226	22.05	22.87	Ceph	5.640	0.17729	- 2	
29	20.78	22.64	Ceph	19.492	0.051302	-12	*	227	21.63	22.47	Ceph	5.848	0.17100	+ 3	
30	19.50	21.60	Ceph	18.291	0.054672	-10	*	228	21.50	22.50	Ceph	7.613	0.13135	+ 6	
H 31	20.55	22.23	Ceph	22.725	0.044004	+12	*	229	21.65	22.25	Ceph	9.208	0.10860	+ 5	
33	19.50	20.84	Ceph	18.853	0.053043	+ 3	*	230	21.60	22.74	Ceph	6.508	0.15366	+ 5	
36	20.20	21.50	Ceph	17.914	0.055823	+ 4	*	231	21.80	22.40	Eclip:	-	-	-14	4 min.
37	20.49	21.57	Ceph	13.338	0.074973	+ 8	*	232	20.85	21.35	Ceph	5.117	0.19542	+ 0	Nebulous
38	20.60	22.00	Ceph	10.125	0.098764	+ 8	*	233	21.60	22.26	Ceph	4.837	0.20673	0	
H 39	20.20	21.84	Ceph	23.970	0.041719	-13	*	234	20.72	21.70	Ceph	9.933	0.10067	+ 7	
40	19.65	20.95	Ceph	33.510	0.029842	+11	*	235	21.07	22.17	Ceph	8.910	0.12485	+ 3	
41	20.04	21.50	Ceph	25.487	0.039236	- 7	*	236	21.20	22.05	Ceph?	27.115	0.03688	+ 1	Max. not obs'd
42	18.30	20.10	Ceph	176.68	0.00566	-23	*	237	21.60	22.42	Ceph	7.085	0.14115	+ 3	
43	20.70	21.30	Irreg	-	-	-37	*	238	21.86	22.46	Ceph	6.283	0.15917	+ 5	
H 44	19.85	21.45:	RCrB	-	-	+ 0	*	239	21.50	21.95	Eclip	-	-	-14	1 1/2 min.
45	20.13	21.65	Ceph	12.889	0.077587	+ 6	*	240	21.20	22.00	Eclip	-	-	+ 1	3 min.
46	20.62	21.58	Ceph	12.923	0.07738	+ 4:	*	241	21.48	22.34	Ceph	6.329	0.15800	0	
47	21.41	22.45	Ceph	6.006	0.16650	+ 2	*	242	21.60	22.35	Ceph:	-	-	- 1	
48	21.40	22.30	Ceph	5.320	0.18797	- 4:	*	243	21.30	22.36	Ceph	8.435	0.11856	+ 2	Companion
H 49	21.00	21.90	Ceph	10.265	0.09742	+ 6	*	244	21.66	22.68	Ceph	4.219	0.23705	- 4	Companion
H 50	21.00	22.40	Ceph	11.378	0.08789	- 7	*	245	21.23	22.56	Eclip	8.216	0.12172	-17	
161	21.84	22.50	Ceph	4.025	0.24844	-		246	21.35	22.31	Ceph	4.946	0.20217	+ 1	
162	21.03	22.15:	Semireg	65.10	0.01536	- 0		247	20.55	21.81	Ceph	7.006	0.14273	0	
163	21.24	22.28	Ceph	4.368	0.22891	- 6		248	21.45	22.15	Short	4 ±	-	-	
164	22.00	22.70	Ceph:	-	-	-		249	21.50	22.12	Ceph	8.809	0.11352	+ 3	
165	22.00	23.00	Ceph:	8 ±	-	-	a	250	21.08	21.96	Ceph	8.301	0.12047	+ 3	
166	20.70	22.40	Ceph	22.302	0.04484	+ 9	a	251	21.30	22.15	Ceph	5.260	0.19010	0	
167	21.35	22.45	Ceph	6.047	0.16536	0	a	252	20.80	21.45	Ceph	13.089	0.07640	+ 2	V 253 companion
168	20.20	21.50	Ceph	13.125	0.07619	+ 5	a	253	20.90	21.50	Ceph	9.551	0.10470	+ 2:	of V 252
169	21.30	22.40	Ceph	6.207	0.16110	0	a	254	21.40	22.40	Ceph	6.978	0.14330	+ 1	
170	21.52	22.70	W Vir:	17.346	0.05765	- 7		255	21.10	(21.7:	Eclip	8.978	0.11138	- 2	
171	21.80	22.50	Ceph	5.081	0.19689	-		256	21.30	22.20	Ceph	5.333	0.18750	- 5	
172	21.53	22.55	Ceph	11.013	0.09080	-		257	20.75	21.65	Ceph	9.038	0.11065	- 6	
173	21.45	22.40	Ceph	5.008	0.19969	- 3		258	21.60	22.60:	Ceph	5.500	0.18182	+ 3	Companion
174	21.90	22.40	Eclip	-	-	-17		259	21.20	21.52	Ceph	5.316	0.18812	- 1	
175	21.60	22.15	Short	-	-	+ 6		260	21.45	22.45	Short	-	-	-	
176	21.75	22.55	Ceph	2.5 ±	-	-	a	261	21.25	21.65	Ceph	11.368	0.08797	+ 7	
177	21.28	21.98	Ceph?	27.972	0.03575	- 4		262	20.45	21.45	Ceph	8.762	0.11413	+ 5	
178	22.15	23.00	Short	-	-	+ 2		263	21.15	21.80	Short	-	-	-	
179	21.70	22.30	Irreg:	-	-	+20		264	20.95	22.05	Ceph	9.524	0.10500	+ 2	
180	21.65	22.27	Ceph	9.181	0.10892	+ 3		265	22.30	22.95	Short	-	-	-	
181	21.70	22.30	Eclip:	-	-	-10		266	22.40	23.00:	Short	-	-	-	
182	21.45	22.00	Eclip	-	-	-12		267	21.08	22.40	Ceph	13.250	0.07547	+11	
183	22.15	23.05	Ceph	5.350	0.18690	-		268	20.84	21.84	Ceph	14.440	0.06925	+ 8	
184	21.95	22.90	Ceph	6.048	0.16534	-		269	21.40	22.12	Ceph	4.620	0.21645	- 2	
185	22.14	22.85	Ceph	7.704	0.12980	-		270	21.01	22.01	Ceph	10.017	0.09883	+ 7	
186	21.50	22.80	Ceph	6.293	0.15890	+ 8		271	20.85	21.97	Ceph	7.911	0.12640	+ 2	
187	21.85	22.55	Ceph	7.042	0.14200	+ 3		272	21.25	22.40	Ceph	6.545	0.15278	- 3	
188	21.20	22.38	Ceph	11.947	0.08370	+10		273	21.65	22.51	Ceph	9.741	0.10266	+ 4	
189	21.65	22.55	Ceph:	3 +	-	-		274	21.31	22.25	Ceph	6.823	0.14657	0	
190	21.35	21.95	Ceph	3.346	0.29890	- 3		275	21.20	22.45	Ceph	21.556	0.04639	+17	
191	21.10	22.10	Ceph	6.545	0.15280	+ 2		276	21.24	21.72	Eclip	5.005	0.19980	-18	
192	20.80	21.50	Ceph	4.773	0.20950	-		277	21.50	21.96	Ceph	2.747	0.36400	- 7	
193	19.70	21.25	Ceph	15.524	0.064415	-	a	278	20.87	22.05	Ceph	9.881	0.10120	- 7	
194	20.93	21.89	Ceph	10.479	0.09543	+ 9		279	21.37	22.25	Ceph	4.921	0.20320	- 3	
195	21.49	22.41	Ceph	4.289	0.23313	0		280	20.34	20.96	Ceph	13.850	0.07220	+ 4	
196	22.15	22.60	Short	-	-	-		281	21.30	22.16	Ceph	9.699	0.10310	-12	
197	22.05	22.70	Ceph:	3 ±	-	-		282	21.35	21.70	Short	-	-	-	
198	21.00	22.28	Ceph	6.002	0.16660	- 4		283	21.50	22.00	Ceph:	4 ±	-	-	
199	21.42	22.38	Ceph	6.101	0.16390	- 2		284	20.95	21.90	Eclip	-	-	-12	4 min.
200	21.95	22.70	Irreg	-	-	+23		285	20.45	22.90	RCrB	-	-	0	*
201	21.55	22.05	Ceph	3.227	0.30990	- 2		286	21.25	22.35	Ceph	4.915	0.20345	0	
202	21.64	22.32	Ceph	6.460	0.15480	- 2		287	21.15	22.15	Ceph	5.095	0.19626	- 1	
203	21.85	22.30	Eclip	-	-	- 8		288	21.02	21.62	Ceph	9.573	0.10446	0	
204	21.05	21.80	Eclip	-	-	- 8		289	20.30	21.65	Ceph:	6 ±	-	-	Close to brt star
205	22.55	23.17:	Eclip	6.944	0.14400	- 5		290	20.54	21.20	Semireg	67.95	0.014716	+ 1	*
206	21.56	22.06	Eclip	4.265	0.23445	- 9		291	20.95	21.45	Irreg	-	-	- 7	
207	20.98	21.94	Ceph	6.545	0.15280	- 0		292	21.95	22.75	Ceph:	8 ±	-	+12	
208	21.02	22.24	Ceph	12.402	0.08063	+ 7		293	20.91	21.99	Ceph	15.015	0.06660	+10:	
209	21.80	22.60	Eclip	-	-	+ 8		294	21.20	21.98	Ceph	7.570	0.13210	+ 3	
210	21.92	22.90	Ceph	5.120	0.19533	0		295	21.50	22.25	Short	-	-	0	
211	21.63	22.37	Ceph	3.833	0.26090	- 3		296	21.44	22.26	Ceph	9.412	0.10625	+ 6	
212	21.55	22.90													

Table VIII. (continued)

Var.	Max.	Min.	Type	Period	Reciprocal of period 1/p	Relative Color	Remarks	Var.	Max.	Min.	Type	Period	Reciprocal of period 1/p	Relative Color	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
304	20.75	21.41	Ceph	8.365	0.11954	+ 1	Companion	389	21.75	22.35	Short	-	-	-	Companion
305	21.45	22.63	Ceph	5.589	0.17893	0		390	21.95	22.55	Short	-	-	+12	
306	21.80	22.80	Long	370.	-	+30:		391	20.85	21.95	Ceph	7.619	0.13125	+ 4	
307	20.75	21.53	Ceph	8.961	0.11160	- 3:		392	21.70	22.40	Ceph	6.196	0.16140	+ 5	
308	19.98	20.65	Eclip	4.9462	0.202174	-15		393	21.15	21.90	Irreg	-	-	-14	a
309	21.08	22.40	Ceph	7.667	0.13043	+ 7		394	21.50	22.25	Ceph	5.285	0.18920	+ 2	
310	22.25	23.00	Ceph	8.210	0.12180	-		395	20.40	21.62	Ceph	10.741	0.093101	+ 6	*
311	20.80	21.82	Ceph	8.171	0.12238	+ 4		396	20.50	21.30	Semireg	100.00	0.010100	+ 3	*
312	21.84	22.90	Eclip	4.898	0.20418	-16		397	21.45	21.95	Ceph:	6.±	-	-	
313	21.29	22.41	Ceph	10.689	0.09355	+13		398	21.60	22.60	Ceph	7.008	0.14270	+ 6	Companion
314	21.62	22.36	Ceph	14.306	0.06990	+ 7	Companion	399	21.27	21.93	Ceph	5.580	0.17920	- 5	
315	20.93	21.59	Ceph	8.464	0.11815	- 3		400	21.20	22.50	Irreg	-	-	+ 5	
316	20.70	21.90	Ceph	10.526	0.09500	+ 6		401	21.23	22.00	Eclip	8.227	0.12155	-13	
317	21.63	22.39	Ceph	6.313	0.15840	0		402	21.68	22.52	Ceph	4.904	0.20390	+ 6	
318	21.40	22.44	Ceph	9.921	0.10080	+ 4		403	21.95	22.75	Ceph	5.103	0.19596	- 1	
319	21.25	22.30	Ceph	7.553	0.13240	+ 4	Companion	404	21.15	22.55	Ceph	17.247	0.05798	+14	
320	21.40	22.58	Ceph	7.823	0.12783	+10		405	20.78	22.02	Ceph	10.549	0.09480	+ 2	
321	21.40	22.00	Ceph	7.723:	0.12948	0	Lg. scatter, comp.	406	20.85	22.00	Ceph	13.643	0.07330	+10	Companion
322	21.54	22.48	Ceph	5.482	0.18240	-	Companion	407	20.95	22.10	Ceph	13.912	0.07188	+11	Companion
323	21.00	21.60	Eclip	18.748	0.05334	- 2		408	21.85	22.67	Ceph	6.188	0.16160	+ 7	
324	21.60	22.60	Ceph	6.481	0.15430	+ 5	Companion	409	21.45	22.10	Eclip:	3.5±	-	- 5	
325	21.10	21.75	Ceph	9.483	0.10545	0:	Companion	410	21.86	22.80	Ceph	6.036	0.16567	+ 3	
326	20.95	22.11	Ceph	7.000	0.14286	+ 2		411	21.20	22.70	Ceph	15.833	0.06316	+ 6	
327	21.60	22.48	Eclip:	-	-	- 4		412	20.90	21.70	Ceph	7.992	0.12512	+ 2	
328	21.53	22.23	Ceph	6.660	0.15014	+ 3	Field II, No. 30	413	21.95	22.75	Irreg	-	-	+30	
329	20.75	22.00	Ceph	12.312	0.08122	+13	Field II, No. 135	414	21.55	22.67	Ceph	3.742	0.26726	- 5	
330	21.05	22.21	Ceph	6.709	0.149055	+ 2:	Field II, No. 29	415	20.80	22.30	Ceph	13.125	0.07619	+10	Field II, No. 31
331	21.30	22.30	Ceph	5.978	0.16728	0		416	21.44	22.48	Ceph	14.364	0.06962	+ 2	Field II, No. 62
332	21.10	22.36	Ceph	7.457	0.13410	+ 2	Field II, No. 70	417	21.65	22.23	Ceph	4.967	0.20131	+ 2	a
333	21.90	22.56	Ceph	5.486	0.18228	-		418	21.40	22.05	Irreg	-	-	+34	a slow
334	20.75	21.60	Ceph	12.294	0.08134	+ 9	Field II, No. 133	419	22.35	22.9	Long	343.	-	+30:	a
335	21.33	22.35	Ceph	5.750	0.17390	- 4	Field II, No. 173	420	22.10	22.95	Short	-	-	-	
336	21.80	22.56	Ceph	4.610	0.21692	+ 7		421	22.30	23.00	Short	-	-	-	
337	21.85	22.45	Short	-	-	-		422	21.95	23.0	Ceph	18.519	0.05400	+18	
338	21.95	22.71	Ceph	5.647	0.17707	-	Field II, No. 203	423	21.42	22.54	Ceph	14.388	0.06950	+15:	
339	21.00	22.30	Ceph	15.232	0.06565	+15	Field II, No. 150	424	21.85	22.75	Ceph	6.728	0.14868	+ 2	
340	21.20	22.20	Ceph	6.645	0.15050	+ 8	Field II, No. 151	425	22.00	22.55	Ceph:	6.±	-	+ 7	
341	20.50	21.84	Ceph	9.881	0.10120	-	Field II, No. 60	426	21.70	22.40	Ceph	9.425	0.10610	+ 5	
342	21.60	22.30	Short	-	-	-		427	21.05	22.40	Ceph	11.257	0.08883	+ 6	
343	20.0	21.5	Ceph	13.210	0.07570	-	a,Field II, No. 57	428	21.07	21.65	Ceph	6.024	0.16600	0	Shift in phase
344	21.73	22.27	Ceph	5.040	0.19840	-	Companion	429	21.45	22.75:	Ceph	5.679	0.17610	+ 2	Companion
345	21.60	21.90	Irreg	-	-	+23		430	20.40	21.20	Irreg	-	-	-10	Slow
346	22.65	22.80	Ceph:	-	-	-		431	21.30	21.90	Ceph	4.082	0.24498	+ 2	Close to V432
347	20.75	21.55	Short	-	-	+12	Close to other stars	432	21.63	22.42	Eclip	67.20	0.01488	+ 2	
348	21.20	22.10	Ceph	9.662	0.10350	+10	Field II, No. 68	433	20.65	22.40	Ceph	22.978	0.04352	+14	a
349	21.95	22.45	Irreg	-	-	+ 5		434	21.95	22.45	Irreg	-	-	+40	a
350	21.50	22.20	Ceph	5.351	0.18688	- 3	Field II, No. 174	435	21.70	22.54	Ceph	4.686	0.21340	+ 3	a
351	21.50	22.64	Ceph	5.719	0.17487	+ 1	Field II, No. 153	436	22.10	22.90	Short	-	-	0	a
352	20.88	21.80	Ceph	6.071	0.16473	+ 1	Field II, No. 175	437	21.55	22.55	Ceph	6.231	0.16050	-	Companion
353	21.52	21.98	Ceph	2.932:	0.341095	-	Field II, No. 67, comp.	438	21.34	22.70:	Ceph	12.811	0.07806	+13	
354	21.58	22.44	Ceph	7.368	0.13573	+ 7	Field II, No. 61	439	20.52	22.44	Ceph	21.698	0.046088	+13	
355	20.61	21.69	Ceph	15.699	0.06370	+ 4	Field II, No. 114	440	20.85	22.50	Ceph	25.707	0.03890	+16	
356	20.50	21.05	Irreg	-	-	- 1		441	21.00	21.80	Eclip	-	-	-16	3 min.
357	21.03	22.51	Ceph	13.293	0.07523	+ 6		442	20.73	21.45	Eclip	9.583	0.10435	-18	
358	21.60	22.30	Ceph	11.922:	0.08388:	+ 9	Companion	443	21.60	22.76	Ceph	4.990	0.20040	+ 5	
359	21.50	22.80	Ceph	6.75:	0.1481:	0	Close to brt. stars	444	21.50	22.50	Eclip	-	-	-13	2 min.
360	21.35	22.10	Eclip	-	-	- 7	7 min.	445	22.00	22.68	Eclip:	-	-	- 9	
361	21.59	22.55	Ceph	6.039	0.16560	+ 3		446	20.15	21.50	Ceph	14.130	0.070770	+ 6	*
362	21.40	22.38	Ceph	11.074	0.09030	+10		447	21.82	22.52	Ceph	5.456	0.18330	+ 7	
363	21.70	22.05	Short	-	-	-		448	21.65	22.55	Ceph	6.475	0.15445	+ 8	Companion
364	20.80	21.44	Ceph	7.120	0.14045	+ 2		449	21.20	22.68	Ceph	19.395	0.05156	+19	
365	21.10	22.50	Ceph	20.568	0.04862	+18		450	20.25	21.65	Ceph	11.700	0.08547	+ 6	Companion
366	20.95	22.35	Ceph	14.407	0.06941	+11		451	21.88	22.70	Ceph	10.969	0.09117	+ 9	
367	21.20	21.90	Irreg	-	-	+ 6	Slow	452	20.80	22.20	Ceph	10.951	0.09132	+ 5	
368	21.20	22.20	Ceph:	-	-	+ 3	Close to brt. stars	453	21.34	22.56	Ceph	20.692	0.04854	+18	
369	20.70	21.35	Irreg	-	-	+ 2		454	20.85	21.45	Ceph	15.152	0.06600	+ 6	Companion
370	21.40	22.30	Ceph	7.537	0.13267	+ 3	Companion	455	21.65	22.35	Ceph	7.138	0.14010	-	Companion
371	21.20	21.95	Short	-	-	- 5	Companion	456	20.80	22.40	Ceph	11.534	0.08670	+ 8	Companion
372	21.35	22.50	Ceph	4.608	0.21700	0	Companion	457	20.35	21.20	Eclip	2.51145	0.398177	-17	*,Field II, No. 65
373	21.86	23.00:	Ceph	5.442:	0.18377	+ 5	Companion	458	21.90	22.90	Ceph	4.635	0.21575	0	a
374	20.80	22.90	RCrB	-	-	+11		459	21.70	22.20	Ceph	8.576	0.11660	+ 8	a
375	21.65	22.95:	Ceph	3.654	0.27367	-	Companion	460	21.05	22.55	Ceph	18.570	0.05385	+15	a
376	21.40	22.50	Ceph	5.276	0.18954	+ 5	Companion	461	20.95	22.85	Ceph	25.151	0.03976	+16	a
377	21.40	22.58	Ceph	8.367	0.11952	+ 6		462	21.40	22.90:	Ceph	11.086	0.09020	-	a
378	21.64	22.74	Ceph	6.198	0.16135	+ 4		463	20.68	22.04	Ceph	12.834	0.07792	+12	a
379	21.70	22.15	Ceph	8.596	0.11633	+12		464	21.60	22.40	Irreg	-	-	+ 30	a
380	21.23	22.65	Ceph	13.300	0.07519	+11		465	20.20	22.00	Ceph	14.973	0.066786	+ 3	*,a
381	21.40	22.40	Eclip	4.865	0.20555	-12		466	21.15	22.35	Ceph	10.971	0.09115	+16	a
382	22.15	22.85	Ceph	3.454	0.28951	+ 4		467	21.60	22.40	Ceph	7.843	0.12750	+17	a
383	21.25	21.65	Ceph	9.425	0.10610	+11									
384	21.00	22.30	Ceph	14.799	0.06757	+11									
385	21.35	22.50	Ceph:	7.893	0.12670	+ 5		Nova							
386	20.80	21.20	Eclip:	-	-	- 3		1951	18.50	23.00	Nova	-	-	-	
387	21.85	22.55	Ceph	4.487	0.22286	- 2		1954	20.60	23.00	Nova	-	-	-	
388	19.24	20.15	Eclip	111.11	0.00900	- 2									

\* Observed on 100-in. plates.  
 a Outside the 8' circle, magnitudes approximate.



two photovisual plates in Field III with the aid of the fly spanker. The relative colors range from  $-20$ , which is a very blue star, to  $+40$ , which is a very red one. The colors for Cepheids lie between  $-8$  and  $+22$ , and for eclipsing binaries between  $-18$  and  $+2$ . The colors for the irregular variables go from blue to red. The remarks are much the same as in Table IV. In addition, for 25 variables which were in the south preceding corner of Field II but are within the  $8'$  circle of Field III, Gaposchkin's variable star numbers are given in the remarks column. These variables are about  $0^m.5$  fainter in that paper because they were in a corner and difficult to measure. In general, the periods agree; if there is a difference, it is mostly a matter of judgment of the individual observer and is not due to any change of period, as they were observed essentially over the same period of time. In only three cases (H22, V416, and V457) is a radically different period given here.

#### 5b. NOVAE, R CORONAE BOREALIS, LONG-PERIOD AND IRREGULAR VARIABLES OF FIELD III

In Field III there are 2 novae, 3 R Corona Borealis stars, and 2 long-period variables. They are plotted in Fig. 5 together with the irregular variable H43. The ordinate for all the variables is photographic magnitude, the abscissa is Julian Day; for the 2 novae there are 20 days to a division, for the 3 R CrB stars and for H43 there are 200 days to a division, and for the 2 long-period variables, 100 days to a division.

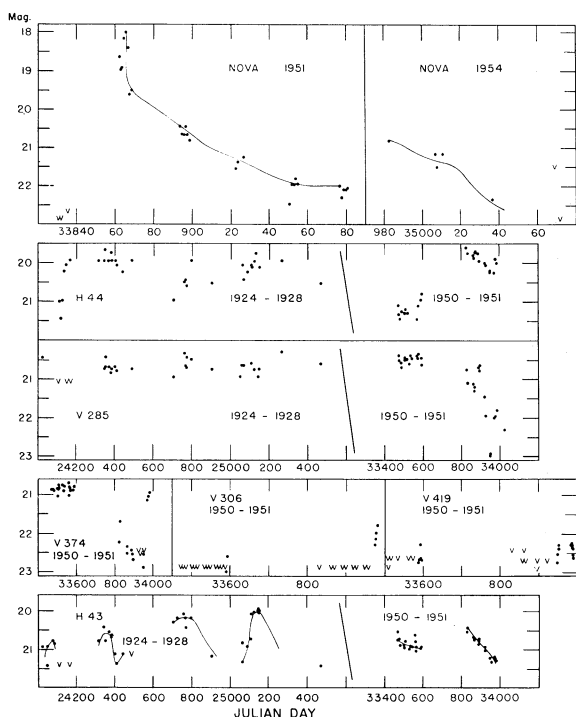


FIG. 5. Field III, 2 novae, 3 R Corona Borealis, 2 long-period, and 1 irregular variables.

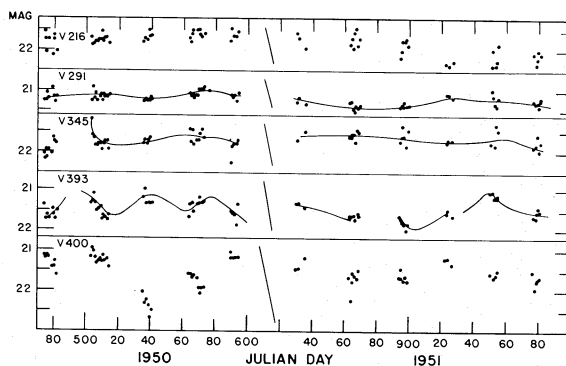


FIG. 6. Five irregular variables of Field III.

The first nova was seen in 1951, but probably not at maximum; the second nova was found in 1954 long after maximum light. H44 is an R Corona Borealis star and appears nebulous at minimum. Its relative color is about zero. V285 seems to be the same kind of star, but its color during a minimum is reddish. V374 was only observed during 1950 and 1951, but it is also a probable R CrB star. These three stars are not like R Corona Borealis itself, which has a range of 9 magnitudes, but they seem to resemble the average of the R CrB stars of the *Variable Star Catalogue* (Kukarkin, Parenago, *et al.* 1958). Their range is about  $2^m.0$  or a little less and their color seems to be bluish-yellow.

V306 and V419 are long-period variables; only the tops of the maxima are seen during the two observing seasons. The periods could not be uniquely determined, but from the data one is shorter and the other longer than a year. H43, a bright irregular variable, was observed on 100-in. plates and looks as if it might be cyclical.

There are also 16 irregular variables. Five of them have well-defined variation and are shown in Fig. 6. V216 is red, V345 is reddish, V291 and V400 have the colors of Cepheids but are irregular or semiregular, and V393 is a blue star. Of the other 11 irregular variables, 6 are redder than  $+20$  on the relative color scale. They are V179, 200, 413, 418, 434, and 464; their mean magnitudes seem to change slowly, but short rapid fluctuations are superposed. Five are not red, but bluer than  $+6$  on the relative color scale. They are V349, 356, 367, 393, and 430.

#### 5c. ECLIPSING BINARIES OF FIELD III

There are also 36 variables that are probably eclipsing binaries. They are all blue stars; 18 of them have few observed minima and, hence, have no periods. Seventeen of them have periods and light curves. The observations are given in Table D and they are plotted in Fig. 7 in order of period, except for V303 which is out of place because of convenience. The observations of V212 are also given in Table D and are plotted in the lower

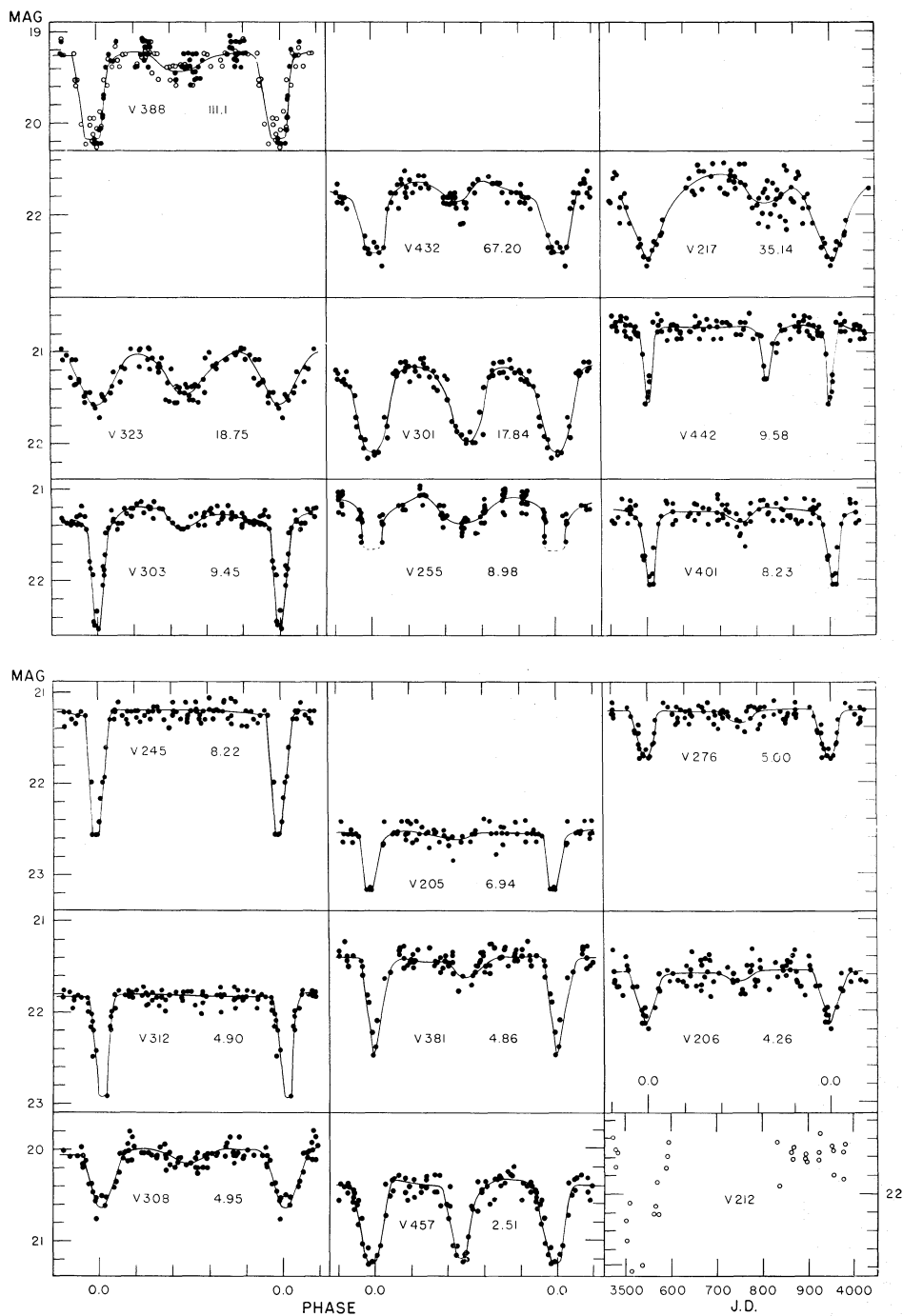


FIG. 7. Light curves of 17 eclipsing variables of Field III, and in the lower right figure observations for 1 eclipsing variable, with Julian Day as the abscissa.

right-hand corner of Fig. 7, but the abscissa is Julian Day instead of phase. Its period is probably over 500 days. The eclipsing stars have either  $\beta$  Lyr- or Algol-type light curves; V217 seems to be a  $\beta$  Lyr binary with a peculiar light curve between minimum. It may have an eccentric orbit and be variable. V442 is an Algol-type binary with marked eccentricity.

#### 5d. CEPHEIDS AND POPULATION II VARIABLES OF FIELD III

The distribution of the 232 Cepheids is shown in Plate VIII. The greatest number lie along the spiral arms made up of stars and dust, but avoid the dust and background of fainter stars seen in the north following corner. The 232 Cepheids have been divided

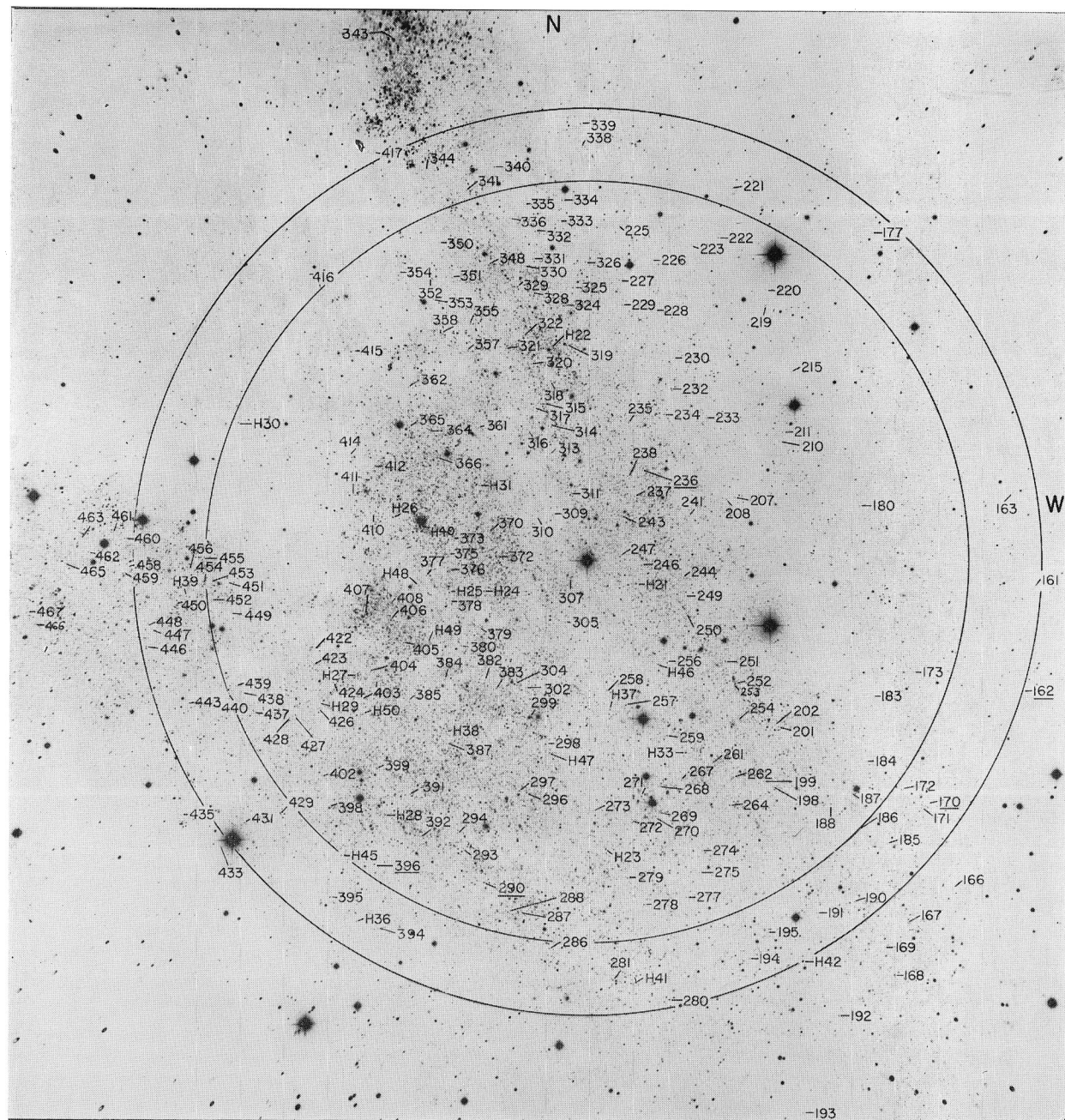


PLATE VIII. Field III, the distribution of the novae, Cepheids, and Population II variables (underlined).

into three groups. The 148 Cepheids of the first group lie within the inner circle of Plate VIII; they are listed in Table IX in order of decreasing period and their light curves are plotted in Figs. 8 through 15. The 28 Cepheids of the second group fall within the outer ring, presumably their magnitudes and amplitudes are not as reliable. They are listed in Table X and shown in Figs. 16 through 18. The 56 Cepheids of the last group are listed in Table XI. Nineteen of them fall outside the rings and 37 have companions affecting the accuracy

of the magnitudes. Since their light curves are not shown, a Julian Day of an observed maximum is given under remarks in Table XI, and these variables have been used only in discussing the period-frequency relationship.

There are also 6 Population II variables in Field III that are listed in Table XII and shown in Fig. 19. They are underlined in Plate VIII and appear to have a tendency to avoid the spiral arms. One of these variables may still have an indeterminate period. It is V177 with

Table IX. One hundred and forty-eight Cepheids in center ring of Field III.

Var. No.	Period	Log P	Mag. of mean <sub>1</sub>	Ampl.	Computed phase of Zero		Var. No.	Period	Log P	Mag. of mean <sub>1</sub>	Ampl.	Computed phase of Zero	
					Max.	Zero						Max.	Zero
H 40	33.510	1.525	20.32	1.30	.100	.100	222	8.094	0.908	21.63	1.02	.500	.550
H 28	26.790	1.427	19.76	2.05	.530	.550	235	8.010	.904	21.59	1.10	.660	.700
H 26	26.196	1.418	21.07	1.50	.220	.250	412	7.992	.903	21.31	0.80	.650	.700
440	25.707	1.411	21.63	1.65	.000	.000	271	7.911	.898	21.43	1.12	.250	.250
H 27	24.130	1.383	20.65	1.95	.400	.400	385	7.893	.897	21.92	1.15	.680	.700
H 31	22.725	1.356	21.40	1.68	.410	.400	320	7.823	0.893	21.91	1.18	.260	.300
439	21.698	1.336	21.51	1.92	.300	.300	225	7.780	.891	22.08	0.76	.980	.000
275	21.556	1.333	21.82	1.25	.800	.850	309	7.667	.885	21.62	1.32	.000	.000
453	20.602	1.314	22.00	1.22	.200	.200	391	7.619	.882	21.43	1.10	.680	.700
365	20.568	1.313	21.78	1.40	.710	.750	228	7.613	.882	22.02	1.00	.700	.700
302	20.024	1.301	21.61	1.56	.150	.150	294	7.570	0.879	21.60	0.78	.120	.150
H 29	19.492	1.290	21.74	1.86	.750	.750	332	7.457	.873	21.64	1.26	.780	.800
449	19.395	1.288	22.00	1.48	.930	.950	354	7.368	.867	21.99	0.86	.200	.200
H 33	18.853	1.275	20.16	1.34	.650	.650	364	7.120	.852	21.09	0.64	.750	.750
422	18.519	1.268	22.7	-	.720	.750	237	7.085	.850	22.00	0.82	.760	.800
H 30	18.291	1.262	20.72	2.10	.070	.100	247	7.006	0.845	21.29	1.26	.960	.950
H 24	17.609	1.246	21.41	1.26	.880	.900	326	7.000	.845	21.50	1.16	.050	.100
H 22	17.569	1.245	20.90	1.80	.270	.300	254	6.978	.844	21.81	1.00	.460	.500
H 23	17.557	1.244	20.59	1.90	.180	.200	274	6.823	.834	21.82	0.94	.930	.950
404	17.247	1.237	21.86	1.40	.660	.700	424	6.726	.828	22.37	0.90	.350	.350
H 21	17.154	1.234	21.02	1.60	.240	.300	330	6.709	0.827	21.63	1.16	.150	.150
411	15.833	1.199	21.81	1.50	.010	.000	328	6.660	.823	21.88	0.70	.720	.750
355	15.699	1.196	21.20	1.08	.350	.350	272	6.545	.816	21.83	1.15	.600	.600
293	15.015	1.176	21.49	1.08	.950	.950	207	6.545	.816	21.46	0.96	.160	.200
384	14.799	1.170	21.70	1.30	.650	.650	230	6.508	.813	22.18	1.14	.950	.950
268	14.440	1.160	21.39	1.00	.480	.500	202	6.460	0.810	22.04	0.68	.380	.400
366	14.407	1.158	21.70	1.40	.060	.050	241	6.329	.801	21.97	0.86	.200	.200
423	14.388	1.158	22.04	1.12	.020	.050	317	6.313	.800	22.06	0.76	.620	.600
298	13.479	1.130	21.07	1.08	.780	.800	238	6.283	.798	22.16	0.60	.650	.700
H 37	13.338	1.125	21.21	1.08	.970	.000	378	6.198	.792	22.16	1.10	.360	.400
380	13.300	1.124	22.01	1.42	.620	.600	392	6.196	0.792	22.09	0.70	.700	.700
357	13.293	1.124	21.86	1.48	.660	.650	408	6.188	.792	22.26	0.82	.200	.150
267	13.250	1.122	21.77	1.32	.980	.000	199	6.101	.785	21.91	0.96	.620	.650
415	13.125	1.118	21.64	1.50	.300	.300	352	6.071	.783	21.38	0.92	.650	.650
H 46	12.923	1.111	21.16	0.96	.320	.350	184	6.048	.782	22.47	0.95	.280	.300
H 45	12.889	1.110	21.02	1.52	.670	.650	361	6.039	0.781	22.15	0.96	.100	.100
438	12.811	1.106	22.09	1.36	.580	.600	410	6.036	.781	22.39	0.94	.920	.950
208	12.402	1.093	21.67	1.22	.720	.750	428	6.024	.780	21.36	0.58	.950	.950
329	12.312	1.091	21.42	1.25	.500	.500	H 47	6.006	.779	21.93	1.04	.910	.900
334	12.294	1.090	21.15	0.85	.600	.600	198	6.002	.778	21.69	1.28	.280	.300
188	11.947	1.077	21.76	1.18	.860	.900	331	5.978	0.777	21.88	1.00	.520	.500
H 25	11.831	1.073	21.06	1.30	.160	.150	227	5.848	.767	22.08	0.84	.630	.650
261	11.368	1.055	21.46	0.40	.280	.300	335	5.750	.760	21.82	1.02	.820	.850
427	11.257	1.052	21.74	1.35	.780	.800	351	5.719	.757	22.10	1.14	.900	.900
362	11.074	1.044	21.95	0.98	.980	.000	226	5.640	.751	22.48	0.82	.120	.150
451	10.969	1.040	22.32	0.82	.620	.650	305	5.589	0.747	21.98	1.18	.100	.150
452	10.951	1.039	21.58	1.40	.650	.650	399	5.580	.747	21.60	0.66	.450	.500
313	10.689	1.029	21.89	1.12	.750	.800	333	5.486	.739	22.23	0.66	.400	.400
405	10.549	1.023	21.42	1.24	.020	.050	215	5.420	.734	22.03	1.06	.860	.900
316	10.526	1.022	21.36	1.20	.270	.300	350	5.351	.728	21.88	0.70	.740	.750
297	10.288	1.012	21.48	1.22	.030	.050	183	5.350	0.728	22.61	0.90	.500	.500
H 38	10.125	1.005	21.33	1.40	.270	.250	266	5.333	.727	21.73	0.90	.360	.350
270	10.017	1.001	21.47	1.00	.960	.950	H 48	5.320	.726	21.89	0.90	.250	.250
294	9.933	0.997	21.19	0.98	.400	.450	259	5.316	.726	21.34	0.32	.500	.550
318	9.921	0.997	21.85	1.04	.900	.900	219	5.266	.721	21.99	0.82	.000	.000
278	9.881	0.995	21.31	1.18	.870	.900	251	5.260	0.721	21.72	0.85	.030	.050
273	9.741	.989	21.97	0.86	.270	.350	210	5.120	.709	22.44	0.98	.170	.200
348	9.662	.985	21.60	0.90	.630	.700	403	5.103	.708	22.41	0.80	.700	.700
288	9.573	.981	21.33	0.60	.040	.100	287	5.095	.707	21.74	1.00	.000	.000
264	9.524	.979	21.36	1.10	.500	.400	173	5.008	.700	21.89	0.95	.400	.400
426	9.425	0.974	22.01	0.70	.450	.450	246	4.946	0.694	21.91	0.96	.070	.100
383	9.425	.974	21.44	0.40	.550	.550	279	4.921	.692	21.87	0.88	.900	.900
296	9.412	.974	21.74	0.82	.030	.050	402	4.904	.691	22.10	0.84	.780	.800
229	9.208	.964	21.95	0.60	.950	.350	233	4.837	.685	21.92	0.66	.080	.150
180	9.181	.963	21.94	0.62	.580	.600	269	4.620	.665	21.85	0.72	.600	.600
257	9.038	0.956	21.17	0.90	.770	.700	336	4.610	0.664	22.25	0.76	.020	.000
307	8.961	.952	21.18	0.78	.800	.800	387	4.487	.652	22.28	0.70	.700	.750
249	8.809	.945	21.74	0.62	.900	.900	211	4.833	.584	22.06	0.74	.010	.050
262	8.762	.943	20.99	1.00	.170	.200	223	3.808	.581	22.04	0.88	.820	.850
379	8.596	.934	21.98	0.45	.650	.650	414	3.742	.573	22.11	1.12	.220	.250
315	8.464	0.928	21.27	0.66	.920	.950	382	3.454	0.538	22.60	0.70	.460	.500
377	8.367	.923	21.88	1.18	.910	.950	201	3.227	.509	21.79	0.50	.100	.100
260	8.301	.919	21.46	0.88	.950	.950	277	2.747	.439	21.71	0.46	.840	.900
310	8.210	.914	22.68	0.85	.860	.900							
311	8.171	.912	21.31	1.02	.660	.650							

a period of 27.97 days. Its relative color of -4 is rather blue and fits the supposition that it is a Population II variable. The minimum has not been observed. However, there is still the possibility that the period may be 14.35 days with a large magnitude scatter. In that case it should be classified as a Cepheid, but its color would then be altogether too blue.

The observations and phases of all the Cepheids of

Tables IX and X and the Population II variables of Table XII are given in Tables B and C in the Appendix. The phases were computed with the reciprocal of the period given in column 6 of Table VIII, using the following equation:

$$\text{Phase} = (1/p)(\text{JD} - 2433000),$$

except for the stars that were observed also on the

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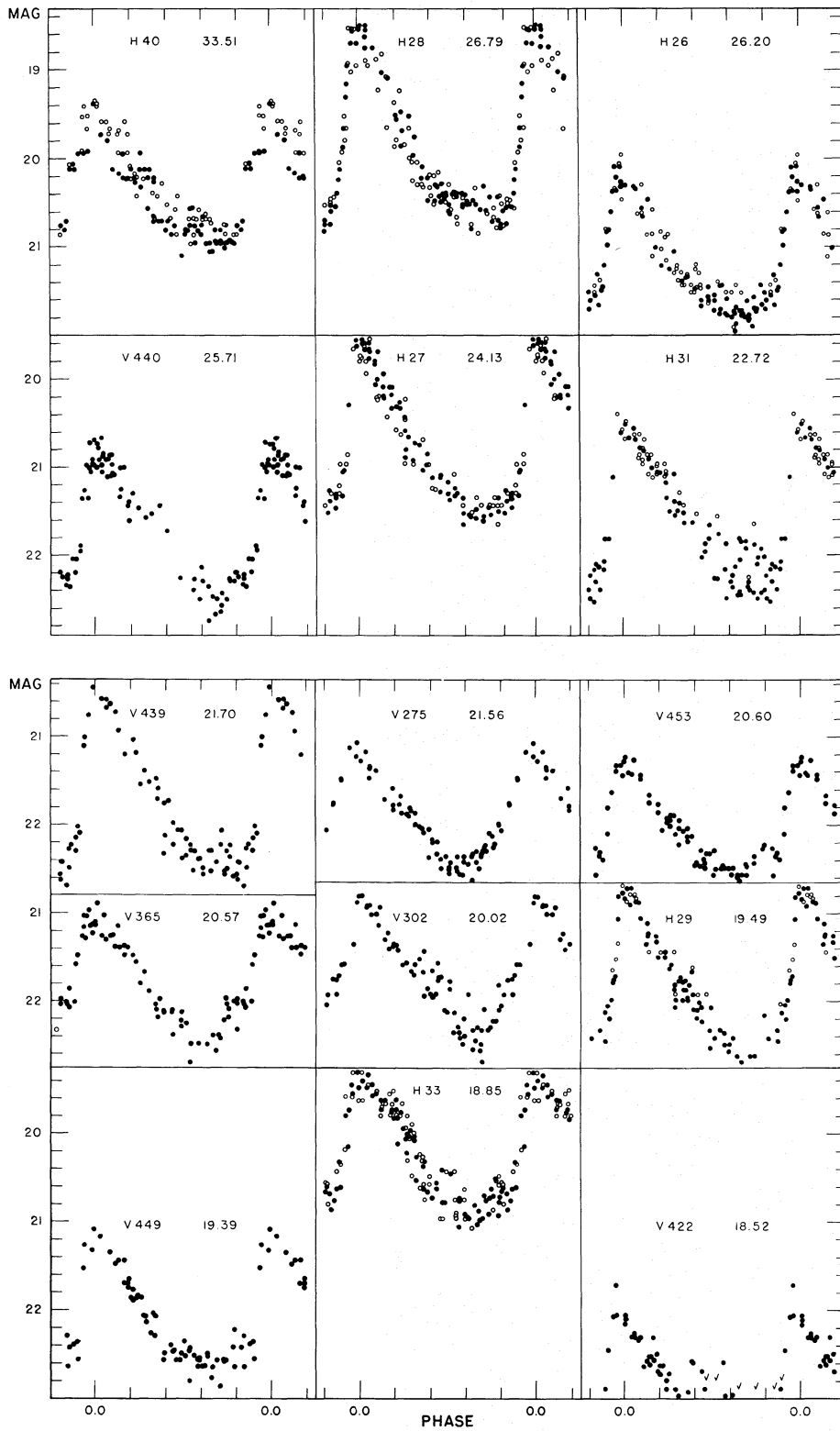


FIG. 8. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

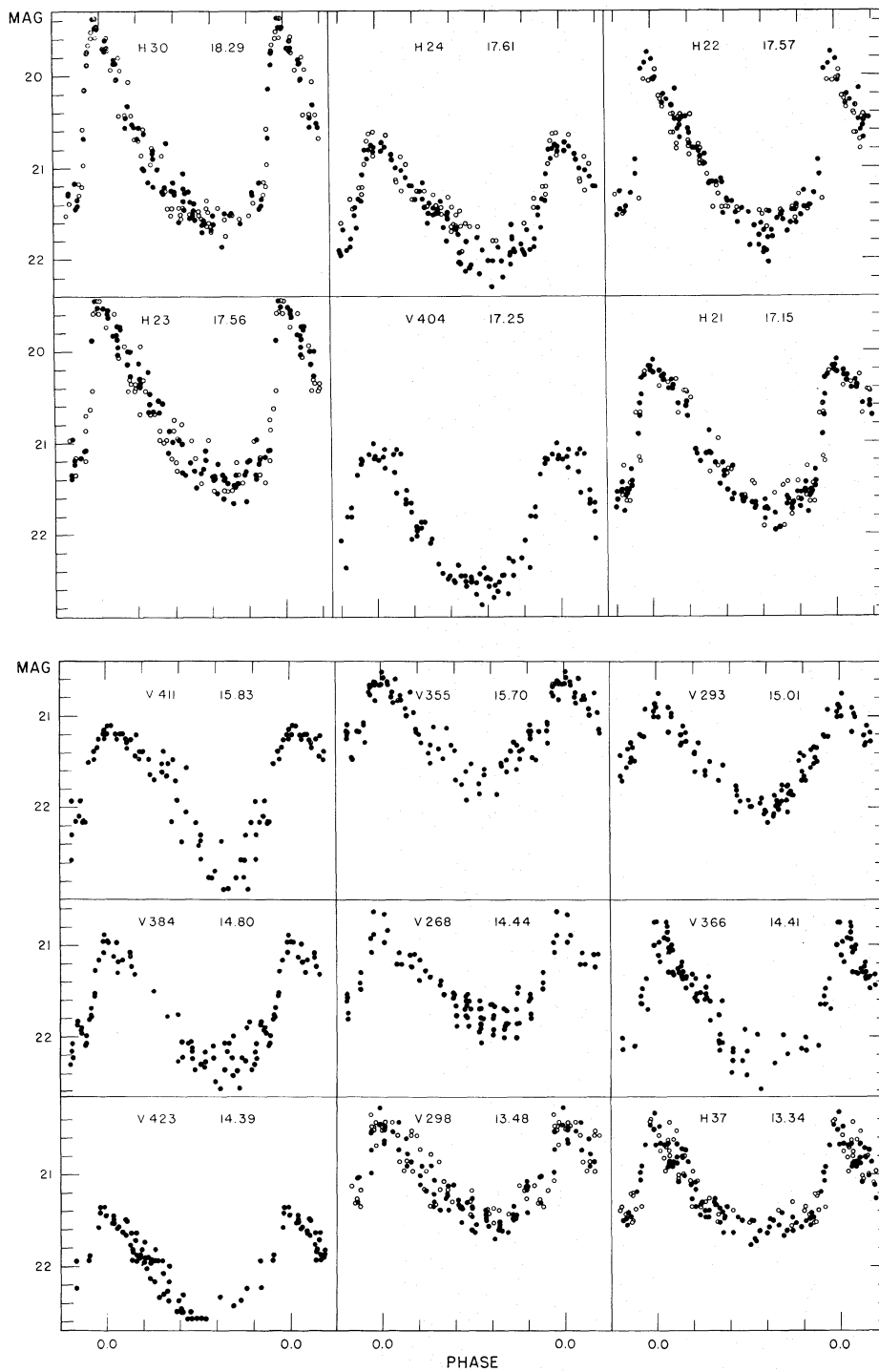


FIG. 9. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

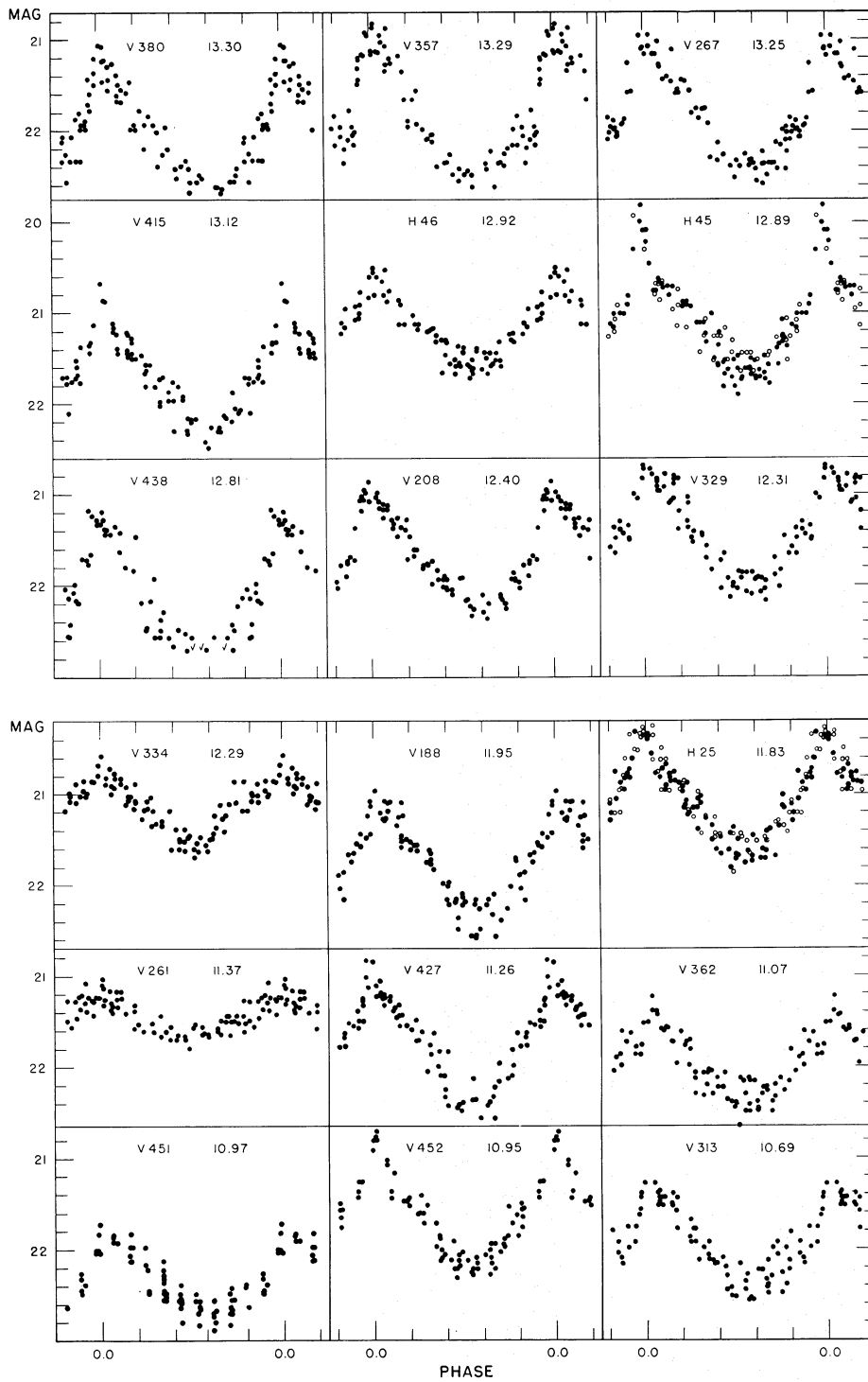


FIG. 10. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

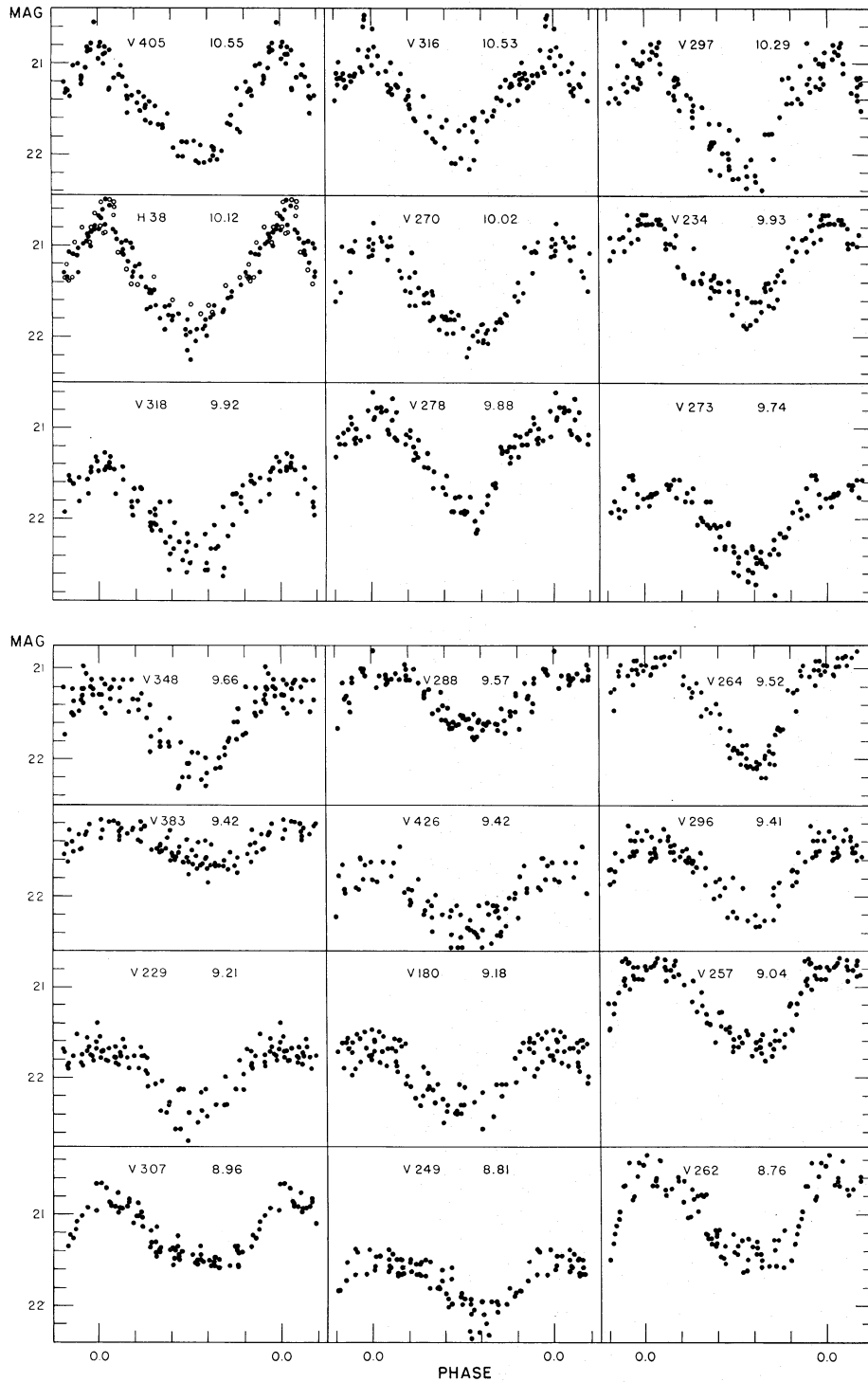


FIG. 11. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.



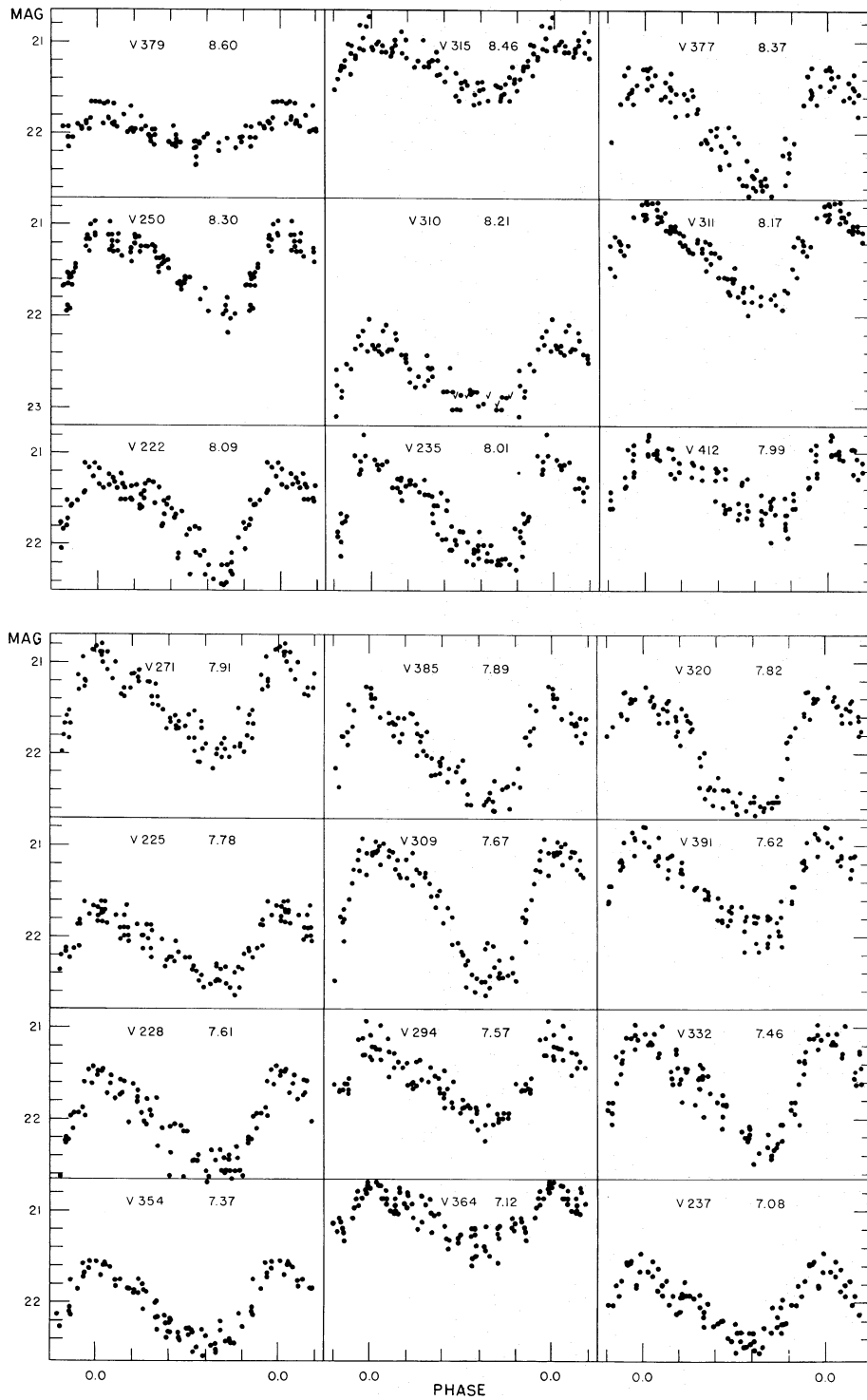


FIG. 12. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

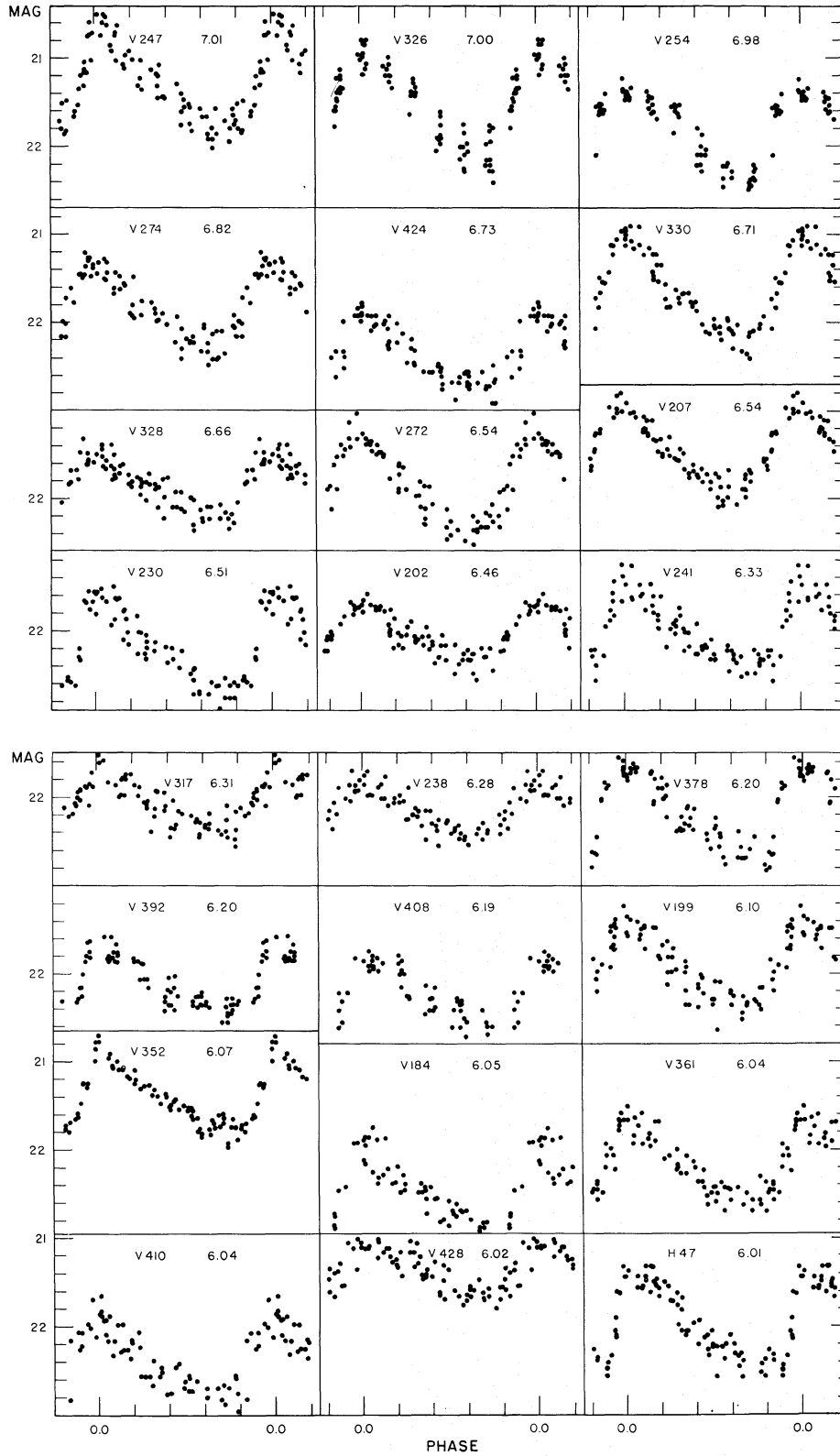


FIG. 13. Cepheids of Field III within inner ring; solid dots, 200-in. observations, open circles, 100-in. observations.

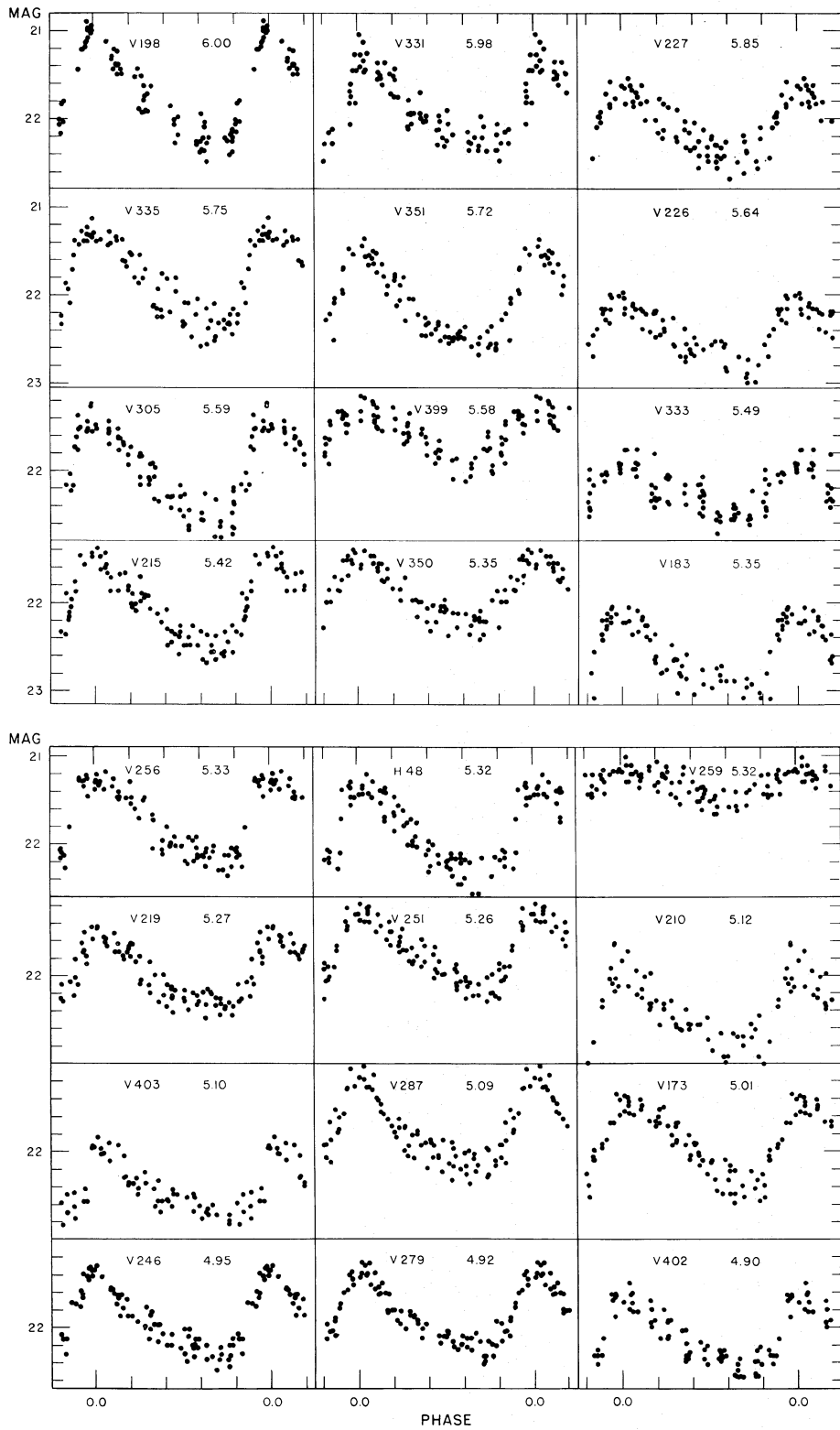


FIG. 14. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

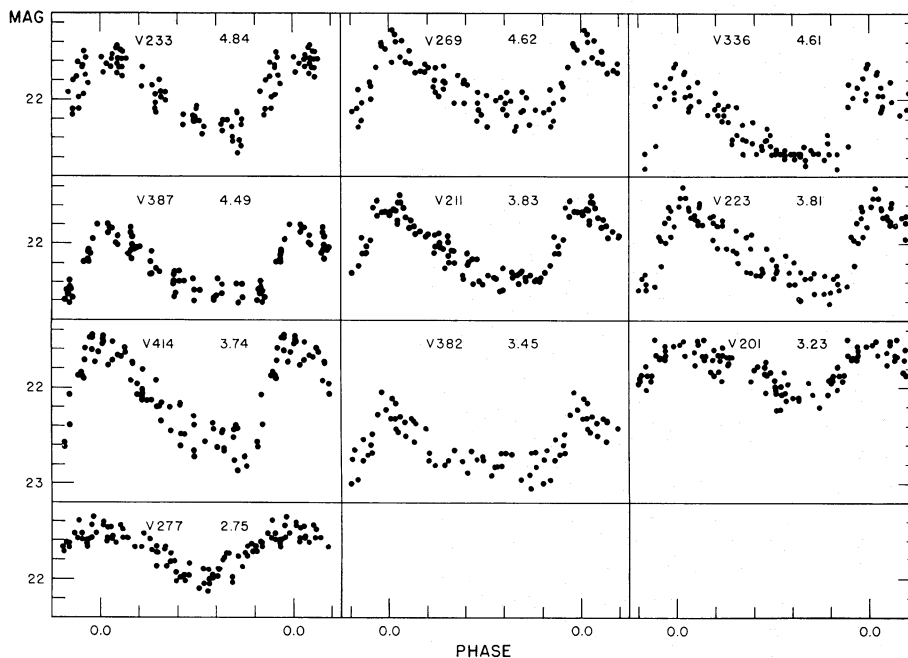


FIG. 15. Cepheids of Field III within inner ring; solid dots, 200-in. observations; open circles, 100-in. observations.

100-in. plates (marked with an asterisk in Tables VIII and B), and for them the following equation was used:

$$\text{Phase} = (1/p)(\text{JD} - 2424000).$$

In Figs. 8 through 19 the solid dots are single observations from the 200-in. plates of 1950 and 1951, and the open circles are 100-in. observations from 1924 through 1948.

Hertzsprung (1926) had observed for the galactic Cepheids a progressive change in shape of the light curve with the change of period length. He notes a hump that ascends the ascending branch as the period grows shorter from about 15 days until 10 days, and then from 9 days to 6 days the hump goes down the descending branch. From 9 to 11 days there is a symmetry around the maximum and often a shoulder on either side of the maximum is visible. The Cepheids of M31 seem to show the same sort of progression, particularly around 9 and 10 days where a symmetry around maximum light is observed.

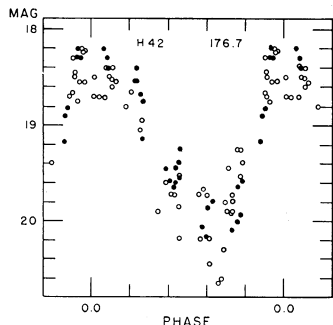


FIG. 16. A 176-day Cepheid in outer ring of Field III; solid dots, 200-in. observations; open circles, 100-in. observations.

TABLE X. Twenty-eight Cepheids in outer ring of Field III.

Var. No.	Period	Log P	Mag. of Mean <sub>1</sub>	Ampl.	Computed phase of	
					Max.	Zero
H 42	176.68	2.247	19.03	1.80	.400	.400
H 41	25.487	1.406	20.73	1.46	.930	.950
H 39	23.970	1.380	21.13	1.64	.450	.450
H 36	17.914	1.253	20.98	1.30	.110	.150
339	15.232	1.183	21.71	1.30	.000	.000
416	14.364	1.157	22.07	1.04	.770	.800
446	14.130	1.150	20.97	1.35	.360	.350
280	13.850	1.141	20.70	0.62	.430	.450
172	11.013	1.042	22.03	1.02	.930	.950
395	10.741	1.031	21.07	1.22	.310	.300
194	10.479	1.020	21.37	0.96	.300	.300
341	9.881	0.995	21.17	1.34	.750	.750
281	9.699	.987	21.71	0.86	.280	.300
185	7.704	.887	22.57	0.71	.230	.250
340	6.645	.822	21.71	1.00	.580	.600
191	6.545	0.816	21.57	1.00	.130	.150
186	6.293	.799	22.15	1.30	.250	.250
221	5.823	.765	22.16	1.05	.420	.450
338	5.647	.752	22.39	0.76	.130	.150
447	5.456	.737	22.22	0.70	.740	.700
394	5.285	0.723	21.86	0.75	.680	.700
171	5.081	.706	22.20	0.70	.600	.600
443	4.990	.698	22.27	1.16	.600	.650
286	4.915	.692	21.75	1.10	.880	.900
163	4.368	.640	21.83	1.04	.850	.850
195	4.289	0.632	21.96	0.92	.850	.850
161	4.025	.605	22.19	0.66	.250	.300
190	3.346	.525	21.68	0.60	.590	.600

6. PERIOD-LUMINOSITY RELATION

The period-luminosity relation is shown in Fig. 20. Figure 20(a) shows the 25 Cepheids of Field I within the 8' circle. The solid lines are the period-luminosity

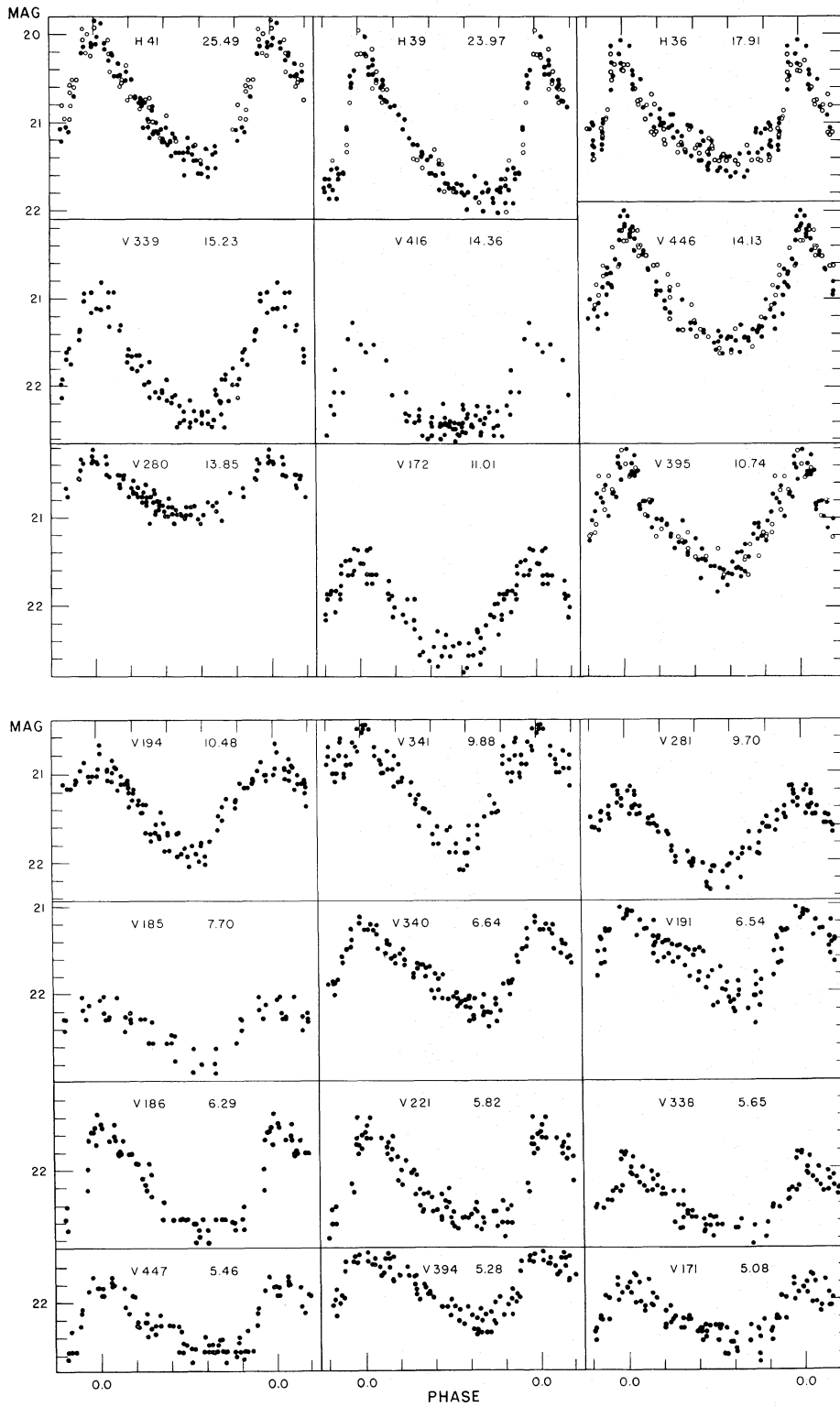


FIG. 17. Cepheids in outer ring of Field III; solid dots, 200-in. observations; open circles, 100-in. observations.

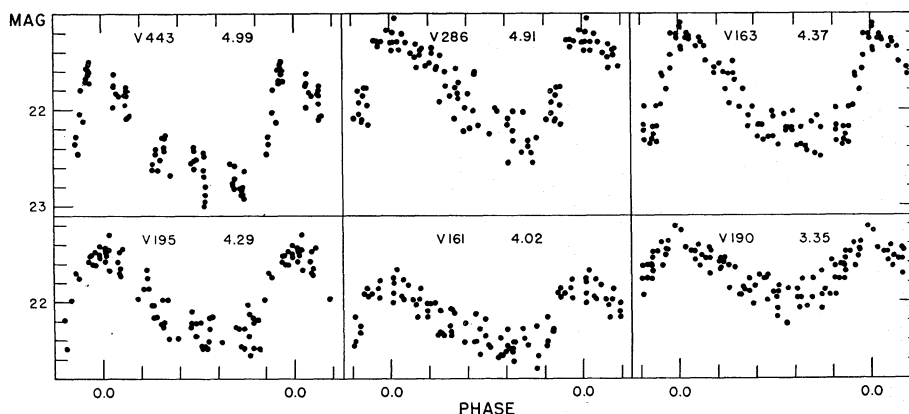


FIG. 18. Cepheids in outer ring of Field III; solid dots, 200-in. observations; open circles, 100-in. observations.

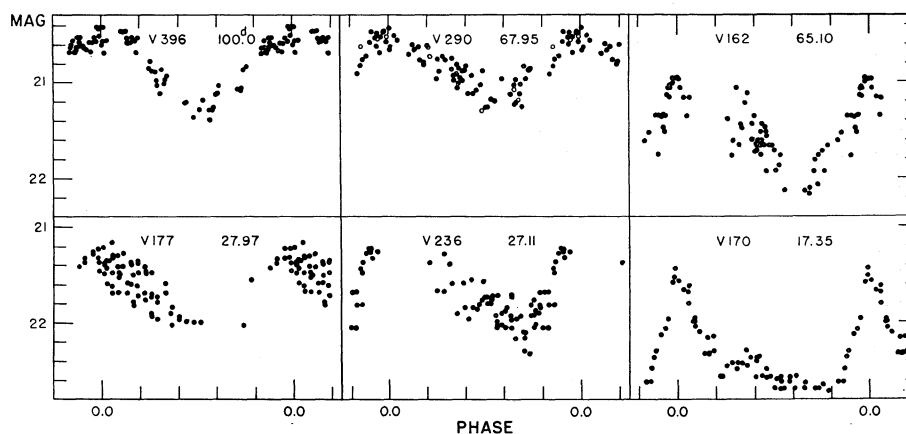


FIG. 19. Six Population II variables of Field III; solid dots, 200-in. observations; open circles, 100-in. observations.

relations as derived from Field IV (Baade and Swope 1963). It is apparent that the Cepheids of Field I show more scatter below the curve and that there are only a few Cepheids a little above the line. This is probably due both to more general absorption in the field and to more variable absorption, although there is the possibility that it is due to differences in the magnitude systems—but this seems unlikely when all the material is reviewed. Also, it is apparent that the variables are not as short nor do they go as faint as in Field IV. This is because the background of faint stars of Field I makes it impossible to measure stars to the plate limit.

In Fig. 20(b) are shown the Cepheids of Field III; the solid dots represent those in Table IX and the open circles are from Table X. This field is 50' from the nucleus in a region where there are bright star clouds and some dust. The solid lines again are taken from Field IV. Here it is apparent that the Cepheids also suffer from much variable absorption but that some of the Cepheids are relatively free from absorption, as in Field IV, as they are above the curve.

There is one variable star, V422, in Field III that is very faint, but it has been called a Cepheid and not a

Population II variable because of a relative red color index of +18.

In the lower diagram, Fig. 20(c), the Cepheids of Fields I and III are combined with those of Field IV. The small open circles represent the Cepheids of Field I, the solid dots Field III, and the large open circles the 20 Cepheids of Field IV. It is seen that though there are some Cepheids of Field I and III above the curve, none are brighter than those found in Field IV. This indicates that the magnitudes are probably consistent between the three fields. It is also apparent that there are many Cepheids in Field IV that are shorter and fainter than those found in the other fields. This is because in Field IV the background of faint stars is mostly missing and, therefore, it is possible to measure to a fainter plate limit.

#### 7. PERIOD-LUMINOSITY RELATION OF POPULATION II VARIABLES

The faintest variables for their length of period are plotted as open squares in Fig. 20 and are listed as Population II variables in Tables VII and XII. They

TABLE XI. Fifty-six Cepheids with close companions (37) or in outer areas (19) of Field III.

Var. No. (1)	Period (2)	LogP (3)	Mag. of mean <sub>I</sub> (4)	Ampl. (5)	J.D. of obs'd max. 2 433 000 + (6)	Phase of max. (7)
461	25.151	1.401	21.86	1.90	574.00	.820
433	22.978	1.361	21.53	1.75	507.40	.080
166	22.302	1.348	21.55	1.70	565.70	.370
460	18.570	1.269	21.79	1.50	537.10	.910
193	15.524	1.191	20.48	1.55	480.00	.660
454	15.152	1.180	21.15	0.60	565.00	.300
465	14.973	1.175	21.16	1.80	509.20	.080
314	14.306	1.156	21.98	0.74	572.80	.050
407	13.912	1.143	21.53	1.15	594.70	.730
406	13.643	1.134	21.50:	1.30:	513.00	.600
343	13.210	1.121	(20.8:)	1.50	475.00	.910
168	13.125	1.118	20.85	1.30	474.80	.170
252	13.089	1.116	21.13	0.65	476.50	.400
463	12.834	1.108	21.47	1.36	536.70	.820
358	11.922:	1.076:	21.95	0.70	538.00	.130
450	11.700	1.068	20.95	1.40	504.00	.070
456	11.534	1.061	21.60	1.60	505.90	.860
H 50	11.378	1.056	21.70	1.40	565.40	.700
462	11.086	1.045	22.14	1.50:	572.90	.680
466	10.971	1.040	21.75:	1.20:	478.00	.570
299	10.591	1.025	21.50:	1.00	565.70	.400
H 49	10.265	1.011	21.45	0.90	505.70	.260
253	9.551	0.980	21.20	0.60	477.60	.000
325	9.483	.977	21.43	0.65	504.90	.250
459	8.576	.933	21.95	0.50	509.90	.450
243	8.435	0.926	21.63	1.06	536.50	.600
304	8.365	.923	21.07	0.66	476.70	.970
467	7.843	.894	22.00	0.80	593.80	.700
321	7.723:	.888	21.77	0.60	514.90	.690
319	7.553	.878	21.78	1.05	509.00	.400
370	7.537	0.877	21.88	0.90	513.70	.160
455	7.138	.854	22.00	0.70	513.60	.950
187	7.042	.848	22.20	0.70	539.80	.660
398	7.008	.845	22.3	1.00:	505.90	.200
324	6.481	.812	22.15:	1.10:	540.90	.460
448	6.475	0.811	22.10	0.90	479.80	.110
437	6.231	.794	22.10:	1.10:	507.00	.350
169	6.207	.793	21.85	1.10	540.60	.100
167	6.047	.781	21.90	1.10	539.70	.280
220	5.900	.771	21.88	0.90	508.50	.200
429	5.679	0.754	22.10	1.30	508.70	.600
258	5.500	.740	22.10	1.00	515.00	.640
322	5.482	.739	22.10	0.94	566.80	.380
373	5.442	.736	22.58	1.14	572.80	.260
376	5.276	.722	21.95	1.10	506.90	.080
232	5.117	0.709	21.15	0.50	505.90	.850
344	5.040	.702	22.02	0.54	591.70	.360
417	4.967	.696	21.96	0.58	571.00	.940
192	4.773	.679	21.15:	0.70	513.60:	.600
435	4.686	.671	22.21	0.84	566.70	.940
458	4.635	0.666	22.50	1.20:	536.90	.830
372	4.608	.664	21.93	1.15	570.90	.900
244	4.219	.625	22.21	1.02	482.90	.440
431	4.082	.611	21.60	0.60	504.90	.680
375	3.654	.563	22.30:	1.30:	537.80	.180
353	2.932	0.467	21.75	0.46	506.80	.900

TABLE XII. Six Population II variables of Field III.

Var. No.	Period	LogP	Mag. of mean <sub>I</sub>	Ampl.	Phase of	
					Max.	Zero
396	100.0	2.00	20.81	0.80	.830	.800
290	67.95	1.832	20.81	0.66	.470	.500
162	65.10	1.814	21.53	1.12	.350	.350
177	27.972	1.441	21.70	0.70	.270	.250
236	27.115	1.433	21.50:	1.00:	.300	.300
170	17.346	1.239	22.28	1.18	.490	.500

It is possibly too faint for the mean of all the Population II variables by over a tenth of a magnitude. This might be a difference in the magnitudes derived for each field, but the Cepheid variables have shown that this is not likely. It could be that the magnitudes of the Population II variables are made too bright by companions or

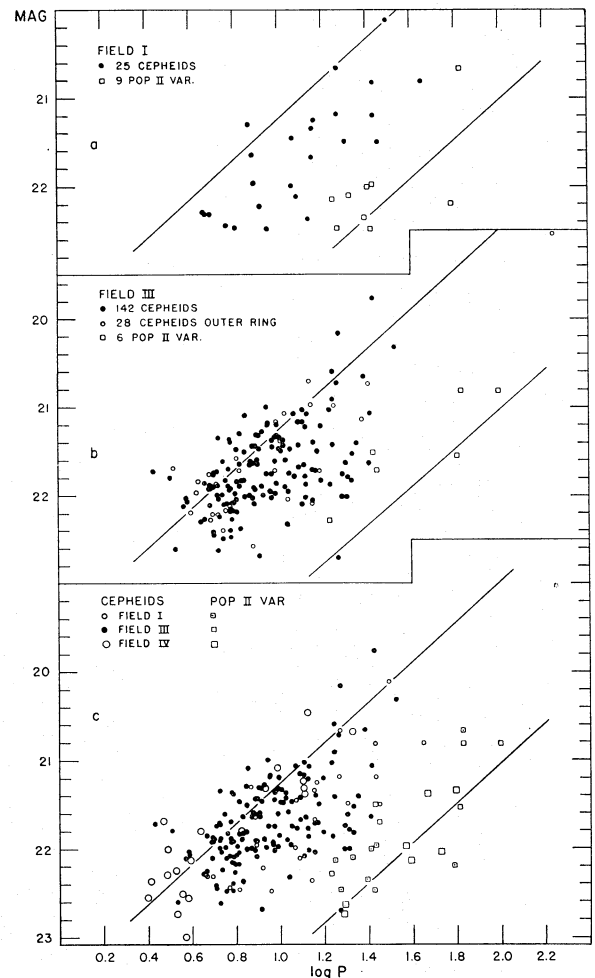


FIG. 20. Period-luminosity curves. (a) Field I: dots, Cepheids; open squares, Population II variables. (b) Field III: dots, Cepheids in inner ring; open circles, Cepheids in outer ring; open squares, Population II variables. (c) Combined P-L curves: open circles, Field I Cepheids; dots, Field III Cepheids; large open circles, Field IV Cepheids. Open squares are Population II variables and the solid lines are the P-L relation for Field IV (Baade and Swope 1963) in all the diagrams.

have also rather small amplitudes (Fig. 21) and relatively blue color indices, from  $-7$  to  $+3$ , for their length of period, as seen in Fig. 22(a). The lower straight line in each diagram of Fig. 20 is the period-luminosity relation of these stars taken from Field IV.

TABLE XIII. Distribution of variable type.

Type	Field I		Field II		Field III		Field IV	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Cepheids	32	28	101	57	247	74	21	39
Short	26	22	7	4	23	7	1	2
Pop. II	9	8	6	3	6	2	7	13
Eclipsing	2	2	16	9	36	10	10	18
Irregular	34	29	46	26	20	6	14	26
Long period	6	5	1	1	2	1	1	2
Nova	7	6	1				0	0
Total	116	...	178	...	336	...	54	...

backgrounds of faint stars, but an inspection of Plates II and VIII shows that the underlined Population II variables lie mainly in areas where there is no bright background of faint stars and they do not seem to have companions to make them appear too bright. It is probably a selection effect, and in Field I and III only the brightest of the Population II variables have been found and the fainter ones are lost in the greater amount of absorption present. Fields I and III have relatively fewer Population II variables than Field IV, both compared to the total number of variables found or to the number of Cepheids present. This is shown in Table XIII and it suggests that possibly only the very brightest of these stars have been found in Fields I and III.

#### 8. PERIOD-AMPLITUDE RELATION

Figures 21(a), (b), and (c) show the period-amplitude relation. The three diagrams are for Field I, Field III, and for the combined Fields I, III, and IV, and the same symbols are used as in Fig. 20. The straight-line curve

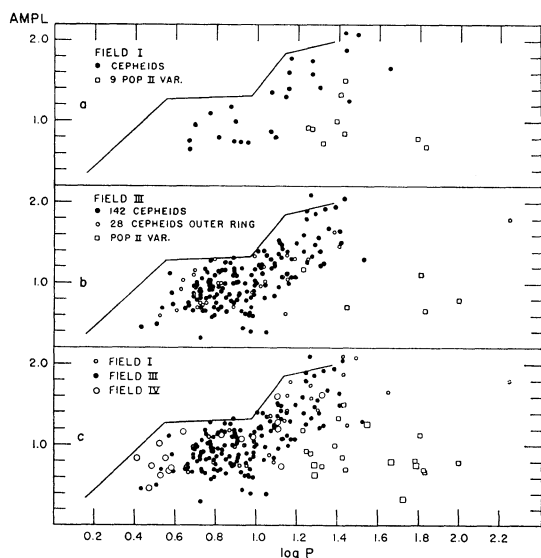


FIG. 21. Period-amplitude curves. (a) Field I, (b) Field III, (c) Fields I, III, and IV. The same symbols are used as in Fig. 20. The enveloping curve is from Kraft (1963).

is taken from Kraft's (1963) amplitude envelope for Cepheids in the Galaxy, and it is apparent that the distribution of amplitudes for M31 is like that found in our Galaxy. Although the discovery of shorter-period Cepheids in M31 is incomplete, there is no evidence for a bimodal distribution such as found for the Small Magellanic Clouds (Arp 1960). The shorter the period, the smaller is the amplitude in M31, and there is no evidence for the large amplitudes for short-period Cepheids, such as is found in the Magellanic Clouds. If the faint variables of M31 had large amplitudes, it should have been possible to find the periods for some of them instead of calling them "short."

In Fig. 21 it is also seen that the longer the period of the Cepheids, the bigger the amplitude, whereas the Population II variables tend to have smaller amplitudes—which is another piece of evidence for classifying them separately from the classical Cepheids.

#### 9. PERIOD-COLOR RELATION OF FIELD III

In Fig. 22(a) the relative color of the Cepheids of Field III has been plotted as the ordinate and the logarithm of the period as the abscissa. The solid dots

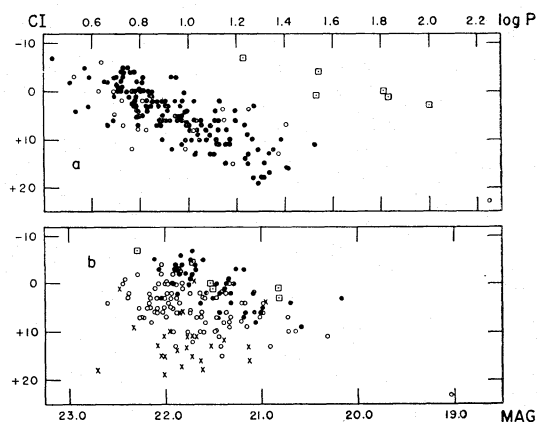


FIG. 22(a). Period-color relation for Field III. Solid dots are Cepheids of inner ring; open circles, Cepheids from outer ring; open squares, Population II variables. (b). Color-luminosity relation for Field III. Solid dots are Cepheids above P-L curve of Fig. 20(b); open circles, Cepheids under curve to  $0^m7$  below; crosses, Cepheids below  $0^m7$  of P-L curve; open squares are Population II variables.



are the inner-ring Cepheids of Plate VIII, the open circles, the 28 Cepheids in the outer ring, and the squares are the Population II variables. The diagram shows that as the periods of the Cepheids grow longer the variables tend to become redder. The Population II variables stand out from the classical Cepheids and are relatively blue for their period length. The dispersion for the Cepheids is partly intrinsic, but is due mostly to varying absorption, which is seen quite clearly in Fig. 22(b), where the relative color is plotted against luminosity. The solid dots are the observations above the P-L curve of Fig. 20(b), the open circles are the observations that fall under the P-L curve to  $0^m.7$  below, and the crosses are the Cepheids that fall  $0^m.7$  or more below the P-L curve. From this diagram it is clear that the solid dots representing the stars that lie above the P-L curve are the bluest and least obscured, and the crosses that represent the stars that fall more than  $0^m.7$  below the P-L curve are the reddest and must be the most heavily obscured. It is interesting to see that the open squares that represent the Population II variables which fall more than  $1^m.0$  below the P-L curve lie among the black dots of the least obscured Cepheids.

The same kind of relationship is also indicated in Field I, but the color determinations are even more approximate and, therefore, they have not been plotted.

#### 10. DISTRIBUTION OF VARIABLE TYPES AND THE PERIOD-FREQUENCY RELATION

The distribution of the types of variables found in each of the four fields is given in Table XIII, both the number of variables and the percentage. Field I and Field IV were fairly completely searched for variables. Field II and Field III have not as yet been completely searched and with more blinking more variables could be found. However, it is interesting to note that the number and percent of Cepheids steadily increases as distance from the center increases, and then it drops in the furthest field. The number of Population II variables seems to be relatively constant in all four

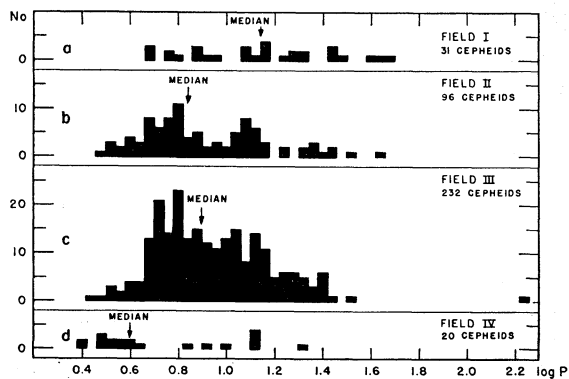


FIG. 23. Period-frequency of Cepheids in (a) Field I, (b) Field II, (c) Field III, and (d) Field IV.

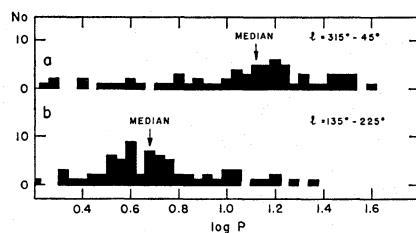


FIG. 24. Period-frequency of Cepheids fainter than 10th magnitude in low latitudes in the Galaxy: (a) towards center between  $l^{\text{II}}$   $315^\circ$  and  $45^\circ$ ; (b) towards anticenter between  $l^{\text{II}}$   $135^\circ$  and  $225^\circ$ .

fields—while the percentage of eclipsing binaries increases with the distance from the nucleus. Most novae are also found closest to the center. This seems also true for the long-period variables, but it should be remembered that only a few of the brightest have been found.

The period-frequency relation is given in Fig. 23 for each of the four variable fields of M31, including Field II (Gaposchkin 1962). From an inspection of the figure, it is clearly seen that as the distance from the nucleus increases, the periods tend to become shorter. This is most marked for the longest variables in each field, if variable H42 of Field III is excluded. The longest Cepheids are the brightest, and they have big amplitudes and hence are the most easily found, and there is no reason to suppose that they have been missed. In the field  $15'$  from the nucleus the longest period is 47 days; in the middle fields, 42 and 33 days, respectively; while in the furthest field,  $96'$  from the center, it is only 21 days.

The same tendency is also seen in the median and mean periods given in Table XIV, but this tendency may also be the effect of difference in the limiting magnitude shown in column 2 of Table XIV. The differing limiting magnitude is due to the background effect of faint stars and not to differences in plate limit.

H42 (Fig. 16) has been excluded because there is some question as to whether it is truly a Cepheid. It has a period of 176 days and a median magnitude of 19.0. It shows some variability in its light curve, particularly at minimum magnitude. If it is in the Andromeda

TABLE XIV. Distance from nucleus and period length of Cepheids.

M31	Distance	Plate limit	Longest	Period Median	Mean	Percentage of periods $< 6^d.3$
Field I	$15'$	$22^m.45$	46.9	13.48	16.48	16%
II	$36'$	...	42.3	7.0	9.8	36
III	$50'$	$22.7$	33.5	8.1	9.8	27
IV	$96'$	$22.8$	21.3	3.9	6.9	60
Galaxy						
Toward center	...		39.0	13.5	...	22
Toward anti-center	...		23.5	4.8	...	73

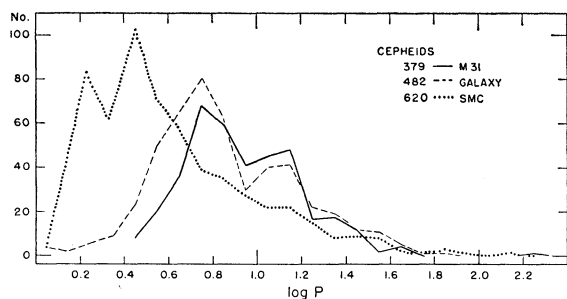


FIG. 25. Comparison of period-frequency. Solid line, 379 Cepheids in M31; dashed line, 482 Cepheids in the Galaxy not suspected of belonging to Population II (Kukarkin, Parenago, *et al.* 1958); and dotted line, 620 Cepheids in the Small Magellanic Cloud (McKibben *et al.* 1942; Nail 1949; Shapley *et al.* 1948; Shapley and McKibben 1940b).

galaxy, it must have an absolute magnitude of over  $-5^m0$ . This is the correct magnitude if it is a Cepheid, but it seems much too bright for a long-period variable that has a maximum fainter than  $21^m5$  in M31. It could be a faint long-period variable in our own system, but this, too, seems unlikely.

The same variation of length of period with distance from the nucleus is also evident in our Galaxy. This is shown in Fig. 24, where all the Cepheids have been plotted from the *Variable Star Catalogue* (Kukarkin, Parenago, *et al.* 1958) that are within certain limits of galactic longitude and fainter than  $10^m$  in their mean, are within  $\pm 10^\circ$  latitude of the galactic equator, and are not called W Virginis type in the Catalogue or otherwise known to be Population II variables. In Fig. 24, diagram (a) is for the Cepheids of low latitude toward the galactic center and (b) is for the Cepheids in the anticenter region. Again it is evident that the longest periods are found in the direction of the nucleus and that they become shorter toward the anticenter direction. In this diagram there is no reason to suppose that the search for variables in both directions is not rather similar and there is no effect of limiting magnitude; therefore, the mean and median periods decreasing and the relative number of short periods increasing in the anticenter direction are notable.

Figure 25 is the period-frequency curve of the Cepheids in M31 (solid line) compared with the Galaxy (dashed line) and the Small Magellanic Cloud (dotted line). The Milky Way system and M31 show essentially the same distribution of periods. There are  $280 \pm 1$  Cepheids with periods longer than  $\log P = 0.75$  in both systems; both curves show a dip at  $\log P = 0.95$ , though it is more pronounced in the Galaxy than in M31. The discovery of variables shorter than  $\log P = 0.7$  is not as complete in M31 as in the Galaxy due to the faintness

of the variables and the fact that none are found shorter than  $\log P = 0.4$  because of plate limit, but the distribution looks as if it would be the same as in the Galaxy and not like that of the Small Magellanic Cloud.

The Cloud is represented by 620 variables—more than in either of the other systems, but it has only 168 Cepheids longer than  $\log P = 0.75$ . There is no indication of a dip at  $\log P = 0.95$ , and for Cepheids shorter than  $\log P = 0.7$  the number increases rapidly until it reaches a maximum at  $\log P = 0.4$ , then diminishes but still shows many variables of short period. It should be remembered that most of these short-period Cepheids of the Small Magellanic Cloud (Arp 1960) have large amplitudes, whereas in both the Galaxy and M31 (Fig. 21) there is a tendency for the short-period Cepheids to have small amplitudes. In the Small Magellanic Cloud the short-period and large-amplitude Cepheids are found mostly in the outlying areas (Shapley and McKibben 1940a). Field IV lies in one of the outer arms of the Andromeda galaxy. It has periods as short as 2.5 days, but they tend to have small amplitudes. If there were some of large amplitude, they would probably have been found, as it is easier to find a variable and its period with a large range than a small one.

In the Milky Way system there are a few variables of short period and large amplitude, but these are the exceptions and it is possible that some of these should be classed as RR Lyrae variables that belong to Population II and should not be considered as true Cepheids.

## 11. SUMMARY

This paper is principally a catalogue of light curves and tables of observations of the Cepheids in the two fields of M31. It corroborates what has been noted before in Field IV. It demonstrates that the Cepheids of M31 are very like the Cepheids of our Galaxy and that there still remain unexplained differences between the Cepheids of the two galaxies and the Cepheids of the Magellanic Clouds.

## ACKNOWLEDGMENTS

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APPENDIX

Table A. 200-inch photographic observations and phases of twenty-six Cepheids and eight "Population II" variables in Field I.

Table with columns for J.D., Mag. Phase H 1\*, Mag. Phase H 3\*, Mag. Phase H 17\*, Mag. Phase H 18\*, Mag. Phase V 51, Mag. Phase V 52, Mag. Phase V 54, Mag. Phase V 56, Mag. Phase V 57, Mag. Phase V 64, and various numbered columns (66-106). Rows list observations for various stars like 474.90, 475.89, etc., with magnitude and phase data.

\* Computed phases using J. D. 2, 400, 000

## VARIABLES IN THE ANDROMEDA GALAXY

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Table A. (continued)

J. D. 2,433,000+	Mag. Phase V 66	Mag. Phase V 74	Mag. Phase V 76	Mag. Phase V 77	Mag. Phase V 87	Mag. Phase V 89	Mag. Phase V 92	Mag. Phase V 93	Mag. Phase V 102	Mag. Phase V 106
511.90	21.62 178	22.15 .380	22.54 279	23.00 .006	21.55 974	(22.6 .527	22.16 .679	22.42 .314	21.61 .577	22.28 .324
512.82	56 210	-	82 .435	(22.8 .148	46 .010	(22.6 .564	22.04 .743	45 .348	71 .743	22.65 .523
513.87	62 248	-	-	22.15 .311	77 051	-	21.68 817	-	61 933	-
514.83	50 282	.76 703	21 .778	21.80 459	99 .087	(22.6 .645	22.21 883	15 .425	86 107	21.80 956
536.89	50 065	.68 133	.54 540	(22.8 .863	48 949	(22.6 .529	21.41 421	.54 257	96 096	22.48 710
537.75	.68 096	.82 228	(22.8 .686	22.48 996	38 983	-	58 481	45 .289	61 252	21.77 896
538.74	.65 131	.18 337	22.12 855	(22.8 .150	.70 022	(22.6 .604	21.74 550	22.18 327	52 431	22.18 110
539.75	.62 167	-	.18 026	-	.89 061	-	22.12 620	21.89 365	58 614	-
540.74	.68 202	-	-	21.96 459	.78 100	(22.6 .684	21.89 690	22.15 402	.99 793	-
.89	.56 207	-	-	22.05 481	.89 105	-	22.04 700	.02 408	.96 820	.42 572
541.76	.56 238	-	-	-	-	-	21.89 761	-	-	-
564.75	.52 054	.44 201	.79 290	.82 163	-	(22.7 .646	37 365	22.38 308	.92 135	22.58 715
565.70	.56 088	.02 306	.68 452	.45 310	21.98 074	-	46 429	.42 344	41 307	21.86 920
566.69	.68 123	.42 416	.82 622	.14 464	22.09 112	(22.7 .726	43 498	.31 381	46 486	22.15 134
567.70	.68 159	-	.42 793	.24 619	21.92 152	22.54 765	.61 569	.21 419	38 668	22.51 351
569.69	.71 230	-	-	-	22.09 230	-	21.65 797	-	-	-
570.79	.59 269	-	(22.5 .320	(22.5 .097	15 272	-	22.12 784	.24 536	.77 227	21.92 018
571.77	.64 304	(22.7 .974	-	(22.5 246	12 310	-	21.70 852	.09 573	46 404	22.09 228
572.89	.64 343	-	(22.8 678	22.02 420	.09 354	.54 973	49 930	.31 615	32 607	45 469
573.93	.56 380	-	22.48 855	.31 580	.34 395	.42 014	21.52 003	.51 654	.65 795	-
590.75	.18 978	23.00 065	23.00 073	.82 176	21.95 051	(22.8 .689	20.67 175	.31 290	.65 837	.34 318
591.65	.32 009	23.00 164	21.89 876	22.54 315	21.92 086	-	20.97 238	22.31 323	.63 000	.54 512
592.64	.52 045	22.12 274	22.12 046	21.99 470	22.24 125	22.76 765	21.13 307	21.80 361	.71 180	.54 727
593.64	.56 080	.12 384	.58 217	22.18 624	.02 164	.76 805	.06 377	22.09 398	.38 360	.05 942
594.81	21.56 122	22.05 511	22.51 415	22.45 803	22.05 209	(22.7 852	21.71 458	21.89 442	21.38 571	22.28 193
830.92	21.73 506	-	-	-	22.15 422	22.09 320	21.68 915	22.09 351	21.58 272	-
832.91	.56 577	-	22.28 013	21.92 552	28 500	-	21.10 054	.12 426	.65 631	22.45 511
833.92	.67 613	-	-	.42 540	-	-	20.51 124	21 464	.86 814	-
835.96	.46 685	(22.8 .072	(22.8 531	22.72 022	.51 619	.15 522	20.97 266	.28 541	61 183	.09 166
836.90	.49 718	-	(22.6 691	.72 167	-	.21 560	21.15 332	.48 576	.52 353	-
863.83	.62 675	(22.6 142	(22.6 283	-	.34 707	-	20.94 209	.18 592	.80 223	.31 172
864.84	.59 711	22.28 253	22.72 455	22.18 479	.45 746	.48 680	21.14 279	.48 630	.55 406	.62 389
865.93	.62 749	-	-	.15 647	.34 788	-	.02 355	-	.57 603	-
866.90	21.41 784	.24 480	.34 806	.62 797	22.16 826	.34 760	.46 423	.36 708	.89 779	.04 834
867.86	20.92 818	-	.18 970	.68 945	21.29 864	-	.58 490	.45 744	.68 952	.21 041
868.86	.88 853	(22.7 .696	.38 140	.68 100	.24 903	.42 841	.48 559	.38 782	.89 133	.24 256
869.86	20.78 889	(22.6 806	.62 311	.76 254	.29 942	.54 881	.65 629	.38 820	.43 314	22.65 472
894.79	21.44 774	22.15 552	(22.8 561	(22.8 102	-.08 915	-	.46 367	.58 760	.71 823	21.65 845
895.01	21.35 782	.21 575	(22.8 597	(22.8 134	-	-	.49 381	-	.68 861	21.83 990
895.95	21.08 816	.42 680	(22.8 759	22.62 281	43 960	.02 927	.67 448	.62 804	.83 032	22.21 095
896.94	20.91 851	-	21.78 928	21.99 434	.65 998	.16 966	.72 517	.34 841	.70 211	.50 308
897.94	.73 886	-	21.86 099	22.15 589	.83 037	.05 007	21.68 586	-	.43 392	-
898.83	.60 918	.65 998	22.31 250	.45 725	.98 072	22.12 043	22.16 648	(22.8 .913	.38 553	22.42 716
899.84	20.70 954	.65 108	.62 423	.51 881	21.92 111	21.58 083	22.33 719	(22.7 .951	.92 736	21.74 933
923.74	21.44 803	-	(22.7 498	22.31 570	.74 044	21.77 042	21.58 385	22.72 853	.89 058	-
.83	.56 806	-	-	.68 048	.68 048	22.02 046	.52 391	.42 856	.89 074	22.24 103
924.77	21.44 840	(22.4 852	22.76 673	.62 729	21.92 084	21.96 083	21.61 456	.48 891	.61 244	22.48 306
927.85	20.60 949	-	-	(22.5 204	22.09 205	21.89 207	22.18 671	-	-	21.99 970
951.65	21.59 794	-	(22.5 256	.09 133	22.18 161	21.29 329	22.19 329	(22.5 906	.92 106	22.28 100
952.64	.46 830	-	-	.18 172	.21 200	-	.37 398	-	.55 285	-
953.67	21.38 866	(22.6 037	(22.7 600	(22.8 .189	22.28 212	.28 242	.58 478	(22.5 983	.38 471	.62 534
954.72	20.70 904	(22.6 153	22.65 780	22.18 351	21.99 253	.31 283	58 544	(22.7 021	.29 661	.21 761
955.83	20.54 843	22.21 274	21.86 969	.24 523	22.05 296	22.42 329	21.58 621	.61 862	.12 000	-
977.63	21.56 717	-	(22.8 886	(22.8 897	21.96 147	21.77 203	20.73 141	(22.7 886	52 804	22.45 639
978.63	.73 753	.42 786	22.05 856	22.68 042	22.24 186	.71 243	20.77 100	(22.7 924	.62 955	21.95 914
.81	.59 759	-	21.86 887	-	.05 193	21.71 250	21.00 223	-	.76 018	22.08 953
979.63	.59 788	.45 896	.77 026	22.51 196	.21 225	22.21 283	.12 280	(22.7 961	.78 166	.12 130
.79	-	-	21.96 054	-	.24 231	.15 290	.06 291	-	-	.28 164
980.68	.71 826	(22.8 011	22.45 206	.18 358	.12 266	.02 325	.41 353	-	.46 356	-
981.69	21.46 862	-	-	22.18 513	22.31 305	22.15 365	58 424	(22.7 039	21.24 538	(22.6 574
983.78	20 73 936	-	-	-	-	-	21 77 569	-	-	-
V 113	V 116	V 117	V 118	V 120	V 121	V 125	V 128	V 130	V 132	
474.90	22.42 046	21.80 022	21.99 170	22.28 681	21.77 581	21.86 083	21.26 248	21.92 433	22.42 522	-
475.89	-	.58 152	22.28 297	22.05 762	.77 603	21.99 203	.62 332	21.99 470	21.99 571	-
479.90	23.00 257	.68 544	22 34 678	21.83 006	.66 870	22.58 568	.67 587	20.43 580	.96 720	22.72 666
479.91	22.82 310	.83 675	21.80 804	22.12 088	.65 692	.54 684	.76 672	.26 817	.96 770	.31 713
480.90	.82 362	21.96 806	.58 930	.72 169	.86 714	.65 804	.52 756	29 654	21.00 819	.62 761
481.90	-	22.05 936	.83 055	.45 251	-	-	21.54 841	.40 690	20.76 868	-
482.89	(22.8 468	21.58 066	.85 181	.68 332	21.80 759	.21 044	20.74 925	20.70 727	20.65 918	22.05 855
504.92	21.99 629	22.05 942	.71 973	.51 126	20.73 250	.58 691	21.68 792	21.08 535	21.26 009	21.83 898
505.87	22.14 679	21.96 067	.96 093	.31 203	.83 271	(22.6 805	21.32 872	20.40 570	.26 056	.99 943
506.84	.12 731	.18 193	21.86 217	.51 282	.91 292	22.72 922	20.59 955	.15 605	.21 104	.83 989
507.85	.31 784	.21 324	22.05 344	.31 364	.81 315	21.99 042	21.21 040	.51 642	.52 154	21.96 306
508.85	.54 837	.65 454	.68 471	.31 445	.83 337	.96 162	.29 125	.57 679	.41 203	22.02 083
509.84	.42 889	.55 585	.68 597	-	.86 359	21.96 283	.49 209	.62 715	.77 252	.09 131
510.84	.34 942	.68 716	22.34 723	22.18 608	.91 382	22.02 403	.68 294	.88 752	.65 302	22.09 178
511.90	.42 897	.74 854	21.35 858	21.99 694	.86 405	.28 530	.97 383	.86 791	21.99 354	21.99 228
512.82	.62 046	.88 974	.41 974	.68 769	.97 425	.42 641	.85 461	20.83 824	22.02 400	-
513.87	.58 101	.96 111	.77 107	.41 855	20.78 449	-	.49 550	21.21 863	.24 452	-
514.83	.68 152	.29 237	.83 229	.71 933	21.00 470	.94 882	.93 632	21.18 898	22.05 500	-
536.89	22.72 315	.55 118	.35 024	.92 730	20.10 962	.38 534	.93 501	20.49 709	21.96 592	21.61 411
537.75	-	.43 230	21.86 133	.71 800	.15 981	.70 637	-	.76 741	22.31 635	.86 452
538.74	23.05 413	.52 360	22.28 258	.73 881	.00 003	.80 756	.72 658	.76 777	22.02 684	.96 499
539.75	22.82 466	.35 491	.09 386	21.96 962	.15 026	(22.7 876	.61 744	20.88 811	21.77 734	21.99 546
540.74	-	.72 621	.31 512	22.02 044	.23 048	-	.43 828	21.04 847	.59 787	22.00 593
.89	22.42 526	.86 640	.25 531	.15 055	.29 051	22.15 015	.60 840	.13 853	.83 790	22.02 600
541.76	-	-	-	22.21 126	20.35 070	21.96 120	14 914	20.02 888	.02 833	-
564.75	21.99 785	.74 756	.34 554	21.89 999	21.61 582	22.51 882	21.37 862	21.73 732	21.15 972	22.48 730
565.70	22.21 835	.80 880	.31 674	21.86 076	.52 604	22.31 997	20.73 943	.97 766	20.91 019	.76 775
566.69	.18 887	.86 011	22.21 800	22.09 158	.43 626	21.99 117	21.08 027	.91 803	21.24 068	.68 822
567.70	22.58 940	.58 142	21.32 925	22.45 239	21.55 648	21.89 237	.23 112	20.91 840	.26 118	22.42 869
569.69	-	21.54 402	21.83 180	-	-	-	21.41 281	21.32 913	21.72 217	21.83 964

Table A. (continued)

J. D. 2, 433,000+	Mag. Phase V 113	Mag. Phase V 116	Mag. Phase V 117	Mag. Phase V 118	Mag. Phase V 120	Mag. Phase V 121	Mag. Phase V 125	Mag. Phase V 128	Mag. Phase V 130	Mag. Phase V 132
570.79	-	21.71 .546	22.24 .319	22.42 .491	21.41 .717	22.48 .610	21.78 .374	21.43 .953	21.55 .271	21.77 .016
571.77	-	21.83 .673	.31 .443	22.24 .570	.80 .739	(22.6 .727	.65 .457	.58 .990	.49 .320	21.86 .062
572.89	(22.8 .214	22.05 .819	.21 .585	21.80 .662	.55 .764	22.42 .861	21.96 .552	21.03 .031	.77 .375	22.05 .115
573.93	(22.8 .269	22.02 .955	22.15 .717	21.96 .746	21.71 .787	.42 .986	22.09 .640	21.38 .070	.92 .427	.18 .164
590.75	22.76 .156	21.43 .152	21.55 .848	22.12 .116	20.46 .162	22.02 .008	20.96 .066	20.40 .686	.83 .260	.15 .960
591.65	22.95 .203	.32 .269	.52 .962	.42 .190	.62 .182	21.99 .116	21.14 .142	.46 .719	.92 .304	.05 .003
592.64	23.05 .256	.43 .400	21.93 .068	.58 .271	.62 .204	22.05 .296	.26 .226	.81 .755	.92 .353	-
593.64	26.00 .309	.38 .530	22.05 .215	.34 .352	.57 .226	21.86 .357	.54 .311	.94 .792	21.86 .493	.21 .097
594.81	22.82 .370	21.71 .682	22.05 .372	22.54 .447	20.76 .252	22.18 .496	21.68 .410	20.97 .835	22.09 .461	22.24 .152
830.92	21.80 .823	21.52 .518	21.99 .277	22.12 .678	21.21 .513	-	21.82 .420	21.74 .503	21.41 .155	-
832.91	-	22.05 .779	22.31 .530	21.58 .841	.49 .557	21.92 .117	.83 .589	20.40 .576	21.52 .254	-
833.92	-	22.09 .910	-	21.76 .923	.41 .580	-	.74 .675	.29 .613	22.02 .304	-
835.96	22.62 .088	21.43 .176	21.24 .916	22.18 .089	.86 .625	22.42 .482	21.55 .848	.35 .688	21.92 .405	22.21 .566
836.90	(22.6 .138	21.41 .299	21.77 .035	.21 .165	21.38 .148	-	20.98 .927	.46 .722	22.31 .641	-
863.83	(22.6 .558	22.09 .816	22.42 .447	.28 .359	20.65 .246	-	21.52 .209	.76 .711	21.92 .785	21.99 .885
864.84	-	21.96 .947	22.39 .574	.45 .441	.81 .268	-	.65 .295	.78 .748	20.54 .835	22.09 .933
865.93	-	-	.24 .530	-	-	21.86 .084	.49 .387	.197 .788	.67 .890	-
866.90	22.15 .720	.39 .217	21.90 .836	22.16 .609	.85 .314	21.92 .201	21.89 .470	20.96 .824	20.67 .937	.09 .030
867.86	-	.58 .342	.71 .959	21.96 .687	.75 .336	-	22.21 .551	21.15 .859	21.02 .985	.31 .076
868.86	.24 .824	.49 .473	21.92 .084	.83 .769	20.70 .358	22.09 .437	.28 .635	.13 .896	.26 .134	22.31 .123
869.86	-	21.77 .604	22.02 .211	.53 .850	21.02 .380	-	22.21 .721	.24 .932	.24 .084	-
894.79	.76 .191	22.12 .860	.28 .370	.55 .881	20.37 .936	.58 .554	21.60 .833	.02 .848	.77 .319	21.96 .350
895.01	22.76 .202	-	-	-	-	-	21.58 .851	.02 .855	.86 .329	.96 .360
895.95	23.00 .252	21.86 .011	.28 .517	21.92 .975	.08 .962	.42 .693	20.77 .932	.08 .890	.77 .376	.71 .405
896.94	(22.8 .305	.54 .141	22.38 .643	22.16 .056	.14 .984	(22.6 .812	20.92 .015	.13 .926	21.94 .425	.78 .451
897.94	(22.8 .357	.38 .272	21.89 .769	.12 .138	.18 .006	22.28 .933	21.10 .100	.49 .963	22.00 .475	21.83 .499
898.83	23.00 .404	.29 .387	.61 .882	.15 .210	.18 .026	21.92 .039	.38 .166	.65 .996	.05 .519	22.12 .541
899.84	22.95 .457	.35 .518	.58 .018	.62 .291	20.23 .048	-	.68 .261	.58 .033	22.12 .568	.18 .588
923.74	21.89 .718	.96 .640	.68 .038	.31 .238	21.58 .581	22.02 .033	.58 .287	13 .910	21.96 .753	-
.83	21.89 .722	.96 .652	21.86 .050	.18 .246	.58 .583	21.99 .044	.65 .294	-	.83 .757	(22.7 .724
924.77	22.18 .772	.86 .775	22.09 .168	.38 .322	.71 .604	.99 .157	21.18 .374	.26 .948	21.80 .425	22.45 .769
927.85	-	.10 .177	.28 .558	.48 .573	21.96 .672	-	22.15 .635	.92 .061	.05 .956	-
951.65	.82 .190	.32 .285	.21 .574	.72 .512	20.60 .203	21.99 .388	21.84 .652	.21 .935	.29 .135	22.05 .042
952.64	-	.52 .416	22.38 .699	.31 .593	.65 .225	-	.65 .736	.46 .971	.61 .184	-
953.67	(22.8 .296	21.61 .549	21.96 .830	22.12 .676	.86 .248	22.42 .631	.41 .823	.58 .009	.41 .235	21.83 .136
954.72	(22.8 .352	22.02 .686	.52 .963	21.92 .762	.88 .271	.76 .577	.10 .912	.68 .048	.86 .287	21.96 .187
955.83	(22.8 .410	22.02 .831	.89 .104	.60 .850	20.90 .296	.54 .891	.03 .006	.74 .088	21.71 .342	22.05 .239
977.63	22.21 .560	21.71 .678	.71 .866	.92 .632	21.71 .781	.38 .511	21.65 .854	.38 .889	22.18 .422	.28 .271
978.63	21.96 .613	.78 .809	.54 .992	.96 .709	.68 .804	.45 .631	20.50 .939	.35 .925	.05 .471	.12 .318
.81	.91 .621	.88 .832	.53 .013	.99 .724	.48 .808	.34 .653	20.70 .954	.25 .931	.02 .490	.34 .327
979.63	21.99 .666	21.96 .940	21.83 .119	.92 .791	.21 .826	.54 .751	21.05 .023	.55 .962	.18 .521	22.05 .366
.79	22.02 .674	22.05 .960	22.09 .139	.71 .804	.46 .830	.65 .771	.10 .037	.46 .967	.12 .529	-
980.68	.12 .721	21.74 .077	21.99 .253	.67 .876	21.10 .849	.72 .878	.41 .113	.58 .001	.05 .573	21.80 .415
981.69	22.22 .774	.05 .208	22.09 .380	.21 .83 .957	20.81 .872	22.34 .978	.46 .198	.32 .038	22.02 .623	.71 .463
983.78	-	21.21 .482	-	-	20.40 .919	-	21.65 .375	21.32 .114	21.80 .727	21.80 .562

J. D. 2, 433,000+	V 144	V 145	V 146	V 147	J. D. 2, 433,000+	V 144	V 145	V 146	V 147
474.90	22.37 .789	(22.4 .618	21.74 .263	22.54 .524	830.92	22.21 .627	-	21.86 .440	21.41 .661
475.89	.40 .805	(22.4 .674	21.86 .397	(22.4 .561	832.91	.28 .660	-	20.83 .709	.20 .734
478.90	.44 .854	21.99 .842	20.83 .805	21.46 .671	833.92	.21 .676	-	20.62 .846	.30 .772
479.91	.48 .871	.83 .898	21.05 .941	.17 .709	835.96	22.21 .709	22.09 .855	21.32 .122	.82 .847
480.90	.68 .887	.61 .954	.24 .075	.42 .745	836.90	(22.4 .725	21.80 .908	.68 .249	.99 .882
481.90	.42 .903	.65 .010	.29 .211	.52 .782	863.88	21.97 .167	-	.02 .893	.61 .875
482.89	(22.4 .919	21.80 .066	.55 .345	21.67 .819	864.84	.92 .183	22.45 .474	.21 .029	.67 .913
504.92	22.02 .281	22.21 .301	21.58 .326	22.15 .632	865.93	.77 .201	-	.26 .177	.78 .953
505.87	.21 .296	.34 .354	22.21 .454	21.48 .667	866.90	.76 .217	.42 .589	.65 .309	.83 .989
506.84	.28 .312	.45 .408	21.96 .585	.30 .702	867.86	.74 .233	.54 .643	.80 .439	.70 .024
507.85	.48 .329	.58 .465	21.02 .722	.25 .740	868.86	.86 .249	22.48 .700	.92 .574	.70 .061
508.85	.48 .345	.65 .521	20.67 .857	.36 .777	869.86	21.99 .266	-	.10 .709	.86 .098
509.84	.21 .361	.72 .577	21.15 .991	.46 .813	894.79	22.22 .675	21.97 .153	.26 .082	.93 .017
510.84	.42 .378	.68 .633	.02 .127	.60 .850	895.01	.28 .678	-	.18 .111	21.70 .026
511.90	.42 .395	.65 .692	.35 .270	21.60 .889	895.95	.22 .693	22.12 .218	-	22.16 .061
512.82	.34 .411	22.68 .743	.55 .395	22.05 .923	896.94	.30 .710	.24 .274	.70 .374	.00 .097
513.87	.42 .428	21.85 .802	.89 .537	21.82 .962	897.94	.28 .726	.19 .330	.96 .509	.18 .134
514.83	.39 .443	.74 .856	.21 .667	.84 .997	898.83	.51 .741	-	21.68 .630	.12 .167
536.89	.48 .805	21.89 .093	21.46 .652	.77 .811	899.84	22.24 .757	.42 .436	20.78 .766	22.09 .204
537.75	.58 .819	22.12 .141	20.76 .768	.79 .843	923.74	21.92 .149	.15 .776	21.05 .000	21.88 .086
538.74	.54 .836	.28 .136	20.88 .902	21.90 .860	.83	22.00 .151	22.31 .780	.10 .012	22.16 .089
539.75	.42 .852	.28 .253	21.10 .939	22.05 .817	924.77	.00 .166	21.80 .833	.52 .140	21.97 .124
540.74	.42 .868	.24 .309	.21 .174	22.02 .953	927.85	.09 .217	21.86 .006	21.68 .557	22.30 .238
.89	-	.42 .317	.41 .193	21.93 .959	951.65	.42 .607	22.10 .340	20.76 .777	21.93 .116
541.76	-	-	.58 .311	22.00 .991	952.64	-	-	21.03 .911	22.09 .152
564.75	22.03 .262	.42 .654	.65 .422	21.86 .839	953.67	.24 .640	.28 .453	.21 .051	.05 .196
565.70	21.89 .278	.31 .707	.77 .550	21.81 .874	954.72	.42 .657	.34 .512	.63 .193	.18 .229
566.69	-	.31 .763	21.41 .684	22.00 .911	955.83	22.31 .676	.41 .574	.61 .343	22.42 .270
567.90	22.06 .312	22.02 .819	20.73 .821	21.71 .948	977.63	21.77 .033	22.21 .796	.76 .293	21.89 .075
569.69	.15 .345	21.71 .931	21.29 .090	22.03 .022	978.63	.55 .050	21.80 .852	.71 .428	21.96 .111
570.79	.18 .362	.61 .993	21.55 .239	21.97 .062	.81	.68 .052	.83 .862	.99 .452	22.02 .118
571.77	.24 .378	.77 .048	22.05 .372	.96 .098	979.63	.83 .066	.77 .908	.89 .563	.12 .148
572.89	.15 .395	21.92 .110	22.02 .523	21.90 .140	.79	-	.77 .917	.92 .585	.09 .154
573.93	.21 .412	22.31 .169	21.15 .864	22.16 .178	980.68	.77 .983	.68 .967	21.05 .705	.18 .187
590.75	.42 .678	.02 .111	.10 .946	21.57 .799	981.69	.77 .100	21.82 .024	20.81 .842	22.31 .224
591.65	.34 .707	.34 .162	.21 .062	.75 .832	983.78	21.77 .134	22.02 .141	21.08 .125	-
592.64	.34 .723	.31 .218	.10 .197	.83 .868					
593.64	.42 .740	.28 .274	.49 .333	.84 .905					
594.81	22.42 .755	22.42 .339	21.89 .490	21.84 .948					

VARIABLES IN THE ANDROMEDA GALAXY

Table B. 200-inch photographic observations and phases of one hundred seventy-six Cepheids and six "Population II" variables in Field III.

Table with 11 columns: J. D., Mag. Phase H 21\*, Mag. Phase H 22\*, Mag. Phase H 23\*, Mag. Phase H 24\*, Mag. Phase H 25\*, Mag. Phase H 26\*, Mag. Phase H 27\*, Mag. Phase H 28\*, Mag. Phase H 29\*, Mag. Phase H 30\*. Rows list various stars with their corresponding magnitudes and phases.

\* computed from J. D. 2, 424, 000.

Table B. (continued)

J.D.	Mag. Phase H 31*	Mag. Phase H 33*	Mag. Phase H 36*	Mag. Phase H 37*	Mag. Phase H 38*	Mag. Phase H 39*	Mag. Phase H 40*	Mag. Phase H 41*	Mag. Phase H 42*	Mag. Phase H 45*										
511.85	21.01	.559	20.61	.537	21.26	.980	20.81	.132	20.98	.428	21.37	.824	20.96	.851	20.78	.207	19.60	.837	21.11	.996
512.87	.06	.604	19.73	.591	21.18	.036	21.08	.208	21.52	.529	.39	.867	.96	.881	.78	.247	.55	.843	.01	.075
513.81	.35	.646	.48	.641	20.63	.089	.39	.279	.68	.622	.77	.907	.76	.909	20.83	.284	.80	.848	.81	1.148
514.88	.55	.693	.34	.698	20.34	.149	21.63	.359	.99	.727	.70	.952	20.71	.943	21.08	.326	19.55	.854	21.73	.231
536.83	.50	.659	19.83	.862	21.04	.374	20.48	.005	.66	.895	.48	.907	20.81	.627	20.81	.225	20.07	.978	20.88	.934
537.80	.50	.701	20.22	.913	.04	.428	.91	.077	.50	.991	.50	.991	.56	.657	21.06	.264	19.94	.989	21.11	.009
538.80	.63	.745	.27	.967	.16	.485	20.73	.152	21.08	.090	.70	.949	.56	.657	21.06	.264	19.94	.989	21.11	.009
539.80	21.63	.789	.32	.020	.04	.540	21.44	.227	20.96	.189	.75	.991	.81	.687	.01	.304	20.07	.995	.63	1.64
540.86	22.02	.836	.56	.076	.11	.600	.30	.306	20.78	.293	.80	.035	.66	.718	.18	.346	.17	.009	.71	2.47
541.81	21.81	.878	.78	.127	.21	.652	21.35	.378	21.06	.387	.80	.075	.21	.382	.36	.005	.73	.320	.61	2.55
564.80	21.66	.889	.96	.345	.13	.936	20.88	.102	21.78	.658	21.72	.034	.71	.433	.13	.284	.22	.137	.59	1.04
565.75	22.26	.931	.63	.395	21.04	.988	20.86	.173	22.26	.752	22.00	.073	.71	.461	.13	.322	20.07	.142	.71	1.78
566.74	.16	.975	.71	.448	20.96	.044	21.30	.247	21.99	.849	21.86	.115	.61	.491	.06	.361	19.80	.148	.61	2.55
567.75	.23	.019	20.76	.502	.48	.100	.32	.323	.71	.949	22.01	.157	.71	.520	.13	.400	19.93	.153	.63	3.33
569.74	.30	.107	19.55	.607	.63	.212	.50	.472	21.03	.146	22.04	.240	.76	.642	.18	.478	20.01	.165	.37	4.88
570.85	.10	.156	.41	.666	20.83	.274	.61	.555	20.68	.255	21.72	.286	.86	.613	.28	.522	19.73	.171	21.01	5.73
571.83	.02	.199	.45	.718	21.06	.328	.50	.629	20.93	.352	.52	.327	.76	.672	.63	.600	.94	.182	20.31	6.49
572.84	.30	.243	.73	.772	21.01	.385	.61	.704	21.23	.452	21.59	.369	.76	.672	.76	.704	28	.641	20.78	8.09
573.88	.16	.289	.73	.827	20.91	.443	21.57	.782	20.56	.555	20.61	.413	.76	.704	28	.641	18.96	.295	.52	1.91
590.65	22.13	.027	.59	.717	21.01	.379	20.68	.040	21.01	.211	21.61	.112	.12	.204	.11	.299	19.17	.283	21.30	1.10
591.70	21.84	.073	.62	.772	.18	.437	21.08	.118	20.56	.315	21.80	.156	.17	.235	.23	.340	18.96	.289	.52	1.91
592.69	22.39	.117	.76	.825	.26	.492	.26	.193	21.19	.412	.77	.197	.22	.265	.23	.380	.90	.295	.61	2.68
593.69	.02	.161	.76	.878	.39	.548	.46	.268	.46	.511	.77	.239	.22	.294	.35	.418	.82	.300	.71	3.46
594.76	22.23	.208	19.97	.935	21.21	.608	21.52	.348	21.93	.617	21.65	.204	20.22	.327	21.44	.460	18.82	.306	21.39	4.28
831.94	21.08	.645	20.63	.517	21.63	.848	20.71	.130	-	-	-	-	20.22	.404	21.21	.766	18.40	.649	20.71	.831
832.95	19.80	.689	19.60	.570	21.11	.905	21.30	.141	21.86	.221	22.435	21.11	.805	22.435	21.11	.805	25	.654	20.93	.909
836.96	21.96	.855	19.62	.782	20.23	.128	20.76	.506	21.50	.537	21.08	.398	20.76	.555	20.12	.963	18.75	.676	21.90	2.20
863.92	22.42	.052	20.73	.212	21.48	.634	.71	.528	20.91	.200	20.46	.513	19.94	.360	15	.021	19.24	.830	.71	3.12
864.89	21.84	.095	20.96	.264	.55	.698	.63	.600	20.50	.296	20.12	.389	20.12	.389	20.12	.389	.24	.836	.78	3.87
865.88	22.42	.138	21.03	.316	.55	.743	.55	.674	21.11	.394	.53	.595	.12	.418	.48	.098	.28	.472	.32	4.64
.97	-	-	20.88	.321	.39	.748	.41	.681	20.96	.402	.58	.599	.12	.421	.46	.102	.38	.942	.23	4.72
866.84	.42	.180	.76	.367	.57	.796	.61	.746	21.35	.488	.83	.634	.27	.446	.43	.135	.17	.847	21.01	5.28
867.91	.52	.227	.51	.424	.55	.856	21.48	.827	.80	.594	.91	.679	.71	.478	.71	.177	.38	.853	20.81	6.21
868.91	22.39	.271	.68	.476	.08	.912	20.98	.902	.75	.693	20.97	.721	.81	.508	.73	.216	.17	.858	21.10	6.99
869.91	21.81	.315	20.32	.530	21.08	.968	20.51	.977	21.92	.792	21.26	.763	.86	.538	.96	.256	.24	.864	.63	7.77
894.84	20.51	.412	19.62	.851	20.96	.359	21.41	.846	20.83	.255	.39	.802	-	-	20.78	.234	.76	.005	.10	7.11
.91	.53	.415	19.73	.855	20.86	.363	21.46	.851	.83	.261	.35	.805	.22	.284	21.06	.237	-	-	.22	7.16
895.81	.56	.455	20.07	.903	21.06	.414	20.91	.918	20.86	.350	.44	.843	.12	.310	21.18	.272	.70	.010	.66	7.86
.99	.56	.463	.01	.913	20.91	.425	.68	.932	21.10	.379	.59	.852	.22	.312	20.86	.279	-	-	.68	8.01
896.78	.78	.498	.09	.955	21.11	.468	.68	.991	.03	.445	.61	.884	.27	.341	21.11	.310	.66	.016	.71	8.61
897.81	20.91	.543	.63	.009	.04	.525	20.88	.069	.54	.547	.59	.927	.32	.371	.23	.350	.73	.022	20.91	9.41
898.90	21.06	.591	.73	.067	.44	.586	21.01	.150	.83	.655	.75	.972	.56	.402	.39	.393	.80	.028	21.11	0.26
899.91	18.63	.686	.78	.121	.59	.642	21.32	.226	.95	.755	.70	.014	20.66	.433	.35	.432	.94	.083	21.59	1.04
923.80	.19	.697	.73	.387	.01	.976	20.66	.017	21.10	.114	.80	.011	19.73	.146	.26	.370	.59	1.69	20.93	9.58
924.82	.41	.732	.78	.442	.26	.033	.86	.093	20.86	.215	.83	.053	.80	.177	.18	.410	.59	.175	21.23	0.37
.94	.52	.738	20.76	.448	21.11	.041	20.81	.101	20.83	.227	.83	.057	.80	.179	.35	.455	-	-	.32	0.46
927.90	21.87	.867	19.45	.600	20.58	.205	21.26	.324	21.70	.519	.80	.182	19.94	.269	.44	.530	19.66	.192	.60	2.76
951.70	22.26	.915	20.12	.868	21.40	.534	20.66	.109	21.80	.870	.70	.175	20.56	.979	.61	.465	18.30	.327	.21	1.22
952.70	21.87	.979	.01	.921	.44	.589	21.11	.184	.58	.968	.92	.217	19.94	.009	.37	.504	.25	.332	.81	2.08
953.70	22.30	.003	.53	.974	.37	.645	.39	.259	21.30	.067	.80	.258	.94	.039	.59	.543	20.03	.389	.61	2.78
954.77	22.45	.050	.66	.031	.52	.705	.37	.339	20.98	.173	.77	.303	.87	.071	.30	.586	.25	.344	.66	3.61
955.78	21.93	.094	.63	.084	.63	.761	21.63	.415	20.71	.273	.59	.345	19.38	.100	.37	.625	20.03	.350	.57	4.39
977.69	21.81	.658	.91	.247	.21	.984	20.91	.057	21.35	.436	.65	.259	20.96	.754	.35	.484	.20	.474	.68	1.39
.75	22.05	.061	.92	.250	.28	.987	20.87	.062	.60	.442	.65	.261	.86	.757	.29	.487	-	-	.52	1.44
978.69	22.36	.102	.81	.900	21.01	.040	20.81	.132	.68	.442	.54	.300	.86	.784	.44	.524	.25	.479	.48	2.17
979.69	21.87	.146	.71	.352	20.32	.096	21.35	.207	.76	.634	.20	.966	20.96	.813	.45	.563	.30	.485	.68	2.94
980.64	21.93	.188	.71	.403	.07	.149	.46	.278	.92	.728	21.08	.382	21.01	.842	.52	.600	.35	.490	20.93	9.58
981.62	22.16	.231	.66	.455	.41	.204	.41	.352	.92	.825	20.56	.423	20.96	.871	.52	.639	-	-	.35	4.44
.75	22.16	.237	20.61	.462	20.46	.211	21.46	.362	21.89	.838	20.41	.429	20.96	.873	21.39	.645	18.40	.496	21.26	4.54
	H 46	H 47	H 48	V 161	V 162	V 163	V 170	V 171	V 172	V 173										
474.96	21.52	.752	21.66	.081	21.44	.278	22.39	.999	21.35	.295	22.26	.723	22.36	.381	21.95	.472	21.89	.126	22.16	.845
475.96	.57	8.30	22.05	.247	21.86	.466	21.96	.247	.16	.311	21.26	.952	22.07	.439	22.02	.669	21.92	.216	-	-
476.95	.63	.907	22.56	.412	22.07	.652	22.01	.494	21.01	.326	21.80	.179	21.44	.496	19	.864	22.52	.307	22.10	2.42
477.95	.52	.984	-	-	22.46	.840	22.42	.742	20.96	.341	22.19	.408	21.68	.554	.30	.060	.69	.397	21.44	4.42
479.93	.23	1.37	21.37	.909	21.30	.212	21.86	.234	21.06	.372	21.39	.861	22.33	.668	22.22	.450	.42	.573	22.05	8.37
480.96	21.08	.217	21.57	.080	.37	.405	22.10	.491	.37	.16	21.80	.097	.56	.727	21.80	.653	22.22	.671	22.59	0.43
481.96	20.83	.294	22.05	.246	21.77	.593	22.42	.739	.35	.403	22.02	.326	.42	.785	21.80	.653	22.22	.671	21.9	

Table B. (continued)

J.D. 2,433,000+	Mag. Phase H 46	Mag. Phase H 47	Mag. Phase H 48	Mag. Phase V 161	Mag. Phase V 162	Mag. Phase V 163	Mag. Phase V 170	Mag. Phase V 171	Mag. Phase V 172	Mag. Phase V 173
571.83	20.91 .248	21.81 .210	21.56 .487	22.56 .065	21.66 .783	21.21 .899	22.57 .966	21.75 .536	21.35 .923	22.56 .188
572.84	.81 .325	22.05 .378	22.01 .677	.01 .316	.44 .798	21.63 .130	.59 .024	21.92 .735	.65 .014	21.59 .390
573.88	20.76 .407	.56 .551	.19 .872	.36 .575	.52 .814	22.36 .367	.62 .084	22.22 .940	21.86 .108	21.72 .598
590.65	21.45 .704	.13 .343	22.36 .024	.13 .741	.81 .073	.19 .205	.69 .051	.59 .240	22.66 .631	22.45 .947
591.70	.55 .785	.30 .517	21.48 .221	22.46 .002	.76 .088	.22 .446	.69 .111	.19 .446	21.98 .726	22.42 .156
592.69	.67 .862	22.36 .682	21.75 .408	21.77 .248	.71 .104	22.22 .672	.69 .168	.04 .641	21.86 .631	21.68 .353
593.69	.67 .939	21.61 .849	22.04 .596	22.16 .496	.93 .119	21.28 .901	.69 .226	.26 .838	.65 .906	.66 .553
594.76	21.59 .022	21.61 .027	22.36 .797	22.29 .762	21.66 .135	21.70 .146	22.72 .288	22.36 .049	21.35 .064	21.93 .768
831.94	20.81 .375	-	-	-	21.66 .778	22.02 .439	-	-	-	-
832.95	20.86 .454	22.56 .686	22.01 .570	22.42 .938	.76 .793	1.16 .670	22.6 .019	22.32 .924	22.36 .632	21.69 .332
836.96	21.67 .764	10 .354	21.44 .323	52 .934	.71 .855	22.49 .588	22.6 .251	21.77 .714	21.65 .997	22.23 .132
863.92	.61 .850	22.10 .842	.54 .390	0.08 .632	.36 .272	21.63 .760	22.49 .805	22.46 .019	22.32 .444	21.48 .516
864.89	.44 .925	21.32 .004	21.98 .574	.56 .873	.52 .285	21.35 .982	.29 .861	.56 .210	.75 .532	21.68 .710
865.88	.32 .002	21.71 .169	22.20 .760	.16 .119	-	22.07 .208	.36 .918	-	.26 .622	22.13 .908
.97	.52 .010	21.76 .184	.46 .777	22.32 .142	.14 .300	21.98 .228	.39 .923	22.32 .423	.52 .630	.33 .926
866.84	.23 .076	22.20 .329	.56 .940	21.95 .358	21.06 .315	22.19 .428	.49 .973	21.86 .594	.13 .709	22.52 .099
867.91	.16 .159	.20 .507	22.29 .141	22.32 .623	20.96 .331	22.22 .673	.69 .035	22.13 .805	22.07 .806	21.87 .313
868.91	21.06 .236	.42 .673	21.48 .329	.39 .872	.96 .346	21.26 .902	22.56 .092	.36 .001	21.48 .897	.50 .512
869.91	20.56 .314	22.13 .840	.63 .517	22.42 .120	20.96 .362	.50 .131	-	.49 .198	21.75 .988	.87 .712
894.84	20.78 .243	21.57 .990	.35 .202	21.92 .314	21.60 .745	.21 .898	21.99 .587	.46 .104	22.16 .251	.93 .691
.91	21.01 .248	.44 .002	.56 .216	21.67 .331	-	1.10 .854	21.96 .591	.32 .118	.26 .257	21.90 .705
895.81	20.51 .318	.71 .150	.50 .385	22.10 .555	.73 .761	-	22.93 .643	.46 .295	.62 .339	22.26 .884
.99	.61 .333	.61 .184	.41 .421	.26 .602	-	21.63 .103	.16 .654	22.32 .333	-	1.10 .923
896.78	.88 .394	21.93 .314	21.72 .568	.19 .796	.61 .775	22.16 .282	.30 .699	21.98 .466	.46 .427	22.39 .078
897.81	20.91 .472	22.10 .485	22.26 .761	22.70 .052	.61 .790	22.42 .518	.45 .759	22.07 .689	.42 .521	21.96 .284
898.90	21.18 .557	.52 .667	22.19 .066	21.80 .323	.48 .807	21.65 .767	.42 .821	22.99 .620	22.29 .620	.41 .501
899.91	.18 .635	.05 .835	21.72 .156	22.36 .574	.93 .822	21.50 .998	.36 .880	2.9 .102	21.98 .712	.66 .703
923.80	.13 .484	22.33 .813	22.13 .647	.01 .509	.61 .189	22.39 .467	22.65 .257	.32 .804	.65 .881	.59 .474
924.82	.13 .562	21.55 .983	.13 .839	.56 .762	.53 .205	22.36 .700	-	.32 .004	.52 .974	.82 .677
.94	11 .571	21.48 .003	22.39 .861	.36 .792	-	21.98 .727	-	22.29 .028	.37 .985	.72 .701
927.90	.39 .801	-	21.41 .417	.01 .527	.76 .252	22.22 .405	21.52 .493	21.92 .611	21.92 .254	21.93 .292
951.70	.18 .642	22.36 .458	22.22 .891	.16 .440	.39 .618	21.14 .854	22.45 .865	22.29 .294	22.56 .414	22.49 .045
952.70	.32 .720	-	22.07 .079	-	.76 .633	21.61 .063	.36 .923	22.49 .1	-	-
953.70	.59 .797	22.56 .791	21.44 .267	22.62 .937	.61 .649	22.29 .311	.56 .961	1.13 .688	.56 .506	21.57 .445
954.77	.41 .860	21.44 .969	.67 .468	21.92 .203	.06 .666	22.46 .556	.62 .042	3.2 .899	22.10 .693	21.71 .658
955.78	.59 .958	21.55 .137	21.98 .658	21.86 .454	21.44 .681	21.80 .788	(22.7 .101)	2.9 .097	21.83 .785	22.10 .860
977.69	.32 .653	22.49 .785	22.29 .776	22.52 .897	22.13 .017	.58 .803	22.62 .364	.36 .409	2.9 .774	.07 .235
.75	.25 .658	22.43 .792	.16 .787	.46 .903	-	2.6 .840	.49 .370	22.46 .415	.86 .777	22.10 .239
978.69	.57 .731	21.57 .952	.16 .964	22.26 .146	.16 .033	21.56 .032	22.13 .421	21.80 .606	.50 .865	21.39 .434
979.69	.44 .808	.50 .118	22.10 .152	21.83 .394	22.10 .048	22.16 .261	21.59 .479	22.29 .803	.52 .956	.50 .634
980.64	.39 .882	21.96 .276	21.48 .231	22.22 .630	21.93 .063	.36 .478	.66 .534	.36 .990	21.65 .042	21.93 .824
981.62	.44 .958	22.23 .440	21.80 .515	.56 .874	-	3.2 .703	21.99 .590	4.9 .183	22.13 .131	22.16 .019
.75	21.57 .968	22.20 .461	22.01 .540	22.29 .906	22.07 .080	22.49 .732	22.05 .598	22.39 .208	22.01 .143	22.22 .046
	V 177	V 180	V 183	V 184	V 185	V 186	V 188	V 190	V 191	V 194
474.96	21.32 .980	21.87 .733	22.80 .770	22.29 .530	(22.7 .650)	21.93 .471	21.54 .754	21.90 .965	21.50 .574	20.76 .325
475.96	.37 .015	-	-	-	-	-	.08 .948	22.05 .254	-	21.18 .425
476.95	.06 .051	22.27 .950	22.89 .142	22.70 .859	(22.9 .908)	22.62 .797	.08 .921	21.46 .560	22.36 .878	21 .515
477.95	.30 .087	.39 .059	23.03 .329	(22.7 .024)	-	-	.10 .005	.86 .859	21.28 .031	.68 .610
479.93	.39 .158	22.42 .274	22.26 .699	22.26 .352	22.29 .295	21.48 .261	21.72 .170	.61 .451	.39 .333	.84 .800
480.96	.71 .193	21.78 .386	.72 .891	.49 .522	-	21.81 .424	22.16 .256	.55 .759	.50 .491	.81 .898
481.96	.46 .228	.99 .495	-	(22.6 .687)	-	-	.10 .340	.73 .058	.77 .644	.48 .993
482.92	.70 .264	.81 .600	(22.9 .258)	(22.7 .846)	-	22.56 .736	22.59 .420	.68 .345	.99 .790	.35 .085
503.87	21 .013	21.88 .882	(22.9 .137)	22.16 .310	.26 .402	22.42 .065	21.65 .174	.26 .607	.54 .991	.37 .084
504.95	.35 .049	22.23 .999	22.80 .375	.36 .488	.32 .554	21.36 .237	22.01 .264	.90 .923	.06 .156	.06 .187
505.90	.41 .084	.10 .103	.23 .553	.49 .645	.46 .666	21.66 .388	.13 .343	.87 .213	.48 .302	21.02 .278
506.87	.28 .121	.16 .208	22.69 .734	.70 .806	.62 .792	22.05 .542	.56 .424	.39 .503	.61 .450	20.96 .370
507.87	.37 .156	22.20 .317	(23.0 .921)	.89 .971	.62 .921	.56 .701	.32 .508	.59 .802	21.96 .603	21.11 .476
508.88	.35 .192	21.61 .427	22.89 .109	22.73 .138	.29 .053	.69 .861	22.26 .593	.96 .104	22.10 .757	21.44 .562
509.89	.48 .228	.57 .536	(22.9 .298)	21.89 .305	.29 .184	.60 .021	-	.76 .406	22.02 .911	.73 .659
510.89	.73 .263	.84 .645	22.16 .485	22.39 .470	.26 .313	22.23 .180	21.56 .761	.63 .705	21.28 .064	.68 .754
511.85	.78 .299	21.59 .750	.16 .665	.39 .629	.32 .438	21.61 .333	.14 .842	.84 .992	.35 .211	.81 .845
512.87	21.59 .335	22.30 .861	22.65 .855	.59 .798	-	-	.10 .927	.96 .297	.61 .367	.76 .943
513.81	22.02 .370	.07 .963	-	-	-	-	.46 .006	.21 .578	21.83 .511	.28 .033
514.88	21.93 .407	22.07 .081	23.10 .331	.86 .130	.80 .831	22.69 .814	.63 .095	.65 .897	22.13 .674	21.16 .135
536.83	.37 .191	21.57 .472	(22.9 .333)	.80 .759	.76 .680	21.66 .302	.19 .933	.76 .458	21.66 .028	20.86 .230
537.80	.41 .226	.76 .578	22.13 .514	22.80 .920	-	21.93 .456	.24 .014	.55 .748	.08 .176	.66 .322
538.80	.48 .262	.68 .687	.42 .702	(22.7 .085)	-	22.36 .615	.56 .098	21.76 .047	.66 .329	20.93 .417
539.80	.73 .297	.99 .795	.83 .888	21.92 .250	-	.62 .777	.83 .181	22.07 .346	21.70 .482	21.18 .512
540.86	.68 .335	21.95 .911	.80 .087	21.86 .426	-	.56 .943	21.98 .270	21.48 .663	22.16 .644	.76 .613
541.81	.84 .369	22.30 .014	-	-	-	-	22.22 .349	21.87 .947	21.88 .789	.66 .705
564.80	.48 .192	21.52 .518	.23 .561	22.32 .384	.46 .541	.56 .747	.22 .274	21.66 .819	.37 .301	.78 .899
565.75	.76 .226	.59 .622	.36 .738	.46 .541	.29 .434	-	.19 .353	22.16 .103	.48 .446	.63 .989
566.74	.93 .261	21.84 .730	.86 .924	.56 .705	.56 .563	22.56 .055	.26 .436	21.57 .898	21.54 .597	.39 .084
567.75	.96 .297	22.22 .840	.72 .112	-	-	21.57 .216	22.10 .520	.41 .700	22.20 .752	21.08 .180
569.74	.90 .368	.39 .056	.07 .484	.42 .201	-	21.93 .533	21.86 .687	.76 .295	21.30 .056	20.96 .370
570.85	.96 .408	-	.39 .698	.39 .384	-	-	21.44 .780	.44 .627	1.18 .226	21.08 .476
571.83	.99 .444	.07 .283	.80 .875	.39 .546	-	(22.6 .864)	20.97 .862	.93 .920	.41 .375	.35 .570
572.84	.99 .479	22.05 .393	.96 .064	.56 .713	.04 .355	-	21.10 .947	.90 .222	.59 .530	.44 .666
573.88	.99 .515	21.90 .507	22.96 .258	.70 .885	.29 .490	21.66 .189	21.50 .934	.46 .533	.72 .689	.68 .765
590.65	.41 .116	22.07 .334	23.10 .392	.56 .658	.56 .666	(22.6 .854)	22.49 .437	.37 .545	.28 .251	.06 .366
591.70	.59 .153	21.90 .448	22.05 .589	.76 .831	(22.8 .802)	22.69 .020	.56 .525	21.63 .859	.46 .411	.11 .466
592.69	.61 .189	.50 .556	22.80 .774	.89 .995						



Table B. (continued)

Table with columns for J.D., Mag. Phase V 177-194, V 185-188, V 188-191, and V 191-194. Rows contain magnitude and phase data for various objects, including 866.84, 867.91, 868.91, etc., up to 927.90.

VARIABLES IN THE ANDROMEDA GALAXY

Table B. (continued)

Table with 12 columns: J.D. 2,433,000+, Mag. Phase V 195, Mag. Phase V 198, Mag. Phase V 199, Mag. Phase V 201, Mag. Phase V 202, Mag. Phase V 207, Mag. Phase V 208, Mag. Phase V 210, Mag. Phase V 211, Mag. Phase V 215. Rows contain magnitude and phase data for various variables.

Table B. (continued)

J. D. 2,433,000+	Mag. Phase V 233	Mag. Phase V 234	Mag. Phase V 235	Mag. Phase V 236	Mag. Phase V 237	Mag. Phase V 238	Mag. Phase V 241	Mag. Phase V 246	Mag. Phase V 247	Mag. Phase V 249	
479.93	21.58 .216	20.93 .314	21.30 .919	21.84 .700	21.55 .742	-	-	22.36 .828	21.39 .027	21.83 .500	22.30 .482
480.96	22.01 .429	.93 .417	21.77 .048	.84 .738	.63 .887	22.02 .554	22.32 .990	.63 .236	.86 .648	21.99 .599	
481.96	-	20.71 .518	22.01 .173	.80 .775	21.78 .029	21.99 .713	21.44 .148	21.96 .438	.83 .790	.84 .712	
482.92	22.26 .834	21.01 .615	22.16 .292	.73 .811	22.01 .164	21.99 .866	21.58 .301	22.02 .632	21.03 .927	.41 .821	
503.87	21.54 .165	.03 .724	21.30 .908	.28 .582	.05 .121	22.33 .201	22.26 .611	22.20 .867	20.60 .917	.50 .199	
504.95	22.04 .389	.35 .833	.58 .042	.39 .622	.39 .274	22.42 .373	.16 .781	21.41 .086	21.03 .070	21.93 .322	
505.90	.22 .585	.76 .928	21.95 .161	.90 .656	.33 .408	21.90 .524	.22 .931	.68 .278	.03 .207	22.28 .430	
506.87	.39 .785	.87 .026	22.01 .282	.59 .692	22.16 .545	21.71 .679	22.29 .084	21.96 .474	.46 .345	22.33 .540	
507.87	22.10 .990	21.66 .127	22.22 .407	.55 .730	21.76 .686	22.07 .838	21.26 .242	22.23 .676	.56 .488	21.81 .653	
508.88	21.67 .202	-	21.98 .533	.81 .767	.66 .825	.33 .998	21.61 .402	22.20 .880	.58 .632	.32 .768	
509.89	21.90 .408	20.91 .330	20.90 .659	.73 .804	.93 .971	.42 .159	22.01 .562	21.35 .984	21.86 .777	.39 .883	
510.89	22.22 .615	.66 .430	21.10 .784	.71 .841	21.91 .112	.36 .318	.32 .720	21.87 .287	20.75 .920	.39 .996	
511.85	22.56 .815	20.71 .527	.35 .904	.71 .877	22.20 .248	22.16 .471	.49 .892	-	20.72 .057	.50 .105	
512.87	21.75 .025	21.23 .630	21.48 .031	21.84 .915	22.33 .392	21.81 .633	22.25 .033	22.13 .687	21.24 .203	.52 .221	
513.81	.50 .220	.41 .724	22.07 .148	22.05 .948	-	21.78 .782	21.26 .181	22.13 .877	.44 .337	21.71 .328	
514.88	.92 .441	.32 .833	22.07 .283	21.93 .988	21.93 .675	22.13 .953	21.72 .351	21.35 .093	.75 .489	22.36 .449	
536.83	.61 .979	.61 .043	21.46 .023	.57 .799	.84 .773	22.42 .447	22.32 .819	22.20 .531	.92 .622	21.46 .941	
537.80	.46 .179	.48 .141	21.80 .144	21.76 .835	.81 .910	21.93 .608	22.32 .972	.20 .726	.52 .760	.50 .051	
538.80	21.95 .386	.01 .241	22.10 .269	22.02 .873	21.93 .052	22.02 .761	21.58 .130	22.20 .928	21.19 .903	.68 .165	
539.80	22.22 .593	21.06 .342	22.22 .394	22.05 .909	22.26 .193	.26 .920	.48 .287	-	20.92 .046	.73 .278	
540.86	22.13 .812	20.66 .448	21.67 .626	21.73 .947	22.42 .342	.26 .089	.98 .455	21.93 .345	21.32 .197	.99 .398	
541.81	21.65 .008	20.76 .544	.10 .645	-	-	-	-	22.07 .538	.44 .332	-	
544.80	22.21 .761	21.50 .858	.86 .515	21.81 .830	21.59 .721	.05 .899	.63 .238	21.55 .186	.80 .614	.63 .116	
565.75	21.80 .354	.63 .954	.24 .635	22.05 .865	21.71 .856	.35 .050	21.83 .389	21.99 .378	.72 .750	.88 .224	
566.74	.66 .162	.61 .034	.14 .759	21.87 .903	22.13 .995	-	22.01 .545	22.23 .578	21.14 .891	21.72 .336	
567.75	21.86 .372	21.68 .156	21.37 .585	21.96 .940	.10 .138	22.39 .368	.26 .705	22.49 .783	20.86 .036	22.05 .451	
569.74	22.29 .782	20.66 .356	22.07 .133	22.10 .014	.42 .419	21.99 .684	22.29 .020	21.57 .184	21.08 .320	21.90 .677	
570.85	21.95 .012	.66 .467	.07 .272	22.05 .055	22.23 .575	22.07 .861	21.39 .195	21.84 .409	21.54 .479	.39 .803	
571.83	.67 .214	20.81 .566	22.19 .394	21.81 .088	21.59 .714	.16 .018	.48 .350	22.30 .607	22.02 .619	.57 .914	
572.84	21.98 .423	21.32 .668	22.92 .520	22.05 .128	.55 .856	.39 .177	21.75 .509	22.23 .811	21.80 .762	.50 .029	
573.88	22.29 .638	21.30 .772	.19 .649	21.81 .164	21.95 .003	.30 .344	22.19 .673	21.76 .021	20.75 .910	.55 .147	
590.65	21.56 .105	20.76 .461	.19 .743	.76 .783	22.49 .430	.49 .014	21.77 .323	22.02 .412	21.46 .303	.66 .051	
591.70	21.86 .322	20.98 .567	.28 .874	.80 .822	22.05 .618	.36 .181	22.04 .489	.39 .624	.48 .453	.52 .170	
592.69	22.16 .527	21.35 .667	.46 .998	21.93 .857	21.81 .658	.49 .338	.22 .645	22.30 .824	.92 .595	.61 .282	
593.69	.32 .734	.41 .767	21.52 .123	22.02 .895	21.46 .799	22.07 .497	.22 .803	21.66 .026	.65 .737	21.87 .396	
594.76	22.10 .955	21.41 .874	22.22 .256	21.93 .935	22.02 .950	21.87 .668	22.36 .972	21.86 .243	21.17 .890	22.10 .517	
831.94	-	21.39 .751	-	-	-	-	-	21.57 .193	21.77 .743	21.93 .442	
832.95	21.58 .196	.41 .853	21.30 .994	21.96 .719	22.23 .571	21.87 .581	22.26 .606	.76 .397	.05 .887	.96 .556	
836.96	21.56 .025	.16 .257	22.29 .494	21.99 .867	22.26 .137	22.42 .219	21.65 .240	21.63 .208	.56 .459	.44 .012	
863.92	22.22 .598	.52 .971	21.30 .860	22.16 .861	21.76 .939	22.20 .511	22.13 .497	22.23 .657	.21 .407	.66 .072	
864.89	22.42 .799	.81 .068	-	21.90 .895	21.96 .079	21.76 .664	.16 .653	22.36 .855	.41 .441	.59 .182	
865.88	-	.39 .167	.95 .105	-	22.23 .219	-	-	.22 .809	21.41 .055	.67 .583	.81 .295
.97	21.50 .022	21.59 .176	21.63 .116	.71 .936	.20 .232	22.02 .837	.26 .823	.32 .071	.86 .595	.87 .305	
866.84	.50 .202	20.91 .264	22.19 .225	21.96 .966	.49 .354	.16 .975	22.39 .961	21.63 .249	.80 .720	21.93 .404	
867.91	21.92 .423	.83 .372	22.19 .358	22.16 .006	.33 .505	.26 .145	21.67 .130	22.16 .465	21.21 .873	22.20 .525	
868.91	22.36 .630	20.76 .472	21.83 .483	21.81 .044	22.02 .646	.42 .304	21.61 .288	.33 .667	20.63 .015	21.99 .639	
869.91	22.22 .836	21.03 .574	.03 .608	21.90 .081	21.66 .788	.26 .464	22.19 .446	.33 .870	21.03 .162	.73 .752	
894.84	21.98 .391	.61 .083	.06 .720	22.10 .002	22.23 .306	.20 .432	21.89 .385	.07 .910	.95 .720	21.96 .582	
.91	.67 .005	.73 .090	.14 .729	.30 .005	.33 .316	.32 .443	21.98 .396	22.13 .924	.58 .730	22.07 .500	
895.81	.44 .191	.32 .180	.39 .841	22.33 .034	.56 .443	22.05 .586	22.22 .538	21.30 .106	.35 .859	21.87 .692	
.99	21.58 .230	.26 .200	.52 .865	21.93 .045	.28 .470	21.94 .616	.18 .568	.42 .145	21.32 .866	.84 .714	
896.78	22.13 .391	21.06 .278	.44 .962	.87 .073	22.23 .580	21.90 .740	.10 .691	21.87 .302	20.60 .997	.66 .802	
897.81	.08 .604	20.96 .382	.95 .091	.68 .112	21.57 .726	22.26 .904	.52 .854	22.20 .510	20.92 .144	.61 .919	
898.90	22.49 .829	.76 .491	21.98 .227	.44 .151	.87 .880	.39 .078	22.22 .026	.36 .731	21.19 .300	.68 .043	
899.91	21.83 .038	20.98 .594	22.01 .354	21.28 .183	21.90 .022	.45 .239	21.67 .186	.13 .935	.61 .444	.55 .158	
923.80	.77 .977	21.87 .999	.10 .336	22.02 .070	22.45 .394	.16 .041	22.26 .960	22.33 .765	21.54 .854	.66 .870	
924.82	.73 .188	.46 .102	.22 .464	22.05 .106	.26 .538	22.49 .203	21.89 .121	21.71 .971	20.50 .000	.63 .986	
.94	21.76 .213	21.41 .112	22.13 .479	-	.05 .555	-	.83 .140	21.73 .996	20.53 .017	.59 .000	
927.90	22.42 .825	20.78 .412	21.28 .848	21.32 .217	-	21.99 .694	.92 .608	-	21.77 .439	.99 .335	
951.70	22.22 .745	21.57 .808	.39 .820	.84 .098	.33 .932	22.26 .482	.80 .369	22.13 .405	21.61 .836	.66 .037	
952.70	-	.39 .908	.95 .944	.81 .135	-	-	21.98 .527	.02 .607	20.75 .979	.66 .151	
953.70	21.58 .158	.90 .009	.89 .069	.37 .172	22.02 .615	.11 .800	22.32 .685	22.36 .809	21.12 .122	.81 .264	
954.77	22.10 .380	.41 .117	21.86 .203	.23 .211	21.81 .766	.23 .971	.29 .854	21.61 .026	.14 .274	.90 .385	
955.78	22.19 .588	21.39 .218	22.19 .329	.26 .249	21.93 .908	22.30 .131	22.22 .013	21.66 .230	.30 .418	.96 .500	
977.69	21.72 .118	20.71 .424	21.58 .064	.76 .057	22.10 .001	21.87 .619	21.92 .475	22.20 .660	.58 .545	.58 .997	
.75	.62 .130	.76 .430	.44 .072	.93 .060	21.93 .009	21.93 .628	21.95 .484	.14 .672	.67 .554	.59 .983	
978.69	21.67 .324	.76 .525	21.86 .189	.68 .094	22.16 .142	22.02 .778	22.19 .633	22.45 .862	.72 .688	.52 .101	
979.69	22.26 .531	20.88 .625	22.01 .314	.68 .131	.42 .283	.20 .937	.46 .791	21.46 .064	21.67 .831	21.81 .214	
980.64	22.26 .728	21.41 .721	21.16 .433	.48 .166	.52 .417	.55 .088	22.49 .941	.78 .256	20.50 .967	22.02 .322	
981.62	21.92 .930	.46 .820	21.75 .555	.23 .205	22.33 .656	.49 .244	21.95 .906	21.96 .454	21.08 .107	22.10 .434	
.75	22.16 .957	21.50 .833	21.70 .567	21.26 .209	21.96 .574	22.55 .265	21.77 .117	22.07 .480	20.97 .125	21.99 .448	
474.96	21.24 .218	21.73 .290	22.36 .062	22.16 .055	21.06 .554	21.26 .349	21.80 .782	20.35 .207	21.68 .871	21.99 .845	
475.96	.39 .339	21.67 .480	-	.22 .262	20.78 .665	.28 .527	.63 .870	20.79 .321	22.07 .976	.26 .921	
476.95	.58 .459	22.02 .668	22.10 .347	21.32 .428	.68 .774	.18 .724	.50 .958	21.03 .434	21.90 .080	.11 .995	
477.95	-	21.86 .858	21.24 .490	21.48 .615	20.86 .885	.61 .912	.44 .046	.21 .549	.23 .185	.16 .071	
479.93	.67 .817	.50 .235	.56 .774	22.16 .987	21.28 .194	.44 .284	.08 .220	.26 .774	21.03 .393	.44 .220	
480.96	.10 .941	.84 .430	21.80 .921	22.26 .180	.55 .218	.30 .478	.32 .310	.56 .920	20.86 .501	21.76 .298	
481.96	.30 .062	21.96 .620	-	21.46 .368	.59 .329	.41 .666	.35 .398	21.50 .006	21.18 .606	22.30 .373	
482.92	.14 .177	22.20 .803	22.49 .202	.50 .547	21.59 .435	.41 .847	.58 .482	20.43 .115	.26 .707	22.26 .446	
.98	.99 .701	22.30 .785	22.42 .204	.18 .475	20.73 .753	.55 .788	.26 .325	20.78 .506	21.90 .906	21.08 .027	
504.95	.44 .831	21.23 .991	21.65 .359	.50 .678	20.71 .874	.46 .991	.25 .422	21.48 .630	22.10 .020	.44 .108	
505.90	.12 .946	.30 .171	.39 .495	21.93 .856	21.28 .978	.41 .170	.54 .504	.63 .738	22.05 .120	.59 .180	
506.87	.19 .063	.68 .456	.50 .634	22.10 .038	.61 .085	.30 .352	.61 .590	.58 .849	21.26 .221	.57 .253	

VARIABLES IN THE ANDROMEDA GALAXY

Table B. (continued)

Table with 11 columns representing magnitude phases (V 250 to V 267) and multiple rows of magnitude and phase data for various objects in the Andromeda Galaxy.

Table B. (continued)

Table with 12 columns: J.D., Mag. Phase V 268, V 269, V 270, V 271, V 272, V 273, V 274, V 275, V 277, V 278. Rows contain numerical data for various magnitudes and phases.

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VARIABLES IN THE ANDROMEDA GALAXY

Table B. (continued)

Table with columns for J.D., Mag. Phase V 279 through V 296, and various variable IDs. The table contains numerous rows of data for each phase, with some rows including additional phases like V 297, V 298\*, V 302, V 305, V 307, V 309, V 310, V 311, V 313, and V 315.

Table B. (continued)

J.D.	Mag. Phase V 297	Mag. Phase V 298*	Mag. Phase V 302	Mag. Phase V 305	Mag. Phase V 307	Mag. Phase V 309	Mag. Phase V 310	Mag. Phase V 311	Mag. Phase V 313	Mag. Phase V 315
980.64	21.48 .318	21.52 .444	21.93 .973	22.10 .466	21.48 .439	21.41 .905	22.86 .442	21.41 .011	21.28 .739	21.17 .863
981.62	22.23 .413	21.35 .516	.93 .022	.17 .641	.35 .549	.08 .033	-	.59 .131	.44 .830	.03 .978
.75	21.99 .426	-	21.71 .028	22.26 .664	21.41 .564	21.08 .050	(22.9 .577	21.46 .146	21.44 .842	21.00 .994
	V 316	V 317	V 318	V 320	V 326	V 328	V 329	V 330	V 331	V 332
474.96	21.24 .121	22.36 .234	21.32 .876	22.26 .714	22.42 .853	22.36 .310	20.97 .576	22.02 .795	21.70 .451	21.35 .692
475.96	21.12 .216	22.16 .392	.46 .977	-	21.21 .996	22.07 .461	20.80 .657	21.93 .944	21.56 .618	.18 .826
476.95	20.63 .310	21.89 .549	.81 .076	22.62 .969	20.80 .137	21.68 .609	21.10 .738	.13 .092	22.13 .784	.48 .959
477.95	21.00 .405	21.86 .707	21.93 .177	21.86 .097	21.36 .280	.50 .759	21.46 .819	.11 .241	.30 .951	21.84 .099
479.93	.37 .593	22.46 .021	22.59 .376	.37 .350	.62 .563	21.84 .057	22.01 .980	21.78 .536	22.36 .282	22.20 .353
480.96	.70 .690	.42 .184	.56 .481	21.63 .482	21.98 .710	22.10 .211	21.86 .064	22.05 .690	21.83 .455	.16 .497
481.96	.74 .785	22.10 .342	22.62 .580	22.04 .610	22.29 .853	-	.92 .145	-	21.48 .622	22.05 .631
482.92	21.86 .877	21.95 .495	21.76 .678	22.39 .732	21.35 .990	22.35 .506	.70 .223	22.07 .982	22.10 .783	20.96 .760
503.87	22.07 .868	.86 .813	.55 .799	21.50 .410	21.37 .983	21.78 .651	.72 .924	21.06 .104	22.36 .287	22.05 .569
504.95	21.58 .970	21.95 .985	.37 .899	21.63 .549	20.86 .137	.57 .813	.85 .012	.23 .265	21.77 .467	21.11 .713
505.90	.46 .061	22.21 .136	.73 .994	22.36 .670	21.21 .273	21.87 .954	21.86 .089	.83 .407	.55 .927	.18 .841
506.87	.28 .153	.39 .289	21.66 .092	.52 .794	.95 .411	22.10 .101	22.16 .168	21.87 .551	21.80 .789	.61 .971
507.87	.05 .248	22.22 .448	22.13 .193	.66 .322	21.89 .554	.16 .251	21.83 .249	22.20 .700	22.13 .956	56 .105
508.88	.11 .343	21.52 .608	.20 .294	22.26 .052	22.10 .698	.10 .403	.65 .331	22.16 .851	.16 .125	21.73 .240
509.89	.24 .439	21.75 .767	.26 .397	21.58 .181	22.22 .843	22.05 .554	21.48 .413	21.50 .002	.19 .294	22.23 .375
510.89	.61 .534	22.22 .926	.49 .497	-	21.41 .986	21.48 .704	20.72 .494	13 .151	22.07 .461	22.29 .509
511.85	.58 .625	.19 .079	22.05 .594	.52 .431	.20 .123	.29 .849	.92 .573	.16 .294	21.37 .622	21.81 .638
512.87	.63 .723	.30 .240	21.63 .697	21.65 .561	.28 .269	21.96 .002	20.89 .656	21.63 .446	21.95 .792	21.13 .775
513.81	.68 .812	.56 .390	.81 .791	22.56 .682	.30 .403	22.23 .143	21.03 .734	22.02 .586	22.13 .950	20.98 .902
514.88	.54 .914	.10 .559	.48 .900	.66 .817	21.98 .556	22.02 .304	21.44 .819	21.98 .746	22.26 .129	21.48 .045
536.83	.39 .999	.04 .034	.81 .112	13 .623	22.26 .691	21.84 .600	20.92 .601	21.66 .017	21.95 .800	.28 .999
537.80	.14 .091	.29 .188	21.90 .209	.59 .746	22.16 .830	.59 .746	21.39 .680	20.96 .161	21.98 .963	.40 .119
538.80	21.14 .186	22.46 .346	22.33 .310	.62 .874	21.24 .973	21.71 .896	.52 .761	21.47 .310	22.36 .130	21.84 .253
539.80	20.94 .281	21.92 .504	.49 .400	22.59 .002	20.86 .116	22.02 .046	.56 .843	21.71 .460	22.07 .293	22.16 .387
540.86	21.10 .382	21.83 .672	22.33 .517	21.70 .138	21.93 .205	.21 .933	.65 .929	22.10 .114	21.46 .475	22.30 .529
541.81	.12 .472	-	.39 .239	.26 .403	-	-	-	-	.52 .634	-
564.80	21.87 .656	22.19 .464	21.28 .932	.32 .198	21.77 .687	.44 .799	.83 .873	20.91 .186	.28 .480	21.11 .740
565.75	22.10 .746	21.61 .614	.44 .028	.26 .320	22.16 .823	.73 .941	.92 .951	21.23 .327	.63 .639	.06 .868
566.74	22.16 .840	.80 .771	21.68 .127	.41 .446	21.56 .964	.84 .090	.86 .031	21.68 .476	21.95 .804	.61 .000
567.75	21.63 .936	21.93 .931	22.26 .239	21.72 .575	20.80 .109	21.93 .241	.92 .113	22.13 .626	22.04 .973	21.96 .136
569.74	21.00 .125	-	.30 .430	22.42 .830	21.39 .393	22.27 .540	.46 .274	22.02 .923	22.49 .306	22.49 .402
570.85	20.86 .230	22.12 .421	.33 .542	.59 .972	21.89 .552	21.59 .707	.30 .365	21.23 .088	21.83 .491	22.05 .551
571.83	20.83 .323	21.89 .577	22.07 .640	22.04 .097	22.29 .692	.50 .853	21.00 .445	20.91 .235	.37 .655	21.37 .683
572.84	21.35 .420	21.98 .736	21.52 .742	21.44 .226	22.29 .836	.78 .006	20.72 .526	21.73 .385	21.95 .824	.06 .818
573.88	.50 .519	22.39 .902	21.73 .847	.48 .359	21.39 .984	.76 .162	20.78 .611	.76 .540	22.32 .999	.55 .957
590.65	.12 .112	21.86 .559	22.07 .537	21.90 .503	21.65 .380	.32 .680	22.13 .973	.55 .040	.06 .804	21.81 .206
591.70	.14 .211	22.00 .726	21.73 .643	22.49 .638	22.07 .530	.63 .837	.07 .058	.08 .195	.22 .979	22.13 .347
592.69	.03 .305	.13 .853	.59 .743	.39 .764	.16 .672	.76 .986	22.07 .138	.54 .343	.29 .145	22.30 .479
593.69	.32 .400	.36 .041	.57 .844	.52 .832	22.22 .814	.78 .136	21.89 .220	.66 .492	22.29 .312	21.90 .613
594.76	21.37 .502	22.32 .210	21.39 .952	22.52 .028	21.61 .967	21.99 .296	21.58 .306	21.96 .652	21.46 .491	21.08 .757
831.94	21.19 .034	-	21.44 .859	21.41 .347	21.80 .851	21.61 .907	20.83 .570	-	22.22 .167	22.23 .563
832.95	.17 .130	21.92 .939	21.32 .961	21.58 .476	.26 .995	.71 .058	20.83 .652	21.06 .155	22.16 .336	21.26 .696
836.96	.46 .511	.72 .574	22.45 .365	22.52 .988	.92 .568	.48 .660	21.98 .978	22.10 .753	21.92 .006	22.10 .238
863.92	.24 .072	21.89 .844	21.96 .083	21.65 .435	.50 .420	.57 .709	21.95 .167	.13 .771	.28 .517	21.18 .853
864.89	21.26 .164	22.10 .998	22.09 .181	21.75 .559	.77 .558	.66 .854	22.01 .246	22.07 .916	.50 .679	.28 .982
865.88	20.60 .258	.29 .155	.56 .281	-	21.86 .699	.87 .003	21.37 .326	21.44 .063	21.95 .854	.66 .114
.97	.52 .266	.26 .169	.39 .290	22.39 .697	22.07 .712	.81 .017	.48 .334	13 .077	22.01 .859	.52 .126
866.84	20.92 .349	.42 .307	.36 .377	.56 .808	21.83 .836	21.99 .147	21.35 .404	.16 .206	.26 .005	21.96 .243
867.91	21.26 .450	22.07 .476	22.16 .485	.56 .945	.14 .990	22.30 .307	20.69 .492	13 .356	.36 .184	22.07 .387
868.91	.63 .545	21.58 .635	21.87 .586	22.26 .073	.14 .132	22.23 .459	20.86 .573	21.66 .515	22.29 .351	22.30 .521
869.91	.83 .641	.75 .794	21.84 .687	21.32 .200	.21 .275	21.81 .608	21.05 .654	22.07 .684	21.41 .518	21.81 .655
894.84	.26 .004	.80 .743	22.05 .200	.56 .387	.77 .837	22.23 .751	20.83 .679	21.57 .380	22 .769	.44 .997
.91	.41 .016	21.98 .754	21.96 .207	.65 .396	.95 .847	.26 .362	21.19 .685	.84 .391	.52 .701	.57 .007
895.81	.41 .101	22.04 .897	21.81 .298	.50 .511	.50 .975	.16 .496	.48 .758	.78 .525	21.72 .851	.44 .128
.99	.18 .119	.13 .927	22.05 .318	.57 .533	.35 .002	22.18 .525	.41 .774	21.78 .553	22.04 .883	.52 .153
896.78	21.21 .193	.32 .050	.16 .395	21.98 .635	.00 .114	21.68 .642	21.70 .836	22.05 .669	.07 .014	21.84 .258
897.81	20.86 .291	.35 .213	.56 .499	22.39 .767	.00 .261	.39 .796	22.04 .920	22.33 .822	.32 .186	22.10 .396
898.90	21.24 .395	22.49 .386	22.20 .609	.52 .966	.41 .417	.81 .960	.04 .009	21.73 .985	22.13 .368	22.26 .542
899.91	21.41 .491	21.89 .546	21.93 .711	22.46 .035	.67 .561	.87 .112	22.10 .091	20.96 .136	21.48 .537	21.50 .678
923.80	22.10 .761	22.39 .330	21.66 .119	21.86 .089	21.48 .974	.61 .700	21.92 .031	22.13 .697	.14 .533	.32 .881
924.82	21.75 .858	22.01 .491	22.07 .222	.61 .220	20.97 .120	.73 .853	.92 .114	.36 .849	.76 .704	.81 .018
.94	.63 .869	21.92 .510	21.81 .234	21.39 .235	21.08 .137	.76 .871	.92 .124	22.40 .867	21.76 .727	21.44 .034
927.90	.12 .150	22.16 .979	-	22.36 .613	.92 .560	-	.39 .364	21.44 .308	22.10 .219	22.36 .431
951.70	.28 .411	21.80 .749	.46 .931	.39 .656	.61 .960	.63 .888	.65 .297	22.13 .856	21.98 .200	21.81 .623
952.70	.30 .506	-	.57 .032	-	.03 .103	21.81 .038	.44 .378	21.84 .005	-	.23 .757
953.70	.75 .601	22.16 .066	21.66 .133	.46 .911	.21 .246	22.10 .188	21.05 .459	20.96 .154	.35 .534	.28 .891
954.77	21.92 .703	.19 .236	22.13 .241	22.52 .048	.44 .398	.13 .350	20.78 .546	21.52 .314	21.56 .715	.44 .035
955.78	22.04 .799	.32 .396	.26 .343	21.56 .177	21.92 .543	22.23 .501	21.10 .628	.78 .464	22.04 .882	.71 .170
977.69	21.61 .880	.06 .866	.30 .551	22.52 .978	22.01 .673	21.52 .790	-	21.96 .730	21.46 .548	.55 .108
.75	.60 .886	.09 .876	22.30 .557	22.52 .986	22.01 .681	.64 .799	21.50 .413	22.08 .739	.26 .558	.55 .116
978.69	.52 .975	.36 .024	21.73 .652	21.80 .106	21.98 .815	.83 .941	20.83 .489	21.10 .879	.44 .716	21.84 .242
979.69	.26 .070	.46 .183	.61 .753	.44 .234	21.80 .958	21.90 .090	20.97 .570	21.55 .028	21.98 .882	22.20 .376
980.64	21.19 .161	.26 .333	.48 .848	.50 .355	20.97 .094	22.13 .233	21.08 .647	.01 .169	22.19 .042	22.42 .504
981.62	20.83 .254	.10 .489	.44 .947	.80 .480	21.10 .234	.10 .380	.30 .727	.23 .315	.22 .205	

VARIABLES IN THE ANDROMEDA GALAXY

Table B. (continued)

J. D. 2,433,000+	Mag. Phase V 333	Mag. Phase V 334	Mag. Phase V 335	Mag. Phase V 336	Mag. Phase V 338	Mag. Phase V 339	Mag. Phase V 340	Mag. Phase V 343	Mag. Phase V 348	Mag. Phase V 350	
505.90	22.26 .215	21.48 .150	21.35 .976	22.53 .739	22.73 .579	21.80 .212	22.00 .138	21.80 .195	21.99 .361	21.87 .542	
506.87	21.99 .392	21.24 .229	21.71 .145	21.84 .949	22.69 .752	21.98 .276	22.16 .284	.90 .296	.59 .461	.40 .724	
507.87	22.16 .574	21.12 .310	21.81 .318	22.02 .166	22.79 .930	22.07 .342	21.87 .434	.60 .397	.52 .564	21.73 .911	
508.88	.39 .759	20.86 .392	22.16 .494	.26 .385	21.90 .108	.16 .408	.13 .586	21.45 .500	.23 .669	22.00 .099	
509.89	.49 .943	.89 .474	22.33 .670	.62 .605	22.25 .286	.46 .474	.40 .741	20.85 .600	.21 .774	.12 .288	
510.89	.52 .125	.86 .556	21.32 .844	22.62 .822	.56 .463	.52 .540	.78 .892	.65 .701	.13 .877	22.22 .475	
511.85	22.13 .300	.89 .634	21.37 .011	21.66 .030	22.56 .633	.30 .603	21.84 .033	.50 .800	.41 .976	21.75 .654	
512.87	21.93 .486	20.83 .717	22.13 .188	21.93 .250	-	.46 .670	22.08 .188	20.95 .901	.55 .082	.48 .843	
513.81	22.05 .657	21.08 .793	.30 .352	-	-	22.46 .732	22.23 .328	-	-	21.72 .021	
514.88	.42 .852	.35 .880	.52 .538	22.56 .688	21.99 .170	21.98 .802	21.65 .490	21.40 .105	.99 .290	22.10 .321	
536.83	.23 .853	.00 .666	.36 .355	.23 .449	22.36 .056	.83 .243	.66 .793	22.10 .328	.37 .562	22.13 .324	
537.80	22.39 .030	.12 .745	22.30 .524	.62 .659	21.99 .223	21.95 .306	22.68 .940	21.70 .424	.13 .662	21.98 .504	
538.80	21.99 .212	.28 .826	21.87 .697	22.72 .876	22.26 .405	22.13 .372	22.07 .091	.45 .525	.35 .765	.70 .690	
539.80	21.93 .395	.62 .907	.39 .871	21.71 .093	.72 .582	.19 .438	22.07 .241	21.15 .627	.48 .869	.75 .877	
540.86	22.20 .588	.61 .993	.52 .055	22.07 .323	(22.8 .770)	.39 .507	21.90 .401	20.75 .734	.93 .979	21.98 .075	
541.81	.16 .761	.39 .071	21.93 .221	-	-	22.29 .570	21.39 .542	20.80 .831	.81 .077	-	
564.80	.59 .952	.35 .941	22.16 .219	.42 .516	22.45 .009	21.32 .079	22.07 .003	21.70 .157	.78 .457	22.29 .550	
565.75	.62 .125	.39 .018	22.10 .385	.62 .722	21.87 .176	.37 .141	.15 .147	21.90 .253	.50 .555	21.44 .727	
566.74	.02 .305	.46 .099	22.33 .557	22.49 .937	22.30 .352	.67 .206	22.2 .295	22.05 .353	.21 .658	21.62 .912	
567.75	-	21.56 .181	21.55 .733	21.81 .156	.56 .531	.77 .273	22.02 .448	21.50 .455	.23 .762	22.00 .100	
569.74	.36 .852	20.86 .343	.81 .079	22.56 .587	-	21.92 .403	21.44 .746	21.00 .658	.55 .968	22.22 .473	
570.85	.49 .055	21.08 .433	21.81 .272	22.45 .828	.23 .079	22.22 .476	.73 .913	20.45 .770	21.87 .083	22.52 .680	
571.83	22.16 .233	20.86 .512	22.05 .442	21.63 .040	.26 .253	.42 .540	21.79 .061	.90 .867	22.05 .184	.56 .863	
572.84	21.76 .417	.69 .595	22.33 .618	22.16 .260	.42 .431	.42 .607	22.17 .212	20.90 .972	22.30 .288	.98 .052	
573.88	22.32 .607	20.94 .879	21.39 .524	.62 .659	.55 .617	.22 .39	22.33 .369	21.25 .977	21.87 .397	21.98 .247	
590.654	21.93 .474	21.52 .043	22.10 .714	.66 .196	.65 .866	21.98 .776	21.81 .893	20.45 .775	22.33 .132	.36 .381	
591.70	.52 .855	.54 .129	21.87 .897	22.09 .351	.69 .572	.61 .845	22.06 .052	21.00 .879	21.93 .241	21.86 .576	
592.69	.42 .035	.50 .209	.55 .069	.52 .566	.62 .947	21.39 .910	.07 .201	21.10 .979	22.10 .343	.58 .762	
593.69	22.52 .218	.30 .291	21.76 .243	22.56 .783	.20 .124	20.94 .976	22.08 .352	.60 .080	21.59 .447	21.85 .948	
594.76	21.76 .413	21.19 .378	22.23 .429	21.78 .015	22.09 .314	21.12 .046	21.50 .511	21.60 .191	21.23 .558	22.07 .149	
831.94	-	20.92 .670	-	-	-	-	22.05 .207	-	-	-	
832.95	22.16 .830	21.08 .752	21.30 .850	22.56 .683	22.49 .490	22.10 .683	22.13 .360	21.80 .293	21.93 .210	21.52 .662	
836.96	22.35 .561	.48 .078	22.49 .547	.56 .553	.10 .200	21.03 .944	21.81 .964	20.90 .699	.23 .625	22.20 .410	
863.92	21.93 .475	.28 .272	.26 .236	.42 .402	22.45 .974	22.32 .717	21.78 .021	21.70 .425	.78 .416	22.00 .449	
864.89	22.10 .652	10 .350	.49 .404	.52 .612	21.81 .147	21.80 .780	22.10 .167	21.45 .526	21.73 .516	21.87 .630	
865.88	.16 .833	.00 .431	-	.36 .826	22.20 .322	.70 .845	.22 .315	20.80 .627	20.98 .619	.48 .816	
.97	.26 .851	21.03 .439	22.30 .592	22.56 .846	.30 .337	.58 .851	22.39 .328	.60 .636	21.06 .628	.48 .822	
866.84	.56 .007	20.97 .509	21.48 .930	22.05 .266	.65 .681	21.17 .978	.28 .620	.70 .831	.13 .829	22.22 .194	
867.91	22.36 .202	.80 .596	-	.65 .681	21.17 .978	.28 .620	.70 .831	.13 .829	22.22 .194	.13 .829	
868.91	21.96 .385	20.78 .677	21.87 .103	.49 .484	.86 .858	20.82 .044	.60 .771	20.95 .933	.28 .932	.26 .382	
869.91	22.26 .567	21.03 .758	22.20 .277	22.49 .701	.36 .035	20.93 .110	.66 .921	21.25 .034	.87 .036	.00 .568	
894.84	.56 .111	.17 .786	.33 .613	21.87 .109	.69 .449	21.92 .746	.28 .673	20.90 .557	.39 .616	.05 .224	
.91	.56 .124	.10 .792	22.23 .625	22.07 .124	.42 .462	22.16 .751	.23 .684	20.70 .568	.23 .623	.08 .250	
895.81	.05 .288	.17 .865	21.28 .781	.23 .319	.66 .620	22.13 .810	.55 .819	21.05 .657	.30 .716	.16 .409	
.99	22.05 .323	.19 .881	.32 .814	.34 .361	.65 .654	21.92 .823	.68 .848	20.90 .673	.50 .736	.42 .444	
896.78	21.99 .465	.30 .944	.41 .950	.49 .530	.59 .793	21.75 .874	21.72 .965	.55 .755	.37 .817	22.00 .590	
897.81	22.07 .653	.61 .028	.81 .129	22.56 .753	.42 .975	20.97 .941	22.05 .120	20.85 .857	.46 .923	21.41 .782	
898.90	.27 .851	.61 .116	21.96 .319	21.87 .989	.07 .168	21.12 .013	22.26 .284	21.10 .970	21.68 .036	21.85 .986	
899.91	.56 .035	.63 .199	22.56 .494	22.16 .208	.23 .347	21.10 .079	21.90 .436	.30 .072	22.30 .141	22.04 .175	
923.80	.02 .390	.63 .142	22.16 .649	.42 .391	.59 .577	22.29 .647	21.97 .033	.30 .488	21.23 .613	21.86 .639	
924.82	.32 .576	.44 .225	21.32 .826	.59 .612	-	22.19 .714	22.16 .187	.00 .590	.13 .719	.56 .830	
.94	.35 .599	.37 .235	21.35 .846	.56 .638	-	21.92 .627	22.32 .204	21.10 .604	.18 .732	.61 .853	
927.90	.23 .137	.10 .475	22.33 .362	.23 .280	-	21.37 .917	21.22 .650	20.75 .902	.81 .037	-	
951.70	.07 .476	.19 .411	.39 .500	.45 .443	.49 .518	22.42 .479	22.30 .232	22.10 .311	.21 .501	21.65 .854	
952.70	.07 .658	21.03 .493	22.23 .674	.56 .600	-	.16 .545	-	21.60 .413	.35 .604	-	
953.70	.49 .840	20.83 .574	21.13 .848	.56 .877	.65 .872	.32 .610	21.48 .532	.35 .511	.30 .708	22.10 .227	
954.77	.52 .035	.72 .661	21.68 .034	.10 .108	.26 .062	22.04 .681	.50 .694	21.00 .622	.21 .819	22.18 .427	
955.78	.42 .220	20.92 .743	22.26 .210	22.46 .328	22.20 .241	21.86 .747	21.63 .845	20.50 .726	21.35 .923	21.71 .616	
977.69	.10 .213	21.03 .525	21.61 .020	21.73 .080	21.81 .120	.72 .185	22.07 .142	21.15 .940	22.05 .191	.55 .705	
.75	22.46 .224	21.00 .530	21.63 .031	21.96 .093	21.84 .130	.65 .189	20.85 .946	.20 .197	.56 .722	.53 .702	
978.69	21.93 .396	20.58 .607	22.13 .194	22.10 .297	22.13 .297	.65 .251	22.02 .294	21.10 .041	22.16 .294	21.76 .897	
979.69	22.42 .578	20.83 .688	.10 .368	.42 .513	.26 .474	21.72 .317	21.90 .444	.45 .143	21.96 .399	22.16 .084	
980.64	.26 .751	21.03 .765	22.10 .533	.69 .720	.56 .672	22.07 .379	.20 .586	.65 .244	.73 .496	.39 .262	
981.62	.56 .930	.19 .845	21.93 .704	22.07 .933	-	.13 .443	.55 .734	.90 .341	.48 .598	.22 .445	
.75	22.52 .953	21.08 .858	21.71 .726	21.99 .961	(22.8 .838)	22.10 .452	21.45 .753	21.90 .351	21.30 .611	22.36 .469	
		V 351	V 352	V 354	V 355	V 357	V 361	V 362	V 364	V 365	V 366
474.96	22.00 .057	21.86 .240	21.87 .466	21.10 .255	21.08 .731	22.69 .653	21.87 .889	20.86 .708	22.04 .092	21.65 .967	
475.96	-	-	22.22 .602	20.63 .319	-	-	.23 .979	20.78 .849	-	20.75 .037	
476.95	.36 .404	.26 .568	.55 .736	.63 .382	21.66 .881	21.93 .983	.59 .068	21.08 .988	.10 .189	20.86 .105	
477.95	22.69 .580	.08 .733	22.56 .872	20.83 .446	22.10 .956	21.93 .148	21.78 .158	.03 .128	.49 .338	21.30 .174	
479.93	21.45 .925	.55 .059	21.68 .141	21.30 .572	.49 .105	22.13 .476	22.23 .338	.50 .406	.49 .334	21.54 .312	
480.96	21.80 .106	.75 .228	.61 .281	.12 .635	.45 .185	.36 .647	.45 .431	21.22 .550	.49 .384	22.07 .384	
481.96	22.26 .281	.92 .393	.86 .416	.14 .701	-	.56 .812	.49 .521	20.94 .691	.56 .433	.39 .453	
482.92	22.50 .448	.48 .551	.99 .547	-	22.62 .330	.49 .971	.26 .608	.86 .826	.22 .480	22.26 .519	
503.87	21.78 .112	.48 .002	21.81 .390	.58 .086	21.93 .906	.26 .441	.49 .439	.69 .769	.04 .438	21.48 .974	
504.95	22.33 .300	.52 .180	22.16 .537	.19 .165	22.05 .987	.49 .620	21.23 .597	.80 .921	.04 .551	20.75 .048	
505.90	.45 .467	.61 .337	.42 .866	21.17 .226	.36 .059	.49 .777	.13 .883	20.94 .054	22.04 .897	21.08 .115	
506.87	22.42 .636	21.70 .496	.60 .797	20.66 .288	.56 .132	22.56 .937	22.05 .770	21.32 .190	21.58 .644	.19 .182	
507.87	21.95 .811	20.79 .660	22.40 .933	.52 .352	.49 .207	21.50 .103	21.63 .861	.19 .330	.03 .693	.58 .251	
508.88	.50 .988	21.20 .827	21.75 .070	.86 .416	.36 .283	21.90 .270	.52 .952	.30 .472	.14 .742	.46 .322	
509.89	21.80 .163	.40 .994	.55 .207	20.92 .481	.36 .359	22.07 .438	.61 .043	21.32 .614	.26 .731	21.77 .392	
510.89	22.40 .940	.56 .158	21.75 .343	21.19 .544	.16 .435	.59 .603	21.63 .133	20.75 .755	.26 .839	22.13 .461	
511.85	.37 .507	.75 .317	22.07 .473	.41 .606	22.36 .507	.62 .762	22.07 .220	20.86 .890	.19 .886	21.92 .528	
512.87	22.56 .686	21.80 .485	.32 .612	.37 .670	21.50 .584	22.36 .931	.30 .312	21.12 .033	.39 .366	.98 .599	
513.81	21.48 .850	20.78 .640	-	.32 .730	.13 .654	21.66 .087	.36 .397	.17 .165	.56 .981	-	
514.88	.66 .038	21.17 .816	.30 .885	.75 .798	21.35 .734	21.68 .284	.30 .494	.28 .315	21.67 .033	.98 .738	
536.83	.55 .875	.75 .									



Table B. (continued)

J. D.	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase	Mag.	Phase											
2,433,000+	V 351	V 352	V 354	V 355	V 357	V 361	V 362	V 364	V 365	V 366																			
567.75	22.30	.283	21.65	.525	22.05	.061	21.10	.165	21.03	.712	21.99	.019	22.32	.268	20.69	.740	21.86	.604	22.07	.408									
569.74	-	-	.26	.853	-	-	20.78	.292	-.96	.862	-	-	.39	.447	21.20	.019	.28	.700	.16	.546									
570.85	21.70	.820	.37	.036	21.89	.481	.58	.363	21.99	.946	22.23	.533	.16	.548	.30	.175	.14	.755	.56	.623									
571.83	21.65	.996	.66	.198	22.18	.614	20.60	.426	22.39	.020	.56	.695	.49	.636	.60	.312	.03	.802	.29	.691									
572.84	22.30	.172	.70	.364	.49	.752	21.00	.490	.26	.095	.62	.862	22.16	.727	.19	.454	.26	.851	.19	.761									
573.88	.35	.354	.60	.535	22.20	.893	.21	.556	.49	.173	.23	.034	21.61	.821	21.19	.601	21.39	.890	22.13	.833									
590.65	.47	.287	.83	.298	21.63	.169	.32	.624	.23	.434	.69	.811	22.13	.336	20.80	.957	20.97	.717	21.37	.397									
591.70	.50	.471	.77	.471	.82	.311	.46	.691	22.20	.513	22.07	.985	-	-	21.05	.104	20.89	.768	.19	.070									
592.69	22.60	.644	.00	.635	21.90	.446	.70	.754	21.23	.588	21.84	.149	.16	.520	.30	.243	21.30	.816	.30	.138									
593.69	21.99	.819	.08	.799	22.15	.582	.92	.818	.16	.663	22.10	.315	.23	.610	.39	.384	.39	.865	.35	.208									
594.76	21.75	.006	21.32	.975	22.30	.727	21.86	.886	21.28	.744	22.20	.492	22.26	.707	21.08	.534	21.37	.917	21.52	.282									
831.94	-	-	-	-	-	-	-	-	21.21	.587	-	-	-	-	20.86	.846	-	-	-	-									
832.95	22.37	.658	21.65	.212	22.10	.056	-	-	20.88	.663	22.45	.936	22.30	.215	20.92	.988	21.98	.498	-	-									
836.96	22.32	.360	.21	.872	22.32	.601	20.63	.314	22.10	.964	22.42	.600	22.30	.577	21.14	.551	.17	.693	20.92	.093									
863.92	21.90	.074	.70	.310	21.57	.260	21.48	.031	.13	.997	21.68	.065	21.66	.012	.39	.338	.80	.004	21.65	.965									
864.89	22.23	.244	21.72	.473	21.85	.392	.32	.093	.36	.066	21.81	.226	.73	.099	.17	.473	21.89	.051	21.00	.032									
865.88	.49	.416	20.86	.636	22.16	.526	.17	.156	.42	1.140	22.00	.390	.71	.189	.24	.612	-	-	20.75	.101									
.97	.52	.432	20.72	.651	.16	.538	.26	.162	-	-	.26	.404	21.81	.197	21.24	.624	22.19	.103	20.80	.107									
866.84	.56	.584	21.10	.794	.39	.656	21.17	.218	.62	.212	.42	.549	22.20	.276	20.72	.748	.13	.146	21.26	.167									
867.91	22.10	.772	.39	.960	.37	.801	20.69	.286	.42	.292	.23	.372	.23	.372	.94	.898	.13	.198	21.44	.242									
868.91	21.57	.949	.50	.136	.42	.937	.66	.350	22.36	.368	22.36	.891	.65	.462	20.83	.038	.80	.031	21.30	.311									
869.91	22.13	.122	.67	.300	22.13	.073	20.75	.413	21.99	.443	21.68	.057	22.49	.553	21.41	.179	.49	.295	22.07	.390									
894.84	.43	.477	.75	.407	21.80	.457	21.52	.001	-.59	.185	21.87	.803	20.86	.680	.10	.507	20.94	.110	20.94	.110									
.91	.50	.501	.65	.419	-	-	.56	.006	22.23	.324	21.93	.197	.99	.810	.78	.690	22.10	.510	21.03	.116									
895.81	-	-	.26	.567	22.23	.588	.39	.063	.26	.392	22.07	.346	.78	.892	.86	.816	21.98	.554	.24	.178									
.99	22.62	.683	.26	.598	20.61	.614	.30	.075	.20	.406	.23	.378	.87	.910	.92	.843	21.98	.564	.37	.191									
896.78	21.71	.820	.05	.727	.28	.720	.37	.125	22.16	.465	.30	.507	.39	.979	20.97	.952	22.07	.601	.32	.245									
897.81	21.53	.001	.31	.896	.45	.860	.46	.190	21.78	.542	.45	.677	.59	.072	21.03	.098	21.48	.651	21.58	.317									
898.90	22.05	.191	.46	.076	22.26	.008	21.10	.260	.18	.624	.30	.858	21.73	.171	.26	.251	.08	.705	22.16	.393									
899.91	.52	.367	.83	.242	21.72	.145	20.83	.324	21.15	.700	.07	.025	22.07	.262	21.17	.392	.10	.754	22.26	.463									
923.80	.60	.546	.62	.178	21.85	.387	21.52	.846	22.07	.497	22.20	.981	.39	.419	20.80	.748	.48	.915	21.30	.121									
924.82	.29	.720	.75	.346	22.00	.526	.58	.911	22.02	.574	21.63	.150	.13	.511	21.02	.891	.49	.965	.30	.192									
.94	.22	.744	.65	.366	.30	.542	.65	.919	21.32	.583	21.73	.170	22.42	.522	.04	.907	.61	.970	.37	.200									
927.90	.46	.267	.10	.853	22.42	.944	.39	.107	.18	.806	22.42	.660	22.49	.553	21.08	.666	22.26	.272	21.98	.114									
951.70	.56	.424	.10	.774	21.55	.174	.52	.623	21.44	.596	.42	.601	.59	.029	20.72	.807	-	-	.12	.057									
952.70	.49	.599	.28	.938	.76	.310	-	-	20.83	.672	-	-	.59	.029	20.72	.807	-	-	.05	.196									
953.70	22.04	.773	.55	.103	21.75	.446	.37	.751	20.88	.747	22.39	.933	21.96	.119	20.92	.947	-	-	.37	.196									
954.77	21.67	.961	.77	.279	22.39	.591	.61	.819	21.35	.827	21.66	.110	22.13	.216	21.24	.097	.39	.421	.61	.270									
955.78	22.07	.137	.89	.446	.33	.728	21.75	.883	.57	.903	21.68	.277	.05	.307	.35	.239	.39	.470	21.61	.341									
977.69	21.55	.964	.52	.055	.28	.702	20.75	.279	21.96	.551	22.49	.905	.07	.285	.19	.317	.01	.535	22.01	.861									
.75	.59	.979	.50	.065	.36	.710	.66	.283	22.06	.555	22.45	.915	.04	.290	.26	.326	.05	.328	.14	.865									
978.69	21.90	.143	.80	.220	.47	.838	.66	.342	20.93	.626	21.59	.071	.07	.376	.58	.458	.01	.584	22.10	.930									
979.69	22.45	.318	.98	.386	22.45	.973	.80	.406	20.96	.701	21.96	.237	.13	.462	21.12	.598	22.01	.632	21.70	.000									
980.64	.48	.484	21.63	.540	21.85	.102	.83	.467	21.26	.773	22.20	.394	.39	.552	20.78	.731	21.26	.679	20.97	.066									
981.62	.56	.656	20.97	.703	.70	.235	20.97	.529	.66	.846	.52	.556	.39	.640	21.00	.869	.14	.726	21.00	.134									
.75	22.63	.679	20.92	.724	21.59	.253	21.15	.537	21.90	.857	22.49	.578	22.33	.651	21.02	.887	21.24	.733	21.32	.143									
V 377			V 378			V 379			V 380			V 382			V 383			V 384			V 385			V 387			V 391		
474.96	22.10	.767	22.23	.635	22.02	.252	21.68	.712	22.32	.506	21.28	.393	22.07	.093	22.20	.177	22.10	.850	22.16	.338									
475.96	21.68	.887	.13	.796	-	-	21.99	.787	-	-	.21	.500	-	-	-	-	-	-	.22	.10	.467								
476.95	.37	.005	22.69	.956	22.05	.487	22.20	.862	.69	.082	.19	.605	.10	.228	22.39	.430	.56	.294	21.23	.599									
477.95	21.57	.124	-	-	21.96	.605	.39	.937	.54	.371	.32	.710	22.07	.295	21.81	.556	.59	.517	.01	.730									
479.93	22.39	.361	21.68	.437	.71	.831	.33	.086	-	-	.48	.920	21.84	.428	.66	.807	.32	.958	.46	.991									
480.96	.56	.484	21.78	.603	.96	.950	.49	.163	.68	.243	.39	.030	.87	.498	21.57	.938	.60	.187	21.66	.126									
481.96	-	-	-	-	21.93	.067	-	-	.43	.532	.58	.136	21.76	.566	22.23	.064	-	-	22.16	.257									
482.92	22.56	.718	22.23	.919	22.16	.178	(22.6	.311	.76	.810	.61	.238	20.96	.631	22.14	.186	.19	.624	22.10	.383									
503.87	21.59	.222	21.90	.299	21.66	.615	21.84	.886	-	-	.48	.460	21.76	.046	21.68	.840	.59	.292	21.81	.133									
504.95	22.36	.352	.66	.474	.89	.740	22.33	.967	-	-	.28	.575	22.16	.119	21.87	.977	22.46	.532	.78	.274									
505.90	.10	.465	21.99	.627	21.99	.850	.52	.038	.05	.463	.26	.675	.16	.183	22.10	.937	21.80	.745	.78	.399									
506.87	.52	.581	22.36	.783	22.13	.963	.69	.111	.81	.743	.19	.778	.49	.249	.07	.220	22.19	.961	21.44	.526									
507.87	22.23	.701	.45	.945	.07	.080	(22.8	.187	.91	.033	.52	.855	.07	.317	.52	.347	.36	.183	20.91	.657									
508.88	21.68	.821	.59	.108	.26	.198	22.62	.263	.65	.325	.46	.992	.23	.385	22.60	.475	.42	.408	20.91	.790									
509.89	.30	.942	22.02	.271	-	.10	.315	-	.32	.617	.41	.099	22.30	.453	21.71	.703	22.16	.634	21.30	.923									
510.89	.44	.062	21.68	.432	22.05	.431	22.07	.414	(22.7	.907	.67	.205	21.96	.521	.39	.730	21.89	.857	.50	.055									
511.85	21.80	.176	22.05	.567	21.90	.543	21.87	.486	(22.7	.185	.58	.308	21.52	.586	.61	.851	22.32	.081	.81	.180									
512.87	22.10	.298	.10	.751	.66	.661	.59	.563	22.23	.480	.52	.416	20.96	.655	21.81	.981	22.56	.298	.76	.314									
513.81	21.93	.410	.36	.903	-	-	.46	.633	-	-	.19	.629	21.18	.718	22.05	.100	-	-	.84	.438									
514.88	22.45	.538	.69	.076	21.81	.896	21.61	.714	.83	.063	.19	.629	21.23	.790	.56	.235	21.89	.746	.26										

## VARIABLES IN THE ANDROMEDA GALAXY

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Table B. (continued)

J. D. 2,433,000+	Mag. Phase V 377	Mag. Phase V 378	Mag. Phase V 379	Mag. Phase V 380	Mag. Phase V 382	Mag. Phase V 383	Mag. Phase V 384	Mag. Phase V 385	Mag. Phase V 387	Mag. Phase V 391
864.89	22.13 .372	21.71 .550	21.84 .612	22.42 .031	22.70 .394	21.39 .765	22.36 .441	21.76 .581	21.83 .750	21.61 .516
865.88	-	22.36 .710	-	.42 .107	-	.48 .870	21.93 .507	.28 .707	22.08 .970	20.86 .647
.97	.30 .501	.39 .724	.90 .738	.57 .112	.69 .707	.44 .880	.93 .513	.48 .718	.26 .990	21.11 .658
866.84	.49 .605	.49 .865	21.96 .840	.52 .178	.75 .959	.61 .972	21.68 .572	21.66 .829	.49 .184	.16 .772
867.91	22.42 .733	-	22.02 .964	.62 .258	.83 .268	.70 .085	20.88 .644	22.02 .964	.62 .422	.26 .913
868.91	21.61 .852	22.76 .199	.10 .080	.56 .333	.30 .558	.67 .191	21.30 .712	.13 .091	.10 .645	.48 .044
869.91	.39 .972	21.55 .360	.10 .197	.13 .408	(22.9 .848	.67 .297	21.13 .780	.30 .217	.16 .868	.71 .175
894.84	.30 .951	.68 .382	-	.69 .283	-	.48 .943	22.16 .464	.52 .376	-	.39 .448
.91	.28 .960	.76 .394	.10 .105	.64 .288	22.82 .087	-	.54 .959	.07 .469	.30 .385	.56 .440
895.81	.60 .067	.73 .539	.10 .219	.56 .356	-	.63 .045	22.10 .530	.33 .499	22.07 .640	21.18 .575
896.99	.65 .090	21.80 .570	.05 .232	.42 .370	.60 .402	.65 .066	21.99 .543	22.16 .523	21.80 .683	20.96 .600
896.78	.63 .183	22.39 .695	.20 .323	22.26 .429	.35 .628	.70 .148	21.28 .595	21.52 .622	21.83 .857	20.80 .702
897.81	21.96 .306	.42 .862	22.10 .442	21.81 .506	22.66 .926	.70 .257	20.96 .665	.61 .752	22.56 .086	21.13 .838
898.90	22.02 .436	.69 .038	21.96 .569	.37 .588	23.08 .242	.54 .373	21.16 .739	.61 .890	.52 .329	.48 .981
899.91	.62 .557	.83 .200	.68 .687	21.30 .664	22.16 .533	.32 .480	.32 .807	21.76 .018	.56 .554	.57 .113
923.80	.33 .412	.69 .055	.92 .466	22.33 .460	.28 .449	.63 .015	.90 .421	22.23 .045	.04 .878	21.66 .249
924.82	.59 .534	.62 .220	.87 .585	21.93 .537	-	.65 .123	-	-	.29 .105	22.07 .383
.94	22.49 .549	.65 .239	.90 .599	.99 .546	-	.58 .135	-	-	.39 .132	21.99 .399
927.90	21.48 .903	.23 .717	-	.59 .769	.36 .636	.50 .450	21.13 .698	-	.01 .792	.11 .787
951.70	22.26 .747	.07 .557	21.84 .711	.71 .558	.32 .527	.58 .975	22.16 .306	21.90 .580	.52 .096	.30 .910
952.70	21.57 .867	.39 .718	-	.23 .633	-	.56 .081	-	.35 .707	-	.59 .411
953.70	.48 .986	.59 .879	22.10 .944	.39 .709	.69 .105	.65 .187	-	.81 .834	.49 .541	.87 .172
954.77	.81 .114	.56 .052	.16 .078	.46 .789	.69 .416	.75 .301	21.90 .514	21.66 .969	.00 .780	.84 .314
955.78	.73 .235	.80 .215	22.35 .186	.93 .865	.76 .708	.41 .408	21.55 .582	22.23 .097	.29 .005	.93 .446
977.69	.52 .853	13 .750	21.68 .735	.99 .512	.83 .051	.24 .733	22.05 .062	21.87 .873	.04 .888	.84 .322
.94	.55 .860	.33 .760	.93 .742	.93 .517	-	.23 .739	.23 .066	.78 .881	.03 .902	21.78 .330
978.69	.32 .973	.33 .912	.96 .852	.50 .588	.96 .941	.50 .839	.36 .130	21.96 .000	.39 .111	22.10 .454
979.69	.52 .092	.69 .073	21.96 .968	.44 .663	.56 .630	.61 .945	.26 .198	22.30 .126	.42 .333	21.16 .585
980.64	21.52 .206	22.65 .226	22.02 .078	.55 .734	.89 .905	.77 .046	-	.45 .247	22.62 .545	20.96 .710
981.62	22.16 .323	21.71 .384	.10 .192	.93 .808	-	.85 .150	.23 .328	.42 .371	21.83 .764	21.35 .838
.75	22.02 .339	21.78 .405	22.10 .207	21.99 .818	22.91 .226	21.67 .162	22.42 .337	22.62 .388	21.92 .793	21.11 .855
	V 392	V 394	V 395*	V 396*	V 399	V 402	V 403	V 404	V 405	V 408
.474.96	21.82 .658	21.78 .862	20.83 .128	20.68 .750	21.86 .113	21.50 .844	22.69 .073	21.81 .538	20.56 .026	22.36 .753
475.96	21.80 .819	21.93 .051	.38 .221	.58 .760	.48 .292	21.80 .048	-	.35 .596	21.28 .121	-
476.95	22.07 .979	22.10 .239	20.48 .913	.53 .770	.15 .471	22.17 .250	.72 .463	.13 .654	.55 .215	-
477.95	.04 .140	22.23 .428	21.11 .406	.41 .780	.28 .650	22.56 .454	.56 .659	.19 .711	21.63 .310	21.75 .237
479.93	22.29 .461	21.68 .802	.28 .591	.41 .800	-	21.61 .858	.62 .047	.13 .826	22.02 .497	22.46 .557
480.96	21.86 .627	21.93 .988	.68 .687	.41 .810	.61 .188	21.92 .068	-	.66 .886	22.07 .585	.42 .723
481.96	21.82 .788	22.16 .187	.84 .780	.68 .820	.37 .367	22.36 .272	(22.7 .445	21.93 .944	21.93 .690	(22.6 .885
482.92	22.07 .943	.23 .368	.64 .869	.56 .829	.37 .539	22.56 .462	22.56 .633	22.05 .000	.57 .781	(22.6 .040
503.87	.32 .324	22.33 .332	.59 .820	-	.44 .293	21.63 .739	.02 .738	.49 .214	.66 .766	21.86 .425
504.95	22.36 .496	21.87 .536	.61 .921	.85 .050	.17 .487	21.70 .969	.49 .948	.36 .277	.21 .869	22.29 .600
505.90	21.75 .652	.45 .716	21.24 .009	.78 .059	.41 .657	22.39 .153	.62 .136	.69 .332	21.23 .959	.36 .753
506.87	21.67 .808	.71 .900	20.73 .099	.88 .069	.61 .831	.26 .351	.70 .326	.45 .388	20.96 .051	.62 .910
507.87	22.07 .970	21.96 .089	.71 .192	.88 .079	.86 .010	22.39 .555	22.83 .522	.45 .446	21.16 .146	22.62 .072
508.88	.16 .133	22.07 .280	.51 .286	20.98 .069	.56 .190	21.67 .760	21.84 .720	22.07 .505	.35 .241	21.98 .235
509.89	.36 .296	21.96 .471	20.99 .380	21.03 .099	.35 .369	22.90 .967	22.36 .918	21.71 .563	.42 .337	-
510.89	.36 .457	.57 .660	21.01 .473	.21 .109	.44 .548	.19 .171	.56 .114	.18 .621	21.55 .432	-
511.85	22.16 .612	.61 .842	.28 .563	20.86 .118	.46 .727	.32 .367	.76 .303	.01 .677	22.02 .523	22.62 .715
512.87	21.58 .777	21.81 .035	.24 .658	21.01 .129	.67 .906	22.39 .574	22.59 .502	.16 .736	21.90 .620	22.42 .880
513.81	-	-	.55 .745	.20 .98 .138	-	21.65 .766	21.93 .687	.13 .791	22.05 .709	-
514.88	22.05 .102	22.36 .415	.63 .845	20.93 .149	.80 .265	21.92 .984	22.35 .896	21.63 .852	21.28 .810	21.86 .205
536.83	21.65 .644	21.93 .568	.57 .888	21.28 .368	.75 .200	22.56 .460	(22.7 .197	22.52 .125	.30 .891	22.62 .752
537.80	.86 .800	.52 .751	.18 .979	.28 .378	.48 .378	22.42 .657	22.72 .387	.56 .182	21.06 .983	.56 .908
538.80	21.89 .961	21.61 .941	21.03 .072	.26 .388	.28 .553	21.83 .861	22.46 .583	.65 .240	20.91 .078	22.42 .070
539.80	22.36 .123	22.07 .130	20.98 .165	.13 .398	.58 .732	21.92 .062	21.90 .779	.49 .298	21.13 .173	21.92 .232
540.86	.26 .295	22.20 .331	.21 .264	.11 .409	.77 .915	22.22 .282	22.36 .987	22.56 .339	.44 .273	.80 .403
541.81	-	-	20.81 .352	21.03 .418	-	-	-	-	-	-
564.80	.26 .159	21.76 .860	21.08 .492	20.63 .648	.95 .212	.32 .163	21.96 .678	21.08 .747	21.87 .543	21.92 .272
565.75	.36 .312	21.85 .040	.03 .581	.56 .657	.37 .282	22.39 .357	22.05 .864	.08 .802	22.10 .633	22.16 .425
566.74	22.42 .472	22.23 .227	.48 .673	.68 .667	.52 .561	-	.33 .058	21.52 .860	21.96 .727	.29 .585
567.75	21.80 .635	22.13 .418	.55 .767	.63 .677	.35 .741	21.63 .764	.49 .256	22.02 .918	21.73 .823	.32 .748
569.74	-	21.71 .794	.44 .952	.61 .697	.92 .099	22.04 .170	.42 .646	.33 .033	20.86 .011	22.22 .070
570.85	22.42 .135	-	21.26 .056	.61 .708	.65 .296	.32 .396	.30 .863	.45 .098	20.86 .116	21.92 .249
571.83	.22 .293	21.99 .190	20.63 .147	.63 .718	.44 .472	22.22 .597	.56 .055	.45 .155	21.26 .209	21.89 .408
572.84	.46 .456	22.16 .381	.56 .241	.66 .728	.54 .652	21.72 .802	.49 .253	.52 .213	.37 .305	22.14 .571
573.88	.01 .624	21.96 .578	20.86 .338	.58 .739	.70 .839	22.13 .014	.83 .457	.76 .273	21.68 .404	.29 .739
590.65	.39 .331	.59 .751	21.39 .999	.46 .906	21.83 .844	.56 .434	.02 .744	.52 .246	20.83 .994	.01 .449
591.70	22.32 .500	21.71 .950	21.06 .997	.46 .917	22.13 .033	22.32 .648	.42 .949	.56 .307	20.91 .093	.16 .619
592.69	21.63 .660	22.07 .137	20.93 .089	.46 .927	22.04 .211	21.63 .850	.42 .143	.52 .364	21.16 .187	.52 .779
593.69	21.76 .821	22.39 .326	.73 .182	.53 .937	21.48 .390	21.92 .054	.65 .339	.26 .422	.52 .282	.62 .940
594.76	22.16 .994	21.99 .528	20.51 .282	20.58 .948	21.55 .581	22.26 .272	22.69 .549	22.26 .484	21.68 .383	22.22 .113
831.94	-	-	20.81 .363	21.28 .319	-	-	-	-	-	-
832.95	22.56 .437	21.55 .594	21.03 .457	.18 .329	21.63 .264	21.80 .839	22.52 .225	-	21.16 .964	-
836.96	.26 .085	22.10 .353	21.76 .831	21.39 .370	.89 .982	22.32 .657	.56 .011	22.36 .527	.66 .343	21.86 .253
863.92	.49 .436	-	20.91 .341	20.68 .640	21.52 .814	.36 .164	-	.39 .900	21.37 .900	-
864.89	22.29 .593	21.55 .637	21.01 .431	.63 .649	22.10 .988	.29 .351	(22.6 .484	.33 .146	20.88 .991	22.32 .766
865.88	21.83 .753	.52 .824	.19 .523	-	21.75 .167	.56 .553	-	-	21.01 .085	-
.97	.86 .768	.52 .841	.35 .531	.68 .660	.77 .182	22.56 .571	21.96 .665	.42 .209	20.83 .093	-
866.84	21.86 .908	21.99 .006	.39 .612	.66 .668	.32 .338	21.70 .749	22.30 .896	.42 .259	21.03 .176	22.32 .081
867.91	22.32 .080	22.07 .208	.48 .712	.53 .679	.21 .529	21.80 .967	.56 .076	.49 .321	.32 .278	21.95 .254
868.91	.32 .242	22.36 .398	.68 .805	.58 .689	.58 .709	22.36 .172	.52 .272	.45 .379	.48 .373	22.01 .416
869.91	.56 .403	21.66 .587	21.57 .898	.53 .699	.92 .888	.26 .376	.79 .467	.30 .437	.93 .467	.42 .577
894.84	.39 .427	22.16 .303	20.30 .220	.58 .948	.32 .355	.42 .459	-	22.05 .883	.76 .830	.42 .606
.91	.46 .438	.33 .317	.43 .226	-	.41 .360	.36 .473	.62 .368	21.76 .887	.46 .837	.39 .617
895.81	.32 .583	.16 .487	.51 .310	.58 .958	-	.26 .657	.49 .543	.87 .939	.03 .923	.42 .762
896.99	22.26 .614	22.05 .523	.46 .328	-	.39 .565	22.13 .695	22.62 .580	21.87 .951	21.01 .941	.56 .793
896.78	21.58 .740	21.48 .670	20.83 .400	.53 .968	.70 .703	21.72 .854	21.96 .734	22.10 .995	20.78 .015	.70 .920
897.81	21.83 .906	.50 .865	21.08 .496	.56 .979	21.80 .887	22.10 .065	22.30 .335	.42 .055	21.06 .112	22.56 .086
898.90	22.42 .082	21.90 .072	.28 .598	.68 .989	22.07 .084	.42 .287	.49 .148	.52 .118		

Table B. (continued)

J. D. 2,433,000+	Mag. V 392	Phase V 394	Mag. V 395*	Phase V 396*	Mag. V 399	Phase V 402	Mag. V 403	Phase V 404	Mag. V 405	Phase V 408										
924.82	22.39	.266	21.81	.976	21.06	.010	21.20	.248	21.67	.725	22.26	.572	-	-	21.23	.621	22.07	.673	-	-
.94	22.36	.286	21.87	.999	21.11	.021	-	-	21.61	.749	42	.597	-	-	21.21	.628	22.03	.684	22.26	.470
927.90	21.86	.763	22.02	.559	20.48	.297	.37	.279	.92	.280	-	-	21.93	.831	21.32	.800	21.16	.965	(22.6	.948
951.70	22.16	.604	21.93	.061	21.21	.513	.06	.517	.24	.544	22.13	.052	(22.8	.495	22.52	.180	.39	.221	22.73	.795
952.70	21.80	.766	-	-	.41	.606	.08	.527	-	-	-	-	-	-	-	.48	.316	-	-	-
953.70	21.86	.927	22.26	.440	.35	.699	21.06	.537	.86	.903	.49	.460	22.39	.887	22.49	.296	.48	.316	-	-
954.77	22.19	1.00	21.50	.642	.57	.799	20.86	.548	.98	.095	22.32	.678	(22.7	.097	22.62	.357	21.87	.512	21.98	.291
955.78	22.26	.263	.46	.833	.50	.893	.83	.558	21.70	.274	21.83	.884	22.62	.295	22.65	.416	22.10	.608	22.26	.454
977.69	21.75	.799	.73	.979	.61	.932	.57	.777	22.01	.202	22.35	.352	.76	.588	21.18	.686	21.93	.685	(22.6	.995
.75	.86	.809	21.71	.990	.30	.937	-	-	-	.29	.364	-	-	-	.15	.689	.95	.691	-	-
978.69	21.89	.960	22.07	.168	21.21	.026	.43	.787	21.58	.381	22.56	.556	.10	.784	.28	.744	.68	.780	21.83	.156
979.69	22.21	.122	.36	.357	20.78	.119	.51	.797	.51	.560	21.89	.760	.23	.980	.55	.802	.32	.875	21.89	.318
980.64	.26	.275	22.16	.537	.76	.207	.61	.806	.44	.731	21.95	.954	.49	.166	.67	.857	21.18	.964	22.29	.471
981.62	.29	.433	21.55	.722	.38	.299	-	-	-	-	22.32	.154	-	-	.87	.914	20.83	.057	-	-
.75	22.36	.454	21.59	.747	20.28	.311	20.57	.818	21.77	.910	22.29	.180	(22.6	.383	21.96	.922	20.78	.069	(22.6	.650
											V 410	V 411	V 412	V 414	V 415	V 416	V 422	V 423	V 424	V 426
474.96	22.70	.687	21.26	.998	21.93	.426	22.52	.938	21.68	.187	22.07	.067	22.89	.648	21.57	.010	22.46	.617	21.59	.393
475.96	22.22	.852	.26	.062	20.96	.551	21.48	.205	21.32	.263	-	-	21.71	.703	-	.52	.079	-	-	-
476.95	21.89	.016	.35	.124	.81	.675	21.81	.470	20.88	.339	.56	.205	22.05	.756	.63	.148	.62	.913	.46	.605
477.95	22.24	.182	.39	.187	20.96	.800	22.39	.737	21.44	.415	.20	.275	.30	.810	.93	.217	22.72	.061	21.81	.710
479.93	.62	.510	.39	.312	21.21	.047	21.46	.266	21.81	.566	.36	.413	.30	.916	.11	.313	21.93	.355	21.93	.355
480.96	-	-	.71	.377	.35	.176	22.20	.541	22.02	.644	.39	.484	.62	.972	22.49	.427	22.07	.508	.45	.030
481.96	.26	.846	21.57	.440	.66	.302	-	-	22.30	.720	-	-	(22.7	.026	22.56	.496	.49	.567	22.10	.136
482.92	.16	.005	22.42	.501	.68	.423	.56	.065	22.33	.794	.56	.621	(22.8	.078	-	-	.62	.801	21.96	.238
503.87	.73	.476	.30	.824	.21	.044	21.19	.664	21.16	.390	.33	.079	22.89	.209	21.41	.019	.69	.155	21.81	.460
504.95	.66	.655	22.16	.892	.33	.179	22.39	.953	.23	.472	.56	.155	(22.8	.267	.48	.094	.73	.077	.63	.575
505.90	22.07	.812	21.35	.953	.46	.297	21.46	.207	.46	.544	.46	.221	22.59	.319	.66	.160	22.33	.218	21.93	.675
506.87	21.66	.973	.11	.014	.68	.419	22.13	.466	.81	.618	.55	.288	.96	.371	.90	.227	21.90	.362	22.10	.778
507.87	22.19	1.139	.21	.077	21.39	.544	.65	.733	.96	.656	.55	.358	(22.8	.425	21.96	.297	21.93	.510	.42	.885
508.88	.52	.306	.26	.141	20.86	.470	22.83	.003	21.96	.771	.46	.428	-	-	22.07	.367	22.33	.611	.25	.982
509.89	.59	.473	.39	.205	21.23	.796	21.52	.273	22.16	.848	.56	.499	(22.8	.535	-	-	.52	.810	.20	.099
510.89	-	-	.70	.268	.13	.921	21.92	.540	.26	.925	.56	.568	-	-	.49	.507	.69	.959	22.02	.205
511.85	22.16	.798	.66	.328	.30	.040	22.56	.797	.13	.998	.22	.635	(22.8	.640	.56	.573	22.49	.102	21.96	.308
512.87	21.83	.967	21.93	.393	.66	.169	22.62	.070	21.10	.075	22.07	.706	22.07	.696	-	-	21.99	.252	.66	.415
513.81	-	-	-	-	-	-	21.52	.321	22.10	.147	-	-	-	-	-	-	21.93	.393	.63	.516
514.88	22.56	.300	22.30	.520	.81	.422	22.06	.607	21.59	.229	21.61	.846	.30	.803	.36	.784	22.02	.552	21.96	.629
536.83	.12	.937	21.52	.906	.55	.168	.02	.473	22.49	.901	22.43	.374	.89	.989	.16	.310	.76	.816	-	-
537.80	.26	.097	.26	.967	.63	.289	.30	.732	.30	.975	.47	.442	.89	.041	.26	.377	.72	.960	22.56	.061
538.80	.39	.263	.11	.031	.50	.414	22.72	.000	22.05	.051	.36	.511	-	-	.36	.447	-	-	22.39	.167
539.80	.70	.429	.21	.094	.26	.539	21.50	.267	21.71	.127	.29	.581	.56	.149	.56	.516	22.52	.257	21.78	.274
540.86	(22.8	.604	21.44	.161	21.01	.672	22.20	.550	.37	.208	-	.655	(22.8	.206	22.56	.590	21.93	.415	21.59	.386
541.81	-	-	-	-	20.96	.791	-	-	21.32	.380	-	-	-	-	-	-	22.23	.556	-	-
564.80	22.70	.570	22.89	.673	21.03	.668	22.76	.948	22.20	.032	.40	.321	(22.9	.499	21.95	.254	21.95	.254	22.56	.925
565.75	22.59	.728	.56	.733	20.96	.777	21.61	.202	21.71	.104	.21	.387	-	-	21.93	.320	.92	.117	.42	.026
566.74	21.98	.928	.16	.795	21.11	.910	22.10	.467	.52	.180	.34	.566	(22.9	.604	22.36	.388	.33	.263	.16	.131
567.75	21.98	.059	22.10	.859	.16	.037	22.72	.737	.44	.257	22.14	.527	22.45	.659	.49	.459	.10	.413	22.02	.237
569.74	22.46	.389	21.21	.985	.78	.285	21.57	.269	.39	.408	22.81	.665	-	-	.10	.766	-	-	21.63	.449
570.85	-	-	.21	.055	.78	.424	22.16	.565	.44	.493	.46	.742	.33	.828	.33	.674	.69	.873	21.78	.567
571.83	.76	.735	.30	.117	21.39	.547	.36	.827	.63	.568	.53	.811	.56	.879	.42	.742	.69	.020	22.07	.670
572.84	.01	.902	.48	.180	20.81	.673	22.39	.097	.99	.645	.53	.881	.49	.934	22.23	.812	22.69	.110	.23	.779
573.88	.29	.075	.65	.246	21.06	.803	21.59	.375	21.96	.724	21.70	.953	.79	.990	21.93	.885	21.93	.824	.56	.888
590.65	.07	.853	.52	.305	.26	.903	22.62	.857	22.16	.001	22.41	.121	.52	.895	.44	.050	22.70	.818	.05	.668
591.70	.32	.027	21.48	.372	.52	.034	21.87	.138	22.07	.082	.60	.194	.62	.951	.47	.123	.26	.974	.39	.779
592.69	.56	.191	22.05	.434	.73	.158	21.93	.402	21.76	.157	.60	.263	.76	.005	.84	.192	.65	.121	.16	.884
593.69	.76	.357	22.16	.497	.73	.283	22.16	.670	21.52	.233	.49	.333	.96	.059	21.90	.261	.39	.270	.36	.990
594.76	22.86	.534	-	-	21.84	.417	22.42	.956	20.08	.315	22.53	.407	22.92	.117	22.33	.336	22.05	.429	22.52	.104
											21.21	.386	-	-	-	-	-	-	-	-
831.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
832.95	22.10	.995	-	-	21.63	.219	22.45	.614	.44	.462	22.10	.990	-	-	22.23	.890	-	-	21.93	.376
836.96	(22.8	.659	21.93	.862	.06	.720	21.49	.686	21.93	.768	.42	.269	22.69	.196	21.50	.169	21.93	.439	21.99	.801
863.92	22.36	.126	22.76	.565	.28	.094	22.66	.891	22.26	.822	.26	.146	-	-	.44	.042	22.13	.448	22.10	.662
864.89	-	-	.36	.626	.28	.215	21.84	.150	.42	.896	.30	.214	22.05	.704	.59	.110	22.13	.592	.05	.765
865.88	-	-	-	-	.59	.339	21.73	.415	.30	.971	.36	.282	.16	.757	.76	.179	.56	.739	-	-
.97	.73	.462	-	-	.50	.350	22.07	.439	22.26	.978	.42	.289	.07	.762	.63	.185	.56	.753	.23	.880
866.84	-	-	.76	.750	.61	.459	.49	.672	21.87	.044	.41	.349	.26	.810	.81	.245	.89	.882	-	-
867.91	22.83	.787	.56	.817	21.21	.593	22.86	.958	.78	.126	.32	.424	.62	.867	21.81	.320	-	-	.07	.085
868.91	21.86	.952	22.16	.890	20.98	.718	21.73	.225	.76	.202	.53	.494	.62	.921	22.16	.369	22.40	.189	22.33	.191
869.91	22.26	.118	21.48	.943	21.11	.843	22.13	.492	.13	.278	.47	.563	(22.8	.975	22.45	.459	21.85	.338	21.66	.297
894.84	.56	.248	22.36	.818	.16	.961	21.87	.155	.71	.178	.42	.299	-	-	21.93	.191	22.56			

VARIABLES IN THE ANDROMEDA GALAXY

Table B (continued)

J. D.	Mag. Phase V 427	Mag. Phase V 428	Mag. Phase V 438	Mag. Phase V 439	Mag. Phase V 440	Mag. Phase V 443	Mag. Phase V 446*	Mag. Phase V 447	Mag. Phase V 449	Mag. Phase V 451
474.96	22.33 .191	21.55 .843	22.52 .075	22.33 .682	22.26 .476	23.00 .182	20.81 .543	22.36 .060	22.80 .489	22.64 .302
475.96	49 .280	-	-	-	-	-	20.91 .613	-	56 .540	.39 .393
476.95	36 .368	.44 .174	.56 .231	.07 .774	.39 .553	21.50 .581	21.01 .684	.43 .425	.52 .592	.26 .484
477.95	22.33 .457	.45 .340	.56 .309	.35 .820	.49 .592	22.09 .781	28 .754	.56 .608	.56 .644	22.04 .574
479.93	21.68 .632	.58 .668	22.07 .463	.56 .911	.46 .669	.49 .178	.37 .894	.29 .971	.22 .746	21.98 .756
480.96	.50 .723	.55 .839	21.77 .544	.30 .958	.64 .709	22.80 .384	.44 .967	.26 .160	29 .798	22.16 .848
481.96	.23 .812	-	.19 .622	-	.49 .748	21.61 .585	.44 .038	.40 .343	22.36 .850	.36 .939
482.92	.23 .898	.17 .165	21.35 .697	.30 .049	.29 .785	21.80 .777	.39 .106	.62 .519	21.26 .899	.39 .027
503.87	.01 .759	.70 .642	22.42 .332	.23 .014	.13 .600	22.39 .975	.03 .589	.49 .359	.17 .979	.13 .937
504.95	.21 .855	.30 .822	.04 .416	.36 .064	.73 .642	.89 .192	.35 .666	22.65 .557	.40 .035	.56 .036
505.90	.44 .939	10 .979	22.19 .491	.62 .108	.66 .679	22.89 .382	.35 .732	21.84 .731	.44 .083	.49 .213
506.87	.71 .026	.31 .140	21.24 .566	.27 .153	.42 .717	21.54 .577	.39 .801	22.13 .909	.70 .134	.70 .212
507.87	.87 .115	.45 .306	.39 .644	22.16 .199	.26 .756	21.86 .777	.50 .872	.26 .092	21.86 .186	.83 .302
508.88	21.84 .204	.61 .474	21.41 .723	21.01 .245	.19 .795	22.26 .979	.46 .943	.53 .278	22.07 .238	.42 .394
509.89	22.39 .294	.71 .642	21.46 .802	20.41 .292	.32 .834	.63 .182	.60 .015	.56 .463	.29 .290	.32 .466
510.89	.56 .383	.38 .808	22.16 .980	.58 .338	22.04 .874	22.89 .382	.35 .086	22.08 .646	.49 .341	22.01 .577
511.85	.56 .467	.12 .967	.29 .955	.63 .382	21.89 .911	21.72 .574	21.23 .153	21.81 .822	.46 .392	21.86 .665
512.87	22.10 .558	.25 .136	.49 .035	20.94 .429	20.97 .950	21.77 .779	20.88 .226	22.23 .009	.49 .443	22.13 .757
513.81	21.63 .642	.47 .292	.56 .108	21.21 .472	.97 .987	22.29 .967	.88 .292	-	.42 .493	21.98 .844
514.88	.28 .737	.36 .470	.70 .191	.04 .522	20.66 .029	22.70 .182	20.15 .368	.49 .377	.56 .547	22.22 .941
536.83	.55 .687	.27 .114	.56 .905	.18 .533	22.19 .882	21.59 .580	21.63 .921	.56 .401	.56 .679	.49 .942
537.80	.13 .773	21 .275	.56 .981	.39 .578	21.44 .920	21.86 .775	.48 .990	22.33 .579	.42 .729	.49 .031
538.80	.23 .861	.36 .441	-	.48 .624	21.35 .959	22.42 .975	.48 .061	21.84 .762	.42 .780	.56 .122
539.80	.44 .951	.49 .607	(22.6 .137	.76 .670	20.73 .998	-	.44 .132	21.94 .945	22.39 .832	-
540.86	.71 .044	.66 .783	(22.6 .220	21.73 .719	.83 .039	22.92 .388	21.21 .207	22.26 .140	21.52 .885	.70 .310
541.81	21.63 .129	.11 .940	-	-	.86 .076	21.63 .579	20.83 .274	-	.32 .935	-
564.80	22.10 .171	.35 .757	(22.8 .098	22.16 .822	.71 .370	22.96 .186	21.44 .941	22.46 .528	.70 .121	.49 .493
565.75	.45 .255	.02 .914	(22.7 .182	20.86 .666	.73 .007	22.86 .376	21.70 .869	21.71 .702	.89 .170	22.01 .579
566.74	.36 .343	.12 .079	(22.8 .240	.49 .912	20.86 .046	21.72 .574	.44 .038	21.84 .883	21.86 .221	21.92 .670
567.75	22.39 .433	.34 .246	-	.52 .954	21.10 .085	22.10 .777	.37 .110	22.27 .068	22.26 .273	21.83 .762
569.74	21.78 .610	.60 .578	21.98 .474	.49 .050	.00 .163	.45 .176	21.18 .251	.43 .433	.39 .376	22.32 .944
570.85	21.39 .709	.60 .761	.65 .560	.56 .101	.30 .206	22.64 .398	20.61 .329	22.27 .637	.56 .433	.56 .044
571.83	20.85 .795	.36 .924	.44 .637	.69 .146	.46 .244	21.72 .594	.22 .398	21.71 .816	.46 .484	.64 .133
572.84	21.28 .885	.11 .091	.63 .716	22.30 .193	.57 .283	22.07 .797	.46 .470	22.23 .001	.64 .536	.80 .225
573.88	21.55 .978	.26 .264	21.83 .797	21.11 .241	21.52 .323	.69 .005	20.91 .543	.27 .192	.49 .588	.66 .321
590.65	22.23 .467	.05 .048	(22.6 .106	22.07 .014	20.97 .976	22.83 .366	21.28 .730	.69 .266	.35 .454	.22 .850
591.70	21.81 .560	.05 .222	(22.6 .188	.23 .062	.78 .017	21.57 .576	.37 .805	.69 .459	-	.46 .945
592.69	.78 .648	.64 .386	(22.6 .265	.42 .108	.91 .056	21.95 .775	.59 .875	22.13 .640	.64 .559	.69 .036
593.69	.28 .737	.57 .552	22.49 .343	.49 .154	20.89 .095	22.29 .975	.44 .946	21.81 .823	.76 .611	.83 .127
594.76	21.06 .832	21.70 .730	22.13 .427	22.02 .203	21.32 .136	22.80 .190	21.30 .021	22.39 .020	22.86 .666	22.89 .224
831.94	-	21.21 .102	22.36 .941	-	-	21.44 .362	-	-	-	-
832.95	-	.06 .269	-	-	-	21.72 .402	22.56 .923	21.50 .878	21.87 .680	21.08 .947
836.96	22.13 .347	.05 .935	.70 .333	20.58 .366	22.26 .558	21.83 .726	.01 .161	22.49 .415	21.86 .153	.49 .305
863.92	21.50 .744	.70 .410	22.56 .437	21.63 .608	.29 .610	22.56 .130	.44 .069	.56 .356	22.56 .544	.22 .763
864.89	.21 .829	.66 .571	21.70 .513	21.71 .653	.35 .644	.56 .324	.32 .138	22.40 .534	(22.7 .593	.49 .852
865.88	.35 .917	-	.28 .591	.49 .683	.49 .683	22.36 .522	.35 .208	-	-	.29 .942
.97	.46 .925	.48 .751	.32 .598	22.20 .702	.56 .686	21.80 .540	21.06 .214	21.84 .732	-	.56 .590
866.84	21.60 .006	.12 .895	.44 .665	21.99 .742	.56 .720	21.75 .714	20.86 .276	22.05 .892	22.56 .695	.64 .030
867.91	22.05 .096	.16 .073	21.80 .749	22.07 .792	.29 .761	22.36 .930	.00 .352	.15 .088	.64 .749	.70 .127
868.91	.10 .185	.16 .239	22.19 .827	.33 .838	19 .800	.39 .130	.32 .423	.52 .271	.64 .800	.56 .218
869.91	.42 .274	.31 .405	21.92 .905	.39 .884	.26 .839	.76 .330	.66 .493	.56 .454	22.56 .852	22.70 .310
894.84	22.16 .488	.71 .544	22.49 .851	.56 .033	.24 .809	-	.73 .258	-	21.75 .138	21.83 .588
.91	21.96 .494	.58 .555	.46 .857	.56 .036	-	.59 .340	.66 .263	.30 .397	.65 .142	.72 .589
895.81	.99 .574	.80 .704	.56 .927	.56 .976	-	22 .847	.62 .530	.34 .315	.33 .202	.86 .188
896.81	.63 .592	.57 .736	.49 .942	.62 .087	.35 .854	22.13 .558	.06 .339	.49 .235	21.86 .198	21.92 .689
896.78	21.52 .661	.06 .865	.66 .003	.42 .123	22.04 .885	21.98 .714	.27 .395	.56 .380	22.13 .239	22.13 .759
897.81	20.83 .752	.22 .036	.70 .083	.23 .170	21.95 .925	22.64 .921	.51 .468	22.56 .568	.07 .291	.49 .853
898.90	21.23 .849	.16 .217	-	22.10 .220	.00 .967	.52 .141	20.96 .545	21.93 .768	.56 .347	.52 .953
899.91	.55 .939	.65 .384	(22.7 .247	20.76 .267	.00 .066	.73 .342	21.16 .617	22.27 .953	.46 .399	.80 .045
923.80	21.61 .061	.27 .351	(22.7 .112	.68 .368	.26 .935	.42 .129	20.56 .307	.56 .332	(22.7 .631	.73 .223
924.82	22.00 .151	.77 .520	-	.73 .415	21.05 .975	-	.06 .379	.56 .510	22.56 .683	.56 .315
.94	21.81 .162	.60 .540	(22.6 .201	.20 .78 .421	20.91 .980	-	.20 .06 .385	.56 .541	22.56 .689	.56 .327
927.90	22.42 .425	.02 .031	22.56 .432	21.55 .557	.97 .095	22.52 .951	21.11 .597	-	-	22.04 .597
951.70	22.13 .540	.10 .982	(22.7 .290	21.59 .654	.91 .021	21.75 .720	20 .71 .282	22.56 .447	21.48 .069	21.98 .766
952.70	-	.34 .148	22.22 .368	-	-	20.91 .060	.19 .352	-	.44 .121	-
953.70	21.57 .718	.36 .314	22.42 .446	22.23 .746	21.08 .099	22.56 .121	.46 .423	21.78 .813	21.77 .173	22.49 .948
954.77	.11 .813	.67 .492	21.72 .329	.33 .795	.00 .140	.83 .335	.68 .499	22.13 .009	22.07 .228	.56 .046
955.78	.39 .902	.66 .659	21.32 .608	.30 .842	.44 .180	.04 .538	20.91 .570	.56 .194	.04 .280	.64 .138
977.69	-	.43 .296	(22.6 .318	.56 .852	21.05 .032	.46 .929	21.95 .121	.56 .210	.56 .410	.56 .136
.75	.33 .853	.44 .306	-	.49 .855	20.97 .034	.64 .941	.32 .125	.46 .221	.56 .413	.56 .141
978.69	.32 .937	-	22.13 .396	.39 .898	21.10 .071	.52 .129	21.13 .192	.56 .394	.56 .461	.66 .227
979.69	.50 .026	.62 .628	22.16 .475	.30 .944	.08 .110	.80 .329	20.96 .263	22.56 .577	.56 .513	.42 .318
980.64	21.76 .111	.40 .786	21.17 .549	.42 .988	.24 .147	22.29 .520	.23 .330	21.93 .751	.64 .562	.64 .405
981.62	22.26 .198	-	.28 .625	.56 .033	.39 .185	21.63 .716	.30 .399	21.93 .931	-	.46 .494
.75	22.42 .209	21.11 .970	21.39 .635	22.52 .039	21.61 .190	21.86 .742	20.18 .408	22.23 .954	22.64 .619	22.39 .506
2, 433, 000+	V 452	V 453	2, 433, 000+	V 452	V 453	2, 433, 000+	V 452	V 453		
474.96	21.98 .373	22.35 .054	509.89	21.26 .562	22.49 .750	565.75	20.71 .664	21.89 .461		
475.96	.57 .464	22.10 .103	510.89	20.81 .654	.49 .798	566.74	21.17 .754	21.95 .509		
476.95	21.37 .555	21.32 .151	511.85	21.37 .742	.59 .846	567.75	.52 .847	22.19 .558		
477.95	20.81 .646	.28 .200	512.87	.44 .835	.46 .894	569.74	21.86 .028	.49 .655		
479.93	21.46 .827	.48 .297	513.81	21.61 .921	.35 .940	570.85	22.04 .130	.29 .709		
480.96	21.72 .921	.75 .346	514.88	22.01 .019	.22 .992	571.83	.22 .219	.46 .756		
481.96	22.13 .012	.86 .394	536.83	.10 .023	22.32 .058	572.84	22.22 .312	.56 .806		
482.92	22.32 .100	21.92 .441	537.80	.07 .112	21.80 .105	573.88	21.72 .407	.63 .855		
503.87	21.89 .013	22.01 .457	538.80	.10 .203	.39 .153	590.65	21.52 .938	.32 .670		
504.95	22.13 .112	.04 .510	539.80	22.10 .294	.24 .202	591.70	22.07 .034	.49 .721		
505.90	.29 .199	.04 .556	540.86	21.54 .391	21.26 .253	592.69	.19 .124	.49 .769		
506.87	22.16 .290	.42 .603	541.81	-	-	593.69	22.16 .216	.49 .818		
507.87	21.86 .379	.42 .652	564.80	21.26 .577	22.07 .415	594.76	21.95 .313	22.56 .869		
508.88	21.57 .471	22.56 .701	-	-	-	-	-	-		

Table B (continued)

J.D. 2,433,000+	Mag. V	Phase 452	Mag. V	Phase 453	J.D. 2,433,000+	Mag. V	Phase 452	Mag. V	Phase 453	J.D. 2,433,000+	Mag. V	Phase 452	Mag. V	Phase 453
831.94	-	-	-	-	894.95	21.03	.723	21.98	.439	952.70	-	-	21.44	.244
832.95	22.13	.065	-	-	895.81	.48	.805	21.89	.482	953.70	22.22	.092	.44	.292
836.96	21.63	.431	22.46	.626	.99	.48	.823	22.10	.492	954.77	.22	.189	.67	.344
863.92	.61	.893	.39	.935	896.78	.61	.894	.07	.530	955.78	.01	.282	.77	.394
864.89	.72	.982	.26	.982	897.81	21.98	.988	.13	.580	977.69	22.29	.283	.95	.457
865:88	-	-	-	-	898.90	22.22	.088	.29	.632	.75	21.95	.288	21.77	.460
.97	21.92	.080	.26	.034	899.91	22.26	.180	.32	.682	978.69	.89	.374	22.22	.506
866.84	22.13	.159	22.39	.076	923.80	21.95	.362	.56	.841	979.69	.77	.465	.13	.554
867.91	.07	.257	21.63	.128	924.82	.50	.454	.46	.891	980.64	21.44	.552	.46	.600
868.91	22.04	.349	.32	.177	924.82	.65	.466	.56	.896	981.62	-	-	20.91	.641
869.91	21.86	.440	21.41	.225	927.90	.44	.736	22.56	.040	.75	20.78	.653	22.39	.654
894.84	21.08	.717	-	-	951.70	21.41	.909	21.56	.195					

Table C. 100-inch photographic observations and phases of twenty-four Cepheids and two "Population II" variables of Field III.

J.D. 2,400,000+	Mag. H 21	Phase H 21	Mag. H 22	Phase H 22	Mag. H 23	Phase H 23	Mag. H 24	Phase H 24	Mag. H 25	Phase H 25	Mag. H 26	Phase H 26	Mag. H 27	Phase H 27	Mag. H 28	Phase H 28	Mag. H 29	Phase H 29
24,054.75	21.21	.191	-	-	20.75	.118	21.35	.109	(21.5	.627	21.44	.089	-	-	20.48	.044	20.78	.808
058.88	20.43	.432	20.27	.351	20.51	.353	.63	.344	21.42	.976	20.48	.248	19.94	.440	.78	.198	-	-
090.88	.39	.298	-	-	19.45	.175	-	-	-	-	20.69	.766	20.69	.766	.52	.392	-	-
108.70	20.35	.336	-	-	19.59	.191	21.26	.173	20.27	.187	.80	.150	23	.504	.63	.057	-	-
115.80	(21.5	.750	21.44	.591	20.86	.596	-	-	(21.5	.787	20.86	.421	20.97	.799	.57	.322	-	-
117.80	(21.5	.867	21.44	.705	-	-	(21.5	.690	-	-	21.17	.498	-	-	20.47	.397	-	-
147.72	-	-	20.43	.408	19.94	.413	(21.5	.389	-	-	-	-	-	-	19.03	.514	-	-
151.72	(21.5	.844	-	-	-	-	(21.6	.823	.40	.791	-	-	-	-	19.24	.663	.78	.783
171.65	(21.5	.006	21.44	.770	20.97	.776	-	-	21.44	.508	21.21	.554	(21.5	.113	20.45	.407	20.80	.805
320.86	(21.5	.704	20.05	.263	19.59	.275	21.30	.222	20.35	.119	19.96	.246	20.97	.297	20.20	.977	(21.5	.461
349.93	20.69	.399	(21.5	.918	21.21	.930	20.63	.872	21.26	.576	20.63	.357	20.23	.502	30	.062	21.44	.953
353.94	-	-	-	-	19.59	.160	-	-	-	-	-	-	20.23	.668	.34	.212	-	-
357.87	(21.6	.862	20.35	.370	20.43	.382	21.65	.323	20.31	.247	21.26	.662	21.26	.631	.52	.358	(21.5	.360
377.85	(21.6	.026	20.75	.507	20.86	.521	21.65	.458	21.31	.921	.11	.422	20.97	.659	.78	.104	(21.65	.385
384.85	20.43	.434	21.52	.905	21.52	.920	20.72	.855	.26	.528	.48	.890	-	-	20.78	.366	20.68	.744
387.78	21.26	.605	21.44	.072	21.44	.086	21.16	.022	21.65	.775	21.44	.804	21.35	.070	19.80	.475	21.44	.893
405.78	.35	.654	.44	.097	-	-	20.89	.044	20.50	.297	20.90	.491	.21	.816	20.43	.147	20.82	.217
414.76	.17	.178	21.08	.608	20.97	.623	21.85	.554	20.97	.056	21.52	.832	21.44	.188	19.66	.482	(21.5	.278
444.66	21.56	.921	20.06	.310	19.94	.326	.52	.252	21.44	.583	-	-	19.59	.427	19.80	.598	20.78	.812
493.74	-	-	21.30	.103	20.86	.121	21.26	.039	21.48	.731	-	-	19.45	.461	20.57	.430	-	-
709.86	20.31	.380	20.63	.405	20.31	.431	21.44	.313	21.21	.998	21.52	.096	19.73	.418	18.52	.498	-	-
731.83	-	-	21.21	.656	-	-	.48	.855	.48	.855	-	-	20.97	.328	20.68	.318	(21.5	.544
762.81	20.52	.467	20.63	.419	20.43	.447	.70	.320	21.26	.473	21.39	.119	20.58	.612	19.52	.474	21.62	.133
770.78	-	-	(21.4	.901	-	-	20.52	.747	20.58	.424	21.08	.942	21.08	.942	.80	.772	-	-
771.85	(21.5	.991	21.48	.935	21.44	.963	21.21	.829	20.63	.240	21.03	.470	.44	.990	19.85	.812	(21.5	.593
772.97	-	-	20.97	.025	20.97	.025	20.87	.897	-	-	-	-	-	-	20.30	.853	-	-
800.70	21.30	.676	20.97	.576	21.21	.605	(21.5	.472	21.44	.676	-	-	.39	.568	21.65	.182	(21.6	.077
908.63	21.48	.987	21.44	.719	-	-	(21.5	.601	-	-	21.44	.686	20.43	.655	20.30	.917	(21.5	.614
25,063.95	-	-	20.75	.560	20.75	.598	-	-	21.30	.926	21.35	.616	21.44	.092	19.10	.715	(21.5	.583
065.91	21.44	.136	21.30	.671	21.17	.710	-	-	20.61	.092	.48	.690	.35	.173	.24	.788	(21.5	.683
083.87	20.69	.183	-	-	-	-	-	-	-	-	-	-	-	-	.94	.459	-	-
091.91	-	-	-	-	19.45	.191	21.17	.009	20.97	.289	.30	.682	-	-	19.38	.759	-	-
115.84	(21.5	.047	20.75	.514	20.97	.554	.65	.368	.63	.312	.44	.587	.30	.242	18.89	.652	-	-
116.81	21.52	.103	20.80	.569	21.30	.609	21.65	.423	20.97	.994	21.44	.632	21.21	.282	18.82	.688	(21.5	.295
124.79	.34	.568	(21.5	.023	21.17	.063	20.63	.878	21.21	.068	(21.5	.936	-	-	20.52	.986	21.52	.704
147.66	-	-	19.94	.325	20.35	.366	21.44	.175	.08	.001	(21.5	.810	20.43	.561	19.66	.840	-	-
.99	-	-	20.23	.343	.43	.385	.44	.194	21.21	.029	-	-	-	-	20.05	.852	-	-
149.83	-	-	.47	.450	20.69	.490	.32	.300	20.37	.185	21.44	.890	-	-	.32	.322	-	-
150.85	21.26	.098	20.87	.510	21.00	.545	21.48	.352	20.76	.270	21.52	.925	-	-	20.958	-	21.45	.032
266.62	-	-	20.63	.141	-	-	-	-	-	-	20.31	.351	-	-	20.63	.280	-	-
475.84	-	-	21.44	.005	21.35	.058	21.21	.813	-	-	20.58	.337	21.44	.162	20.43	.090	21.35	.713
27,684.80	21.44	.802	21.48	.739	21.52	.871	21.44	.260	21.21	.443	21.21	.663	20.97	.705	18.96	.546	21.92	.038
28,161.73	20.97	.604	21.48	.886	21.20	.123	21.52	.344	21.52	.753	21.52	.870	-	-	20.78	.349	(21.5	.505
780.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(21.65	.265
781.77	21.65	.748	-	-	20.43	.350	(21.5	.557	20.52	.160	21.30	.539	(21.5	.166	18.96	.494	-	-
782.77	(21.5	.807	21.35	.235	.69	.407	(21.5	.613	.36	.244	.30	.577	-	-	.52	.531	(21.65	.366
783.78	(21.5	.866	20.06	.293	.69	.465	(21.5	.671	.96	.330	.35	.614	-	-	.82	.569	-	-
784.76	(21.5	.923	.23	.348	20.97	.521	-	.86	.413	21.52	.653	21.30	.290	18.96	.606	(21.65	.468	
785.75	21.44	.980	.43	.405	21.17	.577	21.44	.783	20.97	.496	(21.5	.691	20.86	.331	-	-	(21.65	.570
786.75	21.44	.039	.43	.462	20.80	.634	20.97	.840	21.48	.581	21.65	.729	19.66	.372	-	-	-	-
788.73	20.69	.154	20.97	.574	-	-	20.65	.952	(21.5	.748	(21.5	.905	-	-	19.87	.754	-	-
29,550.82	-	-	(21.5	.953	20.43	.152	21.44	.231	-	-	(21.7	.895	21.52	.037	20.95	.201	20.86	.768
851.88	21.65	.129	21.56	.089	20.06	.300	21.65	.328	21.48	.607	20.86	.390	20.23	.513	20.05	.439	21.92	.214
30,590.89	20.23	.209	21.44	.153	20.35	.391	21.61	.397	20.97	.068	21.44	.600	21.44	.140	20.43	.035	(21.7	.126
615.80	21.30	.661	20.97	.571	21.52	.810	21.61	.711	.36	.174	21.26	.551	-	-	.34	.954	(21.7	.404
639.73	.65	.056	21.65	.933	19.59	.172	20.97	.070	.36	.197	20.78	.464	.44	.164	.00	.848	22.04	.631
640.71	.65	.113	(21.5	.989	19.74	.228	21.26	.126	20.63	.279	20.86	.502	21.44	.204	30	.885	21.65	.682
669.65	.44	.800	21.44	.636	21.52	.876	.35	.769	21.44	.725	-	-	19.80	.403	20.43	.965	21.92	.167
670.64	21.92	.858	21.44	.693	21.35	.933	21.30	.826	21.52	.809	21.52	.645	19.80	.444	20.16	.002	(21.9	.217
964.85	21.80	.009	20.75	.439	20.97	.690	21.80	.534	21.86	.676	21.92	.876	20.63	.637	20.43	.984	(22.3	.311
32,387.97	21.92	.968	20.80	.443	21.44	.745	21.92	.353	21.35	.960	20.35	.201	-	-	20.67	.106	(21.9	.320

VARIABLES IN THE ANDROMEDA GALAXY

Table C (continued)

Table with 12 columns for magnitude and phase (H 30 to H 41) and 10 columns for magnitude and phase (H 42 to V 446). Rows list various astronomical objects with their corresponding magnitude and phase values.

Table C (continued)

J. D. 2,400,000+	Mag. H 42	Phase	Mag. H 45	Phase	Mag. H 46	Phase	Mag. V 290	Phase	Mag. V 298	Phase	Mag. V 395	Phase	Mag. V 396	Phase	Mag. V 446	Phase
24,320.86	19.72	.814	20.82	.894	20.97		21.08		20.52	.804	-	-	20.63	-	-	-
349.93	.66	.981	21.17	.150	20.86		20.43		20.97	.921	21.26	.578	20.92			
353.94	.72	.003	-	-	-		.35		-	-	-	-	-			
357.87	.60	.026	20.80	.766	-		.43		21.12	.550	20.43	.318	21.17	20.63	.326	
377.85	.90	.139	(21.5	.316	21.17		20.80		21.17	.032	.69	.178	.44	21.07	.740	
384.85	.25	.178	20.97	.859	21.15		21.03		-	-	-	-	.26	20.63	.236	
387.78	19.39	.195	21.26	.086	20.75		20.86		20.43	.769	20.53	.102	21.17	.43	.443	
405.78	18.70	.296	.07	.483	-		21.08		.86	.104	-	-	-	-	-	
414.76	.55	.347	21.44	.180	20.86		20.48		.69	.770	21.17	.614	.52	20.35	.352	
444.66	18.60	.516	-	-	-		.97		20.58	.988	20.80	.397	20.97	-	-	
493.74	19.60	.793	(21.3	.308	21.08		20.31		21.12	.630	21.30	.967	21.21	-	-	
709.86	20.45	.018	21.26	.076	20.52		20.69		21.26	.663	21.17	.089	20.86	20.75	.237	
731.83	19.73	.141	20.69	.780	-		21.21		.18	.293	20.69	.134	20.43	21.35	.792	
762.81	18.50	.317	21.30	.184	20.58		20.63		.26	.591	21.44	.018	21.21	.35	.984	
770.78	.25	.362	20.69	.802	-		.43		.30	.183	-	-	.44	-	-	
771.85	.55	.367	21.15	.887	21.08		.55		.30	.263	-	-	21.37	21.00	.621	
772.97	.55	.374	-	-	-		.43		-	-	-	-	-	-	-	
800.70	18.55	.531	.26	.124	20.45		.97		.37	.402	-	-	20.35	20.85	.665	
908.63	19.80	.140	21.52	.498	21.24		20.35		21.52	.409	-	-	20.35	-	-	
25,063.95	20.18	.022	21.08	.548	21.12		21.26		20.86	.932	21.21	.054	20.63	20.43	.296	
065.91	20.23	.033	20.31	.701	.44		065.91		21.35	.078	20.23	.237	.58	.23	.434	
083.87	19.90	.135	-	-	-		20.52		-	-	-	-	20.43	-	-	
091.91	19.53	.180	-	-	-		.43		20.73	.006	-	-	21.21	-	-	
115.84	18.45	.317	-	-	.08		.69		-	-	-	-	.35	-	-	
116.81	.70	.321	19.94	.650	21.20		.52		20.43	.854	(21.3	.976	.26	-	-	
124.78	.25	.366	21.44	.269	20.65		20.86		21.39	.446	21.44	.718	21.26	.73	.601	
147.66	.60	.495	21.08	.043	-		21.08		-	-	-	-	20.97	.97	.220	
.99	.40	.497	-	-	-		20.97		.17	.167	-	-	20.97	-	-	
149.83	.50	.507	(21.5	.204	.63		21.14		-	-	-	-	21.13	.35	.366	
150.85	18.50	.513	21.44	.278	.75		20.83		21.43	.379	20.91	.144	20.97	20.43	.434	
266.62	19.25	.169	-	-	20.52		-		20.53	.968	-	-	21.21	-	-	
475.84	18.20	.353	21.26	.506	21.15		20.97		21.44	.490	20.80	.402	21.08	20.52	.445	
27,684.80	19.85	.856	20.75	.892	20.97		20.43		21.35	.368	21.21	.058	20.52	21.44	.773	
28,161.73	19.60	.555	-	-	21.26		20.43		20.52	.750	21.14	.461	21.44	20.63	.525	
780.80	-	-	21.17	.928	-		20.52		21.35	.678	21.08	.097	21.08	20.23	.337	
781.77	20.65	.065	.44	.003	21.15		.35		20.52	.750	-	-	.35	.23	.406	
782.77	.70	.071	21.52	.081	20.75		.43		-	-	20.52	.280	.44	.52	.477	
783.78	.60	.076	(21.5	.159	21.30		.27		.87	.899	20.98	.374	.17	20.63	.548	
784.76	.30	.082	21.44	.235	20.63		.35		-	-	-	-	.08	21.24	.617	
785.75	20.18	.088	.52	.312	21.05		.43		20.97	.045	21.21	.558	.26	.36	.687	
786.75	19.80	.093	.44	.590	20.85		20.52		21.17	.119	21.44	.651	.21	21.26	.758	
788.73	19.90	.104	21.21	.543	20.97		-		-	-	-	-	21.21	-	-	
29,550.82	18.75	.417	-	-	-		21.26		-	-	-	-	20.69	21.44	.831	
851.88	19.45	.122	21.26	.030	21.44		21.03		21.08	.139	21.65	.816	21.08	21.21	.137	
30,590.89	18.30	.304	(21.4	.367	21.35		21.30	.992	20.97	.965	21.35	.618	21.35	20.43	.437	
615.80	.75	.445	21.65	.900	.30		20.63	.358	20.43	.813	21.44	.938	20.43	20.85	.200	
639.73	.80	.581	.52	.156	.12		.63	.710	21.17	.588	20.53	.165	.52	21.56	.893	
640.71	18.80	.586	.65	.233	.35		20.72	.724	21.30	.661	20.39	.256	.86	.61	.963	
669.65	19.90	.750	21.30	.478	.35		21.08	.151	20.48	.808	21.65	.951	.97	-	-	
670.64	19.95	.756	20.92	.555	21.44		21.21	.166	20.58	.881	21.17	.042	20.80	21.55	.081	
964.85	18.50	.421	21.44	.382	21.26		20.52	.494	21.17	.708	21.21	.434	20.43	21.62	.902	
32,387.97	18.70	.476	20.87	.797	21.35		20.52	.437	21.44	.287	21.44	.928	21.17	20.89	.616	

Table D. 200-inch photographic observations and phases of eighteen eclipsing binaries in Field III.

J. D. 2,433,000+	Mag. V 205	Phase	Mag. V 206	Phase	Mag. V 212	Phase	Mag. V 217	Phase	Mag. V 245	Phase	Mag. V 255	Phase	Mag. V 276	Phase	Mag. V 301	Phase	Mag. V 303	Phase
474.96	22.42	.394	21.55	.354	21.39		21.63	.517	21.99	.812	21.32	.901	21.32	.897	21.23	.621	21.41	.241
475.96	-	-	.44	.589	.39		.66	.545	.21	.934	.18	.013	.28	.097	.21	.677	.26	.347
476.95	.65	.681	.32	.821	.35		.73	.573	.21	.054	.01	.123	.28	.295	.16	.733	.18	.452
477.95	.79	.825	.33	.055	.71		.47	.602	.16	.176	.16	.234	.18	.494	.06	.790	.30	.558
479.93	-	-	.73	.520	.81		.87	.658	.35	.417	.59	.455	.46	.890	.26	.900	.87	.767
480.96	.56	.258	.81	.761	.71		.57	.683	.11	.542	.18	.570	.26	.096	21.81	.958	.23	.876
481.96	-	-	.55	.995	.52		.81	.717	.21	.664	.06	.681	.23	.296	22.00	.014	.21	.981
482.92	.59	.540	.99	.221	21.57		.93	.744	.26	.781	.32	.788	.28	.487	21.99	.068	.18	.083
503.87	.62	.557	.50	.132	22.23		.71	.340	.11	.331	.06	.121	.26	.673	.28	.242	.42	.299
504.85	.52	.713	.59	.385	.36		.65	.370	.20	.462	.06	.242	.57	.889	.20	.302	.24	.413
505.90	.49	.850	.68	.698	22.23		.68	.398	.35	.578	.59	.347	.37	.079	.35	.356	.16	.514
506.87	22.65	.989	.73	.836	21.99		.93	.426	21.21	.696	.39	.455	.23	.272	.48	.410	.35	.617
507.87	23.17	.133	.66	.070	22.56		.90	.455	22.56	.818	.23	.567	.18	.472	21.96	.466	.39	.722
508.88	22.56	.279	.59	.307	-		.99	.484	21.30	.941	.06	.650	.30	.674	22.13	.523	.84	.829
509.89	.49	.424	.78	.544	.42		.81	.512	.21	.064	.32	.792	.59	.876	21.81	.579	.37	.936
510.89	.69	.568	.81	.778	.42		.96	.541	.21	.185	.32	.904	.23	.076	.26	.635	.13	.042
511.85	.56	.706	21.50	.003	.69		.84	.568	.30	.302	.37	.010	.30	.268	.18	.689	.21	.143
512.87	22.56	.853	22.05	.242	.56		21.78	.598	.21	.426	.01	.123	.37	.471	.21	.746	.44	.251
513.81	-	-	21.50	.463	-		22.16	.624	.11	.541	.08	.228	.13	.659	.18	.799	.39	.351
514.88	23.17	.143	21.66	.714	22.96		21.87	.653	21.38	.671	21.52	.347	21.71	.873	21.42	.859	21.37	.464

Table D (continued)

J. D. 2, 433, 000+	Mag. V 205	Phase V 205	Mag. V 206	Phase V 206	Mag. V 212	Phase V 212	Mag. V 217	Phase V 217	Mag. V 245	Phase V 245	Mag. V 255	Phase V 255	Mag. V 276	Phase V 276	Mag. V 301	Phase V 301	Mag. V 303	Phase V 303	
536.83	22.42	.303	21.44	.860	-	-	21.76	.278	21.34	.343	21.18	.792	21.23	.259	21.66	.089	22.49	.785	
537.80	-.56	.443	.73	.087	-	-	-.57	.306	.06	.461	.44	.900	.21	.452	.28	.144	21.35	.888	
538.80	-.90	.587	.78	.922	22.89	-.59	.59	.334	.06	.583	.11	.011	.26	.652	.23	.200	.21	.994	
539.80	-.42	-.556	-.42	-.556	-.42	-.45	-.45	-.363	21.30	.704	.01	.123	.74	.852	.08	.256	.21	.999	
540.86	-.56	.884	-.57	.805	-	-.43	-.43	.393	22.56	.833	.03	.241	.23	.064	.23	.315	.37	.211	
541.81	-.46	.027	-.46	.027	-.46	.81	.81	.420	21.21	.949	.26	.347	.23	.254	.21	.368	.30	.312	
564.80	-.62	.331	-.66	.417	22.23	.71	.71	.074	21.26	.747	.35	.907	.64	.847	.11	.657	.44	.744	
565.75	-.72	.468	-.59	.640	21.81	.76	.76	.101	22.16	.863	.48	.973	.21	.037	.32	.710	.71	.845	
566.74	-.52	-.872	-.52	.872	22.23	-.46	-.46	.130	21.26	.984	.26	.123	.42	.235	.08	.766	.21	.950	
567.75	-.40	.756	-.83	.109	22.05	.73	.73	.159	.26	.106	.18	.236	.18	.436	.28	.822	.26	.057	
569.74	-.56	.042	-.57	.575	21.93	.44	.44	.216	.26	.349	.39	.457	.71	.834	.76	.934	.44	.266	
570.85	-.69	.202	-.66	.836	21.81	.71	.71	.247	.30	.484	.23	.581	.30	.056	.90	.996	.39	.385	
571.83	-.56	.343	-.57	.065	22.23	.44	.44	.275	.11	.603	.08	.690	.23	.252	.99	.051	.30	.488	
572.84	-.52	.489	-.76	.302	.10	.63	.63	.304	21.35	.726	.30	.803	.42	.453	.39	.108	.39	.695	
573.88	-.65	.639	-.50	.546	22.36	21.66	21.66	.333	22.42	.853	.35	.919	.21	.661	.13	.166	.28	.705	
590.65	-.56	.054	-.61	.478	21.71	22.36	22.36	.810	21.61	.894	.30	.786	.18	.012	.90	.106	.32	.479	
591.70	-.69	.205	-.59	.724	.71	-.46	-.46	.840	.35	.022	.35	.608	.23	.221	.25	.165	.42	.590	
592.69	-.42	.347	-.63	.956	.61	-.43	-.43	.868	.31	.142	.26	.013	.16	.419	.11	.220	21.39	.695	
593.69	-.56	.491	-.73	.191	.57	.30	.30	.897	.26	.264	.28	.125	.28	.619	.23	.276	22.33	.800	
594.76	22.59	.645	21.68	.441	21.44	22.23	22.23	.927	21.21	.394	21.28	.244	21.71	.833	21.32	.336	21.37	.914	
831.94	-	-	21.39	.048	-	21.54	21.54	.677	21.11	.264	20.96	.661	21.37	.222	21.21	.630	-	-	
832.95	22.56	.945	21.96	.285	21.44	21.93	21.93	.706	.11	.387	21.18	.774	.30	.423	.11	.687	21.13	.110	
836.96	-.65	.522	22.05	.225	.93	22.26	22.26	.820	.99	.875	.08	.221	.26	.225	.52	.912	.32	.534	
863.92	-.56	.404	21.54	.546	.61	21.81	21.81	.587	.21	.156	.11	.223	.26	.611	21.81	.423	.26	.386	
864.89	-.52	.644	-.76	.773	.48	.52	.52	.615	.21	.274	.23	.332	.64	.805	22.16	.477	.23	.488	
865.88	-.56	-.700	-.61	.005	.61	.84	.84	.643	.21	.395	.30	.442	.37	.003	-	-	.26	.593	
.97	-.56	.700	21.55	.027	.44	.71	.71	.646	.30	.406	.28	.452	.30	.021	22.10	.538	.32	.603	
866.84	-.56	.825	22.13	.231	.76	21.61	21.61	.671	.21	.516	.18	.549	.30	.195	21.96	.586	21.30	.694	
867.91	22.42	.979	21.59	.481	.71	22.10	22.10	.701	.38	.022	.18	.408	.18	.408	.23	.165	22.87	.898	
868.91	23.17	.123	.69	.716	.35	21.78	21.78	.729	.31	.764	.26	.780	.32	.608	.16	.702	21.44	.913	
884.84	-.69	.857	.46	.950	.66	22.10	22.10	.758	.93	.885	21.37	.891	.74	.808	.26	.758	.16	.019	
.95	-.49	.867	-.57	.811	.61	21.83	21.83	.469	.30	.928	21.18	.675	.46	.803	.21	.160	.35	.663	
895.81	-.56	.997	-.44	.023	.71	.76	.76	.495	.21	.038	.28	.775	.26	.983	.11	.210	21.79	.759	
.99	22.56	.024	21.68	.067	.71	21.73	21.73	.500	.28	.062	.42	.787	.35	.021	.23	.221	22.45	.779	
896.78	23.17	.136	22.20	.250	.35	22.13	22.13	.522	.16	.156	.42	.883	.13	.177	.18	.264	21.42	.861	
897.81	22.56	.285	21.35	.491	.52	21.90	21.90	.551	.21	.281	.35	.998	.45	.382	.30	.322	.26	.970	
898.90	-.56	.442	-.66	.747	.65	22.02	22.02	.583	.26	.414	.06	.119	.32	.600	.37	.383	.21	.085	
899.91	-.59	.587	-.52	.984	.61	22.07	22.07	.611	.21	.537	.11	.232	.37	.802	.93	.440	.32	.192	
923.80	-.52	.027	.28	.585	.57	21.78	21.78	.291	.30	.445	.52	.893	.23	.575	.13	.779	21.18	.719	
924.82	-	-	.50	.824	.71	.52	.52	.320	.30	.569	.26	.007	.44	.779	.21	.836	22.05	.827	
927.90	-.71	-.546	-.66	.546	.30	-.59	-.59	.324	.26	.583	.21	.021	.59	.803	.39	.843	21.87	.859	
951.70	-.65	.045	.40	.126	.48	-.61	-.61	.085	22.56	.841	.42	.000	.18	.150	21.32	.343	.37	.670	
952.70	-.56	-.333	-.84	.595	.44	.78	.78	.114	22.11	.963	.13	.111	.40	.349	-	-	.93	.776	
953.70	-.56	.487	-.66	.846	.61	.52	.52	.142	.33	.084	.16	.223	.11	.549	22.05	.455	.35	.882	
954.77	-.65	.632	-.66	.846	.61	.52	.52	.173	.30	.215	.30	.342	.28	.763	22.10	.515	.30	.985	
955.78	-.65	.632	21.73	.083	.99	21.59	21.59	.201	.30	.337	.37	.455	.18	.965	21.71	.571	.32	.102	
977.69	-.42	.787	22.13	.219	.76	22.33	22.33	.825	.30	.004	.48	.895	.32	.342	.18	.800	.21	.420	
.75	-.43	.931	-.73	.454	.63	-	-	-	.21	.012	.34	.902	.34	.354	.18	.803	.27	.426	
978.69	-.43	.931	-.73	.454	.63	-.56	-.56	.853	.21	.126	.26	.007	.26	.542	.28	.855	.26	.526	
979.69	-.59	.075	-.52	.688	.44	.39	.39	.882	.40	.248	.08	.118	.18	.742	.30	.912	.37	.632	
980.64	-.42	.212	-.76	.911	.44	.33	.33	.909	.21	.363	.26	.224	.13	.932	.87	.965	.30	.732	
981.62	-.45	.353	-.55	.141	.44	.20	.20	.937	.21	.483	.32	.333	.16	.128	.96	.020	.93	.836	
.75	22.65	.372	21.73	.171	21.50	22.06	22.06	.940	21.21	.499	21.35	.348	21.23	.154	21.87	.027	21.48	.849	
V 308		V 312		V 323		V 381		V 385*		V 401		V 432		V 442		V 457*			
474.96	20.20	.025	21.93	.977	21.35	21.44	21.44	.628	19.38	.266	21.26	.731	21.76	.068	20.58	.562	20.38	.711	
475.96	-.07	.227	-	-	-	.46	.46	.833	.38	.275	.52	.853	-	-	.76	.667	20.32	.109	
476.96	-.12	.427	.87	.384	.06	.441	.59	.037	.38	.284	.13	.974	.87	.098	.73	.770	21.14	.503	
477.95	-.10	.629	.84	.588	.16	.494	.23	.242	.24	.293	.35	.095	.76	.112	.86	.874	20.61	.901	
479.93	-.20	.030	21.76	.992	21.01	.600	.32	.649	.24	.311	.78	.335	.76	.142	.86	.081	.41	.690	
480.96	-.15	.238	22.02	.202	20.96	.655	.78	.861	.10	.320	.16	.461	.76	.157	.91	.188	20.46	.100	
481.96	-.38	.441	21.76	.406	21.28	.708	.30	.067	.17	.329	.28	.582	.66	.172	.86	.292	21.16	.498	
482.92	-.04	.635	22.16	.602	.32	.759	.50	.264	.24	.338	.21	.699	.81	.187	.83	.393	20.58	.881	
503.87	-.10	.870	21.81	.880	.46	.876	.52	.570	.24	.527	.23	.245	.93	.500	.78	.579	.53	.252	
504.95	-.05	.089	.84	.100	.37	.934	.45	.792	.38	.536	.93	.377	.66	.515	.82	.691	20.56	.652	
505.90	-.10	.281	.81	.294	21.16	.985	.35	.988	.38	.545	.39	.492	.76	.530	.68	.790	21.06	.030	
506.87	20.56	.477	21.78	.493	20.96	.036	21.44	.187	.24	.554	.35	.610	.81	.545	.73	.887	20.63	.416	
507.87	19.87	.679	22.92	.697	.96	.089	22.23	.393	.31	.563	.35	.731	.61	.560	.81	.995	.38	.815	
508.88	20.17	.883	21.93	.903	20.96	.143	21.46	.600	.31	.572	.55	.854	.76	.575	20.81	.101	.34	.217	
509.89	-.10	.087	.78	.109	21.13	.197	.50	.808	.24	.581	.13	.977	.66	.590	21.01	.207	20.41	.619	
510.89	-.07	.290	.73	.313	.53	.250	.50	.013	.52	.590	.23	.098	.57	.605	20.73	.311	21.16	.017	
511.85	20.76	.484	21.96	.509	.44	.302	21.39	.211	.52	.599	.11	.215	.71	.620	20.86	.411	20.61	.399	
512.87	19.97	.690	22.05	.718	.52	.356	22.10	.420	.38	.608	.74	.339	.57	.635	21.44	.518	.56	.805	
513.81	20.04	.880	21.93	.910	.37	.406	21.46	.613	.52	.617	.13	.453	.66	.650	20.88	.616	.56	.180	
514.88	-.20	.096	21.78	.128	21.00	.463	.59	.833	.31	.626	.35	.583	.71	.663	.78	.728	.36	.606	
536.83	-.61	.534																	



Table D (continued)

J. D. 2,433,000+	Mag. V 308	PhaseV 308	Mag. V 312	PhaseV 312	Mag. V 323	PhaseV 323	Mag. V 381	PhaseV 381	Mag. V 388*	PhaseV 388*	Mag. V 401	PhaseV 401	Mag. V 432	PhaseV 432	Mag. V 442	PhaseV 442	Mag. V 457*	PhaseV 457*
590.65	20.07	.415	21.90	.599	21.13	.505	22.39	.408	19.10	.310	21.18	.793	21.87	.790	20.71	.635	20.15	.766
591.70	20.04	.627	.81	.813	.08	.561	21.52	.624	.17	.319	.37	.921	.87	.805	.71	.644	.41	.194
592.69	19.98	.827	.87	.015	.01	.614	.35	.827	.10	.328	.35	.041	21.93	.820	.73	.848	20.48	.588
593.69	20.04	.030	.90	.220	.08	.668	.26	.033	.17	.337	.35	.163	22.10	.835	.71	.952	21.24	.987
594.76	20.07	.246	21.84	.438	21.08	.724	21.44	.253	19.10	.346	21.18	.293	22.10	.850	20.58	.063	20.41	.413
831.94	19.94	.198	-	-	21.52	.376	21.57	.005	19.45	.479	21.30	.122	-	-	20.76	.813	20.48	.852
832.95	.98	.402	21.78	.072	21.30	.429	.32	.213	.52	.488	.23	.245	-	-	.68	.919	.48	.254
836.96	.87	.212	.73	.890	20.96	.643	.26	.032	.38	.524	.35	.732	21.76	.455	20.78	.337	.38	.831
863.92	.98	.663	.64	.395	21.07	.082	.39	.579	.24	.767	.23	.009	.87	.856	21.30	.150	20.46	.586
864.89	19.94	.859	.99	.583	20.96	.133	.52	.778	.03	.776	.32	.127	.87	.871	20.76	.251	21.26	.972
865.88	-	-	.81	.795	21.16	.186	.35	.982	.10	.785	.39	.248	-	-	.66	.355	20.63	.366
.97	20.07	.075	.84	.813	.21	.191	.39	.000	-	-	.13	.259	.82	.886	.61	.364	.81	.402
866.84	.04	.253	.84	.991	.33	.237	21.32	.179	.17	.794	.96	.364	.66	.901	.81	.454	.29	.748
867.91	20.46	.470	.79	.210	.55	.294	22.49	.399	.38	.803	.16	.494	.76	.916	.71	.566	.48	.174
868.91	19.80	.672	21.84	.414	.39	.347	21.44	.604	.24	.812	.18	.616	21.61	.931	.86	.670	20.36	.572
869.91	20.22	.874	22.10	.618	.55	.401	.48	.810	19.24	.821	.11	.737	-	-	.61	.774	21.09	.971
894.94	.20	.914	22.16	.709	.35	.731	.71	.934	20.17	.046	.32	.768	22.23	.317	20.78	.376	20.66	.898
.95	.15	.928	21.99	.723	.08	.735	.61	.949	.22	.046	.23	.776	.36	.318	.71	.383	.76	.926
895.81	.04	.110	.81	.906	.48	.783	.50	.134	.22	.055	.39	.886	.36	.332	21.03	.477	.34	.284
.99	.04	.149	.87	.945	.55	.793	.44	.173	-	-	.23	.910	.42	.333	21.57	.498	.30	.360
896.78	.01	.306	.87	.104	.57	.834	.44	.333	.07	.064	.28	.003	.42	.347	20.66	.578	.34	.671
897.81	.50	.515	.81	.315	.48	.889	.37	.545	20.07	.073	.30	.129	.30	.362	21.78	.685	.51	.081
898.90	.04	.735	.81	.537	.21	.847	.57	.769	19.94	.082	21.23	.261	.36	.377	.86	.799	.96	.515
899.91	.10	.839	21.96	.744	.18	.001	.46	.976	.73	.091	22.05	.384	22.42	.392	.86	.904	20.56	.917
923.80	.04	.769	22.49	.621	.55	.276	.61	.887	.10	.307	21.32	.288	21.87	.749	20.63	.398	21.06	.429
924.82	.17	.975	21.84	.830	.44	.330	.41	.097	.31	.316	.39	.412	.84	.764	21.50	.503	20.41	.835
.94	.15	.000	.76	.854	.37	.336	.30	.121	-	-	.30	.426	-	-	21.33	.517	.45	.883
927.90	.35	.598	.76	.459	.16	.494	.50	.730	.38	.343	.39	.786	.87	.809	20.65	.826	.73	.062
951.70	.17	.410	.84	.318	.30	.763	.37	.622	.38	.559	.39	.679	.87	.161	.61	.310	20.66	.538
952.70	.04	.612	.87	.522	.44	.816	.39	.827	.59	.568	.26	.800	.81	.176	20.71	.414	21.04	.938
953.70	.10	.814	.81	.726	.71	.870	.50	.033	.45	.577	.16	.922	.87	.191	21.26	.518	20.48	.335
954.77	.27	.031	.78	.945	.44	.927	.39	.253	.45	.586	.16	.052	.81	.206	20.76	.630	.30	.760
955.78	.04	.235	21.78	.151	.32	.981	.63	.460	.24	.595	.39	.175	.93	.222	.78	.736	.32	.173
977.69	.12	.664	22.20	.625	.18	.149	.50	.964	.20	.793	.28	.838	.81	.748	.81	.022	.53	.887
.75	.12	.677	22.42	.637	.06	.153	.45	.876	-	-	.42	.845	.81	.749	.76	.028	.83	.910
978.69	.07	.867	21.78	.829	.06	.203	.37	.170	.31	.802	.23	.960	.81	.763	.83	.126	.30	.285
979.69	20.20	.069	.81	.033	.18	.256	.90	.375	.10	.811	.23	.081	.76	.778	.71	.231	.30	.683
980.64	19.87	.261	.84	.227	.39	.307	.41	.570	.10	.820	.36	.197	.81	.793	.73	.330	20.38	.061
981.62	20.37	.459	.87	.427	.48	.359	.41	.772	19.10	.829	.40	.316	.76	.808	.78	.432	21.06	.451
.75	20.54	.485	21.84	.454	21.37	.366	21.39	.799	-	-	21.74	.332	21.81	.809	20.81	.445	21.21	.503

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