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OPTICAL OBSERVATIONS OF 22 VIOLENTLY VARIABLE EXTRAGALACTIC SOURCES:1968–1986

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ABSTRACT

Broadband photographic observations of 22 optically violent variable (OVV) active galactic nuclei are presented. Over 3100 observations made between 1968 and 1986 at Rosemary Hill Observatory are tabulated and displayed graphically. The majority of the observations were made in either the Johnson *B* system or the international photographic (PG) system. Multicolor data are presented for a few objects. Descriptions of the light curves include the assignment of each OVV to an arbitrary variability subclass. The light curves, some extending over 18 yr, are analyzed for linear trends and underlying structure using linear regression and unequal-interval Fourier transform techniques. The results of the analysis for each of the 22 objects are given and models of the light variations of 3C 120, 3C 345, and 3C 446 are presented. The models of these light curves show underlying structure with rapid variations superimposed. The timescales seen in the light curves of 3C 120, 3C 345, and 3C 446 are compared with characteristic timescales found in massive-accretion-disk models. The timescales most likely to be responsible for the optical behavior are either the viscous or the thermal timescales.

I. INTRODUCTION

Variability continues to be a major stumbling block in understanding the nature of quasars and other AGNs. Radio emission and the broad, redshifted emission lines were the first indications that these objects were different from any previously known objects. It was optical variability that set severe size limitations on the emission regions and revealed the true ultracompact nature of quasars. Optical variability, with its diverse morphological characteristics and seemingly stochastic nature, is still a problem with which no current model can adequately deal. It is critical to investigate the optical-variability problem; long-term monitoring is a necessary part of this investigation.

The monitoring program carried out at the University of Florida's Rosemary Hill Observatory (RHO) has been in continuous operation since 1968. Photographic observations are made of over 200 quasars, BL Lacertids, and active galaxies. Previous summaries of the data were published by McGimsey *et al.* (1975), Scott *et al.* (1976), Pollock *et al.* (1979), and Pica *et al.* (1980a), hereafter referred to as papers I–IV, respectively.

Two objects, 1156 + 295 and 0215 + 01, have been added to the OVV list in Paper III because of recent attention given them in the literature. Some data reported here have been rereduced since Paper III in light of new comparison sequences (0235 + 164) and improved reduction methods (3C 120). While most of the pre-1979 data remained unchanged, some individual observations were rereduced, and observations made within a 1 hr period were averaged (Paper III lists each exposure separately). This averaging not only makes the tables more tractable, but also yields less cluttered light curves.

II. DATA REDUCTION

Data acquisition and reduction procedures were reported in detail in Paper III, so here we give only a brief summary. Most exposures were made at the *f*/4 Newtonian focus of the 76 cm reflector, but at times a few of the brighter OVVs were photographed at the *f*/10.5 Cassegrain focus of the 46 cm reflector. Tests revealed no significant differences between results from the two instruments. Photographic emulsions used in the monitoring program are all hypersensitized, and they are exposed in an atmosphere of dry nitrogen to avoid sensitivity changes due to the humid Florida air. The filter/plate combinations for each color system, as well as the hypersensitization techniques for each emulsion, are listed in Table I. Column 1 designates the color systems, in which the *U*, *B*, and *V* systems are equivalent to the standard Johnson *UBV* system. The PG system is the international photographic system, and *I* is on the Kron system. Columns 2 and 3 indicate the filters and emulsions used to obtain each of the color systems, and column 4 lists the hypersensitization technique for each emulsion. Column 5 gives the references to the hypersensitization techniques of column 4. All exposures were developed at 20° C using either MWP-2 (Difley 1968) or Kodak D-19 developers.

The plates were reduced using a Cuffey Variable-Iris Astrophotometer for image measurement and a Commodore PET 2001 microcomputer for magnitude determination. The reduction programs fit a parabolic curve to the comparison-star iris readings and magnitudes. The error quoted in this paper is the rms scatter of the comparison stars around the calibration curve, which we use as a measure of plate quality (Penston and Cannon 1970). Internal comparison of observations of the same object made in rapid succession suggests that the rms is a conservative estimate of the error; i.e., it tends to overestimate the error in the QSO magnitude. This formal error does not include systematic zero-point errors due to errors in the calibration sequence; however, our experience in combining our data with photoelectric observations indicates that significant zero-point errors are rare.

In two cases, 3C 120 and 3C 371, a fixed iris was used to measure the image to minimize effects of the nebulosity surrounding the nuclei. In such cases, the exposure is also reduced to an empirically determined minimum to suppress nebulosity. Comparison sequences for the 22 fields were obtained either through the literature (photoelectric determination of at least eight stars within 0.3° of the object) when available, or by photographic transfer from a nearby calibrated region. A more detailed account of the calibration procedures is given in Paper III.

All data in this paper have been reviewed, and some earlier data have been rereduced since Paper III. We decided to

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TABLE I. Filter/plate combinations.

COLOR	FILTER	EMULSION	TREATMENT	REFERENCE
PG	NO FILTER	KODAK 103A-O	NITROGEN BAKED HYDROGEN SOAKED	SCOTT AND SMITH, 1976.
PG	NO FILTER	KODAK IIIA-J	FORMING GAS	SCOTT ET AL., 1977.
U	UG-2	103A-O	NITROGEN BAKED HYDROGEN SOAKED	SCOTT AND SMITH, 1976.
B	GG-385	103A-O	NITROGEN BAKED HYDROGEN SOAKED	SCOTT AND SMITH, 1976.
V	GG-495	IIA-D	NITROGEN BAKED	SCHOENING, 1977.
V	GG-495	103A-D	HYDROGEN SOAKED	
I	I-N	RG-695	FORMING GAS BAKED	SCOTT ET AL., 1977.

republish the pre-1979 data here with the additional 7 yr of data for completeness and to make the data more accessible, along with overall light curves. In some instances, as many as 12 exposures were made within 1 hr. Instead of republishing each exposure separately, we averaged all exposures made within a 1 hr period to reduce the volume of data in the tables and minimize clutter in the light curves. The averaging formula weights each exposure by the inverse square of its rms error and calculates the mean magnitude and the combined rms error.

Averaging resulted in a very few cases in reducing the rms errors below 0.01 mag. Since OVVs have been observed to fluctuate 0.01 mag within 1 hr periods (Angione 1971; Kinman 1978; Racine 1970; and Wills *et al.* 1983), we rounded errors smaller than 0.01 up to 0.01. Only three sets of observations of BL Lac were actually affected by this convention.

Errors induced by airmass effects and/or plate inhomogeneities were discussed extensively in earlier publications of the Florida group. Some of this work is reviewed in Pica *et al.* (1987). In that work, each of the 12 to 15 comparison stars in six QSO fields was treated as an unknown; in no case did either the light curve or the chi-square analysis suggest variability of a comparison star, in contrast to the results obtained for the QSOs. Much earlier, Hackney (1972) made both theoretical and experimental studies of the airmass problem. His results indicated that any airmass errors would be hidden in the normal scatter of the photographic data unless observations were made at improbably large zenith distances.

III. OBSERVATIONS

The 22 OVVs are listed in Table II, along with their 1950 coordinates and monitoring information. Columns 1 through 3 list the common name and the right ascension and declination. Column 4 gives the total number of observations for each object, while column 5 indicates the dates between which these observations were made. Column 6 describes the appearance of the light curves in terms of variability subclasses, and column 7 indicates the color system(s) in which each OVV was observed. Column 8 lists the average rms error for each object.

Variability subclasses (Dent *et al.* 1974) are chosen on the basis of the appearance of the optical light curves (see Paper I). An object is assigned to subclass I if its light curve shows rapid flickering without significant long-term trends. Conversely, subclass II shows slow, long-term changes of larger amplitude than any short-term variations. Subclass III is characterized by comparable amplitudes of short- and long-term variations. Finally, subclass IV is defined as episodic, usually showing large-amplitude outbursts with long intervening inactive periods. Only two subclass changes from Paper III were necessary when the objects were reclassified using the additional 7 yr of data. These subclass assignments are presently subjective, and no connection between the subclasses and the underlying physics is known.

The observations are presented in Table III. The first column gives the universal date of the observation, while column 2 lists the Julian date (JD − 2,400,000). Column 3 reports the magnitude (the color system is indicated in the heading of each section), column 4 gives the rms error, and column 5 indicates the number of exposures averaged. If no entry is made in column 5, the magnitude and rms represent a single exposure. The observations are also presented graphically in Fig. 1. The light curves are arranged in order of right ascension, except for those of OJ 287 and BL Lac, which were placed out of order to conserve space. The apparent magnitude is plotted versus date for each object. Where a substantial amount of U, V, or I data are available, it is also plotted for direct comparison. The error bar in the upper left-hand corner of each plot represents an error of ± 0.1 mag.

In the remainder of this section each OVV will be discussed individually, concentrating on its activity since 1979. The reader is referred to Paper III for references to comparison sequences, finder charts, and pre-1979 discussions. The references for objects not included in Paper III are discussed below. Comparison sequences calibrated at RHO are available by request from the authors.

0215+01. The BL Lac object 0215 + 01 was identified by Bolton and Wall (1970), and shown to have no emission lines in its spectrum by Wills and Lynds (1978). We added this OVV to our program in 1981 and detected optical variability over a 3.5 mag range. The comparison field calibration was done by transfer from Selected Area 94 on 24 November 1981. Blades *et al.* (1982) mention that this object had a range of 4 mag. Our brightest measured B magnitude was 14.5 on 20 October 1984, while the faintest was 18.0 on 11 August 1983. In late 1985, 0215 + 01 was again very faint, but by the end of 1986 it was once more brightening.

TABLE II. Source monitoring data.

SOURCE NAME	RIGHT ASCENSION (HMS)	DECLINATION (DMS)	# OBS.	MONITORING PERIOD	SUBCLASS	COLOR SYSTEM	AVERAGE RMS
0215+01	02 15 13.5	+01 30 54	48	9/25/81-11/4/85	III	B	0.15
0235+16	02 35 52.6	+16 24 05	121	12/29/75-2/1/86	I	B	0.17
OE 110	03 06 20.7	+10 17 56	62	1/2/75-1/20/85	III	B	0.13
0420-01	04 20 43.1	-01 27 32	126	12/4/69-1/31/86	III*	PG	0.22
3C 120	04 30 31.6	+05 14 53	127	10/16/71-2/3/86	II	B	0.11
NRAO 190	04 40 04.7	-00 23 16	84	12/8/69-3/7/86	III	PG	0.16
0735+17	07 35 14.3	+17 49 12	153	4/19/74-3/31/86	III	B,U,V,I	0.13
OJ 287	08 51 57.5	+20 18 00	279	12/15/71-4/1/86	II	B,U,V,I	0.12
0906+01	09 06 35.7	01 33 53	195	3/20/69-3/31/86	I	B	0.10
1156+295	11 56 58.1	+29 31 24	145	5/9/80-4/12/86	I	B	0.15
ON 231	12 19 01.0	+28 30 36	117	2/22/72-4/3/86	I	B	0.16
1308+32	13 08 08.2	+32 36 54	105	4/22/76-2/13/86	III	B	0.18
1514-24	15 14 45.0	-24 11-20	101	2/20/72-4/14/86	I	B	0.16
NRAO 512	16 38 49.0	+39 53 00	196	5/7/70-4/10/86	III	PG	0.15
3C 345	16 41 17.7	+39 54 11	212	6/22/71-4/12/86	IV	B,U,V	0.12
NRAO 530	17 30 13.4	-13 02 46	50	7/11/72-8/10/85	IV*	PG	0.16
3C 371	18 07 18.3	+69 48 56	150	12/16/68-11/6/85	III	PG	0.12
OX 074	21 44 43.2	+09 15 43	121	5/13/70-11/11/85	III	PG	0.15
BL LAC	22 00 39.0	+42 02 08	306	6/24/71-1/15/85	I	B,U,V,I	0.08
3C 446	22 23 10.5	-05 12 23	154	9/15/71-11/14/85	III	B	0.14
3C 454.3	22 51 29.2	+15 52 54	116	8/20/71-12/13/85	I	B	0.12
2345-16	23 45 27.2	-16 48 11	175	10/10/69-12/3/85	IV	PG	0.13

* INDICATES SUBCLASS CHANGE FROM PAPER I.

AO 0235+164. This is another BL Lac type OVV. A 5 mag outburst (Pica *et al.* 1980b) in 1979 displayed morphology similar to an outburst that occurred in 1975. Further monitoring revealed rapid variations of about 3 mag, but no major flare was seen in 1983 to indicate that the 1975 and 1979 flares were part of a periodic phenomenon. Observations during 1985–1986 failed to image the object on a number of occasions, even though the plates showed stellar images down to magnitude 19.4. Late 1986 and early 1987 observations showed a dramatic 3.2 mag flare, details of which will be published in a subsequent paper.

All pre-1981 data were rereduced for this paper, using an extended comparison sequence that incorporated new comparison stars fainter than 18th magnitude to avoid extrapolation of the faint end of the calibration curve.

OE 110. The paucity of data since 1978 is primarily due to its faintness since that date. Twenty-nine exposures were made between 1978 and 1986, most with plate limits below 19th magnitude. Only nine of these imaged the object. These limited data prevent any comparison of recent variability with pre-1979 activity. Regression analysis shows a linear trend toward a decreasing mean of 0.12 mag per year although the determination is influenced by the patchy sampling after 1980.

PKS 0420−01. This quasar is very active, exhibiting 2 mag outbursts on a timescale of a few years. The activity during 1977 and 1978 seems to be duplicated during the 1982–1983 observing period. The bright point on 20 November 1979 seems to be a real flare, representing an increase of 1.3 mag in five days, followed by a 1.7 mag decrease in 23 days. This observation is based on only one point, but the plate was carefully examined for defects, with negative results.

3C 120. This Seyfert galaxy has been observed regularly at RHO since 1971. The nebulosity around 3C 120 due to the underlying galaxy is visible on plates even with 3 min exposures. To keep the galaxian contribution to the final magnitude constant, all iris measurements since 1981 have been made with a fixed 6 arcsec aperture, which is always large enough to encompass the Airy disk of the nuclear component. All of the pre-1981 data reported here were rereduced using the fixed-iris method. Comparison of the data reduced with both methods revealed differences of nearly 0.4 mag in some cases, but the average difference for 92 observations was only 0.1 mag. The sense of the difference was that the fixed-iris method consistently produced fainter magnitudes than the variable-iris technique.

The long decline in average brightness noted in Paper III between 1971 and 1979 reversed in late 1979, and 3C 120 gradually brightened until mid-1983, subsequent to which another decline appears to have set in. No major flare activity was seen at RHO, although the slow, long-timescale variability seems to have rapid 0.5 mag variations or "flickering" on timescales of weeks.

NRAO 190. This OVV shows increasing variability as we gather more data, and its range now exceeds 4 mag. It has

TABLE III. OVV observations.

0215+01 B

U.T. DATE	J.D.	MAG.	RMS.	#
9/25/81	44872.705	15.27	0.07	5
9/26/81	44873.726	15.19	0.14	
10/ 1/81	44878.738	15.49	0.07	2
10/ 1/81	44878.789	15.42	0.09	2
10/ 4/81	44881.735	15.35	0.12	
10/21/81	44898.721	15.93	0.11	
11/23/81	44931.697	15.69	0.09	
12/17/81	44955.613	16.06	0.24	
12/18/81	44956.544	16.12	0.18	
1/18/82	44987.553	15.61	0.22	
2/15/82	45015.562	15.21	0.13	
9/14/82	45226.710	15.57	0.13	
10/10/82	45252.638	16.05	0.14	
10/26/82	45268.804	16.34	0.23	
11/24/82	45297.724	16.32	0.17	
12/22/82	45325.710	16.30	0.21	
8/11/83	45557.863	17.97	0.14	
10/ 4/83	45611.769	17.06	0.10	
10/29/83	45636.683	16.19	0.13	
11/ 2/83	45640.690	16.11	0.16	
11/26/83	45664.687	15.78	0.11	2
11/30/83	45668.622	16.00	0.12	2
12/ 1/83	45669.609	16.07	0.12	2
12/ 6/83	45674.592	16.10	0.12	2
12/ 8/83	45676.654	16.06	0.10	2
12/31/83	45699.615	15.78	0.14	
1/ 3/84	45702.580	15.88	0.18	
1/ 5/84	45704.546	16.00	0.24	
9/28/84	45971.833	15.22	0.19	2
10/ 3/84	45976.901	14.80	0.13	
10/17/84	45990.615	14.66	0.06	2
10/19/84	45992.639	14.97	0.21	2
10/20/84	45993.732	14.54	0.11	3
10/23/84	45996.740	14.70	0.14	2
10/25/84	45998.809	14.69	0.15	2
10/26/84	45999.708	14.55	0.14	2
11/ 1/84	46005.786	14.69	0.11	3
11/16/84	46020.638	15.26	0.18	2
11/19/84	46023.629	15.36	0.19	
11/24/84	46028.644	15.28	0.08	2
11/27/84	46031.701	15.04	0.30	
1/22/85	46087.547	16.34	0.15	
7/24/85	46270.840	16.51	0.22	
8/25/85	46302.828	16.41	0.29	
10/ 8/85	46346.638	17.55	0.18	
10/14/85	46352.670	17.74	0.27	
10/20/85	46358.717	17.80	0.22	
11/ 4/85	46373.803	17.66	0.15	

0235+164 B

U.T. DATE	J.D.	MAG.	RMS.	#
12/29/75	42775.667	17.73	0.21	
2/ 9/77	43183.557	19.21	0.12	
9/21/77	43407.798	18.13	0.27	
10/14/77	43430.712	17.87	0.18	
10/19/77	43435.764	18.12	0.33	
11/ 8/77	43455.658	17.93	0.13	
12/ 8/77	43485.697	17.74	0.11	
1/ 4/78	43512.622	18.53	0.09	
1/30/78	43538.554	18.42	0.14	
2/28/78	43567.549	18.21	0.20	
8/31/78	43751.853	18.94	0.13	
9/27/78	43778.702	18.40	0.19	
10/ 3/78	43784.699	17.54	0.14	
10/ 5/78	43786.787	17.76	0.18	
10/ 9/78	43790.833	17.18	0.12	
10/23/78	43804.658	17.88	0.15	
10/24/78	43805.682	18.45	0.24	
11/ 1/78	43813.726	18.43	0.18	
11/ 1/78	43813.696	18.25	0.11	
11/ 6/78	43818.733	18.19	0.15	
11/26/78	43838.638	17.44	0.11	
12/ 2/78	43844.660	17.49	0.09	
12/20/78	43862.576	18.45	0.13	
12/31/78	43873.598	18.44	0.15	
1/19/79	43892.551	16.79	0.11	
1/24/79	43897.528	16.93	0.10	
1/28/79	43901.526	15.59	0.10	
2/ 1/79	43905.613	15.46	0.10	
2/ 1/79	43905.651	15.45	0.09	
2/ 2/79	43906.610	15.54	0.08	2
2/ 3/79	43907.558	15.09	0.18	2
2/ 9/79	43913.570	16.19	0.26	
2/13/79	43917.541	17.78	0.13	
2/14/79	43918.524	17.88	0.17	
2/16/79	43920.549	17.44	0.10	
2/17/79	43921.533	17.23	0.25	
2/21/79	43925.575	16.82	0.11	
2/23/79	43927.568	17.25	0.23	
2/29/79	43933.568	17.15	0.15	
3/16/79	43948.545	17.70	0.25	
7/22/79	44076.869	18.99	0.15	
7/27/79	44081.858	18.86	0.23	
8/20/79	44105.809	18.65	0.22	
9/20/79	44136.843	19.28	0.15	
9/29/79	44145.803	19.24	0.20	
9/30/79	44146.791	18.88	0.18	
10/18/79	44164.721	18.95	0.26	
10/19/79	44165.709	18.64	0.20	
10/22/79	44168.685	18.46	0.19	
11/15/79	44192.698	17.19	0.11	
11/15/79	44192.859	17.55	0.13	
11/16/79	44193.716	18.15	0.14	
11/17/79	44194.754	18.70	0.11	
11/19/79	44196.661	19.43	0.17	
1/ 8/80	44246.566	18.36	0.16	
2/ 5/80	44274.536	19.90	0.15	
2/ 6/80	44275.524	19.64	0.21	
2/19/80	44288.620	18.92	0.07	
3/ 7/80	44305.547	19.15	0.20	
7/22/80	44442.870	17.81	0.14	
9/ 5/80	44487.779	18.40	0.20	
10/ 7/80	44519.767	17.86	0.21	
10/11/80	44523.774	17.31	0.25	
10/13/80	44525.680	17.97	0.10	
10/14/80	44526.748	17.65	0.23	
10/18/80	44530.754	18.33	0.12	
11/ 6/80	44549.810	18.12	0.16	
11/13/80	44556.778	17.07	0.16	
11/29/80	44572.670	17.86	0.13	
12/ 2/80	44575.711	17.62	0.18	
12/ 8/80	44581.654	18.07	0.19	
1/ 3/81	44607.626	18.98	0.13	
1/25/81	44629.580	19.54	0.20	
7/ 6/81	44791.863	18.31	0.15	
8/ 7/81	44823.842	17.88	0.17	
9/ 1/81	44848.828	18.32	0.21	
9/ 8/81	44855.854	17.46	0.16	
9/21/81	44868.703	16.69	0.19	
9/24/81	44871.742	17.41	0.16	
9/25/81	44872.720	17.46	0.20	

0235+164 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
10/ 1/81	44878.842	17.49	0.21	
10/ 4/81	44881.744	17.65	0.13	
10/21/81	44898.733	18.11	0.16	
11/19/81	44927.626	17.07	0.19	
11/21/81	44929.633	17.63	0.12	
11/22/81	44930.663	17.40	0.13	
12/17/81	44955.627	17.55	0.16	
12/22/81	44960.553	18.45	0.18	
1/18/82	44987.569	17.35	0.17	
1/26/82	44995.629	17.68	0.13	
2/15/82	45015.572	17.12	0.17	
2/21/82	45021.597	17.35	0.24	
10/12/82	45254.710	18.65	0.20	
10/25/82	45267.736	19.23	0.22	
11/10/82	45283.767	18.72	0.18	
12/18/82	45321.588	18.44	0.14	2
12/19/82	45322.584	19.92	0.11	
12/22/82	45325.740	17.67	0.11	
9/ 6/83	45583.817	18.39	0.10	
10/ 4/83	45611.776	17.62	0.08	
10/ 6/83	45613.765	17.95	0.13	
10/29/83	45636.690	18.21	0.17	
11/ 2/83	45640.716	18.01	0.17	
11/ 3/83	45641.669	17.56	0.16	
11/25/83	45663.614	18.00	0.21	
11/30/83	45668.641	18.59	0.13	
12/ 7/83	45675.640	18.63	0.11	2
12/ 8/83	45676.667	18.30	0.07	2
12/ 9/83	45677.678	18.48	0.07	
12/31/83	45699.648	18.36	0.16	
1/ 3/84	45702.595	18.62	0.15	
1/ 5/84	45704.557	18.45	0.11	
9/27/84	45970.848	19.36	0.18	
10/25/84	45998.819	18.77	0.10	
10/26/84	45999.719	18.93	0.18	
11/16/84	46020.658	19.72	0.28	
10/16/85	46354.766	19.40	0.19	
11/16/85	46385.661	19.30	0.18	
1/12/86	46442.653	19.38	0.24	
1/31/86	46461.545	19.35	0.09	
2/ 1/86	46462.524	19.23	0.17	

OE 110 P

U.T. DATE	J.D.	MAG.	RMS.	#
1/ 2/75	42414.580	18.99	0.08	
2/ 3/75	42446.563	18.64	0.07	
2/ 9/75	42452.549	18.59	0.14	
3/ 2/75	42473.557	18.76	0.16	
3/ 3/75	42474.542	18.75	0.08	
3/ 7/75	42478.547	19.48	0.23	
3/ 9/75	42480.541	19.00	0.11	
3/10/75	42481.557	18.98	0.07	
8/ 6/75	42630.882	18.73	0.15	
9/ 3/75	42658.799	17.87	0.10	
9/ 4/75	42659.875	17.85	0.12	
9/13/75	42668.876	18.66	0.16	
10/ 2/75	42687.775	17.87	0.13	
10/11/75	42696.842	17.53	0.14	
10/13/75	42698.838	17.79	0.12	
10/14/75	42699.886	17.89	0.09	
11/ 1/75	42717.750	18.14	0.14	
11/29/75	42745.779	17.13	0.08	
12/ 5/75	42751.519	17.25	0.35	
1/ 3/76	42780.607	18.08	0.11	
1/ 5/76	42782.628	18.31	0.10	
10/19/76	43070.760	18.02	0.17	
10/22/76	43073.767	18.41	0.13	
11/22/76	43104.697	17.46	0.17	
1/20/77	43163.631	19.38	0.17	
2/11/77	43185.566	19.03	0.17	
8/12/77	43367.865	19.25	0.16	
10/17/77	43433.794	19.22	0.10	
11/ 6/77	43453.733	19.51	0.14	
11/14/77	43461.755	19.13	0.14	
12/12/77	43489.667	19.14	0.08	

OE 110 B

U.T. DATE	J.D.	MAG.	RMS.	#
10/15/75	42700.880	18.57	0.25	
11/ 2/75	42718.678	18.70	0.11	
11/30/75	42746.736	17.38	0.17	
12/ 5/75	42751.545	17.75	0.16	
12/ 7/75	42753.763	18.32	0.06	
12/12/75	42758.785	18.47	0.10	
12/24/75	42770.565	18.67	0.08	
12/29/75	42775.628	18.53	0.09	
1/ 1/76	42778.607	18.56	0.10	
1/ 2/76	42779.699	18.55	0.08	
1/ 3/76	42780.631	18.43	0.18	
1/ 5/76	42782.603	18.50	0.18	
1/ 9/76	42786.755	18.25	0.07	
1/23/76	42800.652	18.25	0.13	
1/25/76	42802.597	18.29	0.09	
1/30/76	42808.631	19.01	0.10	
2/ 3/76	42811.652	19.28	0.05	
2/23/76	42831.535	18.86	0.09	
2/29/76	42838.538	18.83	0.14	
8/ 1/76	42991.881	18.59	0.11	
11/25/76	43107.706	18.59	0.20	
11/25/76	43107.713	18.25	0.08	
1/ 8/80	44246.603	19.03	0.21	
2/ 6/80	44275.535	19.68	0.05	
9/13/80	44495.861	18.71	0.12	
12/ 6/80	44579.642	18.81	0.11	
1/ 3/81	44607.618	19.63	0.11	
1/ 5/84	45704.592	18.98	0.21	
10/23/84	45996.768	18.71	0.31	
10/26/84	45999.757	18.92	0.11	
1/20/85	46085.611	19.30	0.13	

0420-01 P

U.T. DATE	J.D.	MAG.	RMS.	#
12/ 4/69	40559.604	19.41	0.21	
1/29/70	40615.597	18.74	0.08	
2/ 8/70	40625.588	19.25	0.15	
2/10/70	40627.639	19.21	0.15	
9/29/70	40858.840	18.49	0.10	
10/ 2/70	40861.845	19.11	0.23	
10/ 5/70	40864.847	18.83	0.18	
10/11/70	40870.825	19.04	0.12	
11/ 2/70	40892.826	18.69	0.15	

0420-01 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
11/ 6/70	40896.781	18.64	0.13	
11/26/70	40916.667	18.83	0.19	
11/30/70	40920.722	18.59	0.13	
12/21/70	40941.654	18.73	0.16	
12/29/70	40949.639	18.62	0.10	
1/20/71	40971.642	18.67	0.15	
1/29/71	40980.622	18.68	0.12	
2/17/71	40999.578	18.82	0.12	
2/21/71	41003.557	18.77	0.18	
3/19/71	41029.549	18.55	0.13	
3/28/71	41038.545	18.29	0.08	
10/15/71	41239.799	18.89	0.16	
11/25/71	41280.815	18.84	0.15	
12/10/71	41295.691	18.63	0.24	
12/15/71	41300.675	19.38	0.23	
2/ 7/72	41354.569	19.10	0.10	
3/13/72	41389.597	19.11	0.22	
10/ 9/72	41599.856	18.59	0.23	
11/ 3/72	41624.843	18.31	0.25	
1/27/73	41709.539	18.80	0.14	
3/ 4/73	41745.557	18.78	0.21	
9/ 5/73	41930.907	18.82	0.20	
10/ 4/73	41959.869	18.74	0.08	
10/24/73	41979.774	18.53	0.18	
11/ 2/73	41988.779	18.52	0.17	
11/23/73	42009.782	18.11	0.14	
12/ 2/73	42018.801	18.72	0.16	
12/18/73	42034.602	18.77	0.15	
12/22/73	42038.676	18.74	0.20	
1/16/74	42063.681	18.75	0.08	
2/11/74	42089.544	18.84	0.11	
9/24/74	42314.879	17.65	0.26	
10/18/74	42338.829	17.65	0.20	
11/24/74	42375.826	17.30	0.11	
11/25/74	42376.655	17.19	0.13	
12/11/74	42392.655	17.24	0.14	
12/18/74	42399.681	17.66	0.05	
1/ 4/75	42416.653	17.80	0.19	
1/16/75	42428.610	17.99	0.09	
2/ 3/75	42446.663	17.86	0.23	
2/12/75	42455.562	17.91	0.11	
3/ 2/75	42473.573	17.43	0.20	
3/ 6/75	42477.600	16.89	0.14	
9/ 4/75	42659.893	18.62	0.25	
10/11/75	42696.884	18.38	0.07	2
10/15/75	42700.932	18.72	0.21	
11/ 1/75	42717.808	18.45	0.25	
12/ 7/75	42753.825	18.30	0.11	2
12/24/75	42770.588	18.33	0.07	2
1/ 3/76	42780.695	18.19	0.17	2
1/23/76	42800.671	18.39	0.06	2
10/ 3/76	43054.863	18.27	0.13	2
10/22/76	43073.807	18.06	0.10	2
11/25/76	43107.798	18.29	0.12	2
1/11/77	43154.595	18.32	0.09	2
2/ 9/77	43183.615	18.55	0.10	2
10/14/77	43430.796	17.04	0.11	
11/ 9/77	43456.787	16.63	0.14	
11/11/77	43458.760	16.62	0.15	
11/14/77	43461.780	16.91	0.23	
11/15/77	43462.810	16.70	0.11	
12/ 8/77	43485.728	17.00	0.11	
12/13/77	43490.667	16.51	0.14	
1/ 4/78	43512.664	16.66	0.11	
1/10/78	43518.645	16.85	0.18	
1/12/78	43520.596	17.02	0.05	
1/29/78	43537.581	17.08	0.07	
2/ 7/78	43546.594	17.24	0.06	
2/26/78	43565.565	16.82	0.17	
8/31/78	43751.862	17.41	0.35	
10/ 3/78	43784.799	17.53	0.31	
10/ 5/78	43786.868	17.17	0.18	2
11/ 2/78	43814.764	17.81	0.19	
11/26/78	43838.792	17.92	0.18	
12/ 4/78	43846.681	17.76	0.09	
1/19/79	43892.603	18.56	0.31	
1/29/79	43902.588	18.29	0.15	
2/17/79	43921.572	18.11	0.11	
2/28/79	43932.631	18.10	0.19	
3/21/79	43953.560	17.72	0.24	
9/30/79	44146.888	17.38	0.12	
10/18/79	44164.828	17.83	0.20	
11/15/79	44192.749	17.29	0.12	
11/20/79	44197.753	16.03	0.23	
12/13/79	44220.590	17.70	0.12	2
1/ 8/80	44246.616	17.57	0.20	
2/ 5/80	44274.579	18.01	0.15	
3/ 7/80	44305.563	18.21	0.13	
9/ 5/80	44487.801	18.59	0.23	
10/11/80	44523.856	18.38	0.24	
12/ 2/80	44575.760	18.22	0.18	
12/ 7/80	44580.721	18.81	0.18	
1/ 4/81	44608.667	18.57	0.12	
1/25/81	44629.606	18.46	0.08	
8/ 9/81	44825.872	18.67	0.19	
9/ 3/81	44850.892	18.19	0.07	
11/21/81	44929.738	18.29	0.08	
1/15/82	44984.547	17.27	0.15	
1/26/82	44995.642	17.76	0.11	
2/15/82	45015.583	16.96	0.11	
3/17/82	45045.578	16.73	0.12	
3/18/82	45046.561	16.79	0.10	
3/20/82	45048.576	16.78	0.22	
3/21/82	45049.547	17.29	0.14	
11/24/82	45297.760	17.18	0.24	
12/18/82	45321.655	17.12	0.17	
11/ 3/83	45641.731	17.94	0.27	
1/ 5/84	45704.646	17.86	0.24	
10/23/84	45996.817	17.75	0.32	
11/24/84	46028.686	17.80	0.24	
11/27/84	46031.717	18.33	0.21	
1/22/85	46087.644	17.97	0.22	
10/15/85	46353.822	17.18	0.22	
11/ 9/85	46378.681	17.55	0.17	
11/16/85	46385.756	17.64	0.16	
1/ 6/86	46436.621	17.08	0.11	
1/31/86	46462.609	17.86	0.08	

3C 120 B

U.T. DATE	J.D.	MAG.	RMS.	#
10/16/71	41240.701	14.88	0.14	
10/19/71	41243.852	15.02	0.10	
10/26/71	41250.837	14.71	0.07	
11/ 8/71	41263.627	14.89	0.10	
11/14/71	41269.859	15.27	0.12	
11/17/71	41272.828	14.76	0.07	
11/18/71	41273.872	15.00	0.05	4
11/19/71	41274.840	14.83	0.05	4
11/21/71	41276.925	14.94	0.06	4
11/22/71	41277.894	14.82	0.05	4

3C 120 B

U.T. DATE	J.D.	MAG.	RMS.	#
3/ 6/72	41383.833	15.08	0.08	
9/ 8/72	41568.878	14.69	0.27	
10/ 5/72	41595.781	15.04	0.11	
10/ 8/72	41598.890	14.84	0.17	
10/14/72	41604.852	15.01	0.18	
10/16/72	41606.756	15.03	0.09	
11/ 1/72	41622.821	15.13	0.26	
11/16/72	41637.847	14.76	0.23	
12/ 3/72	41654.753	14.64	0.21	
12/ 4/72	41655.831	14.78	0.06	4
12/ 5/72	41656.783	14.85	0.07	2
12/ 5/72	41656.875	14.78	0.35	
12/ 9/72	41660.837	14.80	0.05	4
1/ 2/73	41684.724	14.88	0.11	
1/23/73	41705.559	15.00	0.10	
1/29/73	41711.603	14.98	0.10	
3/ 4/73	41745.580	15.20	0.07	
9/ 5/73	41930.892	15.37	0.09	
9/ 8/73	41933.865	15.47	0.18	
9/24/73	41949.860	15.38	0.12	
9/30/73	41955.906	15.49	0.18	
10/ 8/73	41963.842	15.16	0.10	
10/24/73	41979.792	15.32	0.09	
10/31/73	41986.837	15.47	0.12	
11/ 3/73	41989.733	15.42	0.14	
12/ 2/73	42018.699	15.30	0.57	
12/25/73	42041.610	15.20	0.10	
1/15/74	42062.628	15.32	0.10	
2/11/74	42089.563	15.00	0.11	
2/14/74	42092.624	15.09	0.10	
2/15/74	42093.561	15.21	0.10	
2/19/74	42097.572	15.23	0.07	
10/18/74	42338.847	15.33	0.06	
11/24/74	42375.847	15.22	0.13	
12/11/74	42392.672	15.11	0.11	
12/18/74	42399.658	15.00	0.08	
1/ 3/75	42415.620	15.14	0.08	
1/31/75	42443.564	15.30	0.12	
3/ 2/75	42473.585	15.21	0.10	
10/11/75	42696.911	15.34	0.07	2
10/15/75	42700.917	15.49	0.07	2
11/ 2/75	42718.748	15.49	0.17	
12/ 7/75	42753.844	15.72	0.06	2
12/10/75	42756.765	15.69	0.10	2
12/12/75	42758.801	15.74	0.07	2
12/24/75	42770.636	15.76	0.10	
12/29/75	42775.661	15.70	0.10	
1/ 1/76	42778.602	15.64	0.11	
1/ 3/76	42780.564	15.63	0.10	2
1/ 5/76	42782.657	15.72	0.10	
3/20/76	42857.567	15.80	0.09	
3/21/76	42858.564	15.69	0.09	
3/25/76	42862.574	15.66	0.16	
3/31/76	42868.563	15.64	0.18	
10/ 3/76	43054.882	15.44	0.12	2
10/19/76	43070.778	15.38	0.08	2
10/21/76	43072.783	15.48	0.06	2
11/ 1/76	43083.817	15.46	0.09	2
11/26/76	43108.730	15.35	0.04	2
12/18/76	43130.601	15.54	0.05	2
1/17/77	43160.587	15.57	0.05	2
2/ 9/77	43183.601	15.60	0.09	2
2/11/77	43185.631	15.75	0.07	2
2/14/77	43188.608	15.89	0.06	2
11/ 9/77	43456.821	15.88	0.11	
1/ 6/78	43514.640	16.16	0.14	
1/12/78	43520.619	15.98	0.08	
1/29/78	43537.603	15.95	0.07	
2/ 5/78	43544.544	15.94	0.12	2
3/11/78	43578.647	15.90	0.12	
8/13/78	43733.886	15.92	0.06	
10/ 5/78	43786.778	15.69	0.16	
10/ 5/78	43786.840	15.71	0.15	
10/ 9/78	43790.869	15.77	0.11	
11/ 2/78	43814.776	15.75	0.14	
11/ 6/78	43818.640	16.16	0.14	
11/26/78	43838.767	15.74	0.08	2
12/27/78	43869.536	15.90	0.12	
1/19/79	43892.624	15.99	0.13	
1/29/79	43902.643	15.69	0.10	
2/21/79	43925.635	15.82	0.07	
3/29/79	43961.557	15.70	0.12	
9/20/79	44136.863	15.82	0.12	
11/16/79	44193.805	15.95	0.13	
1/ 8/80	44246.637	15.65	0.15	
2/ 6/80	44275.583	15.58	0.08	
3/12/80	44310.563	15.20	0.13	
4/11/80	44340.569	15.16	0.12	
9/ 5/80	44487.792	15.30	0.15	
12/ 6/80	44579.680	15.57	0.19	
1/ 4/81	44608.700	15.44	0.11	
1/27/81	44631.575	15.48	0.15	
8/ 9/81	44825.878	15.29	0.14	
9/25/81	44872.772	15.16	0.08	
11/21/81	44929.749	15.04	0.13	
1/15/82	44984.563	15.02	0.13	
2/15/82	45015.592	15.29	0.13	
10/25/82	45267.813	14.73	0.12	
12/18/82	45321.697	15.18	0.13	
12/22/82	45325.767	15.28	0.11	
3/ 5/83	45398.554	15.35	0.08	2
11/ 2/83	45640.762	15.01	0.15	
11/26/83	45664.631	14.72	0.13	
12/ 1/83	45669.633	15.05	0.06	
12/31/83	45699.687	14.92	0.11	
10/25/83	45632.860	15.32	0.08	2
11/19/84	46023.667	15.45	0.18	
11/24/84	46028.706	15.47	0.11	
1/20/85	46085.661	15.29	0.10	
10/ 8/85	46346.694	15.18	0.12	
11/15/85	46384.675	15.20	0.11	
12/13/85	46412.743	15.52	0.10	
12/15/85	46414.654	15.35	0.13	
1/ 6/86	46436.630	15.46	0.08	
1/14/86	46444.660	15.35	0.09	
1/31/86	46461.574	15.34	0.09	
2/ 3/86	46464.595	15.44	0.08	
3/ 7/86	46496.561	15.33	0.08	

NRAO 190 P

U.T. DATE	J.D.	MAG.	RMS.	#
12/ 8/69	40563.708	18.12	0.15	
9/30/71	41224.892	18.22	0.10	
12/13/71	41298.744	17.98	0.13	
10/13/72	41603.847	17.57	0.24	
11/ 5/72	41626.803	17.43	0.18	
1/31/73	41713.596	18.08	0.18	
10/ 6/73	41961.875	18.39	0.10	
12/22/72	42038.693	18.07	0.12	
1/ 4/75	42416.678	18.94	0.22	
3/10/75	42481.576	19.20	0.12	

TABLE III. (continued)

NRAO 190 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
10/13/75	42698.936	18.07	0.22	
11/ 1/75	42717.837	17.04	0.19	
11/14/75	42730.857	18.18	0.17	2
11/29/75	42745.805	18.57	0.05	2
12/ 7/75	42753.802	17.45	0.11	2
12/10/75	42756.820	17.64	0.10	2
12/12/75	42758.800	17.61	0.07	2
12/24/75	42770.611	18.16	0.09	2
12/27/75	42773.705	17.82	0.16	
1/ 1/76	42778.738	18.02	0.08	2
1/ 3/76	42780.710	18.30	0.10	2
1/ 5/76	42782.709	18.24	0.12	
1/25/76	42802.615	17.87	0.25	
2/21/76	42829.596	18.22	0.20	
10/ 3/76	43054.896	18.22	0.08	2
10/22/76	43073.829	17.78	0.14	2
11/25/76	43107.818	16.64	0.13	2
12/18/76	43130.559	17.71	0.13	2
12/25/76	43137.726	18.43	0.08	
1/11/77	43154.634	17.91	0.18	2
10/14/77	43430.827	18.55	0.14	
11/11/77	43458.776	18.25	0.16	
11/15/77	43462.817	18.73	0.17	
12/ 8/77	43485.741	17.82	0.09	
1/ 4/78	43512.710	16.98	0.10	
1/10/78	43518.658	18.37	0.25	
1/12/78	43520.608	18.28	0.07	
1/29/78	43537.614	18.90	0.16	
2/ 5/78	43544.557	18.92	0.14	
3/ 7/78	43574.594	18.96	0.12	
11/ 2/78	43815.764	18.78	0.20	
11/ 6/78	43819.805	18.10	0.20	
12/27/78	43870.632	18.00	0.16	
12/31/78	43874.667	19.03	0.12	
1/19/78	43891.630	17.65	0.25	
1/29/79	43903.637	18.78	0.15	
3/21/79	43953.578	18.05	0.12	
9/30/79	44146.896	18.96	0.21	
11/16/79	44193.788	17.73	0.23	
1/ 8/80	44246.626	18.23	0.25	
2/ 5/80	44274.601	18.94	0.27	
3/16/80	44314.550	18.70	0.18	
11/ 6/80	44549.828	18.90	0.11	
11/ 7/80	44550.819	18.94	0.10	
12/ 4/80	44577.735	18.76	0.18	
12/ 8/80	44581.687	18.64	0.16	
1/ 4/81	44608.678	19.03	0.16	
1/25/81	44629.631	18.79	0.20	
10/ 4/81	44881.833	18.59	0.36	
11/21/81	44929.761	18.01	0.17	
11/23/81	44931.757	18.04	0.14	2
2/15/82	45015.601	18.00	0.24	
10/26/82	45268.870	18.05	0.13	
12/19/82	45322.631	17.44	0.20	
12/22/82	45325.776	17.52	0.15	
11/ 2/83	45640.774	15.73	0.11	
11/26/83	45664.640	16.02	0.16	2
12/ 1/83	45669.655	15.61	0.16	
12/ 6/83	45674.637	16.52	0.07	2
12/ 8/83	45676.703	16.23	0.11	2
12/31/83	45699.703	16.34	0.22	
1/ 5/84	45704.676	16.46	0.18	
11/19/84	46023.678	16.39	0.17	
11/27/84	46031.724	17.11	0.29	
12/29/84	46063.773	17.69	0.24	
1/15/85	46080.724	17.53	0.16	2
2/19/85	46115.594	18.04	0.17	
11/19/85	46388.785	17.31	0.16	
12/13/85	46412.753	16.96	0.17	
12/17/85	46416.710	17.84	0.09	

0735+17 P

U.T. DATE	J.D.	MAG.	RMS.	#
11/ 6/70	40896.833	15.54	0.06	
11/26/70	40916.715	15.32	0.01	
12/ 7/70	40927.808	15.43	0.06	
1/22/71	40973.690	16.02	0.18	
12/10/71	41295.732	15.78	0.08	
12/26/71	41311.789	16.42	0.18	
3/10/72	41386.726	15.96	0.06	
4/15/72	41422.605	16.37	0.04	
10/13/72	41603.896	15.92	0.07	
11/ 5/72	41626.852	16.28	0.10	
1/26/73	41708.659	15.46	0.05	
4/22/73	41794.563	15.53	0.12	
4/28/73	41800.587	15.27	0.07	
4/30/73	41802.569	15.52	0.05	
5/ 1/73	41803.606	15.48	0.12	
5/ 2/73	41804.595	15.37	0.10	
11/24/73	42010.849	16.05	0.09	
12/ 5/73	42021.824	15.88	0.06	
12/19/73	42035.749	16.36	0.08	
1/ 2/74	42049.858	16.18	0.07	
1/15/74	42062.706	15.84	0.15	
1/20/74	42067.590	15.81	0.11	
1/27/74	42074.751	15.69	0.10	
1/29/74	42076.771	15.40	0.09	
2/14/74	42092.666	15.07	0.06	
2/19/74	42097.690	15.15	0.05	
3/14/74	42120.572	15.57	0.04	
3/25/74	42131.593	15.98	0.14	
4/11/74	42148.555	16.28	0.16	
10/18/74	42338.906	15.59	0.08	
11/23/74	42374.812	15.51	0.14	
12/18/74	42399.746	15.32	0.07	
1/ 8/75	42420.658	15.19	0.12	
1/17/75	42429.553	15.11	0.09	
2/ 1/75	42444.607	15.66	0.14	
2/ 3/75	42446.697	15.70	0.18	
2/10/75	42453.594	15.68	0.19	
3/ 3/75	42474.627	15.51	0.08	
3/10/75	42481.594	15.76	0.11	
11/ 1/75	42717.873	15.54	0.08	
12/ 7/75	42753.863	15.24	0.06	2
12/10/75	42756.881	15.07	0.06	2
12/12/75	42758.817	15.16	0.07	2
12/24/75	42770.651	14.87	0.04	2
12/27/75	42773.741	14.97	0.03	2
12/29/75	42775.780	15.00	0.06	2
1/ 1/76	42778.824	14.84	0.06	
1/ 2/76	42779.768	14.89	0.05	
1/ 3/76	42780.758	14.98	0.10	
1/ 5/76	42782.737	14.81	0.06	2
1/ 9/76	42786.817	14.65	0.03	
1/10/76	42787.809	14.65	0.03	2
1/21/76	42798.602	14.58	0.10	2
1/22/76	42799.713	14.76	0.04	2
1/25/76	42802.580	14.54	0.08	
1/26/76	42803.704	14.59	0.05	
1/30/76	42808.827	14.74	0.03	2
2/ 3/76	42811.665	14.80	0.07	
2/21/76	42829.640	15.30	0.06	2
2/23/76	42831.606	15.12	0.06	

0735+17 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
2/26/76	42834.671	15.28	0.08	2
2/29/76	42837.631	15.29	0.03	
3/ 2/76	42839.640	15.32	0.09	2
3/ 4/76	42841.658	15.18	0.09	
3/20/76	42857.654	15.10	0.12	
3/21/76	42858.632	14.93	0.07	
3/25/76	42862.597	14.96	0.04	3
3/27/76	42864.567	15.00	0.13	
3/27/76	42864.619	15.25	0.14	
3/28/76	42865.636	15.07	0.05	2
3/28/76	42865.653	15.07	0.07	
4/ 2/76	42870.577	15.06	0.05	2
4/ 3/76	42871.629	14.80	0.09	2
4/ 4/76	42872.695	14.91	0.11	2
4/18/76	42886.588	15.04	0.09	2
4/24/76	42892.604	15.18	0.07	2
4/29/76	42897.584	15.09	0.05	2
5/30/76	42928.582	16.07	0.06	2
10/ 3/76	43054.914	15.06	0.07	2
10/29/76	43080.873	15.32	0.08	2
11/19/76	43101.841	15.32	0.08	2
12/18/76	43130.699	14.75	0.09	
1/17/77	43160.745	14.77	0.03	2
1/20/77	43163.758	14.76	0.05	2
2/11/77	43185.602	14.53	0.06	
2/12/77	43186.579	14.44	0.10	2
2/12/77	43186.651	14.24	0.08	2
2/23/77	43197.744	14.46	0.06	

0735+17 U

U.T. DATE	J.D.	MAG.	RMS.	#
1/ 1/76	42778.788	14.16	0.11	
12/27/76	43139.844	14.89	0.12	
2/12/77	43186.640	14.03	0.22	
2/14/77	43188.573	13.82	0.11	
2/18/77	43192.628	14.15	0.13	
2/19/77	43193.618	13.91	0.11	
2/21/77	43195.644	13.63	0.08	
2/23/77	43197.781	13.74	0.23	
2/25/77	43199.753	13.72	0.16	
3/14/77	43216.655	13.85	0.07	
3/23/77	43225.653	13.84	0.18	
4/ 6/77	43239.587	13.95	0.11	2
4/ 8/77	43241.656	13.88	0.25	
4/ 9/77	43242.551	14.37	0.21	
4/10/77	43243.551	14.11	0.17	
4/11/77	43244.572	14.18	0.18	2
4/12/77	43245.558	14.48	0.28	
4/13/77	43246.653	13.92	0.17	
4/15/77	43248.587	14.19	0.17	
4/16/77	43249.556	14.12	0.19	
4/18/77	43251.557	14.60	0.13	
4/19/77	43252.573	14.23	0.06	
4/21/77	43254.594	14.24	0.07	
4/29/77	43262.573	13.68	0.08	
5/ 9/77	43272.572	13.79	0.09	
5/13/77	43276.583	13.44	0.12	
5/14/77	43277.576	13.49	0.14	
5/15/77	43278.581	13.38	0.12	
5/18/77	43281.587	14.08	0.10	
12/ 8/77	43485.851	15.38	0.14	
1/12/78	43520.693	15.38	0.12	
2/ 7/78	43546.651	15.70	0.06	
4/ 5/78	43603.551	15.70	0.11	
10/ 9/78	43791.881	16.56	0.07	
11/ 2/78	43815.719	15.88	0.12	
11/11/78	43824.861	16.20	0.05	2
12/ 2/78	43845.761	15.44	0.07	
12/27/78	43870.672	15.68	0.16	
1/25/79	43899.640	15.42	0.07	
10/ 9/80	44521.874	14.32	0.06	2
12/ 6/80	44579.831	14.68	0.08	2
3/26/81	44689.566	14.93	0.08	2
11/12/83	45650.859	15.57	0.07	
11/15/83	45653.879	14.83	0.14	2
12/ 1/83	45669.711	15.73	0.10	
12/ 6/83	45674.665	15.44	0.14	
12/ 7/83	45675.685	15.61	0.19	

0735+17 B

U.T. DATE	J.D.	MAG.	RMS.	#
4/19/74	42156.608	16.18	0.02	11
4/21/74	42158.578	16.23	0.15	
4/21/74	42158.616	16.16	0.03	10
1/ 1/76	42778.783	14.70	0.14	
4/23/76	42891.589	15.38	0.13	
11/22/76	43104.867	15.54	0.07	2
11/25/76	43107.888	15.41	0.04	2
12/25/76	43137.794	15.60	0.13	2
12/27/76	43139.862	15.52	0.07	
1/11/77	43154.654	14.95	0.07	2
2/14/77	43188.608	14.45	0.06	3
2/18/77	43192.644	14.59	0.08	2
2/19/77	43193.612	14.57	0.14	
2/21/77	43195.649	14.10	0.08	
2/23/77	43197.756	14.20	0.05	
2/25/77	43199.762	14.35	0.06	3
3/14/77	43216.613	14.29	0.05	2
3/23/77	43225.628	14.45	0.10	
3/24/77	43226.692	14.24	0.11	
4/ 6/77	43239.591	14.57	0.05	5
4/ 8/77	43241.653	14.56	0.15	
4/ 9/77	43242.549	14.65	0.22	
4/10/77	43243.548	14.60	0.11	
4/11/77	43244.568	14.73	0.12	2
4/13/77	43246.658	14.77	0.05	
4/15/77	43248.584	14.63	0.13	
4/16/77	43249.553	14.38	0.12	
4/18/77	43251.554	14.92	0.18	
4/19/77	43252.556	14.97	0.24	
4/21/77	43254.590	14.79	0.03	
4/29/77	43262.568	14.41	0.10	4
5/ 1/77	43264.563	14.56	0.06	2
5/ 9/77	43272.567	14.71	0.25	
5/13/77	43276.578	14.03	0.05	
5/14/77	43277.581	13.90	0.19	
5/15/77	43278.577	13.99	0.07	
5/17/77	43280.581	14.95	0.07	
5/18/77	43281.581	15.04	0.13	
5/26/77	43289.578	15.18	0.23	
10/17/77	43433.909	15.14	0.05	
11/11/77	43458.828	15.37	0.05	
11/15/77	43462.897	15.36	0.16	
12/ 8/77	43485.846	15.62	0.03	
1/ 4/78	43512.762	16.05	0.07	
1/10/78	43518.755	15.70	0.05	
1/12/78	43520.685	15.88	0.15	

0735+17 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
1/30/78	43538.617	16.68	0.13	
2/ 7/78	43546.644	16.06	0.04	
2/28/78	43567.645	15.69	0.05	
3/ 2/78	43569.613	15.98	0.07	
3/14/78	43581.667	15.78	0.06	
3/30/78	43597.590	16.28	0.02	
4/ 4/78	43602.551	16.19	0.06	
4/ 5/78	43603.547	16.12	0.10	
4/28/78	43626.561	16.02	0.10	
10/ 5/78	43786.848	16.79	0.17	
10/ 9/78	43790.890	16.49	0.15	
11/ 2/78	43814.856	16.19	0.12	
11/ 4/78	43816.800	16.70	0.12	
11/ 6/78	43818.847	17.22	0.11	
11/11/78	43823.859	16.54	0.08	4
12/ 2/78	43844.769	16.22	0.16	
12/27/78	43869.675	15.98	0.17	
12/31/78	43873.765	15.93	0.07	
1/25/79	43898.656	15.88	0.11	
1/29/79	43902.676	15.99	0.08	
2/21/79	43925.635	15.98	0.09	
3/ 1/79	43933.607	16.16	0.11	
3/19/79	43951.565	16.07	0.07	
3/28/79	43960.571	15.62	0.12	
3/30/79	43962.611	15.92	0.15	
4/21/79	43984.565	15.80	0.13	
9/30/79	44146.909	15.62	0.06	2
11/19/79	44196.799	15.89	0.17	
1/17/80	44255.667	15.77	0.09	
2/ 8/80	44277.666	15.82	0.12	
3/ 7/80	44305.640	16.70	0.09	
4/ 6/80	44335.569	15.68	0.11	
4/12/80	44341.574	15.65	0.12	
9/13/80	44495.891	15.34	0.13	
10/ 7/80	44519.866	14.75	0.07	2
10/ 9/80	44521.859	15.06	0.13	2
10/11/80	44523.890	14.93	0.07	
10/14/80	44526.871	15.33	0.06	
10/18/80	44530.805	15.55	0.07	2
11/ 6/80	44549.915	15.07	0.11	
12/ 2/80	44575.799	15.25	0.20	
12/ 4/80	44577.803	15.15	0.07	
12/ 6/80	44579.792	15.27	0.07	2
12/ 8/80	44581.745	14.81	0.07	2
12/12/80	44585.782	15.19	0.04	2
1/ 2/81	44606.709	15.08	0.09	
1/ 5/81	44609.812	15.41	0.11	
1/30/81	44634.660	15.35	0.13	
2/26/81	44661.628	15.18	0.10	
3/10/81	44673.681	15.07	0.09	
3/26/81	44689.549	15.43	0.10	2
3/26/81	44689.599	15.41	0.06	2
5/ 1/81	44725.582	15.28	0.10	
9/ 3/81	44850.901	14.69	0.11	
9/ 8/81	44855.892	15.01	0.08	
10/ 1/81	44878.874	14.91	0.12	
11/21/81	44929.778	15.45	0.07	
11/28/81	44936.767	14.83	0.09	
12/ 8/81	44946.777	15.34	0.06	
12/22/81	44960.720	15.47	0.15	
1/15/82	44984.629	15.70	0.06	
1/20/82	44989.641	15.49	0.15	
1/27/82	44996.627	15.36	0.09	
2/15/82	45015.661	14.99	0.10	
2/21/82	45021.638	15.31	0.09	
2/24/82	45024.632	15.18	0.12	
3/17/82	45045.595	15.43	0.14	
3/18/82	45046.572	15.29	0.06	
11/24/82	45297.850	15.42	0.18	
12/18/82	45321.725	15.11	0.16	
3/ 3/83	45396.574	15.85	0.14	
11/ 2/83	45640.790	15.65	0.17	
11/12/83	45650.726	15.94	0.07	2
11/12/83	45650.838	15.84	0.05	2
11/15/83	45653.849	15.47	0.05	4
12/ 1/83	45669.701	16.21	0.08	2
12/ 6/83	45674.677	16.29	0.09	2
12/ 7/83	45675.667	16.07	0.04	2
12/ 8/83	45676.722	16.12	0.06	2
1/ 8/84	45707.712	16.27	0.09	
2/25/84	45755.613	16.33	0.14	
3/ 1/84	45760.563	15.73	0.04	
3/30/84	45789.613	16.20	0.15	
10/23/84	45996.866	17.20	0.10	2
10/26/84	45999.835	16.95	0.15	
0/19/84	45721.713	17.30	0.05	
11/24/84	46028.776	17.03	0.06	
11/29/84	46033.778	17.09	0.07	
1/15/85	46080.742	16.61	0.11	
1/22/85	46087.708	16.49	0.10	
1/26/85	46091.673	16.09	0.10	2
2/16/85	46112.613	15.83	0.07	
2/19/85	46115.666	16.19	0.19	
3/15/85	46139.567	15.72	0.15	2
3/19/85	46143.622	15.64	0.08	2
3/20/85	46144.556	16.14	0.10	
10/15/85	46353.860	15.74	0.10	
11/19/85	46388.873	15.44	0.06	
12/11/85	46410.661	15.28	0.08	
12/15/85	46414.740	15.28	0.08	
12/17/85	46416.792	15.27	0.13	
1/ 6/86	46436.698	15.75	0.12	
1/12/86	46442.692	15.57	0.16	
1/31/86	46461.601	15.64	0.08	
2/ 3/86	46464.658	15.73	0.13	
3/ 6/86	46495.591	16.28	0.04	
3/31/86	46520.565	16.15	0.07	

0735+17 V

U.T. DATE	J.D.	MAG.	RMS.	#
1/ 1/76	42778.795	14.49	0.09	
12/27/76	43139.825	15.08	0.04	
2/12/77	43186.594	13.88	0.18	
2/14/77	43188.583	13.99	0.15	
2/18/77	43192.660	14.18	0.13	
2/19/77	43193.624	14.08	0.15	
2/21/77	43195.653	13.79	0.10	
2/23/77	43197.803	13.74	0.07	
2/25/77	43199.762	13.98	0.06	
3/14/77	43216.676	13.74	0.13	
4/ 6/77	43239.553	14.29	0.07	2
4/ 8/77	43241.660	14.39	0.10	
4/ 9/77	43242.567	14.37	0.08	3
4/10/77	43243.555	14.36	0.08	
4/11/77	43244.575	14.36	0.06	2
4/12/77	43245.562	14.30	0.09	
4/13/77	43246.660	14.13	0.06	
4/15/77	43248.594	14.19	0.07	
4/16/77	43249.561	14.23	0.07	
4/18/77	43251.562	14.64	0.15	
4/19/77	43252.563	14.56	0.17	
4/21/77	43254.601	14.26	0.25	

0735+17 V CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
4/29/77	43262.564	13.84	0.08	2
5/ 1/77	43264.570	14.37	0.15	2
5/ 9/77	43272.578	14.42	0.06	
5/13/77	43276.588	13.56	0.10	
5/14/77	43277.570	13.52	0.18	
5/15/77	43278.590	13.55	0.14	
5/17/77	43280.570	14.19	0.26	
5/18/77	43281.575	14.13	0.10	
5/20/77	43283.583	14.44	0.09	
5/22/77	43285.575	14.65	0.13	2
12/ 8/77	43485.858	15.28	0.08	
1/12/78	43520.701	15.35	0.16	
2/ 7/78	43546.660	15.76	0.06	
4/ 5/78	43603.558	15.81	0.10	
10/ 9/78	43791.887	16.86	0.19	
11/ 2/78	43815.848	16.12	0.13	
11/11/78	43824.846	16.06	0.11	2
12/ 2/78	43845.764	15.67	0.15	
12/27/78	43870.676	15.53	0.13	
1/25/79	43899.669	15.48	0.14	
10/ 7/80	44519.883	14.20	0.08	2
10/ 9/80	44521.892	14.36	0.06	2
12/ 6/80	44579.817	14.78	0.05	2
3/26/81	44689.577	15.18	0.06	2
11/12/83	45650.850	15.53	0.09	
11/15/83	45653.878	15.08	0.08	2
12/ 1/83	45669.718	15.69	0.15	
12/ 6/83	45674.676	15.71	0.16	
12/ 7/83	45675.677	15.63	0.10	

0735+17 I

U.T. DATE	J.D.	MAG.	RMS.	#
11/11/78	43824.886	14.58	0.10	
12/27/78	43870.679	14.40	0.15	
1/25/79	43899.674	14.17	0.16	
2/14/77	43188.606	13.21	0.11	
2/18/77	43192.644	13.22	0.11	
2/19/77	43193.642	13.13	0.09	
2/21/77	43195.632	12.93	0.07	
2/23/77	43197.822	12.99	0.11	
2/25/77	43199.741	13.01	0.18	
4/ 6/77	43239.562	13.55	0.12	
4/ 8/77	43241.668	13.60	0.16	
4/ 9/77	43242.565	13.64	0.18	
4/10/77	43243.564	13.55	0.15	
4/11/77	43244.557	13.99	0.11	
4/16/77	43249.574	13.39	0.09	
4/18/77	43251.573	13.43	0.12	
4/19/77	43252.595	13.40	0.08	
4/21/77	43254.615	13.41	0.12	
4/29/77	43262.556	13.21	0.12	
5/ 1/77	43264.545	13.20	0.12	
5/ 1/77	43264.556	13.50	0.11	
5/ 9/77	43272.588	13.27	0.09	
5/10/77	43273.568	13.59	0.16	
5/13/77	43276.567	12.95	0.10	
5/14/77	43277.562	13.33	0.10	
5/15/77	43278.565	13.04	0.17	
5/15/77	43278.609	13.09	0.18	
5/17/77	43280.560	13.33	0.11	
5/18/77	43281.560	13.43	0.10	
5/20/77	43283.565	13.44	0.08	
5/21/77	43284.569	13.61	0.18	
5/22/77	43285.561	13.59	0.08	
5/27/77	43290.562	13.24	0.07	
12/ 8/77	43485.836	13.91	0.10	
1/ 4/78	43512.772	13.96	0.06	
1/12/78	43520.712	14.10	0.08	
2/ 7/78	43546.679	14.31	0.04	
4/ 5/78	43603.573	14.37	0.08	
10/ 7/80	44519.871	13.46	0.10	
10/ 9/80	44521.878	13.62	0.10	
12/ 6/80	44579.804	14.03	0.14	
3/26/81	44689.577	14.45	0.10	2

OJ 287 P

U.T. DATE	J.D.	MAG.	RMS.	#
2/ 8/70	40625.735	14.17	0.10	
4/30/70	40706.625	13.50	0.10	
5/ 2/70	40708.612	13.48	0.09	
11/ 8/70	40898.881	12.55	0.11	
11/28/70	40918.792	12.88	0.14	
11/29/70	40919.854	12.58	0.09	
12/ 5/70	40925.896	12.98	0.09	
12/23/70	40943.781	12.73	0.11	
1/25/71	40976.816	13.07	0.14	
2/19/71	41001.694	12.69	0.07	
3/26/71	41036.677	12.59	0.11	
5/19/71	41090.597	12.66	0.09	

OJ 287 U

U.T. DATE	J.D.	MAG.	RMS.	#
12/15/71	41300.865	12.76	0.19	
12/19/71	41304.855	12.64	0.12	
12/26/71	41311.869	11.86	0.15	
1/ 7/72	41323.683	12.17	0.14	
1/ 8/72	41324.713	12.65	0.09	
1/10/72	41326.746	12.15	0.12	
1/20/72	41336.741	12.76	0.18	
1/24/72	41340.905	12.36	0.07	
1/25/72	41341.820	12.18	0.07	
2/ 6/72	41353.703	12.20	0.07	
2/ 7/72	41354.663	12.35	0.07	
2/14/72	41361.584	12.45	0.04	3
2/14/72	41361.663	12.45	0.03	3
2/14/72	41361.705	12.41	0.08	
2/14/72	41361.796	12.35	0.06	2
2/14/72	41361.862	12.42	0.05	3
2/19/72	41366.524	12.59	0.07	
2/20/72	41367.726	12.27	0.05	
2/22/72	41369.704	12.39	0.07	
3/ 6/72	41382.658	12.33	0.05	
3/ 9/72	41385.776	12.47	0.08	
3/10/72	41386.647	12.37	0.13	
3/13/72	41389.654	11.89	0.14	
3/14/72	41390.781	12.33	0.11	
3/15/72	41391.677	11.93	0.15	
4/ 3/72	41410.644	12.14	0.08	
4/ 4/72	41411.695	12.68	0.12	
4/11/72	41418.594	12.71	0.07	
4/13/72	41420.576	13.13	0.10	
11/ 5/72	41626.908	13.46	0.11	
1/ 2/72	41684.899	12.38	0.14	

TABLE III. (continued)

OJ 287 U CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
2/ 3/73	41716.761	12.93	0.05	2
2/ 3/73	41716.743	12.92	0.09	2
2/ 3/73	41716.917	12.90	0.08	
2/ 4/73	41717.764	13.21	0.11	
2/ 4/73	41717.843	13.19	0.06	2
2/ 4/73	41717.913	12.97	0.06	2
2/ 5/73	41718.547	13.04	0.01	2
2/ 5/73	41718.609	13.10	0.05	2
2/ 5/73	41718.693	13.23	0.09	2
2/ 5/73	41718.773	13.24	0.08	2
2/ 5/73	41718.877	13.08	0.04	2
2/ 6/73	41719.569	13.48	0.07	2
2/ 6/73	41719.641	13.91	0.09	2
2/ 6/73	41719.839	13.14	0.05	3
2/ 6/73	41719.897	13.03	0.14	
2/ 7/73	41720.540	13.27	0.04	2
2/ 7/73	41720.598	13.69	0.08	2
2/ 7/73	41720.681	13.82	0.08	2
2/ 7/73	41720.758	13.66	0.03	2
2/ 7/73	41720.826	13.19	0.07	2
2/ 8/73	41721.561	13.74	0.07	2
2/ 8/73	41721.621	14.07	0.05	2
2/ 8/73	41721.721	13.79	0.09	2
2/ 8/73	41721.837	13.14	0.05	2
4/ 6/73	41778.672	13.30	0.10	
4/20/73	41792.594	14.03	0.03	
4/21/73	41793.624	13.81	0.07	
10/27/73	41982.869	14.51	0.05	
11/ 2/73	41988.882	13.97	0.11	
11/ 6/73	41992.878	14.25	0.12	
1/ 4/74	42051.860	14.28	0.05	
1/24/74	42071.773	14.59	0.03	
2/23/74	42101.694	15.16	0.06	
2/25/74	42103.705	15.20	0.06	
3/ 1/74	42107.782	15.13	0.09	
3/14/74	42420.615	15.06	0.10	
4/12/74	42149.569	15.34	0.14	
5/11/74	42178.637	15.09	0.09	
5/13/74	42180.580	15.00	0.06	
5/15/74	42182.617	15.11	0.04	
5/21/74	42188.613	14.58	0.08	
5/22/74	42189.594	14.69	0.16	
5/24/74	42191.546	14.87	0.06	
10/21/74	42341.947	15.22	0.10	
11/23/74	42374.886	14.82	0.01	
12/18/74	42399.855	14.51	0.07	
1/ 8/75	42420.755	14.88	0.05	
1/10/75	42422.807	14.50	0.05	
1/21/75	42433.796	14.19	0.13	
2/ 8/75	42451.747	14.09	0.10	
3/ 2/75	42473.622	14.98	0.10	
3/ 7/75	42478.626	14.86	0.06	
3/ 9/75	42480.626	14.79	0.04	
4/ 2/75	42504.589	14.74	0.16	
5/ 5/75	42537.599	15.28	0.08	
2/28/76	42836.660	15.79	0.07	
2/18/77	43192.692	14.85	0.13	
4/10/77	43243.601	14.80	0.08	
12/ 8/77	43485.890	14.59	0.09	
1/10/78	43518.851	14.60	0.04	
2/12/78	43551.745	14.90	0.14	
3/11/78	43578.687	14.72	0.10	
4/ 6/78	43604.588	14.99	0.14	
5/ 9/78	43637.585	14.66	0.09	
11/ 4/78	43816.853	13.82	0.08	2
11/ 5/78	43817.848	13.77	0.08	2
3/30/79	43962.642	15.13	0.23	
5/22/79	44015.636	15.14	0.11	
10/14/80	44526.912	14.94	0.10	2
12/22/81	44960.680	14.52	0.13	2
1/15/82	44984.669	14.53	0.08	2
12/18/82	45321.771	13.90	0.18	
12/19/82	45322.802	13.95	0.14	
12/21/82	45324.785	14.54	0.14	2
12/22/82	45325.879	14.57	0.11	2
1/12/83	45346.758	12.70	0.09	2
1/14/83	45348.668	13.00	0.11	2
1/15/83	45349.622	13.46	0.14	
1/16/83	45350.625	13.18	0.16	
3/10/83	45403.590	13.80	0.13	2
3/12/83	45405.699	13.77	0.12	2
3/14/83	45407.590	14.34	0.23	2
4/ 2/83	45426.610	14.11	0.16	2
4/11/83	45435.715	13.84	0.11	2
5/10/83	45464.654	13.69	0.11	2
11/12/83	45650.895	13.81	0.11	
12/ 7/83	45675.685	14.62	0.10	
12/ 8/83	45676.788	14.17	0.16	2
3/ 9/84	45768.762	13.36	0.19	2
4/21/84	45811.588	15.74	0.19	2
4/25/84	45815.658	15.65	0.18	2
11/19/85	46388.913	16.22	0.15	2
12/11/85	46410.653	15.27	0.09	
12/15/85	46414.812	15.19	0.17	
1/ 6/86	46436.771	16.52	0.08	2
1/12/86	46442.749	16.53	0.10	2
1/14/86	46444.813	16.58	0.16	2

OJ 287 B

U.T. DATE	J.D.	MAG.	RMS.	#
12/15/71	41300.837	13.07	0.16	
12/19/71	41304.783	13.00	0.11	
1/ 7/72	41323.678	12.70	0.16	
1/ 8/72	41324.710	13.13	0.06	
1/10/72	41326.740	13.06	0.13	
1/20/72	41336.737	13.23	0.13	
1/24/72	41340.849	12.99	0.04	
1/25/72	41341.816	12.78	0.05	
2/ 6/72	41353.700	13.13	0.07	
2/ 7/72	41354.656	13.02	0.06	
2/14/72	41361.582	13.05	0.04	3
2/14/72	41361.652	13.02	0.04	2
2/14/72	41361.702	13.06	0.06	2
2/14/72	41361.794	12.90	0.04	3
2/14/72	41361.871	12.90	0.03	2
2/19/72	41366.532	13.16	0.04	2
2/20/72	41367.723	12.98	0.09	
2/22/72	41369.781	13.00	0.03	
3/ 6/72	41382.656	12.99	0.11	
3/ 9/72	41385.771	13.16	0.08	
3/10/72	41386.642	12.99	0.03	
3/14/72	41390.775	12.98	0.09	
4/ 4/72	41411.691	13.25	0.12	
4/ 9/72	41416.635	13.33	0.12	
4/11/72	41418.581	13.55	0.11	
4/13/72	41420.572	13.95	0.10	
4/15/72	41422.552	14.20	0.17	
5/ 2/72	41439.562	13.49	0.19	
5/11/72	41448.615	13.56	0.20	
11/ 5/72	41626.901	13.83	0.19	
1/ 2/73	41684.889	13.25	0.12	
2/ 1/73	41714.693	13.75	0.06	
2/ 3/73	41716.746	13.75	0.12	2

OJ 287 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
2/ 3/73	41716.833	13.73	0.02	2
2/ 3/73	41716.923	13.79	0.10	2
2/ 4/73	41717.788	13.92	0.12	2
2/ 4/73	41717.887	13.96	0.07	3
2/ 5/73	41718.539	13.68	0.05	2
2/ 5/73	41718.601	13.65	0.07	2
2/ 5/73	41718.729	13.99	0.07	2
2/ 5/73	41718.796	13.90	0.10	2
2/ 5/73	41718.869	13.73	0.11	
2/ 6/73	41719.562	14.14	0.06	2
2/ 6/73	41719.634	14.30	0.14	2
2/ 6/73	41719.734	14.09	0.13	2
2/ 6/73	41719.832	13.99	0.09	2
2/ 6/73	41719.891	13.92	0.23	
2/ 7/73	41720.533	13.93	0.04	2
2/ 7/73	41720.591	14.24	0.14	2
2/ 7/73	41720.673	14.23	0.08	2
2/ 7/73	41720.763	14.23	0.10	3
2/ 7/73	41720.842	14.16	0.20	
2/ 8/73	41721.564	14.49	0.04	3
2/ 8/73	41721.655	14.25	0.06	2
2/ 8/73	41721.766	14.32	0.08	2
2/ 8/73	41721.829	14.05	0.10	
3/10/73	41751.722	14.13	0.07	
3/23/73	41764.574	14.32	0.07	
4/ 1/73	41773.564	13.97	0.07	
4/ 6/73	41778.660	14.18	0.04	
4/20/73	41792.585	14.50	0.03	
4/21/73	41793.617	14.49	0.04	
10/ 4/73	41959.898	15.20	0.06	
10/27/73	41982.864	15.07	0.08	
11/ 2/73	41988.865	14.74	0.09	
11/ 6/73	41992.875	14.87	0.08	
1/ 4/74	42051.856	14.99	0.08	
1/24/74	42071.769	15.12	0.13	
2/23/74	42101.686	15.74	0.08	
2/25/74	42103.698	15.88	0.06	
3/ 1/74	42107.776	15.88	0.11	
3/14/74	42120.607	15.67	0.08	
4/12/74	42149.566	16.04	0.19	
5/11/74	42178.623	15.75	0.14	
5/13/74	42180.594	15.53	0.16	
5/15/74	42182.606	15.61	0.08	
5/21/74	42188.603	15.55	0.08	
5/22/74	42189.583	15.32	0.05	
5/24/74	42191.535	15.31	0.06	
6/11/74	42209.637	15.71	0.05	
6/14/74	42212.587	15.06	0.21	
10/18/74	42338.895	15.94	0.18	
10/21/74	42341.911	15.95	0.17	
10/27/74	42347.906	15.76	0.14	
11/23/74	42374.875	15.40	0.07	
12/18/74	42399.843	15.28	0.04	
1/ 8/75	42420.746	15.15	0.18	
1/21/75	42433.801	14.88	0.03	
2/ 1/75	42444.667	14.96	0.13	
2/ 8/75	42451.740	14.82	0.05	
3/ 6/75	42477.710	15.51	0.14	
3/ 7/75	42478.619	15.41	0.28	
3/ 9/75	42480.619	15.50	0.05	
3/13/75	42484.710	15.61	0.13	
4/ 2/75	42504.582	15.44	0.11	
4/10/75	42512.655	15.37	0.01	
5/ 5/75	42537.583	15.86	0.18	
11/ 1/75	42717.859	16.09	0.08	
12/ 7/75	42753.799	15.94	0.04	2
12/10/75	42756.814	15.94	0.04	2
12/12/75	42758.846	16.03	0.05	2
12/24/75	42770.664	15.91	0.06	
12/29/75	42775.685	16.09	0.07	
1/ 1/76	42778.658	16.12	0.05	
1/ 3/76	42780.753	15.60	0.30	
1/ 5/76	42782.716	15.97	0.11	
1/ 9/76	42786.783	15.97	0.04	
1/25/76	42802.701	15.81	0.03	
2/ 3/76	42811.595	15.71	0.03	
2/23/76	42831.578	16.58	0.05	
2/28/76	42836.649	16.59	0.19	
2/29/76	42837.592	16.48	0.08	2
3/ 4/76	42841.706	16.64	0.06	
3/21/76	42858.583	16.73	0.08	
3/25/76	42862.601	16.72	0.06	
4/20/76	42888.613	15.88	0.11	2
4/24/76	42892.600	16.17	0.18	2
4/29/76	42897.608	16.01	0.09	
5/ 4/76	42902.652	16.48	0.05	2
5/26/76	42924.626	15.90	0.12	
10/21/76	43072.848	15.68	0.06	2
11/ 1/76	43083.857	15.78	0.06	2
11/25/76	43107.831	16.03	0.04	2
12/18/76	43130.792	15.95	0.10	2
12/27/76	43139.917	15.92	0.08	2
1/17/77	43160.687	15.96	0.03	2
2/11/77	43185.670	15.72	0.06	2
2/14/77	43188.671	15.39	0.05	2
2/18/77	43192.683	15.37	0.19	
2/19/77	43193.633	15.59	0.07	2
2/26/77	43200.793	16.11	0.04	2
3/23/77	43225.694	15.06	0.04	2
3/24/77	43226.760	15.26	0.12	
4/ 8/77	43241.586	15.22	0.03	2
4/10/77	43243.605	15.30	0.02	2
4/10/77	43243.626	15.41	0.11	
4/12/77	43245.640	15.52	0.07	
5/ 9/77	43272.605	15.35	0.05	2
11/15/77	43462.915	15.32	0.13	
12/ 8/77	43485.897	15.12	0.13	
1/ 6/78	43514.717	14.61	0.09	
1/10/78	43518.858	15.08	0.09	
2/12/78	43551.751	15.44	0.12	
3/ 2/78	43569.658	15.42	0.08	
3/ 7/78	43574.656	14.79	0.21	
3/11/78	43578.682	15.45	0.05	
3/14/78	43581.676	15.45	0.16	
3/30/78	43597.654	15.43	0.05	
4/ 4/78	43602.617	15.86	0.09	
4/ 6/78	43604.583	15.58	0.11	
4/28/78	43626.587	15.51	0.19	
5/ 5/78	43633.618	14.99	0.11	
5/ 9/78	43637.581	15.23	0.07	
5/26/78	43654.578	14.97	0.24	
5/29/78	43657.574	14.91	0.12	
5/30/78	43658.584	15.01	0.14	
6/ 8/78	43667.587	14.90	0.26	
11/ 2/78	43814.878	14.98	0.12	
11/ 4/78	43816.806	14.40	0.18	2
11/ 4/78	43816.877	14.43	0.14	2
11/ 5/78	43817.806	14.25	0.19	2
11/ 5/78	43817.878	14.50	0.09	3
12/ 2/78	43844.805	15.79	0.30	
12/31/78	43873.889	15.44	0.35	
1/ 6/79	43879.760	15.75	0.32	
1/29/79	43902.716	15.76	0.06	
2/21/79	43925.676	15.43	0.22	
3/19/79	43951.628	15.20	0.15	
3/28/79	43960.594	15.20	0.11	
3/30/79	43962.638	15.51	0.17	
4/27/79	43990.653	15.54	0.18	

OJ 287 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
5/22/79	44015.628	15.61	0.23	
1/22/80	44260.723	15.27	0.18	
0/28/80	44277.674	15.55	0.13	
3/ 7/80	44305.658	15.10	0.07	
3/12/80	44310.635	15.01	0.19	
4/ 6/80	44335.592	15.63	0.05	
4/12/80	44341.606	15.73	0.17	
5/12/80	44371.596	15.48	0.13	
10/ 9/80	44521.919	15.51	0.11	
10/14/80	44526.888	15.49	0.06	2
11/ 8/80	44551.917	15.81	0.14	
12/ 4/80	44577.868	15.64	0.18	
12/ 8/80	44581.757	15.59	0.21	
1/ 2/81	44606.807	15.60	0.24	
2/28/81	44663.665	15.35	0.13	
3/10/81	44673.722	14.89	0.20	
3/14/81	44677.801	15.22	0.07	2
3/26/81	44689.667	15.50	0.20	
5/ 1/81	44725.595	15.83	0.21	
10/ 7/81	44884.890	15.83	0.11	
11/28/81	44936.803	15.34	0.20	
12/ 4/81	44942.891	15.63	0.20	
12/17/81	44955.672	15.32	0.18	2
12/22/81	44960.649	15.39	0.15	2
1/15/82	44984.641	15.24	0.08	2
1/20/82	44989.716	15.39	0.35	
1/26/82	44995.694	15.39	0.22	
2/18/82	45018.672	15.29	0.18	
2/22/82	45022.699	15.33	0.10	
3/18/82	45046.606	15.67	0.12	
3/21/82	45049.598	15.33	0.09	
4/13/82	45072.583	15.47	0.21	
11/25/82	45298.926	14.97	0.18	
12/18/82	45321.760	14.95	0.10	
12/19/82	45322.809	15.09	0.14	2
12/21/82	45324.793	15.01	0.10	2
12/22/82	45325.881	14.94	0.09	2
1/12/83	45346.750	13.48	0.10	2
1/14/83	45348.634	13.68	0.09	2
1/15/83	45349.641	13.65	0.04	2
1/16/83	45350.639	13.54	0.07	2
2/18/83	45383.756	14.77	0.24	
3/ 3/83	45396.638	14.19	0.14	
3/ 7/83	45400.572	14.35	0.15	2
3/10/83	45403.569	14.14	0.11	2
3/12/83	45405.708	14.30	0.16	2
3/14/83	45407.552	14.52	0.21	2
3/20/83	45413.667	14.38	0.17	2
3/22/83	45415.782	14.34	0.16	
3/29/83	45422.590	13.89	0.15	2
4/ 2/83	45426.586	14.31	0.15	2
4/ 2/83	45426.674	14.36	0.23	
4/17/83	45441.688	14.18	0.17	
4/11/83	45435.657	14.43	0.13	2
5/ 6/83	45460.610	14.51	0.21	
5/ 8/83	45462.625	14.30	0.14	
5/10/83	45464.585	14.45	0.09	2
5/12/83	45466.604	14.54	0.05	
5/13/83	45467.601	14.26	0.09	
11/12/83	45650.787	14.15	0.13	2
11/12/83	45650.914	14.28	0.10	2
12/ 6/83	45674.717	14.97	0.13	
12/ 7/83	45675.713	15.13	0.06	2
12/ 8/83	45676.758	14.48	0.17	2
12/ 8/83	45676.828	14.49	0.17	2
12/31/83	45699.767	15.49	0.15	
1/ 8/84	45707.756	15.06	0.13	
3/ 1/84	45760.573	13.98	0.13	2
3/ 9/84	45768.744	13.77	0.10	4
3/11/84	45770.825	14.33	0.09	2
3/21/84	45780.583	14.82	0.06	2
3/25/84	45784.588	14.92	0.19	2
3/30/84	45789.657	15.30	0.17	2
4/ 5/84	45795.655	15.26	0.22	
4/20/84	45810.592	15.99	0.14	4
4/21/84	45811.574	15.87	0.15	2
4/21/84	45811.662	15.87	0.11	2
4/25/84	45815.591	15.86	0.05	2
4/25/84	45815.673	15.86	0.14	2
4/28/84	45818.608	15.75	0.07	2
4/30/84	45820.624	15.57	0.10	2
11/24/84	46028.822	16.86	0.06	2
11/29/84	46033.851	17.69	0.16	
1/15/85	46080.790	16.36	0.09	2
1/21/85	46086.873	15.40	0.05	2
1/26/85	46091.716	15.61	0.12	2
2/16/85	46112.676	15.60	0.15	2
2/19/85	46115.682	15.90	0.21	
3/15/85	46139.624	15.50	0.13	2
3/19/85	46143.754	16.10	0.23	
3/20/85	46144.610	16.09	0.21	
3/23/85	46147.569	16.05	0.23	
4/10/85	46165.616	15.84	0.05	
11/17/85	46386.933	16.52	0.12	
11/19/85	46388.894	16.76	0.05	2
12/11/85	46410.644	15.81	0.10	
12/15/85	46414.801	16.76	0.13	2
12/17/85	46416.844	16.45	0.13	
1/ 6/86	46436.753	16.86	0.13	2
1/12/86	46442.735	16.91	0.07	2
1/14/86	46444.794	16.92	0.11	2
1/31/86	46461.626	17.56	0.21	
2/ 1/86	46462.655	16.76	0.24	
2/13/86	46474.701	16.67	0.16	
3/ 6/86	46495.632	16.16	0.04	
3/ 7/86	46496.655	16.11	0.27	
3/31/86	46520.606	15.98	0.14	
4/ 1/86	46521.606	16.03	0.25	

OJ 287 V

U.T. DATE	J.D.	MAG.	RMS.	#
12/15/71	41300.856	12.67	0.09	
12/19/71	41304.828	12.50	0.08	
12/26/71	41311.882	12.22	0.21	
1/ 7/72	41323.690	12.31	0.17	
1/ 9/72	41325.704	12.67	0.09	
1/10/72	41326.758	12.46	0.12	
1/20/72	41336.747	12.65	0.09	
1/24/72	41340.828	12.40	0.06	
1/25/72	41341.912	12.52	0.15	
2/ 5/72	41352.709	12.62	0.04	
2/ 7/72	41354.677	12.58	0.05	
2/14/72	41361.591	12.70	0.03	3
2/14/72	41361.643	12.69	0.07	
2/14/72	41361.694	12.63	0.03	3
2/14/72	41361.809	12.59	0.04	2
2/14/72	41361.873	12.54	0.04	3
2/19/72	41366.531	12.77	0.14	
2/20/72	41367.733	12.68	0.10	
2/22/72	41369.792	12.54	0.24	
3/ 6/72	41382.668	12.61	0.08	
3/ 9/72	41385.746	12.78	0.09	
3/10/72	41386.658	12.68	0.07	

OJ 287 V CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
3/13/72	41389.661	12.76	0.17	
3/14/72	41390.788	12.67	0.09	
3/15/72	41391.682	12.47	0.15	
4/ 3/72	41410.650	12.82	0.08	
4/ 4/72	41411.701	12.96	0.11	
4/15/72	41422.560	12.22	0.19	
5/ 2/72	41439.573	13.70	0.24	
5/11/72	41448.626	13.11	0.13	
11/ 5/72	41626.915	13.43	0.06	
1/ 2/73	41684.913	12.87	0.15	
2/ 1/73	41714.708	13.26	0.07	
2/ 3/73	41716.744	13.46	0.13	2
2/ 3/73	41716.819	13.42	0.06	2
2/ 3/73	41716.900	13.30	0.05	2
2/ 4/73	41717.774	13.55	0.20	
2/ 4/73	41717.854	13.72	0.03	2
2/ 4/73	41717.923	13.54	0.06	2
2/ 5/73	41718.558	13.24	0.07	2
2/ 5/73	41718.619	13.46	0.04	2
2/ 5/73	41718.709	13.47	0.05	2
2/ 5/73	41718.784	13.57	0.10	2
2/ 5/73	41718.860	13.47	0.06	2
2/ 6/73	41719.586	13.51	0.09	2
2/ 3/73	41719.653	13.76	0.12	2
2/ 6/73	41719.752	13.78	0.17	2
2/ 6/73	41719.854	13.49	0.03	2
2/ 7/73	41720.550	13.41	0.04	2
2/ 7/73	41720.608	13.64	0.07	2
2/ 7/73	41720.691	13.68	0.09	2
2/ 7/73	41720.768	13.70	0.14	2
2/ 7/73	41720.838	13.69	0.03	2
2/ 8/73	41721.570	13.80	0.11	2
2/ 8/73	41721.632	13.83	0.09	2
2/ 8/73	41721.700	13.68	0.12	
2/ 8/73	41721.784	13.83	0.07	2
3/10/73	41751.782	13.68	0.13	
4/ 1/73	41773.587	13.35	0.17	
4/ 6/73	41778.681	13.66	0.13	
4/20/73	41792.603	14.04	0.18	
4/21/73	41793.633	13.93	0.17	
10/ 4/73	41959.902	14.61	0.07	
10/27/73	41982.876	14.88	0.17	
11/ 2/73	41988.881	14.69	0.14	
11/ 6/73	41992.885	14.81	0.12	
1/ 4/74	42051.867	14.64	0.18	
1/24/74	42071.781	14.52	0.15	
2/23/74	42101.705	15.40	0.08	
2/25/74	42103.714	15.35	0.09	
3/ 1/74	42107.791	15.64	0.11	
3/14/74	42120.626	15.29	0.08	
4/12/74	42149.562	15.55	0.25	
5/11/74	42178.657	15.26	0.14	
5/15/74	42182.629	15.10	0.23	
5/22/74	42189.608	14.36	0.15	
5/24/74	42191.559	14.73	0.12	
10/21/74	42341.922	15.62	0.12	
11/23/74	42374.856	14.93	0.16	
12/18/74	42399.865	14.71	0.11	
1/10/75	42422.750	14.46	0.15	
1/21/75	42433.813	14.65	0.08	
2/ 1/75	42444.632	14.58	0.10	
2/ 8/75	42451.757	14.71	0.09	
3/ 7/75	42478.635	15.03	0.15	
3/ 9/75	42480.635	14.65	0.14	
3/13/75	42484.729	14.56	0.12	
4/ 2/75	42504.601	15.08	0.15	
2/28/76	42836.674	16.39	0.12	
2/18/77	43192.721	14.90	0.22	
4/10/77	43243.607	14.79	0.10	
12/ 8/77	43485.903	15.06	0.12	
1/10/78	43518.867	14.78	0.09	
2/12/78	43551.767	14.84	0.12	
3/11/78	43578.692	14.75	0.13	
5/ 6/78	43634.575	14.97	0.15	
11/ 4/78	43817.842	14.17	0.09	2
11/ 5/78	43818.827	14.07	0.10	2
3/30/79	43962.622	15.10	0.24	
5/17/79	44010.615	15.35	0.24	
5/22/79	44015.645	15.20	0.13	
10/14/80	44526.899	14.95	0.09	2
3/14/81	44677.788	14.61	0.10	2
12/22/81	44960.662	14.86	0.14	2
1/15/82	44984.653	14.77	0.09	2
12/18/82	45321.790	14.51	0.19	
12/19/82	45322.816	14.69	0.19	
12/21/82	45324.802	14.51	0.11	2
1/15/83	45349.603	13.55	0.13	
3/10/83	45403.614	13.95	0.16	2
3/12/83	45405.723	13.81	0.12	2
3/14/83	45407.567	13.79	0.06	2
3/20/83	45413.683	13.45	0.23	
3/29/83	45422.581	13.61	0.21	
4/ 2/83	45426.619	13.92	0.14	2
4/11/83	45435.740	13.50	0.10	2
4/17/83	45441.703	13.63	0.10	2
5/10/83	45464.658	13.89	0.09	2
11/12/83	45650.894	13.81	0.14	
12/ 7/83	45675.706	14.44	0.14	
12/ 8/83	45676.803	14.40	0.06	2
3/ 9/84	45768.774	13.45	0.10	2
4/21/84	45811.607	15.41	0.14	2
4/25/84	45815.638	15.36	0.15	2
4/30/84	45820.647	15.04	0.25	
11/19/85	46388.926	16.23	0.10	
12/11/85	46410.705	15.55	0.14	
12/15/85	46414.820	15.90	0.07	
1/ 6/86	46436.788	16.18	0.09	2
1/12/86	46442.767	16.17	0.06	2
1/14/86	46444.835	16.23	0.11	2

OJ 287 I

U.T. DATE	J.D.	MAG.	RMS.	#
2/ 3/73	41716.891	12.75	0.10	
2/ 4/73	41717.797	12.81	0.16	
2/ 5/73	41718.656	12.71	0.05	
2/ 5/73	41718.849	12.91	0.16	
2/ 6/73	41719.696	12.52	0.12	
2/ 6/73	41719.792	13.00	0.17	
2/ 7/73	41720.826	12.46	0.10	
4/30/73	41802.619	13.58	0.22	
5/13/73	41815.585	13.27	0.13	
11/ 6/73	41992.861	13.98	0.23	
1/ 4/74	42051.841	13.92	0.05	
1/24/74	42071.808	14.18	0.10	
10/27/74	42347.894	14.17	0.16	
11/23/74	42374.906	14.61	0.06	
12/18/74	42399.892	14.25	0.05	
1/10/75	42422.788	14.01	0.17	
2/ 1/75	42444.651	13.85	0.11	
2/ 8/75	42451.788	13.59	0.19	
3/ 2/75	42473.642	14.49	0.06	
3/ 7/75	42478.651	14.56	0.21	
4/24/76	42892.573	14.75	0.07	

TABLE III. (continued)

OJ 287 I CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
4/29/76	42897.582	14.80	0.08	
11/ 1/76	43083.918	14.63	0.07	
1/20/77	43163.813	14.36	0.13	
2/14/77	43188.653	14.09	0.10	
2/18/77	43192.742	14.07	0.11	
4/10/77	43243.584	13.71	0.08	
12/ 8/77	43485.915	14.23	0.05	
3/11/78	43578.702	14.25	0.07	
4/ 5/78	43603.604	14.25	0.13	
5/ 9/78	43637.601	14.14	0.08	
11/ 4/78	43817.853	13.48	0.09	
11/ 5/78	43818.865	13.34	0.07	2
3/30/79	43962.630	14.00	0.13	
5/20/79	44013.592	14.38	0.09	
5/22/79	44015.656	14.59	0.09	
10/14/80	44526.924	14.32	0.04	
12/22/81	44960.694	13.91	0.15	
1/16/83	45350.625	12.34	0.09	
3/14/83	45407.611	12.87	0.09	
4/ 2/83	45426.648	12.87	0.03	2
5/10/83	45464.648	12.95	0.09	
5/13/83	45467.601	13.23	0.08	
4/21/84	45811.632	14.40	0.32	
4/25/84	45815.580	14.64	0.19	
4/25/84	45815.608	14.58	0.20	

0906+01 P

U.T. DATE	J.D.	MAG.	RMS.	#
3/20/79	40300.687	16.95	0.05	
3/23/69	40303.674	16.79	0.06	
4/ 7/69	40318.562	16.82	0.06	
4/ 9/69	40320.583	17.07	0.14	
4/13/69	40324.583	16.91	0.14	
4/20/69	40331.656	16.61	0.09	
4/24/69	40335.578	16.53	0.15	
5/11/69	40352.569	16.93	0.07	
6/ 8/69	40380.562	16.29	0.09	
10/13/69	40507.877	17.13	0.16	
11/10/69	40535.913	17.13	0.12	
11/12/69	40537.903	17.31	0.09	
11/15/69	40540.903	16.58	0.09	
1/ 9/70	40595.771	17.22	0.10	
1/31/70	40617.759	17.14	0.07	
2/ 8/70	40625.760	16.99	0.10	
2/10/70	40627.736	17.11	0.19	
2/14/70	40631.833	16.74	0.10	
3/31/70	40676.587	17.27	0.06	
4/ 7/70	40683.740	16.88	0.13	
4/29/70	40705.646	17.34	0.12	
4/30/70	40706.594	17.65	0.13	
5/ 2/70	40708.562	17.38	0.09	
5/ 7/70	40713.573	17.42	0.09	
5/ 9/70	40715.611	17.46	0.05	
5/26/70	40732.601	17.24	0.08	
5/31/70	40737.583	17.54	0.09	
9/30/70	40859.897	16.72	0.11	
10/ 3/70	40862.886	16.83	0.09	
10/ 5/70	40864.899	16.75	0.10	
10/ 9/70	40868.885	16.24	0.20	
10/11/70	40870.906	16.04	0.09	
11/ 2/70	40892.913	16.41	0.10	
11/ 6/70	40896.882	16.75	0.05	
11/ 8/70	40898.894	17.01	0.07	
11/28/70	40918.854	17.14	0.13	
11/29/70	40919.837	17.14	0.09	
12/ 3/70	40923.875	16.63	0.12	
12/ 5/70	40925.906	16.46	0.10	
12/ 8/70	40928.826	16.69	0.08	
12/23/70	40943.757	17.37	0.21	
12/29/70	40949.698	16.91	0.06	
1/ 1/71	40952.744	16.85	0.07	
1/ 4/71	40955.814	16.72	0.15	
1/16/71	40967.601	16.81	0.07	
1/20/71	40971.705	16.27	0.05	
1/22/71	40973.776	16.24	0.14	
1/23/71	40974.865	16.78	0.09	
1/25/71	40976.799	16.82	0.06	
1/26/71	40977.724	16.75	0.12	
1/27/71	40978.830	16.87	0.06	
1/29/71	40980.771	16.61	0.13	
1/30/71	40981.687	16.68	0.15	
2/ 2/71	40984.822	16.46	0.07	
2/14/71	40996.590	16.58	0.11	
2/17/71	40999.694	16.99	0.09	
2/19/71	41001.719	17.23	0.12	
2/20/71	41002.646	17.26	0.13	
2/21/71	41003.683	17.29	0.11	
2/22/71	41004.756	17.42	0.13	
2/24/71	41006.653	17.39	0.03	
2/27/71	41009.529	17.35	0.05	
3/ 1/71	41011.667	17.38	0.11	
3/ 3/71	41013.772	17.43	0.09	
3/ 4/71	41014.781	17.41	0.04	
3/17/71	41027.540	17.07	0.06	
3/19/71	41029.670	16.85	0.14	
3/21/71	41031.542	16.60	0.09	
3/23/71	41033.677	16.57	0.05	
3/26/71	41036.703	16.73	0.07	
3/28/71	41038.674	16.94	0.16	
3/29/71	41039.605	16.84	0.16	
3/31/71	41041.736	17.08	0.08	
5/18/71	41089.577	17.04	0.11	
5/19/71	41090.576	16.66	0.08	
5/20/71	41091.577	16.61	0.09	
5/21/71	41092.580	16.65	0.10	
5/22/71	41093.580	16.38	0.08	
5/26/71	41097.576	16.67	0.09	
6/18/71	41120.576	16.48	0.16	
6/21/71	41123.576	16.85	0.21	

0906+01 B

U.T. DATE	J.D.	MAG.	RMS.	#
11/ 9/70	40899.885	17.38	0.18	
11/26/70	40916.867	16.98	0.07	
1/ 1/71	40952.805	17.09	0.07	
1/22/71	40973.833	16.62	0.11	
1/30/71	40981.731	16.71	0.12	
2/ 2/71	40984.781	16.68	0.05	
2/21/71	41003.771	17.38	0.11	
2/24/71	41006.637	17.40	0.08	
2/27/71	41009.590	17.65	0.06	
3/17/71	41027.594	17.32	0.07	
5/20/71	41091.621	16.70	0.10	
10/19/71	41243.916	17.52	0.10	
11/26/71	41281.922	17.72	0.08	
12/15/71	41300.899	17.46	0.10	
12/25/71	41310.840	17.62	0.07	
2/20/72	41367.830	17.47	0.06	

0906+01 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
3/10/72	41386.773	17.22	0.06	
3/15/72	41391.649	17.52	0.11	
4/ 3/72	41410.578	17.14	0.05	
4/11/72	41418.614	17.10	0.12	
5/ 2/72	41439.591	17.18	0.08	
11/ 3/72	41624.871	17.91	0.10	
1/ 2/73	41684.835	17.85	0.09	
1/14/73	41696.865	17.94	0.07	
1/29/73	41711.748	17.70	0.07	
3/ 4/73	41745.687	17.91	0.09	
4/22/73	41794.616	17.84	0.07	
4/28/73	41800.610	17.72	0.08	
5/ 1/73	41803.629	17.26	0.06	
12/19/73	42035.834	17.38	0.08	
1/ 4/74	42051.938	17.71	0.10	
1/24/74	42071.842	17.12	0.07	
1/27/74	42074.784	17.25	0.08	
1/29/74	42076.828	17.67	0.08	
2/19/74	42097.737	17.24	0.11	
2/24/74	42102.723	17.32	0.07	
3/14/74	42120.652	17.35	0.08	
3/19/74	42125.654	17.36	0.09	
4/11/74	42148.621	17.10	0.06	
4/23/74	42160.653	16.79	0.09	
4/28/74	42165.768	16.81	0.26	
11/24/74	42375.926	17.39	0.09	
12/19/74	42400.863	17.19	0.11	
1/10/75	42422.833	17.26	0.10	
1/18/75	42430.750	17.57	0.09	
2/ 3/75	42446.743	17.59	0.14	
2/10/75	42453.716	17.33	0.13	
2/16/75	42459.784	17.65	0.12	
3/ 6/75	42477.684	17.38	0.20	
3/10/75	42481.673	17.84	0.09	
4/ 6/75	42508.649	17.71	0.07	
5/ 1/75	42533.571	18.43	0.19	
5/ 4/75	42536.567	17.88	0.18	
5/ 9/75	42541.581	17.77	0.13	
5/12/75	42544.594	17.73	0.14	
12/ 7/75	42753.942	17.72	0.06	2
12/29/75	42775.819	17.70	0.11	
1/ 3/76	42780.789	17.64	0.15	
1/ 8/76	42785.819	17.45	0.04	2
1/30/76	42808.847	17.75	0.05	2
2/ 6/76	42814.767	17.99	0.13	
2/21/76	42829.693	17.75	0.06	2
2/29/76	42837.634	17.94	0.08	2
3/25/76	42862.675	17.93	0.07	2
4/ 2/76	42870.619	17.92	0.07	2
4/18/76	42886.607	17.86	0.06	2
4/27/76	42895.615	18.14	0.07	2
12/27/76	43139.933	17.81	0.05	2
1/20/77	43163.785	18.05	0.06	2
2/11/77	43185.716	17.73	0.09	2
2/19/77	43193.738	17.53	0.06	2
4/10/77	43243.614	18.16	0.08	2
4/18/77	43251.594	17.81	0.07	2
5/ 9/77	43272.621	18.02	0.07	2
1/12/78	43520.735	17.51	0.16	
2/13/78	43552.725	18.15	0.13	
3/11/78	43578.658	18.06	0.09	
3/30/78	43597.667	18.13	0.07	
4/ 6/78	43604.626	17.98	0.07	
4/28/78	43626.603	17.82	0.10	
1/ 3/79	43877.794	17.75	0.07	
2/21/79	43926.676	17.87	0.14	
3/19/79	43951.647	17.89	0.09	
4/21/79	43984.610	17.83	0.13	
5/28/79	44021.588	17.69	0.19	
1/24/80	44262.765	17.81	0.09	
2/19/80	44288.663	17.18	0.18	
3/12/80	44310.648	17.58	0.10	
4/ 6/80	44335.622	17.55	0.10	
4/16/80	44345.638	17.78	0.13	
5/12/80	44371.587	17.69	0.11	
12/ 6/80	44579.890	17.78	0.18	
1/ 3/81	44607.745	17.64	0.11	
4/ 3/81	44697.614	17.63	0.12	
11/28/81	44936.815	17.87	0.07	
1/20/82	44989.726	17.29	0.13	
1/27/82	44996.685	17.59	0.07	
2/20/82	45020.655	16.85	0.13	
3/ 3/82	45031.806	17.20	0.11	
3/16/82	45044.662	17.51	0.08	
3/21/82	45049.628	17.57	0.09	
4/13/82	45072.597	17.52	0.19	
12/21/82	45324.662	17.81	0.08	
3/10/83	45403.640	17.57	0.13	
5/ 6/83	45460.623	17.73	0.07	
2/ 8/84	45738.761	17.74	0.08	
3/21/84	45780.603	17.85	0.05	
11/24/84	46028.844	17.63	0.09	
3/20/85	46144.620	17.67	0.07	
3/23/85	46147.578	17.81	0.16	
1/12/86	46442.787	17.61	0.06	
1/31/86	46461.636	17.61	0.08	
3/ 7/86	46496.665	17.95	0.15	
3/31/86	46520.601	17.89	0.13	

1156+295 B

U.T. DATE	J.D.	MAG.	RMS.	#
5/ 9/80	44368.626	17.36	0.12	
6/ 4/80	44394.619	17.33	0.15	
4/ 3/81	44697.663	13.65	0.15	
4/ 4/81	44698.562	13.96	0.08	2
4/ 4/81	44698.685	14.29	0.12	2
4/ 5/81	44699.563	14.08	0.10	
4/ 5/81	44699.566	14.05	0.08	
4/ 5/81	44699.619	13.78	0.07	2
4/ 6/81	44700.541	13.63	0.05	2
4/ 7/81	44701.614	14.43	0.06	2
4/ 7/81	44701.681	14.36	0.07	2
4/ 8/81	44702.547	14.37	0.09	4
4/ 9/81	44703.738	14.60	0.12	2
4/ 9/81	44703.792	14.39	0.12	2
4/10/81	44704.744	14.71	0.12	2
4/12/81	44706.861	14.81	0.09	3
4/13/81	44707.649	14.70	0.09	4
4/25/81	44719.573	15.79	0.11	4
4/30/81	44724.733	16.39	0.04	2
5/ 1/81	44725.627	15.97	0.09	2
5/ 3/81	44727.637	15.89	0.11	
5/10/81	44734.758	15.98	0.11	2
5/30/81	44754.621	15.74	0.23	
6/ 3/81	44758.647	15.73	0.07	2
6/ 6/81	44761.665	15.09	0.16	2
6/ 7/81	44762.749	14.75	0.15	2
6/25/81	44780.622	15.89	0.12	4
6/29/81	44784.620	15.91	0.13	2
6/29/81	44784.662	15.72	0.12	2
7/ 1/81	44786.632	14.49	0.18	
7/ 3/81	44788.599	16.01	0.07	4
7/ 5/81	44790.613	16.46	0.10	2

1156+295 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
7/ 6/81	44791.588	15.80	0.12	4
7/ 6/81	44791.644	15.78	0.13	2
7/25/81	44810.602	14.79	0.18	2
7/28/81	44813.635	15.20	0.08	4
8/18/81	44834.557	14.09	0.09	4
8/24/81	44840.551	14.14	0.13	4
11/28/81	44936.870	16.83	0.10	
12/ 4/81	44942.927	16.30	0.09	2
1/21/82	44990.782	16.29	0.07	2
1/27/82	44996.782	16.06	0.08	2
2/15/82	45015.703	14.79	0.11	
2/18/82	45018.722	15.73	0.13	2
2/18/82	45018.789	15.79	0.11	2
2/21/82	45021.699	15.34	0.10	
2/24/82	45024.653	15.47	0.19	
3/ 3/82	45031.819	14.96	0.20	
3/16/82	45044.693	14.76	0.07	2
3/18/82	45046.651	14.74	0.08	2
3/21/82	45049.760	15.74	0.16	
3/31/82	45059.767	15.24	0.16	
4/13/82	45072.651	14.69	0.20	
4/15/82	45074.663	14.46	0.22	
4/15/82	45074.672	14.59	0.20	
4/28/82	45087.763	14.97	0.12	2
4/28/82	45087.819	14.98	0.12	2
5/14/82	45103.650	16.45	0.13	2
5/16/82	45105.611	16.28	0.23	
5/19/82	45108.634	16.07	0.23	
5/22/82	45111.640	15.98	0.24	
6/19/82	45139.634	15.25	0.21	
11/25/82	45298.938	15.06	0.13	2
12/22/82	45325.906	17.05	0.23	
2/18/83	45383.844	17.31	0.20	
3/10/83	45403.719	14.93	0.14	2
3/12/83	45405.818	15.97	0.21	
3/14/83	45407.752	16.08	0.16	
4/12/83	45436.640	17.46	0.13	
4/17/83	45441.790	17.50	0.24	
5/12/83	45466.705	18.01	0.15	
6/ 9/83	45494.590	17.55	0.22	
6/10/83	45495.593	17.91	0.12	2
6/11/83	45496.610	17.88	0.12	2
6/13/83	45498.585	17.75	0.18	
7/ 6/83	45521.595	17.76	0.28	
11/12/83	45650.933	16.64	0.24	
12/ 8/83	45676.844	15.60	0.15	2
12/ 8/83	45676.888	15.63	0.13	2
1/ 8/84	45707.766	16.48	0.15	
2/ 9/84	45739.846	15.15	0.19	
3/ 1/84	45760.759	15.78	0.18	2
3/ 9/84	45768.815	14.95	0.25	
3/11/84	45770.810	15.01	0.13	2
3/21/84	45780.640	15.49	0.07	2
3/25/84	45784.651	15.17	0.14	2
3/30/84	45789.780	16.02	0.11	2
4/ 5/84	45795.669	16.21	0.26	
4/ 7/84	45797.766	16.60	0.16	
4/21/84	45811.681	16.31	0.21	
4/25/84	45815.690	16.10	0.26	
5/20/84	45840.641	14.88	0.20	
6/ 1/84	45852.635	15.08	0.18	2
6/ 1/84	45852.583	14.84	0.12	2
6/ 2/84	45853.641	14.91	0.22	
1/16/85	46081.770	15.79	0.28	2
1/20/85	46085.749	16.34	0.14	2
1/21/85	46086.810	16.14	0.13	
1/26/85	46091.731	15.50	0.12	
2/16/85	46112.724	14.75	0.13	2
2/19/85	46115.749	14.65	0.21	
3/15/85	46139.756	16.41	0.17	2
3/19/85	46143.893	15.59	0.23	
3/23/85	46147.715	15.33	0.10	
3/24/85	46148.657	15.15	0.10	2
3/26/85	46150.762	15.54	0.13	
3/26/85	46150.767	15.49	0.11	
4/11/85	46166.649	14.02	0.16	2
4/16/85	46171.642	14.30	0.13	2
4/16/85	46171.722	14.10	0.19	2
4/17/85	46172.628	14.61	0.21	2
4/18/85	46173.681	14.15	0.33	
4/18/85	46173.737	14.36	0.15	2
4/19/85	46174.601	14.89	0.19	2
4/23/85	46178.667	15.21	0.13	2
4/23/85	46178.747	14.46	0.14	2
4/26/85	46181.751	15.01	0.14	2
5/ 8/85	46193.583	15.50	0.18	2
5/15/85	46200.610	16.02	0.18	2
5/17/85	46202.614	15.52	0.13	2
5/17/85	46202.675	15.45	0.11	2
5/18/85	46203.619	15.47	0.12	2
5/24/85	46209.659	14.53	0.10	2
6/ 9/85	46225.612	14.13	0.10	4
6/19/85	46235.628	14.60	0.09	4
6/20/85	46236.609	14.36	0.11	2
7/ 8/85	46254.596	15.03	0.23	2
7/10/85	46256.596	14.64	0.18	2
7/17/85	46263.596	14.79	0.18	2
1/ 6/86	46436.821	17.08	0.12	2
1/12/86	46442.867	17.26	0.09	2
1/31/86	46461.662	16.58	0.24	
2/ 1/86	46462.676	16.40	0.21	
2/13/86	46474.800	16.83	0.14	
2/14/86	46475.758	17.24	0.13	
2/17/86	46478.829	16.52	0.16	
3/ 6/86	46495.733	17.23	0.14	
3/18/86	46507.783	17.02	0.14	2
3/30/86	46519.624	17.25	0.19	
3/31/86	46520.699	17.11	0.14	
3/31/86	46520.705	17.07	0.11	
4/ 1/86	46521.681	16.76	0.23	
4/ 3/86	46523.659	16.48	0.13	
4/10/86	46530.626	16.93	0.13	
4/12/86	46532.617	17.07	0.20	

ON231 B

U.T. DATE	J.D.	MAG.	RMS.	#
2/22/72	41369.758	16.96	0.17	
3/21/72	41397.753	16.83	0.05	
5/ 2/72	41439.672	17.46	0.17	
6/11/72	41479.608	16.65	0.04	
6/27/73	41860.627	17.01	0.17	
6/28/73	41861.622	16.78	0.06	
6/30/73	41863.593	16.86	0.18	
7/ 3/73	41866.641	16.99	0.23	
7/25/73	41888.595	16.39	0.19	
7/26/73	41889.587	16.95	0.13	
1/27/74	42074.947	17.32	0.22	
3/21/74	42127.808	16.80	0.16	
4/28/74	42165.828	17.26	0.13	
5/15/74	42182.724	16.92	0.24	
5/17/74	42184.661	16.88	0.11	
5/21/74	42188.742	16.70	0.16	
5/24/74	42191.651	16.56	0.13	

ON 231 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
5/28/74	42195.744	17.04	0.12	
6/11/74	42209.699	17.40	0.14	
6/13/74	42211.694	17.27	0.15	
6/16/74	42214.603	17.13	0.17	
6/17/74	42215.642	17.43	0.08	
6/17/74	42215.708	17.33	0.18	
6/18/74	42216.615	17.30	0.15	
6/19/74	42217.604	17.28	0.13	
6/21/74	42219.632	16.91	0.14	
6/23/74	42221.670	17.05	0.13	
6/24/74	42222.637	17.06	0.10	
7/14/74	42242.637	16.99	0.17	
7/15/74	42243.626	17.21	0.12	
7/16/74	42244.633	17.05	0.17	
7/17/74	42245.637	16.95	0.06	
7/20/74	42248.592	16.92	0.12	
2/ 7/75	42450.764	17.13	0.22	
3/13/75	42484.845	17.32	0.10	
5/ 9/75	42541.656	16.68	0.23	
6/ 5/75	42568.594	16.57	0.12	2
6/ 6/75	42569.611	16.12	0.09	
6/11/75	42574.609	16.77	0.19	
6/13/75	42576.634	16.47	0.06	2
6/14/75	42577.660	15.98	0.05	
7/ 3/75	42596.623	16.32	0.08	2
7/ 8/75	42601.628	15.75	0.06	
1/ 3/76	42780.876	16.09	0.16	
1/26/76	42803.843	16.15	0.08	
2/ 3/76	42811.870	16.45	0.04	
3/ 4/76	42841.829	16.67	0.16	
3/25/76	42862.753	16.72	0.08	
4/ 4/76	42872.778	15.91	0.09	
4/23/76	42891.689	16.52	0.12	
4/24/76	42892.692	16.70	0.14	
4/29/76	42897.676	17.21	0.32	
6/ 1/76	42930.661	15.38	0.22	
2/19/77	43193.899	16.23	0.07	2
2/23/77	43197.890	16.47	0.05	
2/25/77	43199.871	16.52	0.17	2
2/26/77	43200.874	16.65	0.03	2
3/23/77	43225.779	15.91	0.07	2
4/10/77	43243.711	16.40	0.05	2
4/12/77	43245.712	16.49	0.08	
4/18/77	43251.694	16.64	0.10	2
4/19/77	43252.801	16.46	0.10	2
2/13/78	43552.878	16.94	0.14	
3/ 7/78	43574.854	17.13	0.13	
4/ 7/78	43605.686	17.05	0.27	
4/11/78	43609.696	17.28	0.17	
4/29/78	43627.661	17.27	0.20	
5/11/78	43639.756	17.23	0.17	
5/28/78	43656.650	16.88	0.12	
6/ 7/78	43666.675	17.01	0.21	
7/26/78	43715.603	16.65	0.19	
12/ 2/78	43844.856	16.42	0.21	2
12/10/78	43852.860	16.09	0.11	
12/27/78	43869.820	16.35	0.05	
12/31/78	43873.862	16.28	0.28	
3/21/79	43953.646	16.26	0.08	
3/28/79	43960.753	16.30	0.21	
4/21/79	43984.675	15.64	0.20	
5/17/79	44010.649	15.91	0.23	
5/20/79	44013.614	15.88	0.25	
5/22/79	44015.661	15.83	0.26	
5/28/79	44021.635	16.29	0.24	
6/17/79	44041.636	15.60	0.21	
6/24/79	44048.651	16.07	0.14	
1/24/80	44262.886	16.03	0.08	
3/22/80	44320.731	16.50	0.15	
4/12/80	44341.719	15.86	0.15	
5/ 9/80	44368.633	16.18	0.27	
6/ 9/80	44399.613	16.35	0.18	
1/ 5/81	44609.896	15.94	0.11	
1/30/81	44634.790	16.30	0.20	
2/12/81	44647.858	16.14	0.25	
4/ 3/81	44697.837	16.04	0.22	
4/30/81	44724.731	16.36	0.22	
5/30/81	44754.667	16.58	0.16	
7/ 1/81	44786.639	16.89	0.13	
3/ 3/82	45031.842	16.98	0.23	
3/31/82	45059.801	16.74	0.15	
4/15/82	45074.696	16.60	0.30	
5/16/82	45105.633	16.00	0.29	
6/16/82	45136.618	15.82	0.22	
3/10/83	45403.755	16.08	0.23	
4/12/83	45436.667	16.41	0.13	
5/10/83	45464.658	15.81	0.27	
6/ 5/83	45490.613	16.34	0.06	
6/11/83	45496.694	16.10	0.23	
2/ 9/84	45739.854	15.30	0.21	
3/30/84	45789.811	15.58	0.26	
4/21/84	45811.693	15.67	0.11	
6/ 2/84	45853.662	16.10	0.24	
3/24/85	46148.703	15.34	0.07	
4/19/85	46174.670	16.07	0.24	
1/12/86	46442.909	16.70	0.16	
2/13/86	46474.847	16.46	0.16	
3/18/86	46507.837	15.94	0.19	
4/ 1/86	46521.698	16.42	0.25	
4/ 3/86	46523.683	16.71	0.15	

1308+32 B

U.T. DATE	J.D.	MAG.	RMS.	#
4/22/76	42890.693	16.45	0.09	2
5/ 3/76	42901.725	16.82	0.12	2
1/26/77	43169.880	15.69	0.09	2
2/21/77	43195.919	15.86	0.17	2
2/25/77	43199.925	15.63	0.17	2
3/27/77	43229.860	15.32	0.11	2
4/13/77	43246.751	16.11	0.07	2
4/18/77	43251.760	15.52	0.08	2
5/14/77	43277.667	15.61	0.20	
3/ 7/78	43574.869	16.86	0.13	
4/ 2/78	43600.764	15.28	0.15	
4/ 3/78	43601.692	15.20	0.12	
4/ 5/78	43603.726	15.64	0.15	
4/28/78	43626.685	16.33	0.13	
5/ 2/78	43630.692	15.86	0.19	
5/ 6/78	43634.631	15.98	0.09	
5/26/78	43654.628	15.64	0.15	
5/27/78	43655.660	15.40	0.27	
5/28/78	43656.675	15.46	0.07	2
5/30/78	43658.620	15.58	0.29	
5/31/78	43659.710	15.58	0.23	
6/ 2/78	43661.675	15.42	0.14	
6/ 9/78	43668.633	15.73	0.16	
7/ 6/78	43695.663	16.37	0.10	
7/26/78	43715.613	16.40	0.17	
8/ 5/78	43726.591	16.35	0.19	
8/ 8/78	43729.556	16.38	0.15	
12/31/78	43874.917	17.95	0.20	
3/ 1/79	43933.768	17.60	0.16	
3/20/79	43952.707	17.16	0.05	

TABLE III. (continued)

1308+32 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
3/27/79	43959.728	17.08	0.20	
3/30/79	43962.817	17.30	0.18	
5/17/79	44010.659	17.08	0.18	
2/21/79	43925.688	16.89	0.19	
5/29/79	44022.689	16.77	0.18	
6/17/79	44041.663	17.42	0.13	
1/24/80	44262.926	16.24	0.16	
2/ 8/80	44277.712	17.36	0.26	
2/19/80	44288.836	17.26	0.21	
3/22/80	44320.751	17.46	0.16	
4/12/80	44341.752	17.31	0.16	
5/ 9/80	44368.697	17.27	0.20	
6/ 5/80	44395.648	17.68	0.15	
6/12/80	44402.591	17.09	0.11	
7/ 5/80	44425.631	15.18	0.21	
7/ 6/80	44426.599	15.05	0.05	4
8/ 7/80	44458.625	15.45	0.06	4
7/10/80	44430.590	16.19	0.06	3
7/10/80	44430.659	16.18	0.12	2
7/11/80	44431.643	15.91	0.09	2
7/16/80	44436.588	17.06	0.10	2
7/17/80	44437.701	17.09	0.08	2
8/ 2/80	44453.583	17.46	0.11	2
8/ 4/80	44455.578	17.51	0.08	
11/ 8/80	44551.933	17.24	0.13	
12/ 6/80	44579.951	17.38	0.23	
1/30/81	44634.827	18.13	0.25	
3/26/81	44689.676	16.61	0.20	
4/ 1/81	44695.702	17.40	0.20	
4/ 3/81	44697.738	17.65	0.14	
4/ 3/81	44697.821	17.48	0.13	
4/ 7/81	44701.745	17.98	0.22	
4/30/81	44724.785	15.82	0.14	
5/ 1/81	44725.668	16.04	0.11	
5/ 3/81	44727.756	15.79	0.12	
5/12/81	44736.783	17.19	0.13	2
5/30/81	44754.681	18.37	0.29	
7/ 1/81	44786.647	17.86	0.18	
3/18/82	45046.683	16.97	0.13	
6/20/82	45140.597	17.70	0.22	
3/12/83	45405.794	15.79	0.16	
4/14/83	45438.724	16.12	0.27	
5/13/83	45467.724	15.85	0.23	
6/ 5/83	45490.667	15.65	0.18	
7/ 6/83	45521.629	16.69	0.16	
1/ 8/84	45707.792	17.39	0.14	3
1/29/84	45729.778	17.09	0.17	2
2/ 9/84	45739.752	17.06	0.27	
2/ 9/84	45739.898	16.98	0.24	
3/ 1/84	45760.828	17.01	0.16	2
3/ 9/84	45768.891	17.04	0.20	
4/ 5/84	45795.728	17.07	0.15	2
4/ 7/84	45797.751	16.92	0.11	
5/ 7/84	45827.822	16.93	0.14	
6/ 2/84	45853.672	16.99	0.14	
5/20/84	45840.683	17.44	0.18	2
6/ 1/84	45852.658	17.11	0.13	2
2/16/85	46112.910	16.79	0.28	
3/20/85	46144.726	17.42	0.28	
3/24/85	46148.744	17.25	0.14	2
3/26/85	46150.829	17.21	0.13	
4/17/85	46172.708	17.68	0.22	
4/18/85	46173.820	17.56	0.14	2
4/19/85	46174.685	17.71	0.23	
4/23/85	46178.751	17.56	0.15	
5/15/85	46200.654	17.80	0.20	
5/17/85	46202.705	17.36	0.06	2
5/18/85	46203.698	17.59	0.14	2
5/24/85	46209.677	17.50	0.15	2
5/25/85	46210.712	17.15	0.15	2
6/19/85	46235.660	17.05	0.11	
6/20/85	46236.669	17.42	0.17	
7/ 8/85	46254.614	17.90	0.28	
7/17/85	46263.608	16.93	0.22	
2/13/86	46474.856	18.33	0.15	

1514-24 B

U.T. DATE	J.D.	MAG.	RMS.	#
2/20/72	41367.931	16.09	0.13	
4/18/72	41425.806	16.07	0.25	
7/ 9/72	41507.624	16.64	0.07	
3/ 4/73	41745.932	16.11	0.28	
3/18/73	41759.890	15.64	0.26	
4/ 9/73	41781.812	15.67	0.05	
4/11/73	41783.827	15.46	0.08	
4/28/73	41800.770	15.62	0.06	
5/ 2/73	41804.703	15.33	0.16	
5/12/73	41814.661	15.92	0.08	
6/10/73	41843.676	16.29	0.18	
6/23/73	41856.685	16.16	0.10	
6/27/73	41860.665	16.11	0.10	
6/30/73	41863.667	15.68	0.09	
7/ 3/73	41866.704	15.60	0.15	
7/26/73	41889.606	15.74	0.26	
3/ 1/74	42107.926	15.95	0.06	
4/19/74	42156.851	16.12	0.11	
4/28/74	42165.858	15.96	0.04	
5/19/74	42186.763	15.79	0.23	
6/14/74	42212.716	16.07	0.06	
6/16/74	42214.716	15.95	0.08	
6/17/74	42215.750	16.11	0.11	
6/18/74	42216.733	16.02	0.10	
6/19/74	42217.719	15.80	0.21	
6/21/74	42219.737	15.99	0.09	
6/23/74	42221.740	15.94	0.11	
7/11/74	42239.656	15.92	0.11	
7/15/74	42243.623	15.72	0.11	
7/16/74	42244.687	15.76	0.13	
7/17/74	42245.694	15.96	0.14	
7/20/74	42248.646	15.92	0.04	
2/ 9/75	42452.933	15.29	0.18	
4/17/75	42519.847	15.43	0.24	
5/12/75	42544.747	15.26	0.28	
5/16/75	42548.791	15.46	0.13	
6/ 1/75	42564.660	15.57	0.22	
7/ 8/75	42601.667	16.18	0.14	
3/11/76	42848.896	15.75	0.10	2
4/ 4/76	42872.813	16.24	0.08	2
5/ 4/76	42902.735	16.71	0.20	
5/26/76	42924.696	16.26	0.13	2
5/31/76	42929.744	16.33	0.21	
6/ 1/76	42930.719	16.12	0.31	
6/ 5/76	42934.751	16.39	0.13	2
7/28/76	42987.591	16.11	0.11	2
4/19/77	43252.779	15.12	0.15	2
4/21/77	43254.697	15.34	0.17	
4/27/77	43260.778	16.64	0.10	2
5/ 9/77	43272.673	15.42	0.21	
5/13/77	43276.707	15.42	0.10	
5/14/77	43277.753	15.57	0.20	
5/15/77	43278.761	15.04	0.22	
5/17/77	43280.717	15.28	0.12	
5/18/77	43281.734	14.74	0.16	

1514-24 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
5/20/77	43283.749	15.22	0.15	
5/24/77	43287.679	14.21	0.14	
5/25/77	43288.744	14.32	0.13	
6/ 8/77	43302.703	15.66	0.16	
6/ 9/77	43303.714	15.34	0.11	
6/20/77	43314.676	15.51	0.11	
6/21/77	43315.741	15.58	0.20	
6/23/77	43317.685	15.65	0.17	
7/ 9/77	43333.587	15.67	0.23	
7/15/77	43339.590	15.56	0.18	
7/20/77	43344.628	15.64	0.19	
7/21/77	43345.672	16.02	0.24	
3/14/78	43581.889	16.33	0.07	2
5/ 1/78	43629.726	15.86	0.23	
5/31/78	43659.756	15.98	0.13	
6/ 9/78	43668.649	15.90	0.24	
7/26/78	43715.593	15.19	0.18	
3/31/79	43963.894	15.34	0.26	
5/ 3/79	43996.735	15.82	0.22	
5/22/79	44015.718	15.58	0.44	
5/28/79	44021.676	15.33	0.17	
5/30/79	44023.687	15.10	0.14	
6/17/79	44041.649	15.06	0.15	
6/23/79	44047.681	15.00	0.20	
6/25/79	44049.653	15.19	0.20	
6/29/79	44053.665	15.10	0.21	3
7/27/79	44081.590	15.29	0.12	
8/14/79	44099.657	15.23	0.13	
1/24/80	44262.935	15.13	0.19	
3/22/80	44320.854	15.03	0.16	
4/16/80	44345.817	15.46	0.15	
5/11/80	44370.794	15.83	0.14	
6/ 5/80	44395.657	15.77	0.10	
2/12/81	44647.950	14.91	0.08	
3/10/81	44673.872	15.27	0.17	
4/ 1/81	44695.838	15.31	0.19	
5/ 1/81	44725.726	15.50	0.20	
3/ 3/82	45031.928	15.65	0.07	
5/16/82	45105.753	15.97	0.18	
4/17/83	45441.871	15.96	0.22	
5/ 6/83	45460.751	15.49	0.16	
7/11/83	45526.649	15.98	0.14	
3/ 7/84	45766.862	16.24	0.18	
3/25/85	46149.758	15.10	0.27	
3/18/86	46507.893	15.75	0.09	
4/14/86	46534.774	15.98	0.06	

NRAO 512 P

U.T. DATE	J.D.	MAG.	RMS.	#
5/ 7/70	40713.750	17.54	0.11	
5/31/70	40737.680	17.56	0.13	
6/ 3/70	40740.704	16.32	0.24	
6/ 5/70	40742.694	17.79	0.11	
6/ 6/70	40743.621	18.35	0.09	
6/ 6/70	40743.857	18.13	0.16	
6/ 8/70	40745.769	18.25	0.17	
6/ 9/70	40746.725	18.02	0.13	
6/11/70	40748.753	17.97	0.17	
6/13/70	40750.760	17.73	0.08	
6/15/70	40752.800	17.80	0.21	
6/16/70	40753.821	17.75	0.21	
6/27/70	40764.609	17.41	0.14	
6/27/70	40764.734	17.45	0.14	
6/29/70	40766.635	17.64	0.25	
6/29/70	40766.738	18.07	0.18	
6/30/70	40767.599	17.55	0.13	
6/30/70	40767.831	17.68	0.09	
6/31/70	40768.602	18.09	0.19	
7/ 7/70	40774.604	17.97	0.21	
7/ 9/70	40776.762	18.04	0.14	
7/11/70	40778.800	18.33	0.21	
7/12/70	40779.769	18.46	0.14	
7/15/70	40782.809	18.81	0.16	
7/31/70	40798.769	18.47	0.11	
8/ 2/70	40800.588	18.29	0.12	
8/ 4/70	40802.705	18.37	0.14	
8/22/70	40820.569	18.05	0.21	
8/23/70	40821.566	18.04	0.17	
8/24/70	40822.604	18.17	0.15	
8/25/70	40823.678	18.33	0.10	
8/27/70	40825.565	18.15	0.17	
8/30/70	40828.577	18.18	0.18	
8/31/70	40829.571	18.88	0.21	
9/ 1/70	40830.589	19.17	0.14	2
9/ 3/70	40832.553	18.29	0.12	
9/ 5/70	40834.594	18.77	0.08	
9/ 6/70	40835.604	18.85	0.14	
9/20/70	40849.542	18.88	0.16	
9/21/70	40850.535	18.71	0.15	
9/22/70	40851.538	18.80	0.12	
9/22/70	40851.708	18.56	0.21	
9/24/70	40853.539	18.53	0.28	
9/25/70	40854.590	19.10	0.09	
9/27/70	40856.601	18.94	0.23	
9/30/70	40859.531	18.58	0.14	
10/ 1/70	40860.549	18.67	0.10	
10/ 3/70	40862.537	18.66	0.10	
10/ 5/70	40864.576	18.74	0.16	
11/ 2/70	40892.519	18.58	0.27	
1/27/71	40978.937	19.07	0.09	
1/29/71	40980.942	18.63	0.09	
1/30/71	40981.928	19.02	0.18	
2/24/71	41006.928	18.86	0.08	
2/27/71	41009.862	18.56	0.08	
3/ 4/71	41014.932	18.68	0.09	
3/28/71	41038.858	18.74	0.08	
3/31/71	41041.890	18.85	0.09	
4/ 2/71	41043.851	18.64	0.15	
4/25/71	41066.817	18.45	0.10	
5/ 3/71	41074.828	18.98	0.13	
5/ 5/71	41076.835	18.45	0.05	
5/19/71	41090.692	18.91	0.06	
5/20/71	41091.774	18.50	0.07	
5/21/71	41092.735	18.42	0.10	
5/22/71	41093.731	18.51	0.11	
5/23/71	41094.753	18.77	0.19	
5/25/71	41096.798	18.64	0.11	
5/26/71	41097.735	18.82	0.13	
6/ 3/71	41105.793	18.66	0.10	
6/18/71	41120.669	18.75	0.10	
6/21/71	41123.813	19.20	0.11	
6/22/71	41124.711	18.56	0.14	
6/24/71	41126.677	18.86	0.12	
6/27/71	41129.781	18.70	0.11	
6/30/71	41132.769	19.07	0.12	
7/ 2/71	41134.742	19.12	0.13	
7/15/71	41147.591	18.32	0.10	
7/17/71	41149.625	18.96	0.09	
7/21/71	41153.631	18.80	0.11	
7/29/71	41161.728	18.83	0.08	
8/14/71	41177.593	17.91	0.15	
8/20/71	41183.656	17.25	0.10	
8/22/71	41185.573	17.33	0.09	

NRAO 512 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
8/23/71	41186.569	16.95	0.16	
8/24/71	41187.569	17.25	0.25	
8/26/71	41189.735	17.26	0.08	
8/27/71	41190.615	17.29	0.18	
9/11/71	41205.549	17.31	0.09	
9/13/71	41207.619	17.42	0.12	
9/15/71	41209.551	17.50	0.10	
9/19/71	41213.535	17.86	0.11	
9/22/71	41216.559	17.63	0.11	
9/25/71	41219.588	18.24	0.21	
10/ 9/71	41233.535	17.81	0.18	
10/11/71	41235.519	17.83	0.09	
10/12/71	41236.546	17.99	0.15	
10/16/71	41240.510	17.29	0.18	
10/19/71	41243.528	17.60	0.19	
10/22/71	41246.518	17.18	0.07	
1/25/72	41341.925	18.22	0.10	
2/14/72	41361.948	17.82	0.06	
3/14/72	41390.896	17.94	0.12	
3/21/72	41397.890	17.97	0.21	
4/16/72	41423.839	17.19	0.18	
4/18/72	41425.849	17.04	0.09	
5/21/72	41458.875	18.15	0.07	
6/ 3/72	41471.635	17.58	0.15	
6/ 4/72	41472.716	17.17	0.14	
6/ 9/72	41477.606	17.31	0.21	
6/14/72	41482.751	18.01	0.17	
7/ 3/72	41501.601	17.73	0.15	
7/ 8/72	41506.709	18.15	0.16	
7/18/72	41516.724	17.77	0.06	
8/ 3/72	41532.616	17.77	0.13	
8/11/72	41540.574	17.62	0.12	
9/ 3/72	41563.572	18.07	0.11	
9/ 5/72	41565.569	17.89	0.18	
9/ 8/72	41568.568	17.87	0.23	
10/ 2/72	41592.537	17.51	0.10	
10/ 7/72	41597.542	17.54	0.18	
11/ 3/72	41624.511	17.33	0.14	
11/ 4/72	41625.513	17.33	0.14	
11/ 5/72	41626.518	17.61	0.14	2
3/ 4/73	41745.909	18.16	0.15	
4/ 9/73	41781.877	18.52	0.08	
5/ 2/73	41804.817	18.44	0.08	
5/26/73	41828.684	18.88	0.06	
6/ 1/73	41834.659	18.46	0.11	
6/ 5/73	41838.756	18.87	0.08	
6/23/73	41856.615	18.42	0.11	
6/30/73	41863.707	18.60	0.14	
7/ 3/73	41866.726	19.26	0.24	
7/ 8/73	41871.739	18.02	0.19	
7/24/73	41887.664	18.50	0.20	
7/25/73	41888.672	18.32	0.15	
7/26/73	41889.643	18.07	0.17	
8/29/73	41923.569	18.21	0.14	
9/18/73	41943.553	18.08	0.16	
9/30/73	41955.583	18.57	0.16	
2/24/74	42102.901	18.66	0.26	
3/31/74	42137.865	18.16	0.11	
4/19/74	42156.871	18.03	0.08	
4/20/74	42157.825	18.51	0.19	
4/30/74	42167.808	17.63	0.08	
5/ 1/74	42168.852	17.81	0.19	
5/17/74	42184.753	18.52	0.15	
5/22/74	42189.724	18.39	0.19	
5/24/74	42191.767	18.17	0.09	
5/26/74	42193.774	17.69	0.25	
6/13/74	42211.718	18.02	0.19	
6/17/74	42215.688	18.35	0.11	
6/21/74	42219.676	18.81	0.19	
7/16/74	42244.597	19.13	0.21	
9/12/74	42302.548	18.59	0.11	
3/20/75	42491.917	18.45	0.15	
4/18/75	42520.872	18.28	0.22	
5/ 7/75	42539.759	18.20	0.17	
5/16/75	42548.822	18.65	0.12	
6/ 4/75	42567.709	18.28	0.13	
6/10/75	42573.699	18.50	0.18	
6/18/75	42581.753	18.56	0.20	
8/28/75	42652.560	18.69	0.23	
7/ 5/76	42964.736	18.84	0.23	
4/12/77	43245.788	18.44	0.15	
5/15/77	43278.723	18.29	0.25	
3/17/78	43584.865	18.63	0.15	
5/ 1/78	43629.742	17.92	0.20	
5/11/78	43639.801	18.63	0.13	
5/29/78	43657.719	18.35	0.15	
6/ 9/78	43668.725	17.86	0.09	
7/ 6/78	43695.721	18.45	0.21	
8/ 5/78	43725.662	17.77	0.23	
8/ 8/78	43728.604	18.03	0.19	
8/26/78	43746.633	18.71	0.21	
8/31/78	43751.612	18.17	0.18	
5/12/80	44371.797	18.00	0.11	
5/21/80	44380.751	17.93	0.13	
6/13/80	44403.677	18.55	0.17	
8/ 4/80	44455.648	18.51	0.16	
9/ 8/80	44490.569	19.00	0.20	
4/ 1/81	44695.784	18.21	0.11	
5/ 3/81	44727.733	18.31	0.15	
6/ 8/81	44763.766	18.40	0.17	
7/ 6/81	44791.733	18.48	0.10	
8/26/81	44842.594	18.57	0.14	
6/16/82	45136.710	17.78	0.18	
4/14/83	45438.776	18.66	0.14	
8/10/83	45556.606	18.51	0.13	
10/ 1/83	45608.551	19.35	0.26	
4/ 5/84	45795.773	18.55	0.13	
2/19/85	46115.905	18.33	0.18	
8/17/85	46294.774	18.45	0.17	
6/24/85	46240.746	18.40	0.18	
7/24/85	46270.763	18.55	0.21	
4/10/86	46530.792	17.94	0.12	

3C 345 P

U.T. DATE	J.D.	MAG.	RMS.	#
9/20/70	40849.559	16.12	0.05	
9/22/70	40851.559	16.27	0.12	
9/23/70	40852.542	16.19	0.09	
9/25/70	40854.604	16.24	0.06	
10/ 1/70	40860.569	16.30	0.15	
10/ 3/70	40862.553	16.17	0.14	
10/26/70	40885.536	16.19	0.09	
11/ 2/70	40892.535	16.25	0.14	
1/30/71	40981.942	16.01	0.12	
2/24/71	41006.937	15.97	0.06	
2/27/71	41009.875	15.88	0.12	
3/23/71	41053.881	15.91	0.15	
3/28/71	41038.889	15.79	0.01	
3/31/71	41041.899	15.45	0.09	
4/25/71	41066.831	15.62	0.15	
5/19/71	41090.701	15.44	0.07	
5/21/71	41092.753	15.24	0.11	
5/31/71	41102.764	15.40	0.15	

3C 345 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
6/22/71	41124.733	15.53	0.20	
6/24/71	41126.697	15.42	0.07	
6/27/71	41129.802	15.32	0.07	
6/30/71	41132.781	15.29	0.16	
7/ 2/71	41134.757	15.46	0.12	
7/15/71	41147.604	15.48	0.06	
7/17/71	41149.640	14.95	0.15	
7/18/71	41150.587	14.84	0.19	
7/29/71	41161.740	14.88	0.20	

3C 345 U

U.T. DATE	J.D.	MAG.	RMS.	#
6/22/71	41124.747	16.01	0.02	
7/ 4/71	41136.827	15.25	0.09	
7/18/71	41150.601	15.55	0.15	
7/21/71	41153.658	15.77	0.17	
8/14/71	41177.621	15.27	0.08	
8/27/71	41190.667	15.17	0.15	
9/11/71	41205.588	14.68	0.21	
9/15/71	41209.578	14.53	0.16	
9/19/71	41213.588	15.22	0.06	
9/25/71	41219.619	14.91	0.13	
10/11/71	41235.549	14.58	0.15	
10/12/71	41236.572	14.68	0.06	
10/16/71	41240.544	15.34	0.13	
10/19/71	41243.556	15.15	0.21	
10/22/71	41246.562	14.79	0.33	
2/13/72	41360.926	15.82	0.09	
2/22/72	41369.918	15.90	0.06	
3/21/72	41397.915	15.82	0.10	
4/18/72	41425.867	15.69	0.10	
5/21/72	41458.792	15.95	0.13	
6/ 3/72	41471.618	15.52	0.13	
6/ 4/72	41472.690	15.90	0.07	
6/ 9/72	41477.657	15.64	0.17	
6/12/72	41480.663	15.89	0.15	
6/14/72	41482.709	15.90	0.20	
7/ 3/72	41501.633	15.56	0.17	
7/ 3/73	41866.756	16.28	0.22	
7/24/73	41887.693	16.61	0.10	
7/26/73	41889.686	16.06	0.16	
7/29/73	41892.583	16.52	0.12	
9/19/73	41944.548	16.14	0.19	
3/18/74	42124.831	16.35	0.20	
4/19/74	42156.849	16.19	0.09	
5/19/74	42186.838	16.11	0.12	
5/24/74	42191.793	16.29	0.08	
6/21/74	42219.705	15.98	0.23	
3/27/79	43959.881	15.43	0.14	
4/ 3/81	44697.885	15.48	0.04	2
4/ 9/81	44703.846	15.90	0.11	2
5/12/83	45466.648	15.26	0.06	2
8/11/83	45557.610	15.53	0.02	2
9/ 5/83	45582.643	15.39	0.11	
10/ 4/83	45611.566	15.72	0.13	
10/ 6/83	45613.545	15.52	0.06	

3C 345 B

U.T. DATE	J.D.	MAG.	RMS.	#
6/22/71	41124.781	16.09	0.09	
7/ 4/71	41136.857	15.86	0.19	
7/18/71	41150.629	15.51	0.18	
7/21/71	41153.649	15.82	0.12	
8/14/71	41177.613	16.06	0.12	
8/27/71	41190.653	15.50	0.27	
9/11/71	41205.605	15.52	0.09	
9/15/71	41209.572	15.22	0.13	
9/19/71	41213.581	15.72	0.19	
9/22/71	41216.583	15.47	0.10	
9/25/71	41219.614	15.61	0.11	
10/ 9/71	41233.559	15.42	0.08	
10/11/71	41235.542	15.33	0.09	
10/12/71	41236.565	15.34	0.04	
10/19/71	41243.549	15.77	0.08	
10/22/71	41246.553	15.52	0.07	
2/13/72	41360.919	16.32	0.04	
2/22/72	41369.910	16.32	0.10	
3/14/72	41390.927	16.31	0.04	
3/21/72	41397.903	16.36	0.08	
4/18/72	41425.859	16.27	0.06	
5/21/72	41458.780	15.98	0.05	
6/ 3/72	41471.599	16.26	0.04	2
6/ 4/72	41472.680	16.15	0.02	
6/ 9/72	41477.635	16.58	0.15	
6/12/72	41480.653	16.20	0.14	
6/14/72	41482.701	16.23	0.09	
7/ 3/72	41501.622	16.43	0.11	
7/ 9/72	41507.719	15.93	0.13	
7/18/72	41516.740	16.23	0.09	
8/ 3/72	41532.587	16.49	0.17	
8/11/72	41540.594	16.43	0.13	
8/14/72	41543.601	16.18	0.06	
9/ 3/72	41563.553	16.44	0.06	
9/ 5/72	41565.549	16.51	0.11	
9/ 8/72	41568.588	16.42	0.13	
10/ 2/72	41592.558	16.20	0.07	
10/ 7/72	41597.581	16.26	0.12	
10/11/72	41601.576	16.05	0.17	
3/ 4/73	41745.898	16.78	0.06	
4/ 9/73	41781.917	16.68	0.16	
4/28/73	41800.808	16.78	0.06	
5/11/73	41813.831	16.89	0.15	
5/26/73	41828.703	16.78	0.07	
6/ 1/73	41834.638	16.71	0.03	
6/ 5/73	41838.732	16.88	0.17	
6/ 9/73	41842.809	16.97	0.08	
6/23/73	41856.631	16.62	0.02	
6/27/73	41860.697	16.99	0.16	
7/ 3/73	41866.750	17.16	0.07	
7/ 8/73	41871.722	16.70	0.17	
7/23/73	41886.714	16.97	0.17	
7/24/73	41887.686	16.72	0.12	
7/26/73	41889.661	16.83	0.17	
8/23/73	41917.580	16.82	0.15	
8/29/73	41923.578	16.80	0.09	
9/18/73	41943.537	17.01	0.19	
9/19/73	41944.542	16.92	0.18	
2/25/74	42103.768	16.89	0.06	
3/18/74	42124.824	16.71	0.03	
3/31/74	42137.881	16.82	0.06	
4/19/74	42156.843	16.72	0.10	
4/21/74	42158.866	16.67	0.08	
4/30/74	42167.822	16.74	0.21	
5/17/74	42184.733	16.65	0.06	
5/19/74	42186.831	16.75	0.05	
5/24/74	42191.793	16.87	0.03	
6/13/74	42211.701	16.83	0.06	
6/17/74	42215.744	16.83	0.03	

TABLE III. (continued)

3C 345 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
6/19 74	42217.708	16.54	0.10	
6/21/74	42219.694	16.82	0.09	
6/28/74	42226.789	16.64	0.04	
7/16/74	42244.613	16.84	0.17	
8/13/74	42272.597	16.65	0.11	
8/18/74	42277.597	16.67	0.28	
9/12/74	42302.571	16.60	0.03	
4/18/75	42520.859	16.68	0.03	
5/ 7/75	42539.790	16.72	0.02	
5/16/75	42548.836	16.69	0.13	
6/ 4/75	42567.719	16.66	0.12	
6/18/75	42581.814	16.62	0.13	
7/ 5/75	42598.748	16.43	0.15	
7/ 9/75	42602.703	16.64	0.03	
8/ 2/75	42626.683	16.72	0.13	
8/28/75	42652.566	17.07	0.10	
8/29/75	42653.630	17.09	0.33	
9/26/75	42681.597	16.54	0.12	
2/11/76	42819.908	16.54	0.08	2
2/28/76	42836.881	16.42	0.07	2
5/ 4/76	42902.785	16.26	0.09	2
6/ 1/76	42930.747	16.30	0.13	2
6/18/76	42947.695	16.36	0.09	
6/22/76	42951.724	16.28	0.05	3
7/ 5/76	42964.752	16.06	0.10	2
7/26/76	42985.679	16.65	0.21	
7/29/76	42988.598	16.60	0.10	2
8/17/76	43007.596	16.66	0.03	2
8/29/76	43019.620	16.74	0.04	2
9/16/76	43037.571	16.39	0.07	2
3/29/77	43231.912	16.33	0.03	2
4/12/77	43245.802	16.44	0.04	
4/19/77	43252.764	16.34	0.04	2
5/15/77	43278.736	16.24	0.16	2
5/25/77	43288.773	16.61	0.06	2
6/23/77	43317.776	16.55	0.19	
7/ 9/77	43333.685	16.29	0.24	
7/22/77	43346.696	16.45	0.13	2
9/ 9/77	43395.602	15.69	0.14	
10/ 4/77	43420.547	16.48	0.13	
3/17/78	43584.858	16.51	0.06	
5/ 1/78	43629.758	16.89	0.13	
5/ 6/78	43634.742	16.77	0.06	
5/29/78	43657.741	16.09	0.14	
6/26/78	43685.675	16.47	0.15	
7/ 6/78	43695.751	16.64	0.06	
8/ 5/78	43725.670	16.41	0.12	
8/ 8/78	43728.621	16.77	0.18	
8/26/78	43746.633	16.12	0.13	
8/27/78	43747.607	16.11	0.21	
8/29/78	43749.630	15.98	0.11	
8/31/78	43751.601	16.27	0.13	
9/ 3/78	43754.630	17.15	0.10	
3/21/79	43953.750	16.04	0.05	2
5/29/79	44022.762	17.08	0.24	
6/25/79	44049.692	16.63	0.10	
6/30/79	44054.715	16.73	0.23	
7/29/79	44083.727	16.69	0.20	
8/16/79	44101.624	16.63	0.16	
10/18/79	44164.518	16.38	0.15	
4/12/80	44341.785	16.63	0.15	
5/12/80	44371.787	16.03	0.13	
5/21/80	44380.766	16.06	0.09	
6/13/80	44403.688	16.45	0.11	
7/ 6/80	44426.748	15.97	0.12	
7/16/80	44436.697	16.59	0.13	
8/ 2/80	44453.635	16.39	0.17	
9/ 8/80	44490.585	16.28	0.27	
10/ 2/80	44514.555	15.97	0.13	
3/10/81	44673.854	15.98	0.09	
4/ 1/81	44695.799	16.07	0.16	
4/ 3/81	44697.900	15.64	0.08	2
4/ 9/81	44703.835	15.85	0.19	
4/30/81	44724.819	16.14	0.16	
5/30/81	44754.731	15.87	0.15	
6/ 8/81	44763.779	16.10	0.18	
6/30/81	44785.615	15.98	0.09	2
8/26/81	44842.616	15.95	0.08	
9/24/81	44871.590	16.07	0.14	
10/19/81	44896.529	15.93	0.12	2
5/17/82	45106.769	15.37	0.23	
6/16/82	45136.699	15.68	0.19	
6/20/82	45140.693	15.77	0.14	
8/15/82	45196.703	15.21	0.10	
10/12/82	45254.531	15.27	0.12	2
10/16/82	45258.556	15.15	0.14	
10/20/82	45262.555	15.76	0.16	2
4/13/83	45437.787	15.71	0.11	
4/14/83	45438.792	15.92	0.18	
5/11/83	45465.669	15.80	0.09	
5/12/83	45466.631	15.77	0.07	2
5/13/83	45467.758	15.72	0.14	
6/ 2/83	45487.656	15.91	0.13	2
7/ 5/83	45520.731	16.00	0.12	
7/15/83	45530.713	15.94	0.18	
8/10/83	45556.613	16.03	0.12	2
8/11/83	45557.594	15.90	0.10	2
9/ 5/83	45582.636	15.73	0.19	
9/ 6/83	45583.577	15.82	0.13	
9/31/83	45608.533	16.05	0.10	
10/ 4/83	45611.540	16.05	0.12	2
10/ 5/83	45612.542	16.01	0.15	
10/ 6/83	45613.539	15.93	0.15	
10/27/83	45634.523	15.76	0.16	
4/ 5/84	45795.778	16.45	0.12	2
4/25/84	45815.756	16.34	0.07	
6/ 2/84	45853.717	16.28	0.13	
2/18/85	46114.915	16.40	0.04	
5/17/85	46202.788	16.84	0.13	
5/25/85	46210.794	16.70	0.10	
6/24/85	46240.753	17.04	0.31	
7/ 8/85	46254.650	16.88	0.19	
7/24/85	46270.756	16.71	0.15	
9/ 8/85	46316.565	16.42	0.20	
10/15/85	46353.542	16.57	0.27	
4/ 3/86	46523.770	16.56	0.14	
4/12/86	46532.737	16.47	0.12	

3C 345 V

U.T. DATE	J.D.	MAG.	RMS.	#
6/22/71	41124.866	15.77	0.09	
7/ 4/71	41136.810	15.33	0.13	
7/18/71	41150.646	15.12	0.11	
7/21/71	41153.675	15.60	0.22	
8/14/71	41177.637	15.71	0.09	
8/27/71	41190.685	15.37	0.07	
9/11/71	41205.614	15.13	0.11	
9/15/71	41209.590	14.88	0.04	
9/19/71	41213.567	15.08	0.08	
9/22/71	41216.615	15.06	0.06	
9/25/71	41219.642	15.00	0.24	
10/ 9/71	41233.587	14.79	0.13	
10/11/71	41235.568	14.74	0.17	

3C 345 V CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
10/12/71	41236.590	14.92	0.03	
10/16/71	41240.560	15.28	0.14	
10/19/71	41243.574	15.36	0.18	
10/22/71	41246.540	15.20	0.06	
2/13/72	41360.937	15.95	0.06	
2/22/72	41369.934	15.92	0.06	
3/21/72	41397.929	15.91	0.09	
5/21/72	41458.807	15.74	0.08	
6/ 3/72	41471.597	15.98	0.09	
6/ 4/72	41472.703	15.98	0.14	
6/ 9/72	41477.686	16.05	0.06	
6/12/72	41480.684	16.01	0.11	
6/14/72	41482.728	16.13	0.19	
7/ 3/72	41501.647	15.67	0.14	
7/ 9/72	41507.744	15.71	0.09	
7/ 3/73	41866.741	16.95	0.19	
7/24/73	41887.699	17.22	0.05	
7/26/73	41889.674	17.11	0.18	
8/29/73	41923.594	16.82	0.09	
9/19/73	41944.559	16.57	0.18	
2/25/74	42103.934	16.91	0.07	
3/18/74	42124.840	16.76	0.08	
4/19/74	42156.860	16.48	0.05	
5/19/74	42186.847	16.70	0.06	
5/24/74	42191.803	16.45	0.11	
6/19/74	42217.725	16.84	0.10	
6/21/74	42219.747	16.54	0.10	
7/16/74	42244.628	16.85	0.17	
3/27/79	43959.845	15.84	0.11	
4/ 3/81	44697.901	15.49	0.05	2
4/ 9/81	44703.857	15.44	0.09	2
5/12/83	45466.668	15.45	0.03	2
8/11/83	45557.626	15.64	0.08	
9/ 5/83	45582.652	15.83	0.04	
10/ 4/83	45611.556	15.93	0.01	
10/ 6/83	45613.560	15.97	0.05	

NRAO 530 P

U.T. DATE	J.D.	MAG.	RMS.	#
7/11/72	41509.701	18.72	0.16	
6/ 5/73	41838.859	18.86	0.09	
5/12/75	42544.826	18.71	0.16	
6/12/75	42575.756	18.96	0.15	
4/29/77	43262.927	18.38	0.10	
5/17/77	43280.838	18.40	0.01	
6/ 9/77	43303.731	18.03	0.12	2
7/11/77	43335.665	18.06	0.15	2
7/15/77	43339.656	17.93	0.29	
8/ 6/77	43361.579	17.42	0.21	
8/10/77	43365.644	17.22	0.16	
8/16/77	43371.613	17.13	0.16	
9/ 6/77	43392.550	16.48	0.13	
9/ 7/77	43393.543	16.19	0.05	
9/ 8/77	43394.553	15.54	0.03	
9/ 9/77	43395.590	16.89	0.07	
10/ 3/77	43419.522	17.38	0.37	
5/ 5/78	43633.778	17.95	0.14	
6/ 2/78	43661.772	18.26	0.18	
7/ 6/78	43695.705	18.36	0.21	
7/26/78	43715.646	18.35	0.20	
8/ 5/78	43725.631	18.09	0.21	
8/ 8/78	43728.661	18.52	0.28	
5/ 3/79	43996.774	18.79	0.18	
5/ 4/79	43997.817	18.64	0.19	
5/30/79	44023.758	18.54	0.19	
6/23/79	44047.700	18.27	0.24	
2/19/80	44288.947	18.51	0.17	
3/22/80	44320.906	18.54	0.15	
7/ 5/80	44425.688	19.17	0.14	
4/30/81	44724.852	18.19	0.10	
6/ 4/81	44759.746	18.19	0.14	
6/ 9/81	44764.794	18.35	0.12	
7/ 1/81	44786.694	17.46	0.18	
7/ 3/81	44788.690	16.82	0.06	2
7/ 5/81	44790.668	17.23	0.07	2
7/ 6/81	44791.674	16.76	0.10	2
7/ 7/81	44792.707	16.70	0.09	2
7/24/81	44809.618	18.18	0.11	2
8/24/81	44840.574	17.79	0.14	2
4/18/83	45442.813	17.83	0.17	
5/ 6/83	45460.726	18.93	0.14	
6/17/83	45502.774	17.41	0.13	
7/ 5/83	45520.693	18.81	0.16	
8/ 8/83	45554.667	18.47	0.18	
9/28/83	45605.537	18.50	0.24	
4/ 7/84	45797.824	17.90	0.12	2
5/27/85	46212.765	19.00	0.15	
7/20/85	46266.775	18.49	0.18	
8/10/85	46287.616	18.72	0.27	

3C 371 P

U.T. DATE	J.D.	MAG.	RMS.	#
12/16/68	40205.000	14.86	0.13	
12/30/68	40219.000	14.53	0.09	
2/25/69	40277.000	14.91	0.08	
3/20/69	40300.000	14.41	0.11	
4/13/69	40324.799	14.97	0.06	
6/ 9/69	40380.000	14.42	0.07	
7/11/69	40413.723	14.70	0.14	
8/21/69	40454.816	15.26	0.16	
9/ 5/69	40469.708	14.98	0.08	
10/13/69	40507.551	14.63	0.11	
11/ 6/69	40531.635	14.46	0.11	
4/ 7/70	40683.904	14.56	0.04	
5/ 2/70	40708.797	14.39	0.10	
5/ 7/70	40713.787	14.50	0.11	
5/11/70	40717.825	14.60	0.08	
5/31/70	40737.711	14.22	0.17	
6/ 5/70	40742.735	14.64	0.11	
6/10/70	40747.791	14.24	0.14	
7/ 7/70	40774.666	14.29	0.21	
8/ 2/70	40800.679	14.29	0.13	
8/23/70	40821.600	14.04	0.16	
8/27/70	40825.589	14.28	0.11	
9/ 3/70	40832.613	14.18	0.20	
9/20/70	40849.708	14.10	0.09	
10/ 1/70	40860.596	14.34	0.07	
10/ 3/70	40862.587	14.46	0.17	
5/ 3/71	41074.868	14.65	0.05	
5/20/71	41091.808	14.43	0.14	
6/27/71	41129.756	14.67	0.12	
7/17/71	41149.667	14.38	0.15	
7/18/71	41150.680	14.18	0.07	
7/21/71	41153.713	14.32	0.06	
7/23/71	41155.589	14.27	0.06	
8/20/71	41183.631	14.70	0.12	
11/ 8/71	41263.566	14.51	0.08	
6/ 9/72	41477.727	14.33	0.10	

3C 371 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
7/ 9/72	41507.812	14.03	0.08	
8/ 9/72	41538.590	13.99	0.10	
9/ 3/72	41563.594	14.07	0.10	
9/ 8/72	41568.645	14.18	0.10	
10/ 2/72	41592.583	14.19	0.08	
10/ 7/72	41597.603	14.30	0.11	
10/11/72	41601.605	14.08	0.11	
4/11/73	41783.891	14.33	0.08	
6/ 4/73	41837.766	14.13	0.14	
6/27/73	41860.742	14.38	0.10	
7/ 8/73	41871.778	14.21	0.17	
8/23/73	41917.726	14.24	0.08	
9/18/73	41943.587	14.28	0.16	
9/30/73	41955.624	14.31	0.12	
4/21/74	42158.884	14.56	0.09	
4/30/74	42167.845	14.69	0.08	
5/19/74	42186.812	14.34	0.17	
5/22/74	42189.770	15.02	0.15	
5/24/74	42191.820	14.64	0.15	
5/26/74	42193.807	15.13	0.14	
5/30/74	42197.781	14.86	0.11	
6/14/74	42212.775	14.67	0.12	
6/20/74	42218.794	14.44	0.14	
7/16/74	42244.701	14.52	0.15	
7/22/74	42250.694	14.72	0.12	
8/13/74	42272.635	14.23	0.10	
8/18/74	42277.625	14.62	0.15	
9/ 9/74	42299.576	14.63	0.11	
10/11/74	42331.543	14.47	0.14	
4/20/75	42522.827	14.09	0.07	
5/ 7/75	42539.810	14.10	0.11	
5/16/75	42548.870	13.62	0.25	
6/ 7/75	42570.767	13.83	0.12	
6/18/75	42581.842	13.99	0.16	
7/ 4/75	42597.761	13.93	0.06	
7/ 5/75	42598.794	14.16	0.25	
7/ 8/75	42601.741	14.22	0.10	
7/ 9/75	42602.749	14.28	0.18	
7/10/75	42603.785	14.36	0.19	
8/ 2/75	42626.710	14.82	0.11	
8/ 6/75	42630.663	14.50	0.30	
8/28/75	42652.576	14.36	0.21	
9/ 3/75	42658.663	14.24	0.11	
9/26/75	42681.600	14.56	0.06	2
10/ 2/75	42687.625	14.62	0.13	
4/16/76	42884.893	14.81	0.01	2
4/27/76	42895.710	14.00	0.09	2
5/ 4/76	42902.854	14.01	0.10	2
6/ 2/76	42931.790	14.14	0.10	2
6/25/76	42954.792	14.63	0.12	2
7/ 5/76	42964.797	14.66	0.07	2
7/23/76	42982.669	14.67	0.08	2
8/ 2/76	42992.684	14.36	0.17	2
8/25/76	43015.587	14.69	0.17	
9/16/76	43037.606	14.70	0.07	2
5/13/77	43276.818	14.31	0.06	2
5/25/77	43288.805	14.36	0.09	2
6/23/77	43317.785	14.24	0.19	
7/22/77	43346.711	14.42	0.13	
8/ 6/77	43361.650	13.66	0.21	
9/ 5/77	43391.592	14.07	0.11	
9/ 8/77	43394.605	14.11	0.15	
10/ 5/77	43421.555	14.27	0.09	2
3/17/78	43584.901	14.02	0.10	
5/ 5/78	43633.853	14.16	0.07	
5/31/78	43659.734	14.36	0.11	
6/ 9/78	43668.758	14.13	0.19	
7/ 6/78	43695.732	14.20	0.17	
8/ 8/78	43728.636	13.91	0.25	
8/26/78	43746.656	14.15	0.05	
9/ 4/78	43755.581	14.24	0.24	
9/23/78	43774.557	14.03	0.20	
10/23/78	43804.512	14.24	0.21	
5/28/79	44021.752	14.14	0.19	
6/19/79	44043.726	14.36	0.20	
7/22/79	44076.738	14.21	0.10	
7/27/79	44081.700	14.18	0.11	
8/16/79	44101.673	14.09	0.09	2
8/26/79	44111.658	13.95	0.10	2
9/19/79	44135.586	14.13	0.08	
10/13/79	44159.544	14.27	0.08	
10/19/79	44165.530	14.34	0.13	
5/12/80	44371.844	14.49	0.11	
6/18/80	44408.762	14.47	0.15	
7/17/80	44437.672	14.39	0.14	
8/ 7/80	44458.706	14.31	0.11	
9/10/80	44492.625	14.63	0.14	
10/10/80	44522.672	14.13	0.09	
6/ 4/81	44759.793	14.09	0.11	
6/29/81	44784.756	14.52	0.24	
7/ 6/81	44791.765	14.02	0.08	
7/28/81	44813.701	14.50	0.08	2
8/26/81	44842.676	14.51	0.20	
9/19/81	44866.579	14.71	0.12	
10/21/81	44898.609	14.50	0.08	
5/22/82	45111.774	14.50	0.06	
10/11/82	45253.587	14.34	0.19	
6/10/83	45495.755	14.37	0.07	
7/ 6/83	45521.706	14.43	0.11	
7/17/83	45532.739	14.34	0.12	
8/ 7/83	45553.609	14.52	0.12	
9/ 6/83	45583.623	14.68	0.20	
10/ 1/83	45608.551	14.78	0.13	
4/25/84	45815.790	14.34	0.10	
8/30/84	45942.731	14.18	0.18	
9/27/84	45970.633	14.41	0.05	4
5/17/85	46202.817	14.15	0.16	
6/24/85	46240.800	14.50	0.18	
7/10/85	46256.663	14.39	0.13	
8/13/85	46290.744	14.46	0.18	
9/ 8/85	46316.610	14.51	0.12	
10/ 8/85	46346.561	14.68	0.12	
10/15/85	46353.581	14.76	0.13	
11/ 6/85	46375.513	14.62	0.13	

3C 371 B

U.T. DATE	J.D.	MAG.	RMS.	#
3/27/79	43959.922	14.19	0.12	
3/29/79	43961.846	14.00	0.11	
3/30/79	43962.913	14.32	0.13	
3/31/79	43963.815	14.97	0.14	
4/ 2/79	43965.829	14.43	0.13	
8/20/79	44105.747	14.53	0.15	
8/22/79	44107.714	14.63	0.19	
7/28/81	44813.701	15.20	0.09	2
8/ 4/81	44820.736	15.16	0.16	2
8/ 6/81	44822.615	15.24	0.15	2
8/ 6/81	44822.726	15.11	0.09	3
5/22/82	45111.774	15.12	0.09	2
5/11/83	45465.750	15.36	0.09	
6/ 9/83	45494.761	14.86	0.12	
11/ 2/83	45640.589	15.27	0.20	

3C 371 U

U.T. DATE	J.D.	MAG.	RMS.	#
3/29/79	43961.851	14.60	0.21	
3/31/79	43963.832	14.42	0.28	
4/ 2/79	43965.834	14.77	0.18	
8/20/79	44105.752	14.77	0.25	
8/22/79	44107.719	14.69	0.21	
7/28/81	44813.728	15.31	0.11	2
8/ 6/81	44822.713	15.53	0.23	2

3C 371 V

U.T. DATE	J.D.	MAG.	RMS.	#
3/29/79	43961.857	13.66	0.12	
3/31/79	43963.822	13.78	0.16	
4/ 2/79	43965.842	13.81	0.14	
8/20/79	44105.760	14.08	0.20	
8/22/79	44107.728	14.14	0.16	
7/28/81	44813.747	14.22	0.09	2
7/ 6/81	44791.647	14.14	0.11	2

3C 371 I

U.T. DATE	J.D.	MAG.	RMS.	#
2/27/69	40279.708	13.32	0.10	
7/11/69	40413.778	13.41	0.06	
8/21/69	40454.799	13.71	0.13	
8/25/69	40458.756	13.53	0.10	
10/13/69	40507.574	13.57	0.06	
11/ 6/69	40531.654	13.32	0.11	
6/11/70	40748.828	13.42	0.16	
7/ 7/70	40774.699	13.29	0.21	
7/ 5/76	42694.812	13.44	0.18	
10/16/76	43067.542	13.18	0.19	
10/21/76	43072.538	13.36	0.07	
8/12/77	43367.653	13.07	0.02	

OX 074 P

U.T. DATE	J.D.	MAG.	RMS.	#
5/13/70	40719.875	16.82	0.10	
7/30/70	40797.844	17.28	0.11	
8/23/70	40821.708	16.56	0.14	
8/27/70	40825.621	17.27	0.13	
8/30/70	40828.810	17.14	0.19	
9/ 1/70	40830.632	17.33	0.14	
9/ 3/70	40832.698	17.32	0.15	
9/ 6/70	40835.690	17.15	0.19	
9/22/70	40851.608	17.38	0.21	
9/22/70	40851.708	17.33	0.14	
9/26/70	40855.604	17.11	0.15	
9/27/70	40856.648	17.36	0.14	
9/28/70	40857.609	17.15	0.16	
10/ 5/70	40864.701	17.05	0.07	
10/22/70	40881.621	17.33	0.08	
10/26/70	40885.597	17.27	0.06	
11/ 2/70	40892.562	17.40	0.13	
11/18/70	40908.537	17.41	0.10	
11/28/70	40918.610	17.61	0.15	
12/19/70	40939.528	17.53	0.08	
5/ 5/71	41076.874	17.70	0.09	
5/20/71	41091.794	17.82	0.18	
6/ 3/71	41105.847	17.60	0.05	
6/20/71	41122.831	17.83	0.08	
6/30/71	41132.815	17.61	0.13	
7/24/71	41156.849	17.69	0.13	
8/31/71	41194.849	17.76	0.12	
9/19/71	41213.738	17.57	0.15	
10/12/71	41236.617	17.73	0.08	
11/15/71	41270.568	17.54	0.07	
12/15/71	41300.565	17.85	0.10	
7/18/72	41516.770	17.78	0.14	
8/ 3/72	41532.670	17.65	0.10	
8/ 8/72	41537.866	17.92	0.13	
8/14/72	41543.709	17.91	0.07	
8/17/72	41546.724	17.57	0.08	
9/ 3/72	41563.656	17.83	0.10	
9/11/72	41571.615	17.57	0.12	
10/ 2/72	41592.619	17.69	0.10	
10/ 8/72	41598.615	17.64	0.11	
11/ 3/72	41624.583	17.63	0.16	
11/28/72	41649.503	17.59	0.12	
7/ 8/73	41871.802	17.89	0.18	
8/10/73	41904.821	17.15	0.16	
9/ 1/73	41926.768	17.50	0.14	
9/21/73	41946.582	17.61	0.15	
10/ 4/73	41959.749	16.83	0.10	
10/19/73	41974.555	17.77	0.22	
11/28/73	42014.560	17.70	0.12	
5/19/74	42186.869	17.29	0.15	
5/22/74	42189.831	17.64	0.18	
6/17/74	42215.866	17.94	0.18	
7/17/74	42245.823	16.97	0.11	
8/14/74	42273.735	17.02	0.12	
9/ 9/74	42299.640	17.01	0.09	
10/ 9/74	42329.619	17.31	0.12	
12/ 9/74	42390.557	17.77	0.11	
5/19/75	42551.858	17.65	0.11	
6/11/75	42574.869	17.87	0.16	
7/ 7/75	42600.857	17.24	0.19	
7/19/75	42612.840	17.23	0.09	2
8/ 3/75	42627.773	16.47	0.13	
8/ 6/75	42630.702	16.93	0.14	2
8/14/75	42638.721	17.66	0.09	2
8/26/75	42650.654	16.95	0.17	
9/ 3/75	42658.787	17.51	0.10	
9/ 6/75	42661.681	17.46	0.20	
10/ 2/75	42687.676	16.64	0.06	2
10/25/75	42710.628	17.89	0.16	
11/ 1/75	42717.513	17.68	0.18	
11/30/75	42746.521	17.86	0.07	2
7/29/76	42988.790	18.18	0.09	2
8/29/76	43019.681	18.05	0.26	
9/16/76	43037.650	17.19	0.11	2
9/26/76	43047.631	17.89	0.11	
6/23/77	43317.785	17.14	0.21	
7/ 9/77	43333.731	17.11	0.26	
7/13/77	43337.786	17.64	0.18	
8/11/77	43366.722	17.39	0.25	
9/ 6/77	43392.679	18.04	0.21	
9/ 8/77	43394.644	17.50	0.23	
10/ 3/77	43419.608	17.32	0.08	
10/12/77	43428.583	17.45	0.13	
11/11/77	43458.562	17.82	0.08	
8/ 8/78	43728.794	17.58	0.14	
8/26/78	43746.714	17.84	0.27	
10/24/78	43806.550	18.28	0.22	
11/23/78	43836.549	17.56	0.15	

TABLE III. (continued)

ON 0'4 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
6/24/79	44048.788	17.17	0.23	
6/29/79	44053.851	17.79	0.20	
6/30/79	44054.818	17.81	0.24	
7/22/79	44076.790	17.70	0.13	
7/30/79	44084.763	17.19	0.24	
8/26/79	44111.701	17.77	0.23	
9/19/79	44135.655	17.83	0.07	
10/18/79	44164.582	17.05	0.10	
11/10/79	44187.561	17.27	0.11	
11/15/79	44192.620	17.46	0.18	
11/20/79	44197.569	17.66	0.14	
6/18/80	44408.860	17.37	0.14	
7/17/80	44437.749	17.78	0.19	
8/ 7/80	44458.750	17.54	0.12	
9/10/80	44492.672	17.59	0.13	
10/ 5/80	44517.578	17.59	0.19	
10/11/80	44523.629	18.08	0.20	
12/ 2/80	44575.535	17.36	0.17	
6/29/81	44784.800	17.42	0.20	
9/ 1/81	44848.654	17.74	0.15	
9/20/81	44867.609	17.72	0.16	
10/19/81	44896.594	17.87	0.18	
10/30/81	44907.566	17.72	0.12	
9/15/82	45227.613	17.66	0.21	
8/ 9/83	45555.694	17.39	0.24	
9/28/83	45605.603	17.77	0.12	
8/28/84	45940.633	17.84	0.19	
5/29/85	46214.858	17.72	0.16	
7/22/85	46268.857	17.70	0.13	
9/ 9/85	46317.649	17.06	0.32	
10/ 7/85	46345.602	17.53	0.20	
10/14/85	46352.539	17.18	0.21	
11/11/85	46380.599	18.08	0.10	

BL LAC U

U.T. DATE	J.D.	MAG.	RMS.	#
6/24/71	41126.835	15.33	0.07	
7/17/71	41149.699	15.47	0.10	
7/21/71	41153.856	15.31	0.15	
7/25/71	41157.781	15.77	0.10	
8/14/71	41177.684	15.46	0.14	
8/20/71	41183.720	15.52	0.19	
8/26/71	41189.805	15.44	0.10	
8/31/71	41194.778	15.17	0.06	
9/ 1/71	41195.799	14.86	0.03	
9/13/71	41207.669	15.31	0.14	
9/15/71	41209.662	15.08	0.07	
9/19/71	41213.669	15.38	0.08	
9/22/71	41216.668	15.08	0.12	
9/25/71	41219.742	15.83	0.13	
9/27/71	41221.754	15.81	0.05	
9/29/71	41223.796	15.77	0.09	
9/30/71	41224.797	15.47	0.06	
10/12/71	41236.703	15.96	0.06	
10/16/71	41240.667	16.13	0.05	
10/19/71	41243.672	15.66	0.07	
11/ 8/71	41263.509	15.87	0.12	
11/ 8/71	41263.600	15.96	0.13	
11/14/71	41269.646	16.12	0.07	
11/15/71	41270.512	16.00	0.08	
11/15/71	41270.683	16.34	0.18	
12/14/71	41299.581	15.51	0.07	
4/18/72	41425.900	14.81	0.06	
5/21/72	41458.792	15.61	0.21	
7/13/72	41511.808	15.49	0.09	
8/ 8/72	41537.794	15.00	0.16	
8/14/72	41543.794	15.65	0.10	
8/16/72	41545.783	15.80	0.11	
9/ 3/72	41563.694	16.11	0.12	
9/ 8/72	41568.687	15.69	0.11	
9/18/72	41578.749	15.62	0.22	
10/ 1/72	41591.622	16.47	0.15	
11/ 3/72	41624.549	15.23	0.22	
11/ 4/72	41625.551	15.61	0.18	
5/ 1/73	41803.849	15.53	0.13	
5/11/73	41813.869	14.58	0.03	
6/ 4/73	41837.856	15.16	0.05	
6/ 7/73	41840.840	14.84	0.15	
7/25/73	41888.721	15.92	0.11	
9/ 5/73	41930.790	16.24	0.06	
9/22/73	41947.661	16.23	0.14	
10/28/73	41983.710	15.66	0.13	
11/24/73	42010.598	15.85	0.07	
5/21/74	42188.847	15.05	0.16	
5/24/74	42191.877	15.31	0.12	
5/30/74	42197.887	15.29	0.03	
6/17/74	42215.797	15.21	0.14	
6/29/74	42227.882	15.71	0.08	
12/10/74	42391.535	16.59	0.10	
6/19/77	43313.794	16.53	0.17	
6/20/77	43314.803	16.68	0.08	
6/23/77	43317.843	16.60	0.12	
7/11/77	43335.785	15.60	0.13	
8/10/77	43365.728	15.85	0.13	
8/12/77	43367.775	16.42	0.19	
9/ 8/77	43394.705	15.44	0.15	
10/17/77	43433.620	15.69	0.10	
11/ 8/77	43455.539	15.37	0.09	
8/31/78	43752.754	15.59	0.26	
11/ 2/78	43815.510	15.58	0.09	
6/29/79	44053.736	14.99	0.21	
7/30/79	44084.705	15.14	0.07	
8/20/79	44105.697	14.92	0.13	
8/22/79	44107.670	15.01	0.11	
9/29/79	44145.710	15.65	0.19	
10/12/79	44158.617	15.87	0.16	
10/19/79	44165.584	15.43	0.19	
5/25/80	44384.863	16.37	0.09	2
6/ 8/80	44398.784	16.52	0.13	2
6/12/80	44402.759	16.48	0.11	2
10/13/80	44525.601	15.96	0.08	2
12/ 6/80	44579.553	17.13	0.07	2
6/10/83	45495.842	16.29	0.11	
6/11/83	45496.728	16.59	0.17	
11/30/83	45668.560	16.47	0.17	
11/31/83	45669.574	16.29	0.17	
12/ 7/83	45675.622	16.01	0.14	
12/ 8/83	45676.608	16.00	0.11	

BL LAC B

U.T. DATE	J.D.	MAG.	RMS.	#
6/24/71	41126.828	15.59	0.12	
7/17/71	41149.692	15.83	0.09	
7/21/71	41153.847	15.40	0.05	
7/25/71	41157.774	15.86	0.09	
8/14/71	41177.677	15.56	0.11	
8/20/71	41183.710	15.31	0.08	
8/26/71	41189.797	15.63	0.07	

BL LAC B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
8/31/71	41194.770	15.18	0.07	
9/ 1/71	41195.788	14.84	0.05	
9/ 2/71	41196.846	14.78	0.09	
9/13/71	41207.661	15.31	0.07	
9/15/71	41209.656	15.49	0.11	
9/19/71	41213.662	15.56	0.15	
9/22/71	41216.661	15.44	0.06	
9/25/71	41219.735	16.12	0.05	
9/27/71	41221.741	15.79	0.06	
9/29/71	41223.787	15.83	0.06	
9/30/71	41224.790	15.62	0.14	
10/12/71	41236.694	16.01	0.04	
10/16/71	41240.660	16.01	0.07	
10/19/71	41243.665	15.76	0.04	
10/26/71	41250.779	15.97	0.04	
11/ 8/71	41263.593	16.03	0.06	
11/14/71	41269.635	16.01	0.05	
11/15/71	41270.503	16.10	0.03	
11/15/71	41270.674	16.45	0.09	
11/16/71	41271.722	15.96	0.02	
11/18/71	41273.589	15.68	0.01	6
11/18/71	41273.651	15.66	0.01	5
11/18/71	41273.695	15.73	0.01	5
11/18/71	41273.725	15.83	0.01	2
11/19/71	41274.691	15.63	0.01	5
11/19/71	41274.741	15.73	0.02	4
11/20/71	41275.524	16.40	0.03	5
11/20/71	41275.569	16.30	0.03	3
11/20/71	41275.608	16.30	0.03	4
11/20/71	41275.645	16.35	0.06	3
11/21/71	41276.518	16.07	0.02	6
11/21/71	41276.563	16.08	0.01	6
11/21/71	41276.598	15.97	0.01	4
11/21/71	41276.646	16.04	0.01	6
11/21/71	41276.688	16.04	0.02	4
11/21/71	41276.717	16.10	0.04	2
11/22/71	41277.526	15.84	0.01	4
11/22/71	41277.572	15.80	0.03	3
11/22/71	41277.610	15.84	0.02	3
11/22/71	41277.647	15.82	0.02	2
11/22/71	41277.703	15.89	0.02	4
12/14/71	41299.571	15.72	0.06	
4/18/72	41425.886	15.04	0.07	
5/21/72	41458.780	15.86	0.06	
6/15/72	41483.823	15.58	0.10	
6/22/72	41490.765	15.73	0.11	
7/13/72	41511.798	15.72	0.04	
7/19/72	41517.819	15.68	0.02	
7/22/72	41520.777	15.30	0.10	
8/ 3/72	41532.701	15.23	0.06	
8/ 7/72	41536.791	15.33	0.07	
8/ 8/72	41537.794	15.32	0.16	
8/ 9/72	41538.701	15.61	0.08	
8/ 9/72	41538.753	15.84	0.13	
8/10/72	41539.688	15.75	0.14	
8/11/72	41540.764	15.52	0.09	
8/12/72	41541.691	15.63	0.06	
8/13/72	41542.791	16.02	0.09	
8/14/72	41543.755	16.02	0.17	
8/15/72	41544.617	15.54	0.03	2
8/16/72	41545.770	15.57	0.10	
8/17/72	41546.744	15.33	0.13	
8/19/72	41548.558	15.73	0.15	
8/23/72	41552.667	15.55	0.14	
9/ 2/72	41562.658	16.17	0.04	
9/ 3/72	41563.685	16.09	0.10	
9/ 4/72	41564.705	16.27	0.16	
9/ 5/72	41565.711	16.16	0.12	
9/ 6/72	41566.545	15.78	0.12	
9/ 8/72	41568.676	15.87	0.05	
9/ 9/72	41569.534	15.74	0.03	
9/11/72	41571.682	15.95	0.11	
9/12/72	41572.569	15.79	0.04	
9/18/72	41578.647	15.89	0.06	
9/18/72	41578.739	15.65	0.09	
10/ 1/72	41591.612	15.99	0.07	
10/ 7/72	41597.624	16.15	0.09	
10/19/72	41609.630	15.55	0.12	
10/20/72	41610.619	15.54	0.11	
11/ 3/72	41624.538	15.12	0.07	
11/ 4/72	41625.538	15.20	0.14	
12/ 4/72	41655.716	15.25	0.13	
12/ 6/72	41657.576	15.24	0.10	
12/ 7/72	41658.598	15.36	0.15	
12/ 8/72	41660.495	15.48	0.08	
4/28/73	41800.833	15.47	0.04	
5/ 2/73	41804.849	15.78	0.06	
5/11/73	41813.860	15.09	0.03	
6/ 1/73	41834.862	14.38	0.13	
6/ 4/73	41837.847	15.40	0.21	
6/ 7/73	41840.835	15.02	0.15	
6/30/73	41863.782	15.23	0.08	
7/ 3/73	41866.906	15.52	0.14	
7/ 6/73	41869.914	15.53	0.08	
7/11/73	41874.835	15.69	0.08	
7/25/73	41888.715	15.97	0.13	
7/26/73	41889.705	16.14	0.15	
8/ 9/73	41903.808	15.52	0.03	10
8/ 9/73	41903.853	15.62	0.01	10
8/ 9/73	41903.889	15.59	0.01	7
9/ 5/73	41930.694	16.42	0.05	
9/ 5/73	41930.783	16.04	0.05	
9/22/73	41947.661	16.38	0.10	
9/30/73	41955.670	16.41	0.08	
10/ 2/73	41957.783	16.58	0.02	7
10/ 2/73	41957.834	16.71	0.03	7
10/ 2/73	41957.875	16.57	0.03	9
10/ 4/73	41959.559	16.37	0.03	11
10/ 4/73	41959.602	16.30	0.02	10
10/ 4/73	41959.644	16.49	0.01	6
10/ 4/73	41959.688	16.40	0.01	10
10/ 4/73	41959.715	16.42	0.02	2
10/28/73	41983.699	15.75	0.02	
10/31/73	41986.593	15.99	0.07	
11/24/73	42010.591	16.35	0.09	
12/19/73	42035.526	16.17	0.05	
5/21/74	42188.838	15.25	0.06	
5/24/74	42191.872	15.72	0.05	
5/26/74	42193.874	15.25	0.15	
5/28/74	42195.819	15.56	0.02	
6/17/74	42215.786	15.56	0.04	2
6/18/74	42216.792	15.70	0.02	6
6/19/74	42217.751	15.54	0.05	
6/20/74	42218.799	15.42	0.05	
6/21/74	42219.792	15.81	0.03	
6/23/74	42221.792	15.92	0.03	3
6/23/74	42221.842	15.87	0.04	3
6/23/74	42221.892	15.85	0.03	3
6/23/74	42221.793	15.76	0.04	5
6/23/74	42221.839	15.72	0.01	5
6/23/74	42221.886	15.74	0.03	6
6/28/74	42226.831	15.79	0.03	
6/29/74	42227.842	15.81	0.02	2
6/30/74	42228.857	15.94	0.03	2
7/14/74	42242.746	15.71	0.01	2
7/15/74	42243.792	15.98	0.01	5
7/16/74	42244.776	15.92	0.02	8
7/16/74	42244.823	15.90	0.01	10
7/17/74	42245.833	16.05	0.02	2
7/18/74	42246.862	15.55	0.04	
7/19/74	42247.785	15.75	0.01	4
7/20/74	42248.766	15.97	0.03	3
7/24/74	42252.776	16.26	0.01	5
7/27/74	42255.789	16.38	0.02	4
9/11/74	42301.709	16.10	0.16	
9/12/74	42302.622	16.24	0.05	
10/16/74	42336.582	16.02	0.02	2
10/18/74	42338.670	16.38	0.03	
12/10/74	42391.529	16.57	0.03	
8/ 9/75	42633.690	16.28	0.13	
8/16/75	42640.829	16.06	0.07	
9/ 3/75	42658.792	16.15	0.12	
9/ 5/75	42660.790	16.12	0.06	
10/ 1/75	42686.663	15.82	0.03	2
10/28/75	42713.613	15.28	0.05	
10/30/75	42715.655	15.34	0.03	2
11/ 1/75	42717.619	15.28	0.01	2
11/ 4/75	42720.625	15.14	0.02	2
11/29/75	42745.519	15.76	0.01	
1/ 1/76	42778.536	15.95	0.07	
1/ 1/76	42778.547	15.98	0.05	
1/ 2/76	42779.542	15.86	0.05	
1/ 2/76	42779.547	15.78	0.05	
5/ 4/76	42902.846	15.22	0.05	
5/31/76	42929.809	15.51	0.03	2
6/ 1/76	42930.810	15.25	0.04	
6/ 5/76	42934.812	14.97	0.10	
8/25/76	43015.764	15.77	0.04	2
9/16/76	43037.624	15.86	0.04	2
9/17/76	43038.648	16.05	0.04	2
10/16/76	43067.569	15.72	0.07	2
10/19/76	43070.755	15.54	0.04	2
10/21/76	43072.629	15.42	0.03	2
12/18/76	43130.555	16.11	0.03	2
1/17/77	43160.543	15.85	0.05	2
5/13/77	43276.793	16.18	0.03	2
5/25/77	43288.874	16.77	0.06	2
6/20/77	43314.797	16.62	0.15	2
6/21/77	43315.741	16.48	0.10	
6/23/77	43317.848	16.54	0.06	2
7/ 9/77	43333.704	16.36	0.05	2
7/11/77	43335.778	15.82	0.05	
7/13/77	43337.757	16.43	0.04	2
7/15/77	43339.701	16.09	0.11	
7/18/77	43342.772	16.04	0.12	
7/21/77	43345.785	15.97	0.13	
8/11/77	43366.816	15.80	0.14	
8/12/77	43367.785	15.95	0.13	
8/15/77	43370.783	15.75	0.25	
8/16/77	43371.810	16.00	0.17	
9/ 6/77	43392.710	15.50	0.16	
9/ 8/77	43394.700	15.68	0.13	
10/ 5/77	43421.685	15.57	0.04	
10/12/77	43428.642	15.48	0.17	
10/17/77	43433.614	15.55	0.12	
11/ 8/77	43455.533	15.59	0.11	
5/ 5/78	43633.883	16.21	0.08	
5/30/78	43658.767	15.95	0.07	
5/31/78	43659.769	15.92	0.07	
6/ 9/78	43668.837	15.99	0.08	
7/ 9/78	43698.708	15.42	0.05	
7/27/78	43716.699	14.79	0.05	
8/ 5/78	43725.757	15.16	0.09	
8/ 8/78	43728.776	15.50	0.15	
8/13/78	43733.821	15.30	0.18	
8/27/78	43747.712	15.57	0.10	
8/29/78	43749.694	15.75	0.19	
8/31/78	43751.754	15.80	0.12	
10/ 3/78	43784.629	15.95	0.09	
10/ 5/78	43786.677	16.53	0.05	2
10/ 9/78	43790.762	15.65	0.07	
10/23/78	43804.590	15.63	0.21	
11/ 2/78	43814.519	15.75	0.21	
11/25/78	43837.518	15.56	0.11	
5/28/79	44021.808	15.81	0.10	
6/23/79	44047.788	14.88	0.16	
6/25/79	44049.826	15.31	0.10	
6/29/79	44053.730	15.39	0.09	
6/30/79	44054.772	15.10	0.12	
7/22/79	44076.844	15.08	0.16	
7/27/79	44081.843	15.22	0.15	
7/30/79	44084.692	15.15	0.14	
8/ 2/79	44087.760	15.23	0.12	
8/20/79	44105.694	15.16	0.14	
8/22/79	44107.664	14.96	0.13	
9/14/79	44130.697	15.64	0.12	
9/29/79	44145.706	15.81	0.05	
10/12/79	44158.613	15.73	0.09	
10/18/79	44164.555	15.68	0.17	
10/19/79	44165.578	15.62	0.15	
11/19/79	44196.602	15.19	0.11	
1/17/80	44255.527	16.16	0.20	
4/12/80	44341.885	16.57	0.13	
4/23/80	44352.893	16.56	0.09	
5/21/80	44380.846	17.01	0.17	
5/25/80	44384.847	16.29	0.08	2
5/27/80	44386.877	16.09	0.08	4
6/ 8/80	44398.756	15.83	0.07	2
6/12/80	44402.743	16.30	0.11	
6/16/80	44406.869	16.29	0.04	2
7/ 5/80	44425.710	15.87	0.11	
7/10/80	44430.694	15.93	0.10	
7/18/80	44438.741	15.26	0.12	
7/23/80	44443.811	15.95	0.11	2
8/ 7/80	44458.782	15.29	0.17	
9/ 8/80	44490.633	16.08	0.14	
9/12/80	44494.669	15.33	0.15	
10/ 2/80	44514.590	15.85	0.11	
10/11/80	44523.698	16.23	0.16	
10/13/80	44525.586	16.03	0.08	2
12/ 3/80	44576.611	16.80	0.10	
12/ 5/80	44578.539	16.60	0.09	2
1/ 1/81	44605.573	17.04	0.09	
1/ 3/81	44607.542	17.17	0.11	
1/24/81	44628.524	17.10	0.08	
3/10/81	44673.931	16.72	0.15	
5/ 3/81	44727.896	15.98	0.07	
6/ 4/81	44759.831	16.09	0.19	
7/ 1/81	44786.781	16.93	0.11	
7/ 7/81	44792.771	16.37	0.09	
8/ 9/81	44825.754	16.32	0.12	
8/25/81	44841.703	16.52	0.22	
9/ 2/81	44849.632	16.51	0.10	
9/19/81	44866.578	16.86	0.08	
10/ 2/81	44879.600	16.73	0.16	
10/20/81	44897.645	16.61	0.12	
11/20/81	44928.526	16.40	0.12	
12/17/81	44955.505	16.62	0.14	
8/14/82	45195.775	16.96	0.09	2
9/13/82	45225.548	16.60	0.09	
10/ 9/82	45251.568	16.57	0.20	
12/17/82	45320.549	16.42	0.17	
6/ 9/83	45494.781	16.51	0.10	2
6/10/83	45495.815	16.56	0.09	2
6/11/83	45496.714	16.42	0.14	
6/11/83	45496.778	16.72	0.14	
7/ 6/83	45521.783	16.46	0.12	
7/ 9/83	45524.752	16.42	0.14	
8/ 9/83	45554.617	16.12	0.15	
12/ 1/83	45607.618	15.78	0.10	
10/29/83	45635.571	16.07	0.11	
11/ 2/83	45639.601	16.02	0.11	
11/30/83	45667.542	16.29	0.09	2
11/31/83	45668.583	16.22	0.08	2
12/ 6/83	45673.574	16.04	0.09	2
12/ 7/83	45674.603	15.93	0.07	2
12/ 8/83	45675.613	16.02	0.05	4
12/31/83	45698.566	16.26	0.08	
4/25/84	45815.831	16.23	0.08	
6/ 2/84	45853.822	16.10	0.13	
8/30/84	45942.800	16.00	0.13	
10/19/84	45991.572	15.32	0.22	
10/20/84	45992.656	15.39	0.21	
11/25/84	46028.517	15.46	0.19	
7/22/85	46267.686	15.32	0.14	
10/ 8/85	46345.625	15.33	0.14	
10/15/85	46352.602	15.61	0.11	
11/ 6/85	46374.632	15.90	0.16	
11/15/85	46383.554	15.61	0.25	

BL LAC V

U.T. DATE	J.D.	MAG.	RMS.	#
6/24/71	41126.816	14.46	0.02	
7/17/71	41149.709	14.56	0.06	
7/21/71	41153.868	14.27	0.03	
7/25/71	41157.792	14.67	0.09	
8/14/71	41177.669	14.42	0.04	
8/20/71	41183.733	14.23	0.07	
8/26/71	41189.816	14.48	0.08	
8/31/71	41194.790	14.19	0.06	
9/ 2/71	41196.838	13.84	0.05	
9/13/71	41207.657	14.32	0.04	
9/15/71	41209.646	14.35	0.08	
9/19/71	41213.656	14.34	0.05	
9/25/71	41219.728	14.99	0.06	
9/27/71	41221.763	14.71	0.06	
9/29/71	41223.781	14.80	0.06	
9/30/71	41224.808	14.48	0.08	
10/12/71	41236.692	14.81	0.09	
10/16/71	41240.676	15.02	0.05	
10/19/71	41243.687	14.64	0.09	
10/26/71	41250.764	14.84	0.03	
11/ 8/71	41263.517	14.88	0.01	
11/ 8/71	41263.588	14.87	0.04	
11/14/71	41269.547	15.06	0.05	
11/14/71	41269.623	15.06	0.04	
11/15/71	41270.523	15.17	0.07	
11/15/71	41270.667	15.15	0.07	
11/16/71	41271.751	14.79	0.01	
12/14/71	41299.593	14.62	0.04	
4/18/72	41425.906	14.11	0.07	
5/21/72	41458.885	14.83	0.04	
6/15/72	41483.815	14.50	0.03	
6/22/72	41490.785	14.69	0.05	
8/ 8/72	41537.818	14.35	0.05	
8/ 9/72	41538.728	14.49	0.19	
8/10/72	41539.707	14.59	0.07	
8/11/72	41540.775	14.35	0.03	
8/11/72	41540.789	14.35	0.08	
8/12/72	41541.717	14.70	0.07	
8/13/72	41542.801	14.78	0.20	
8/14/72	41543.773	14.51	0.13	
8/16/72	41545.796	14.44	0.09	
8/17/72	41546.754	14.30	0.06	
8/19/72	41548.565	14.59	0.07	
9/ 3/72	41563.706	14.91	0.05	
9/ 4/72	41564.729	14.93	0.04	
9/ 5/72	41565.719	14.76	0.07	
9/ 8/72	41568.701	14.71	0.03	
9/11/72	41571.700	14.70	0.11	
9/12/72	41572.577	14.38	0.18	
9/18/72	41578.731	14.51	0.04	
10/ 1/72	41591.636	14.77	0.20	
10/ 7/72	41597.647	14.80	0.09	
10/19/72	41609.662	14.88	0.08	
11/ 3/72	41624.560	14.10	0.06	
11/ 5/72	41626.581	14.19	0.06	
12/ 9/72	41660.508	14.37	0.05	
5/ 1/73	41803.868	14.67	0.05	
5/11/73	41813.883	13.96	0.03	
6/ 4/73	41837.867	14.16	0.12	
6/ 7/73	41840.826	13.99	0.04	
7/ 3/73	41866.899	14.32	0.03	
7/25/73	41888.730	14.74	0.04	
9/ 5/73	41930.801	15.12	0.03	
9/22/73	41947.650	15.07	0.06	
10/28/73	41983.722	14.86	0.03	
11/24/73	42010.610	15.27	0.03	
12/19/73	42035.535	15.15	0.03	
5/21/74	42188.830	14.17	0.08	
5/24/74	42191.878	14.49	0.02	
5/26/74	42193.877	14.21	0.04	
5/30/74	42197.901	14.45	0.05	
6/17/74	42215.807	14.50	0.11	
6/17/74	42215.810	14.51	0.04	
6/19/74	42217.810	14.44	0.03	
6/21/74	42219.768	14.75	0.02	
6/28/74	42226.845	14.86	0.18	
6/29/74	42227.837	14.74	0.02	
7/15/74	42243.776	14.94	0.04	
7/19/74	42247.807	14.73	0.06	
7/24/74	42252.819	15.31	0.04	
12/10/74	42391.547	15.63	0.09	
6/19/77	43313.806	15.55	0.08	
6/20/77	43314.788	15.59	0.09	
6/23/77	43317.851	15.54	0.06	
7/11/77	43335.772	15.23	0.11	
7/18/77	43342.765	15.36	0.13	
7/21/77	43345.799	15.20	0.11	
8/ 8/77	43363.709	14.79	0.17	
8/10/77	43365.737	14.82	0.09	
8/12/77	43367.788	15.01	0.22	
9/ 8/77	43394.711	14.68	0.16	
10/ 4/77	43420.584	14.36	0.08	
10/14/77	43430.635	14.51	0.05	
11/ 8/77	43455.544	14.46	0.22	
5/29/78	43657.772	15.02	0.04	
5/31/78	43659.778	14.84	0.07	
8/31/78	43752.758	14.63	0.09	
11/ 2/78	43815.513	14.84	0.06	
6/29/79	44053.744	14.38	0.07	
6/30/79	44054.789	14.22	0.09	
7/30/79	44084.719	14.30	0.12	
8/20/79	44105.706	14.03	0.14	
8/22/79	44107.678	13.89	0.07	
9/29/79	44145.701	14.68	0.12	
10/12/79	44158.639	14.81	0.15	
10/19/79	44165.593	14.58	0.17	
5/25/80	44384.838	15.18	0.14	

TABLE III. (continued)

BL LAC V CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
5/27/80	44386.840	14.88	0.06	4
6/ 8/80	44398.798	15.33	0.21	
6/ 8/80	44398.799	15.28	0.08	
6/12/80	44402.770	15.42	0.07	2
10/13/80	44525.624	14.70	0.06	2
12/ 6/80	44579.574	15.46	0.06	2
6/10/83	45495.829	15.34	0.12	
6/11/83	45496.743	15.26	0.09	
11/30/83	45668.570	15.29	0.08	
12/ 1/83	45669.605	15.21	0.14	
12/ 7/83	45675.620	14.92	0.13	
12/ 8/83	45676.621	14.91	0.08	

BL LAC I

U.T. DATE	J.D.	MAG.	RMS.	#
7/ 3/73	41866.885	13.16	0.11	
7/25/73	41888.749	13.62	0.06	
9/ 5/73	41930.826	14.04	0.08	
9/22/73	41947.693	14.16	0.10	
10/28/73	41983.742	13.62	0.09	
7/29/76	42988.715	12.93	0.13	
10/16/76	43067.563	13.24	0.11	
6/19/77	43313.825	14.25	0.10	
6/23/77	43317.871	14.37	0.08	
7/11/77	43335.801	14.15	0.05	
7/15/77	43339.721	14.09	0.11	
7/21/77	43345.771	14.27	0.13	
8/ 8/77	43363.726	14.00	0.12	
8/10/77	43365.762	13.68	0.12	
8/12/77	43367.807	14.20	0.11	
9/ 8/77	43394.690	13.55	0.08	
10/12/77	43428.681	13.31	0.23	
10/17/77	43433.650	13.38	0.15	
11/ 8/77	43455.560	13.45	0.10	
8/31/78	43751.797	13.29	0.13	
11/ 2/78	43814.545	13.57	0.09	
7/30/79	44084.727	13.19	0.14	
8/20/79	44105.715	12.95	0.10	
9/22/79	44107.688	12.91	0.08	
9/29/79	44145.690	13.60	0.11	
10/12/79	44158.649	13.68	0.07	
10/19/79	44165.602	13.32	0.07	
5/25/80	44384.824	14.06	0.06	
5/27/80	44386.776	13.49	0.15	2
6/ 8/80	44398.831	14.20	0.07	2
6/12/80	44402.805	14.24	0.11	
10/13/80	44525.640	13.82	0.07	
12/ 6/80	44579.588	14.34	0.07	
6/11/83	45496.760	14.42	0.05	

3C 446 B

U.T. DATE	J.D.	MAG.	RMS.	#
9/15/71	41209.701	18.36	0.13	
9/15/72	41575.719	18.28	0.06	
10/ 8/72	41599.610	18.33	0.16	
12/25/73	42041.506	17.87	0.22	
9/11/74	42301.656	15.44	0.11	
9/15/74	42305.590	15.55	0.11	
9/16/74	42306.785	15.96	0.04	
9/24/74	42314.746	16.77	0.16	
10/ 9/74	42329.639	16.68	0.13	
10/10/74	42330.647	17.23	0.09	
10/13/74	42333.640	16.48	0.11	
10/18/74	42338.759	17.16	0.08	
10/21/74	42341.683	17.26	0.12	
12/ 4/74	42385.516	17.01	0.13	
6/14/75	42577.837	17.91	0.05	
7/10/75	42603.855	18.05	0.05	
8/ 6/75	42630.797	17.50	0.17	
8/13/75	42637.783	17.45	0.06	2
9/ 2/75	42657.854	18.09	0.10	
10/ 3/75	42687.737	18.78	0.07	2
10/28/75	42713.583	17.83	0.09	
11/30/75	42746.550	17.89	0.06	2
1/ 3/76	42780.524	16.60	0.03	
7/29/76	42988.867	17.74	0.05	2
8/ 1/76	42991.799	17.87	0.04	2
8/28/76	43018.730	18.31	0.10	2
9/16/76	43037.671	17.71	0.06	
10/15/76	43066.578	17.81	0.07	2
11/12/76	43094.530	17.66	0.10	2
6/19/77	43313.865	17.82	0.16	
6/21/77	43315.832	18.07	0.13	
7/13/77	43337.811	17.12	0.16	
7/15/77	43339.772	17.01	0.20	
8/11/77	43366.750	17.47	0.11	
9/ 6/77	43392.694	17.63	0.11	
10/12/77	43428.549	17.10	0.14	
11/ 1/77	43448.561	16.16	0.08	
11/ 6/77	43453.558	16.80	0.06	
11/11/77	43458.586	16.62	0.07	
8/ 5/78	43725.801	16.15	0.15	
8/ 7/78	43727.805	16.58	0.09	
8/27/78	43747.695	16.58	0.17	
8/29/78	43749.728	16.59	0.14	
8/31/78	43751.719	16.17	0.15	
9/ 1/78	43752.747	16.05	0.17	
9/ 4/78	43755.704	16.06	0.09	
9/11/78	43762.770	16.29	0.17	
9/23/78	43774.608	16.12	0.13	
10/ 2/78	43783.628	16.31	0.18	
10/ 3/78	43784.601	16.67	0.07	
10/ 5/78	43786.585	16.83	0.17	
10/ 5/78	43786.707	17.06	0.31	
10/ 9/78	43790.692	16.35	0.04	
10/23/78	43804.589	16.42	0.13	
10/24/78	43805.612	16.34	0.24	
11/ 1/78	43813.533	16.52	0.08	
11/23/78	43835.574	16.96	0.16	
12/ 2/78	43844.580	15.85	0.10	
12/23/78	43865.505	16.25	0.14	
12/24/78	43866.510	16.44	0.13	
7/22/79	44076.822	16.18	0.11	
7/30/79	44084.775	15.91	0.11	
8/26/79	44111.739	16.46	0.12	
9/19/79	44135.680	16.70	0.11	
9/20/79	44136.706	16.21	0.13	
10/13/79	44159.647	16.36	0.23	
10/18/79	44164.606	15.97	0.21	
11/10/79	44187.585	16.44	0.24	
11/17/79	44194.597	16.49	0.20	
11/20/79	44197.607	16.37	0.18	
1/ 8/80	44246.527	15.42	0.15	
5/12/80	44371.878	15.33	0.30	
6/12/80	44402.831	15.43	0.07	2
7/17/80	44437.849	16.57	0.13	
7/22/80	44442.817	17.06	0.17	
7/23/80	44443.795	17.16	0.13	2

3C 446 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
8/ 7/80	44458.770	17.30	0.18	
9/ 5/80	44487.663	17.48	0.15	
9/13/80	44495.626	17.47	0.15	
10/ 5/80	44517.614	17.83	0.18	
10/ 9/80	44521.620	18.14	0.16	
10/11/80	44523.673	17.65	0.19	
11/ 7/80	44550.557	18.41	0.07	4
11/29/80	44572.535	18.35	0.14	
12/ 4/80	44577.558	18.34	0.17	
1/ 3/81	44607.510	18.04	0.20	
5/ 5/81	44727.881	16.71	0.11	
6/ 4/81	44759.863	16.95	0.21	
6/29/81	44784.859	16.54	0.17	
7/ 1/81	44786.837	16.48	0.15	
7/ 7/81	44792.852	16.33	0.16	
8/ 7/81	44823.749	17.00	0.16	
9/ 1/81	44848.679	16.09	0.23	
9/ 3/81	44850.674	15.91	0.19	
9/ 4/81	44851.691	15.95	0.16	
9/ 8/81	44855.762	15.58	0.14	
9/20/81	44867.628	15.86	0.10	2
9/24/81	44871.654	15.64	0.25	
9/25/81	44872.592	16.43	0.16	
9/26/81	44873.600	15.95	0.10	
10/ 1/81	44878.589	16.38	0.11	2
10/ 1/81	44878.653	16.45	0.07	2
10/ 2/81	44879.643	16.58	0.17	
10/ 9/81	44881.621	16.62	0.14	
10/19/81	44896.621	16.55	0.17	
10/23/81	44900.648	16.40	0.19	
11/22/81	44930.540	16.60	0.20	
12/20/81	44958.538	16.05	0.20	
9/14/82	45226.669	15.36	0.17	
10/10/82	45252.595	16.44	0.19	2
10/16/82	45258.656	16.09	0.26	
11/10/82	45283.617	16.50	0.13	
7/12/83	45527.835	17.11	0.14	
8/10/83	45556.728	15.05	0.21	
8/11/83	45557.720	14.92	0.12	2
9/ 5/83	45582.703	15.93	0.15	
10/ 1/83	45608.665	16.23	0.17	
10/ 4/83	45611.593	16.02	0.18	
10/ 5/83	45612.619	16.08	0.14	
10/ 6/83	45613.542	16.32	0.13	
10/27/83	45634.594	16.28	0.18	
11/ 3/83	45641.537	15.89	0.20	
11/26/83	45664.544	15.11	0.09	2
12/ 1/83	45669.528	15.39	0.12	2
12/ 5/83	45673.534	15.34	0.13	2
12/ 6/83	45674.561	15.40	0.12	2
12/ 7/83	45675.546	15.39	0.11	2
12/ 8/83	45676.567	15.49	0.08	2
5/31/84	45851.855	17.06	0.09	2
6/ 2/84	45853.841	17.32	0.15	
9/16/84	45959.544	17.62	0.15	
9/27/84	45970.684	18.17	0.11	2
10/ 2/84	45975.778	17.94	0.11	2
10/19/84	45992.586	17.90	0.12	2
10/22/84	45995.585	17.82	0.13	2
10/25/84	45998.561	18.07	0.13	2
10/25/84	45998.640	18.25	0.10	2
10/26/84	45999.535	17.96	0.11	2
11/16/84	46020.528	17.98	0.18	
11/19/84	46023.517	17.71	0.13	2
12/19/84	46053.543	18.31	0.26	
5/27/85	46212.871	18.34	0.11	2
5/29/85	46214.871	18.36	0.10	2
6/24/85	46240.826	18.13	0.15	
6/25/85	46241.831	18.57	0.17	
7/22/85	46268.869	18.88	0.14	
9/ 7/85	46317.683	18.63	0.13	
9/19/85	46327.717	18.72	0.09	
10/ 9/85	46347.604	18.76	0.23	
10/14/85	46352.574	18.81	0.15	
10/18/85	46356.686	19.01	0.23	
11/ 9/85	46378.535	18.74	0.17	
11/11/85	46380.533	18.86	0.18	
11/14/85	46383.549	19.05	0.18	

3C 454.3 B

U.T. DATE	J.D.	MAG.	RMS.	#
8/20/71	41183.792	16.36	0.07	
9/ 1/71	41195.878	16.74	0.09	
7/22/72	41520.812	17.11	0.08	
8/11/72	41540.737	16.98	0.07	
10/ 2/72	41592.656	17.20	0.08	
10/ 8/72	41598.638	17.19	0.04	
11/ 3/72	41624.641	17.03	0.07	
8/10/73	41904.839	16.57	0.10	
8/25/73	41919.784	16.83	0.17	
9/ 7/73	41932.794	17.79	0.15	
9/24/73	41949.650	16.69	0.05	
10/21/73	41976.613	16.76	0.13	
12/22/73	42038.510	16.87	0.04	
5/22/74	42189.984	16.97	0.10	
7/17/74	42245.881	17.28	0.06	
9/12/74	42302.723	17.01	0.12	
10/10/74	42330.671	17.13	0.09	
12/ 4/74	42385.537	16.87	0.06	
12/ 9/74	42390.596	17.12	0.04	
7/19/75	42612.856	17.23	0.08	
8/ 6/75	42630.810	17.13	0.15	
8/14/75	42638.746	17.09	0.09	
9/ 4/75	42659.742	17.23	0.05	
11/ 2/75	42718.517	17.21	0.14	
11/30/75	42746.601	17.16	0.06	2
12/26/75	42772.562	16.88	0.07	2
7/29/76	42988.883	16.75	0.06	2
8/ 1/76	42991.817	17.01	0.09	2
8/23/76	43013.718	16.88	0.12	
9/20/76	43041.626	16.92	0.07	2
10/15/76	43066.616	16.98	0.12	2
11/12/76	43094.556	17.07	0.05	2
6/19/77	43313.874	17.45	0.30	
8/11/77	43366.783	17.07	0.22	
9/ 7/77	43393.684	17.13	0.22	
10/12/77	43428.533	17.68	0.12	
11/ 8/77	43455.625	17.20	0.07	
1/ 6/78	43514.516	16.99	0.07	
8/ 7/78	43727.814	17.25	0.07	
8/ 8/78	43728.887	16.93	0.10	
9/ 7/78	43758.719	17.28	0.26	
9/23/78	43774.619	17.03	0.21	
10/ 3/78	43784.644	16.98	0.17	
10/ 5/78	43786.597	17.09	0.13	
10/ 5/78	43786.724	17.43	0.13	
10/23/78	43804.592	17.22	0.09	
11/21/78	43833.585	16.87	0.10	
12/24/78	43866.562	17.33	0.15	
7/ 3/79	44057.796	17.62	0.04	
7/22/79	44076.810	17.54	0.06	
9/19/79	44130.713	17.50	0.18	
9/20/79	44136.716	16.99	0.09	

3C 454.3 B CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
10/13/79	44159.658	16.76	0.10	
10/21/79	44167.639	16.42	0.12	
11/10/79	44187.591	16.38	0.17	
11/16/79	44193.637	16.22	0.14	
11/19/79	44196.575	16.55	0.18	
11/20/79	44197.619	16.38	0.14	
1/ 8/80	44246.540	16.33	0.16	
6/20/80	44410.831	16.86	0.15	
7/18/80	44438.817	16.53	0.19	
9/ 5/80	44487.696	16.78	0.20	
9/13/80	44495.681	16.50	0.12	
10/ 9/80	44521.656	16.69	0.10	
12/ 5/80	44578.558	16.52	0.09	
7/ 1/81	44786.828	16.99	0.22	
7/ 3/79	44057.796	17.19	0.16	
7/23/79	44077.560	17.57	0.08	
9/20/79	44136.716	17.10	0.13	
10/13/79	44159.658	16.75	0.09	
10/21/79	44167.639	16.44	0.06	
11/10/79	44187.591	16.44	0.16	
11/16/79	44193.637	16.27	0.13	
11/19/79	44196.575	16.63	0.13	
11/20/79	44197.619	16.42	0.16	
1/ 8/80	44246.540	16.33	0.15	
6/20/80	44410.831	16.78	0.16	
7/18/80	44438.817	16.48	0.13	
9/ 5/80	44487.696	16.83	0.15	
9/13/80	44495.681	16.49	0.11	
10/ 9/80	44521.656	16.72	0.09	
12/ 5/80	44578.558	16.54	0.09	
7/ 1/81	44786.828	16.88	0.17	
8/ 9/81	44825.784	16.40	0.08	
9/ 1/81	44848.705	16.83	0.06	
9/21/81	44868.693	16.76	0.19	
10/23/81	44900.677	17.02	0.06	
11/21/81	44929.567	16.97	0.08	
12/17/81	44955.550	16.86	0.14	
9/15/82	45227.686	17.30	0.13	
10/16/82	45258.676	17.36	0.14	
11/10/82	45283.693	16.95	0.12	
7/12/83	45527.869	17.36	0.11	
8/ 9/83	45555.790	17.03	0.14	
8/11/83	45557.760	17.03	0.07	
9/ 6/83	45583.701	16.72	0.09	
10/27/83	45634.569	17.14	0.09	
8/28/84	45940.715	16.77	0.11	
9/27/84	45970.745	17.12	0.22	
10/22/84	45995.617	16.95	0.16	
10/25/84	45998.660	17.06	0.13	2
11/16/84	46020.541	16.95	0.11	
7/24/85	46270.810	16.49	0.18	
9/ 9/85	46317.724	16.52	0.19	
9/19/85	46327.780	16.43	0.09	
10/18/85	46356.676	16.88	0.14	
11/ 5/85	46374.565	16.70	0.18	
11/11/85	46380.678	16.83	0.08	
12/ 3/85	46402.551	16.40	0.07	

2345-16 P

U.T. DATE	J.D.	MAG.	RMS.	#
10/10/69	40504.691	17.04	0.10	
11/ 9/69	40534.677	16.71	0.09	
11/12/69	40537.691	16.58	0.17	
11/30/69	40555.590	15.82	0.14	
12/ 3/69	40558.556	15.58	0.10	
12/ 5/69	40560.512	15.85	0.20	
12/ 5/69	40560.578	15.75	0.12	
12/ 6/69	40561.708	16.34	0.18	
12/ 8/69	40563.507	16.33	0.11	
12/ 8/69	40563.593	16.44	0.14	
12/30/69	40585.563	16.56	0.08	
1/ 9/70	40595.521	15.89	0.19	
1/11/70	40597.531	16.09	0.13	
1/11/70	40597.539	16.05	0.10	
1/29/70	40615.526	16.02	0.12	
1/31/70	40617.533	15.52	0.18	
2/ 8/70	40625.526	15.95	0.07	
6/ 9/70	40746.846	17.35	0.04	
6/11/70	40748.857	17.30	0.12	
6/16/70	40753.860	16.87	0.18	
7/ 1/70	40768.832	17.14	0.16	
7/ 7/70	40774.843	16.71	0.10	
7/11/70	40778.856	16.83	0.15	
7/31/70	40798.822	17.16	0.13	
8/ 4/70	40802.868	16.84	0.10	
8/23/70	40821.653	17.39	0.06	
8/29/70	40827.835	17.29	0.19	
8/31/70	40829.849	17.31	0.12	
9/ 6/70	40835.750	17.36	0.12	
9/ 7/70	40836.776	17.29	0.09	
9/22/70	40851.628	17.25	0.12	
9/24/70	40853.690	17.24	0.13	
9/30/70	40859.599	17.22	0.09	
10/ 5/70	40864.753	17.18	0.08	
10/26/70	40885.642	17.32	0.08	
11/ 1/70	40891.655	17.28	0.13	
11/18/70	40908.589	17.40	0.07	
11/28/70	40918.641	17.50	0.12	
11/29/70	40919.572	17.38	0.08	
12/21/70	40941.506	17.28	0.12	
12/27/70	40947.507	17.33	0.06	
1/16/71	40967.516	17.32	0.04	
1/18/71	40969.492	17.33	0.08	
1/20/71	40971.520	17.44	0.06	
1/22/71	40973.519	17.38	0.12	
1/29/71	40980.517	17.56	0.15	
6/21/71	41123.866	17.01	0.07	
6/22/71	41124.857	18.07	0.12	
6/24/71	41126.864	17.45	0.14	
6/26/71	41128.853	17.79	0.08	
6/27/71	41129.847	17.67	0.10	
6/30/71	41132.868	17.70	0.11	
7/ 2/71	41134.860	17.70	0.10	
7/21/71	41153.880	17.64	0.11	
7/24/71	41156.867	17.63	0.08	
8/20/71	41183.819	17.46	0.09	
8/26/71	41189.842	17.41	0.09	
8/27/71	41190.833	17.33	0.09	
9/ 1/71	41195.849	17.62	0.10	
9/13/71	41207.845	17.70	0.11	
9/19/71	41213.767	17.42	0.07	
9/27/71	41221.816	17.36	0.10	
10/11/71	41235.674	17.30	0.04	
11/13/71	41269.640	17.02	0.10	
12/14/71	41299.608	17.29	0.06	
1/10/72	41326.508	17.30	0.11	
1/18/72	41334.521	17.18	0.09	
7/18/72	41518.867	17.47	0.05	
7/20/72	41518.869	17.45	0.12	
8/11/72	41540.817	16.98	0.10	
8/16/72	41545.893	17.01	0.09	
9/ 4/72	41564.844	17.22	0.11	
9/12/72	41572.673	17.23	0.09	

2345-16 P CONT.

U.T. DATE	J.D.	MAG.	RMS.	#
9/18/72	41578.802	17.28	0.13	
10/ 2/72	41592.681	17.41	0.08	
10/ 8/72	41598.697	17.25	0.11	
10/ 9/72	41599.659	17.32	0.15	
10/11/72	41601.676	17.47	0.11	
10/13/72	41603.647	17.21	0.14	
11/ 3/72	41624.617	17.24	0.10	
11/11/72	41632.617	17.41	0.09	
11/27/72	41648.565	17.18	0.10	
7/ 8/73	41871.841	17.53	0.09	
8/10/73	41904.886	17.22	0.08	
8/25/73	41919.819	17.32	0.12	
9/ 6/73	41931.813	16.60	0.08	
9/ 7/73	41932.773	16.61	0.10	
9/ 8/73	41933.810	16.94	0.16	
9/18/73	41943.610	17.24	0.16	
9/19/73	41944.662	17.11	0.11	
9/22/73	41947.719	17.24	0.09	
9/30/73	41955.776	17.16	0.11	
10/ 4/73	41959.749	17.21	0.10	
10/19/73	41974.625	17.28	0.14	
10/28/73	41983.666	16.86	0.12	
10/31/73	41986.696	16.90	0.10	
12/15/73	42031.510	17.23	0.11	
8/16/74	42275.801	17.10	0.18	
9/11/74	42301.677	17.53	0.19	
9/16/74	42306.805	17.70	0.14	
10/ 9/74	42329.619	17.63	0.12	
10/21/74	42341.698	17.63	0.06	
12/ 4/74	42385.551	17.66	0.10	
12/10/74	42391.575	17.69	0.07	
1/ 2/75	42414.509	17.34	0.09	
8/ 6/75	42630.833	17.67	0.12	
8/13/75	42637.803	17.45	0.10	
8/13/75	42637.807	17.79	0.11	
9/ 4/75	42659.766	17.49	0.15	
9/ 4/75	42659.777	17.51	0.12	
10/11/75	42696.717	17.53	0.08	
10/11/75	42696.721	17.62	0.07	
11/30/75	42746.669	17.55	0.11	
11/30/75	42746.706	17.84	0.10	
12/27/75	42773.600	17.52	0.20	
12/27/75	42773.618	17.66	0.18	
8/ 1/76	42991.834	17.73	0.21	
8/30/76	43020.786	17.72	0.24	
8/30/76	43020.791	17.40	0.15	
9/29/76	43050.768	17.48	0.11	
10/16/76	43067.609	17.81	0.18	
10/16/76	43067.612	17.59	0.16	
12/20/76	43132.533	17.44	0.09	
6/21/77	43315.870	17.77	0.13	
7/13/77	43337.849	17.53	0.15	
8/11/77	43366.799	17.96	0.21	
9/ 9/77	43395.700	18.00	0.15	
9/20/77	43406.728	17.92	0.15	
11/ 6/77	43453.635	17.71	0.10	
12/ 9/77	43486.580	17.85	0.06	
1/ 6/78	43514.537	17.78	0.07	
8/13/78	43733.841	17.81	0.19	
8/29/78	43749.754	17.62	0.15	
10/23/78	43804.621	17.48	0.22	
11/23/78	43835.597	17.62	0.08	
12/ 2/78	43844.529	17.93	0.15	
12/18/78	43860.519	17.61	0.12	
12/18/78	43860.524	17.44	0.19	
12/20/78	43862.512	17.87	0.18	
12/24/78	43866.542	17.38	0.26	
12/31/78	43873.528	17.42	0.16	
1/19/79	43892.512	17.61	0.22	
6/30/79	44056.853	17.73	0.23	
7/22/79	44076.857	16.78	0.19	
8/20/79	44105.792	17.30	0.23	
8/26/79	44111.756	17.02	0.14	
9/20/79	44136.757	17.72	0.17	
10/19/79	44165.642	17.44	0.19	
11/16/79	44193.648	17.51	0.09	
7/22/80	44442.854	17.28	0.21	
8/ 9/80	44460.841	17.22	0.11	
9/ 8/80	44490.774	17.32	0.20	
9/13/80	44495.742	17.54	0.14	
10/ 9/80	44521.674	17.38	0.13	
11/29/80	44572.557	17.35	0.17	
7/ 6/81	44791.853	17.59	0.11	
8/ 7/81	44823.803	18.17	0.19	
8/ 9/81	44825.807	17.78	0.10	
9/ 3/81	44850.755	17.52	0.11	
9/ 8/81	44855.811	17.90	0.14	
9/31/81	44878.880	17.76	0.17	
10/21/81	44898.663	17.27	0.07	
11/21/81	44929.557	17.36	0.06	
12/17/81	44955.522	17.22	0.19	
9/15/82	45227.716	17.70	0.17	
9/ 6/83	45583.710	17.19	0.15	
9/31/83	45608.700	17.58	0.21	
10/ 6/83	45613.652	17.45	0.19	
10/27/83	45634.577	17.65	0.23	
8/28/84	45940.766	17.44	0.20	
11/16/84	46020.573	17.73	0.14	
10/12/85	46350.663	17.57	0.13	
11/11/85	46380.694	17.65	0.20	
11/14/85	46383.590	17.37	0.15	
12/ 3/85	46402.571	17.65	0.09	

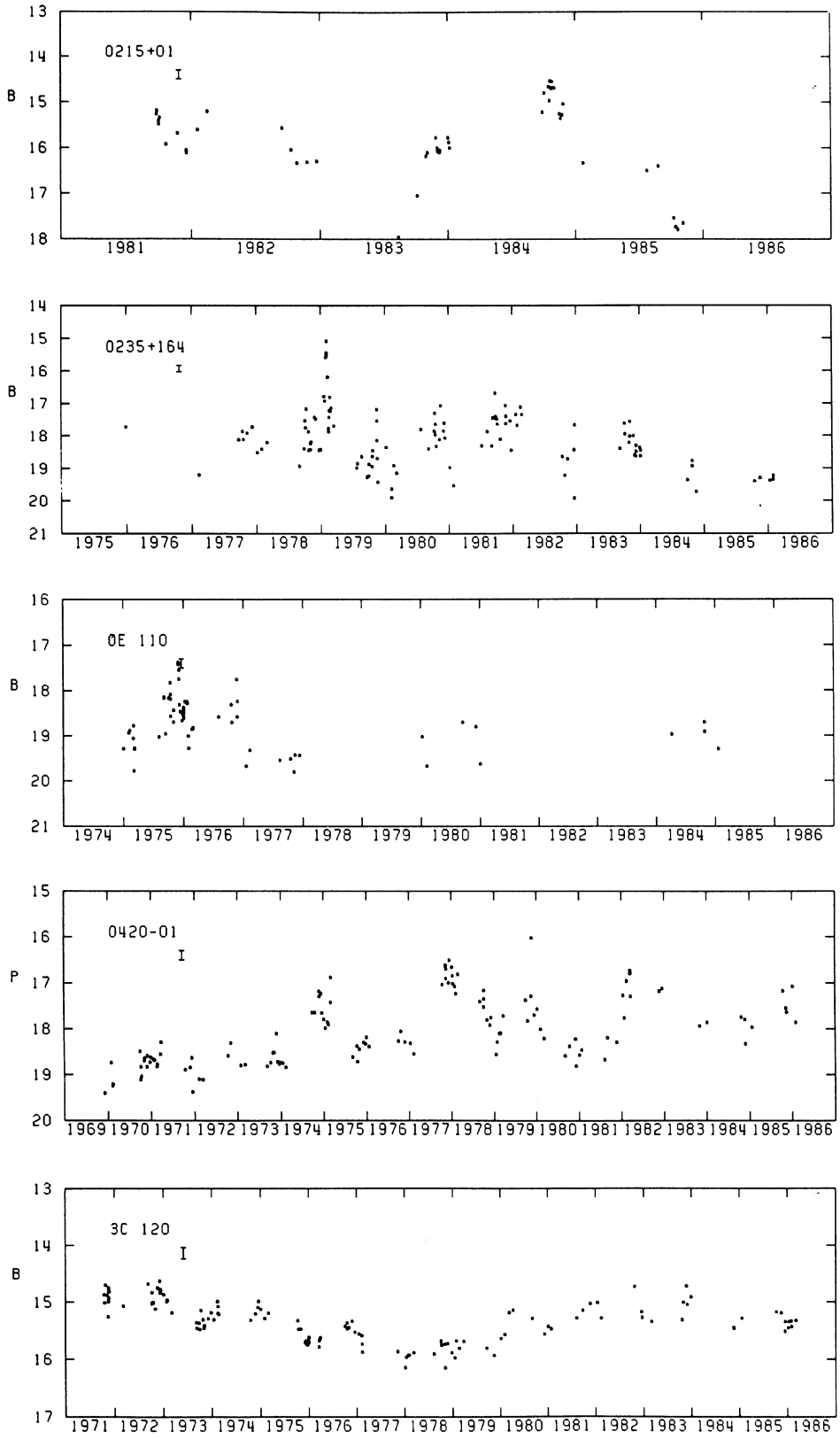


FIG. 1. Light curves of 22 optically violent variable extragalactic sources. The color system used for each graph is denoted on the ordinate. OJ 287 and BL Lac are shown out of right ascension order to conserve space. The error bar under the source name represents 0.2 mag.

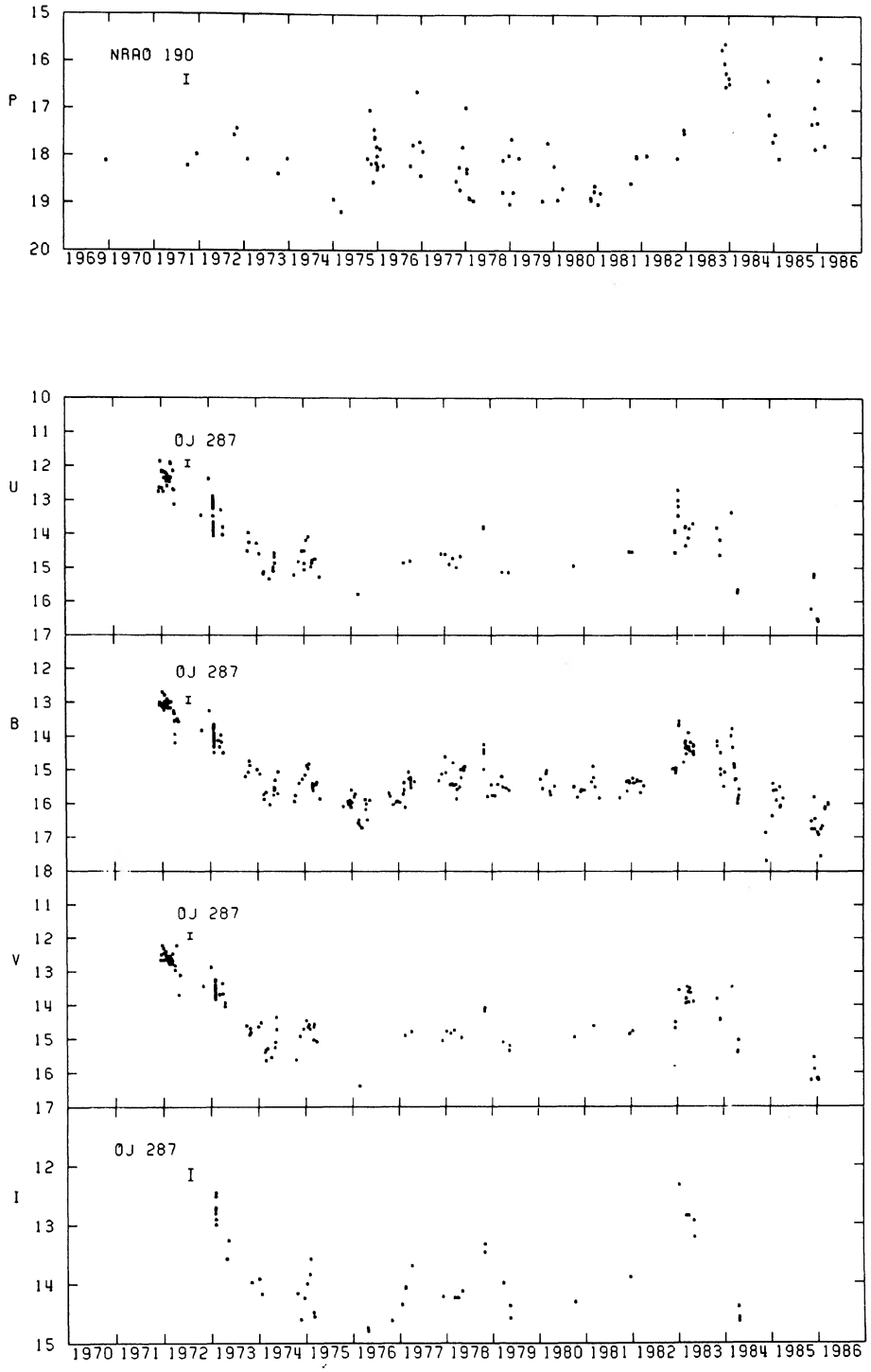


FIG. 1. (continued)

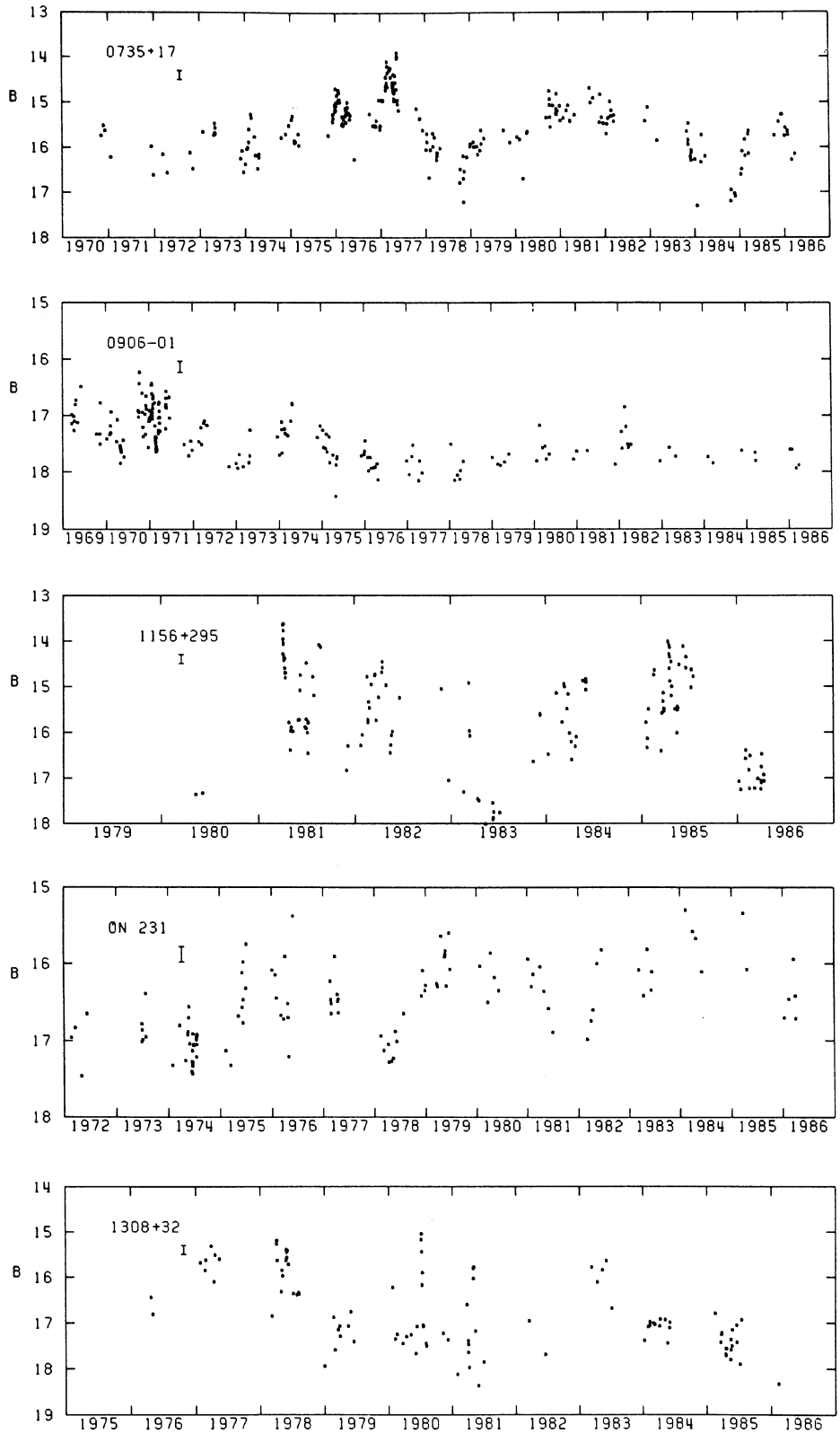
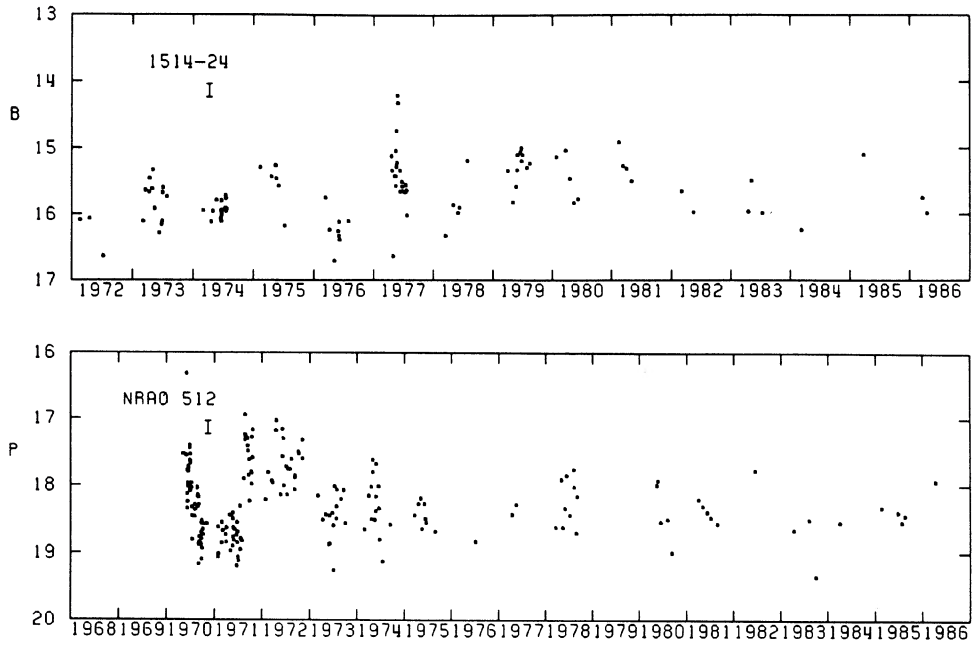


FIG. 1. (continued)



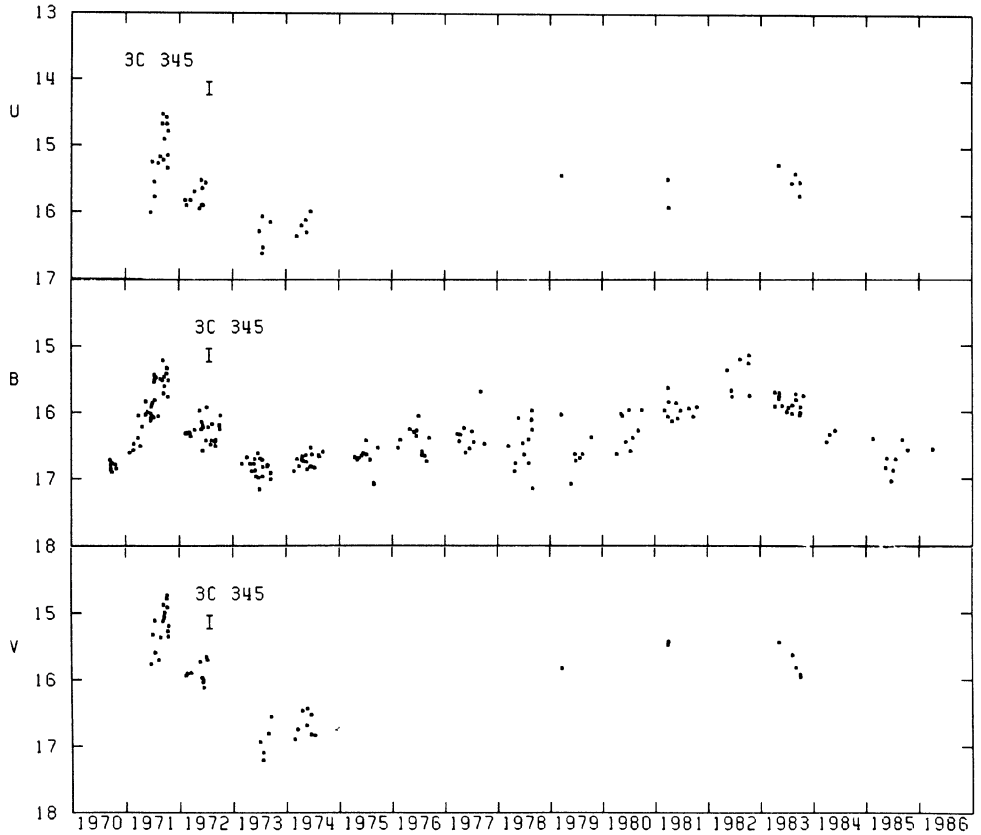


FIG. 1. (continued)

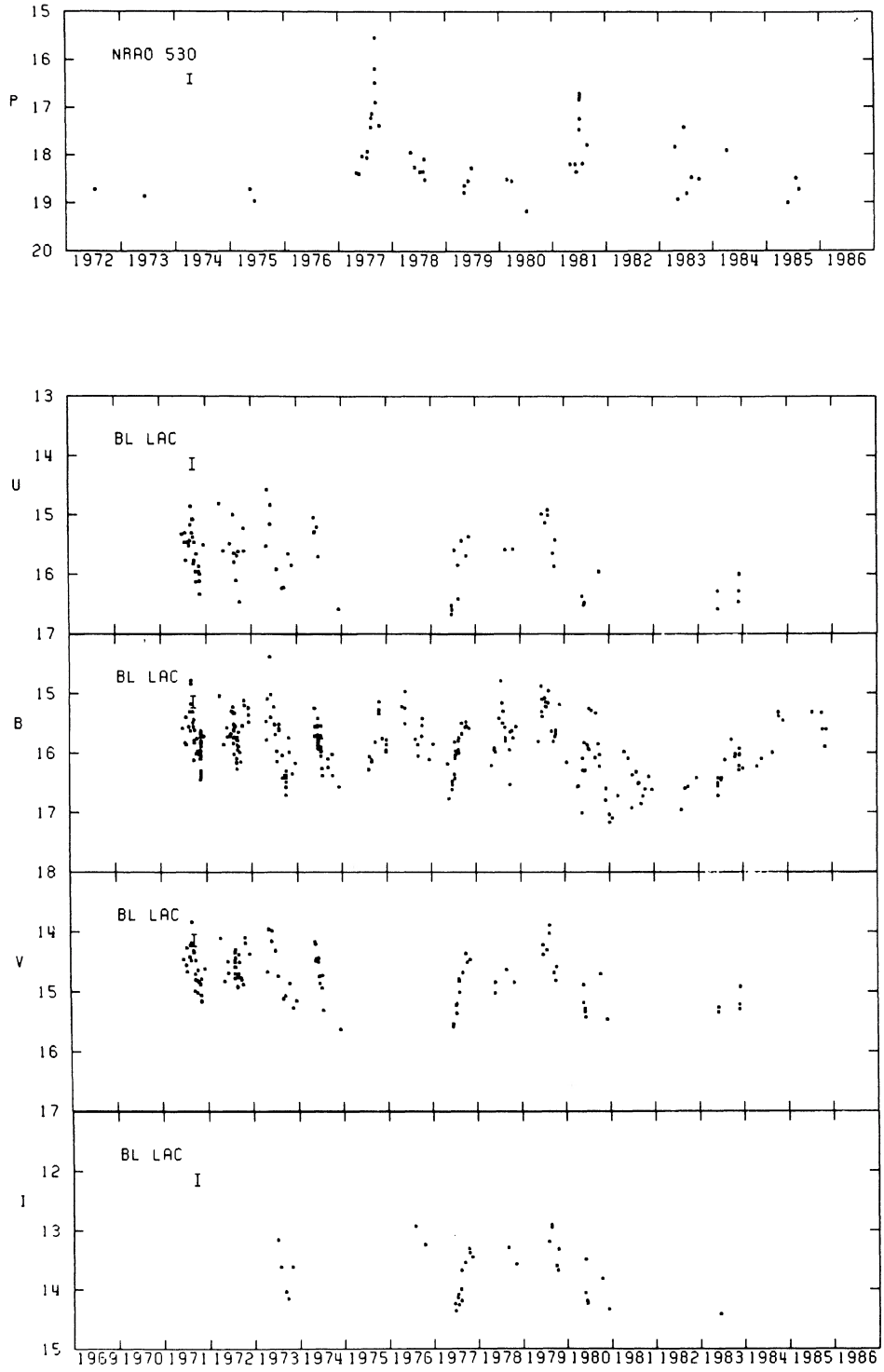


FIG. 1. (continued)

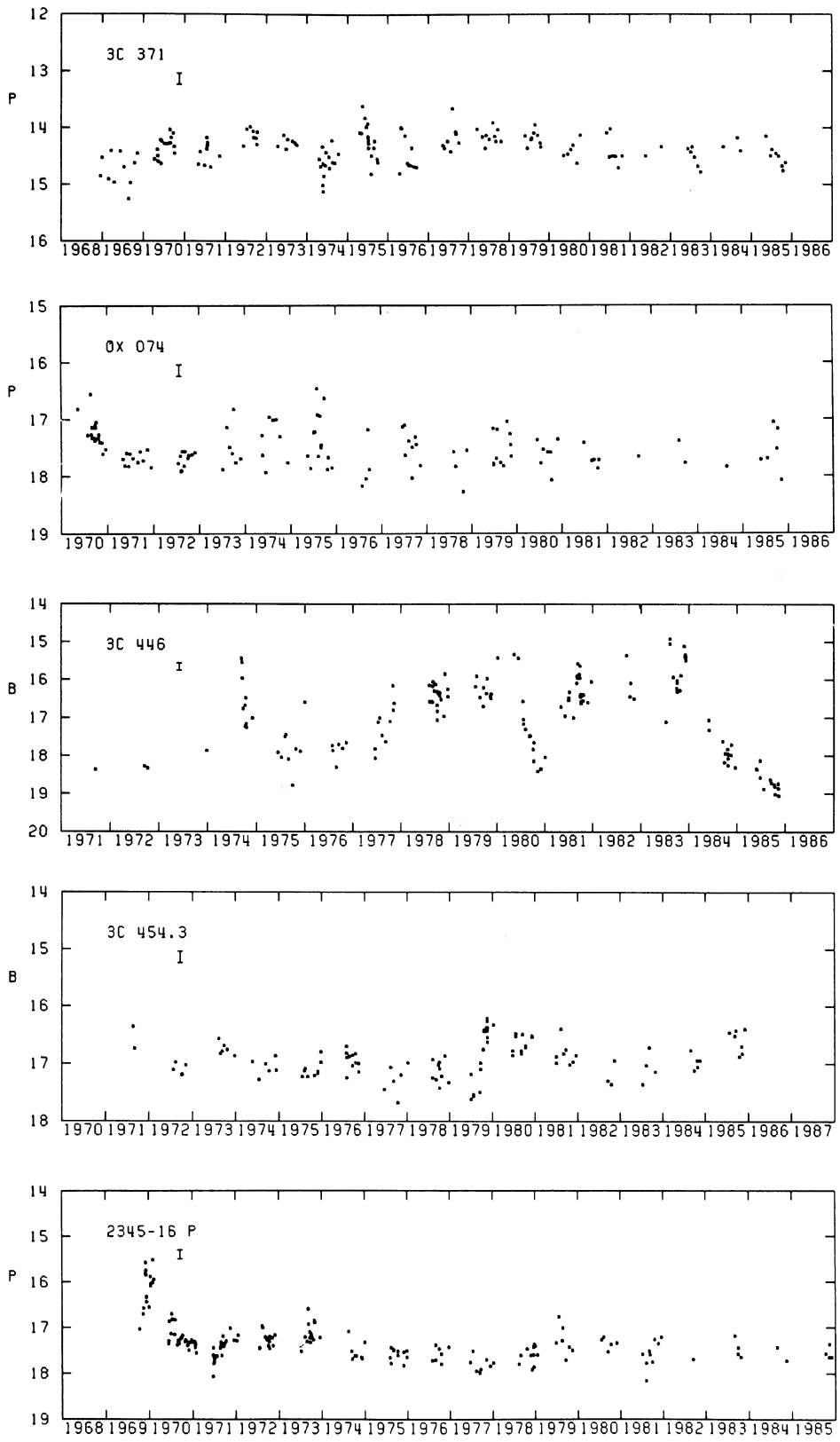


FIG. 1. (continued)

been very active, particularly in recent years, exhibiting an increase of 1.4 mag in 28 days in early 1986. This rapid brightening was followed by a 1.9 mag decrease over a 34 day period. The object was seen as bright as 15.6 on 1 December 1983.

0735+17. This highly variable BL Lac has been the subject of many detailed studies. Multifrequency observations including the RHO data were analyzed by Bregman *et al.* (1984). The optical light curve suggests long-term trends with amplitudes of about 2 mag, with more rapid flares of 1–1.5 mag, superimposed.

OJ 287. This active BL Lac object has been heavily monitored at RHO since 1971 and has shown variability over a 5 mag range. The recent outbursts in 1983 and 1984 were followed by a general decline in brightness. Seen at $B = 13.8$ on 9 March 1984, OJ 287 rapidly faded to $B = 16.0$ on 20 April 1984. By late 1984 it had faded to $B = 17.7$, but proceeded to brighten throughout early 1985. A linear-regression analysis indicates a decrease in average brightness of about 0.15 mag per year. The light curve in Fig. 1 contains the early PG data converted to the B system by an empirically determined B–PG correction of $+0.50$.

Analysis of the 1972 and 1983 outbursts by Sillanpää *et al.* (1985) found the morphology of the two outbursts to be very similar. The polarization of OJ 287 during optical outbursts is discussed in Sitko *et al.* (1985).

0906+01. After the initial activity seen in 1970–1971, 0906 + 01 has been relatively quiescent. An outburst of 0.8 mag in two months occurred in early 1982. Since that time 0906 + 01 has been inactive. The early PG magnitudes in Table III can be converted to B magnitudes by an offset of B–PG = $+0.20$, based on a series of B and PG exposures taken within minutes of each other on several occasions.

1156+295. This quasar is one of the most variable observed. First identified by Wills (1966) as the optical counterpart of the radio source 4C 29.45, it was added to the RHO list in 1980. The 20 star comparison sequence was calibrated by photographic transfer from the ON 231 field. Comparison-star magnitudes and a finder chart for the RHO sequence are published in Wills *et al.* (1983). In early 1981, a 4 mag outburst was detected at RHO. Cooperative observations of this outburst covering the spectrum from radio through ultraviolet are reported by Wills *et al.* (1983) and by Glassgold *et al.* (1983). The extremely erratic variations continued throughout 1984, and in 1985 another outburst, with an amplitude of 2.5 mag, was observed at RHO. Coordinated x-ray and optical observations of this outburst were made with the *EXOSAT* x-ray satellite and the RHO 76 cm telescope. The results of these simultaneous observations are still under analysis, but a preliminary report can be found in Webb and McHardy (1986). Recent optical monitoring shows 1156 + 295 flickering between 16th and 17th magnitude; linear-regression analysis shows decreasing mean brightness at a rate of 0.15 mag per year.

ON 231. This object is another of the BL Lac class. A series of 2 mag outbursts was observed in 1975–1976 and this type of rapid activity has continued through 1986 and early 1987.

1308+32. High-amplitude flares and long-term variations characterize the light curve of this BL Lac object. The flares in 1980 and 1981 were closely monitored at RHO, showing an increase in brightness of 2.6 mag between 5 June and 6 July 1980. This increase was followed by a 2 mag decline by 16 July 1980, with another 2 mag flare occurring during April of 1981. This bursting behavior of 1308 + 32 was analyzed by Mufson *et al.* (1985). The linear trend indicates a decrease in mean magnitude of 0.16 mag per year. This object has shown less activity in recent years. Early 1987 observations indicate that 1308 + 32 is at a very faint stage, with $B > 18.8$.

1514−24. This BL Lac, also called AP Librae, has been observed at RHO since 1972. One major outburst was seen in 1977. Since that time, little major bursting activity has been detected, although there is evidence of a long-term rise and fall of about a magnitude between 1977 and 1984. A moderate flare in 1985 may have escaped detection because of a paucity of observations. Flickering with an amplitude of a magnitude is common.

NRAO 512. This is another OVV whose initially violent behavior appears to have tapered off. It is possible that some events since 1976 were missed due to apparently sparse sampling, but on many of the plates taken during this interval NRAO 512 was simply below the plate limit. The major flare in 1970 had an amplitude of 3 mag, followed by subsequent events of 1 to 2 mag. Rapid changes of the order of a magnitude are seen in the post-1979 data.

3C 345. This object is one of the most active QSOs, although it fails to display the very rapid bursting behavior seen in sources such as 1308 + 32 and 0235 + 164. Major long-term variations with amplitudes of 2 mag are seen in 1970–1973 and 1980–1985. Short-term flickering is superimposed on the long-term variations with amplitudes of 0.5–1.0 mag. A detailed multifrequency analysis of this source was presented by Bregman *et al.* (1986), who included extensive optical, radio, and ultraviolet data. A correlation between the optical outbursts and the production of superluminally expanding radio sources was reported there. The light curve of 3C 345 has been analyzed a number of times in search of periodic behavior. The work of Smyth and Wolstencroft (1970) and other analyses will be discussed in Sec. IV.

NRAO 530. The recent sampling of this normally faint, bursting QSO is not sufficiently dense to define the bursting activity seen earlier. In spite of the sampling problem, a major outburst was detected in 1981 and another in 1985. These outbursts had amplitudes near 2 mag over periods of weeks.

3C 371. This N type galaxy has been observed to vary over a 2 mag range in the optical region. Optical activity since 1979 has been confined to a 1 mag range between PG = 14.0 and PG = 15.0.

The plates were all re-examined because of our concern over the nebulosity around the stellar nucleus. Exposures made after 1981 were all reduced using a fixed-iris setting to limit and standardize the contribution of the surrounding galaxy. Tests with exposures made before 1981 showed that any systematic errors due to the galaxian component were no larger than the usual rms errors. This is in contrast to the 3C 120 plates, which were completely rereduced because similar tests revealed differences between the fixed and variable-iris methods greater than the normal rms errors. Multifrequency observations of 3C 371 including RHO data were reported by Worrall *et al.* (1984).

OX 074. This QSO showed three large-amplitude events in the interval 1973–1975. Since 1979, only a small outburst in 1985 is prominent in the light curve, although other events could have been missed due to the infrequent observations made between 1982 and 1984.

BL Lac. The prototype of the BL Lacertae class of AGN, this object is well known as one of the most active sources observed. The RHO data show rapid, 1–2 mag flares occur-

ring frequently from 1971 to 1981. Then a slow brightening from $B = 17.2$ on 4 January 1981 to $B = 15.6$ on 15 November 1985 occurred with relatively little flaring activity. This change in the variability characteristic will be closely monitored in the future at RHO.

Photometric data published by Hagen-Thorn *et al.* (1984) agree well with the RHO data when nearly simultaneous observations are compared.

3C 446. This BL Lac type AGN exhibits large, spikelike outbursts and slow, large-amplitude variations. No major spikelike outbursts have been observed since 1974; rather, large-amplitude variations over a number of years seem to dominate the light curve. Observations made in late 1985 showed 3C 446 to be at its all-time faintest measured magnitude, 19.1, but by late 1986 it had gradually recovered to $B = 17.5$. The multifrequency spectral distribution of 3C 446, including the RHO data, has been analyzed by Brown *et al.* (1986), and other multifrequency work is in progress by Bregman (1986).

3C 454.3. This OVV was rather quiescent during the early years of monitoring at RHO, but a fast 1.5 mag flare occurred in late 1979. Following the outburst, the brightness declined slowly for about 3 yr, with flickering similar to that seen before 1979. Since 1983, a general brightening has been observed.

2345−16. The outburst in 1969 is the only major event observed in this QSO. Its behavior since 1970 would not qualify it as an OVV. Rapid, low-amplitude fluctuations of about 0.5 mag are present in the light curve.

IV. ANALYSIS

Many attempts have been made to detect periodicities in QSOs and related objects (Smyth and Wolstencroft 1970; Jurkevich *et al.* 1971). Periodicities on the order of 100–1000 days were reported for 3C 345 by Smyth and Wolstencroft and by Barbieri *et al.* (1977). Evidence for 350 day and 22.5 yr periods in the light curve of 3C 120 was seen by Jurkevich *et al.* Recent periodic analysis of 3C 345 by Babadzhanyants and Belokon (1984) and of 3C 446 by Barbieri *et al.* (1985) detected periodic behavior on the order of thousands of days in both sources.

The nature of optical observations of faint objects makes the detection of periodicities, if any exist, extremely difficult. Unequal intervals of time between observations and annual gaps in the data extending over several months complicate any analysis, along with normal observational uncertainties and the relatively short baselines of the data sets (often only one or two "periods").

The construction of long-term light curves using data gathered by the same instruments and reduced by the same procedures is ideal for investigating the variability behavior of AGNs. Data collected at RHO extend over 18 yr in some cases. The observing frequency for each object is between two observations per week and a few per year, depending on historical variability characteristics. Generally, for OVVs, the observing frequencies range between one per month and two per week. An object undergoing an outburst is often observed every clear night during its active phase. The reduced sampling frequency in recent years for a few of the objects reported here was in part due to heavy commitments to cooperation with active satellites such as *IUE*, *EXOSAT*, and *IRAS*.

The data were first analyzed for long-term linear trends by the linear-regression routine given by Bevington (1969). The fit was weighted using instrumental weighting and then removed from the data. The data were then analyzed by the unequal-interval Fourier transform method discussed by Deeming (1975).

Figure 2 shows the power spectra of 3C 120, 3C 345, and 3C 446. The spectral window of 3C 345 is also shown. The spectral window is used to identify aliases that contaminate the power spectrum. Generally, the spectral windows for the data analyzed here show a peak at 1 yr, which represents the annual "observing season" for each object; however, some of the less frequently monitored objects exhibited very complex spectral windows with broad primary and secondary peaks. The features are labeled according to the periods they represent, and possible aliases are labeled in brackets. Only the spectral window of 3C 345 is shown, because it is identical with the spectral windows of the two other sources. The significance of the spectral features in the power spectra of 3C 120, 3C 345, and 3C 446 has been estimated by Monte Carlo simulations. The original magnitudes have been randomly scrambled among the original epochs and then Fourier analyzed. The most prominent spectral features in these simulated spectra were then compared with the original spectral features. The significance of the original spectral peak is defined as

$$s = \frac{P(\text{original})}{\overline{P}(\text{simulated})} . \tag{1}$$

P (original) is the power in the original feature and $\overline{P}$ (simulated) is the average power of the strongest peaks seen in the simulated power spectra for a given object. The noise level, $\overline{P}$ (simulated), is shown in Fig. 2 for each power spectrum.

Table IV lists the results of Fourier transform analysis for each of the 22 sources. Column 1 gives the object name, while columns 2–4 list the periods identified with the three most powerful peaks in the power spectrum. Columns 5–7 give the normalized power of each periodic component. Column 8 contains comments about the power spectrum of the source.

Models of the light curves can be constructed based on the periodic components identified by the Fourier analysis (Barbieri *et al.* 1977). The model can be written as

$$m = A + Bt + \sum C_i \cos\left[\frac{2\pi t}{P_i} + \zeta_i\right] . \tag{2}$$

In Eq. (2), A and B are the intercept and slope given by the regression analysis. The C_is are the amplitudes for each periodic component. The ζ_is are the phase shifts in radians, which can be calculated by taking the arctangent of the ratio of the imaginary and real parts of the Fourier transforms.

The model resulting from the Fourier analysis was fitted only to the data for 3C 120, 3C 345 and 3C 446, which were selected because of the extensive data available and the existence of previous timescale analyses in the literature. A fitting scheme that combines the Gauss–Newton and BFGS curve-fitting procedures was used to fit the models to the data. This "hybrid method" (Jacobs 1977) was used to adjust the linear coefficients and the amplitudes and phases of the sinusoidal components to achieve the best possible fit. The starting parameters for the linear coefficients were taken from the regression analyses, while starting values for the cosine parameters were deduced from the Fourier results. The periods were not adjusted by the fitting process and were taken from Table IV. The results are shown in Table V. Al-

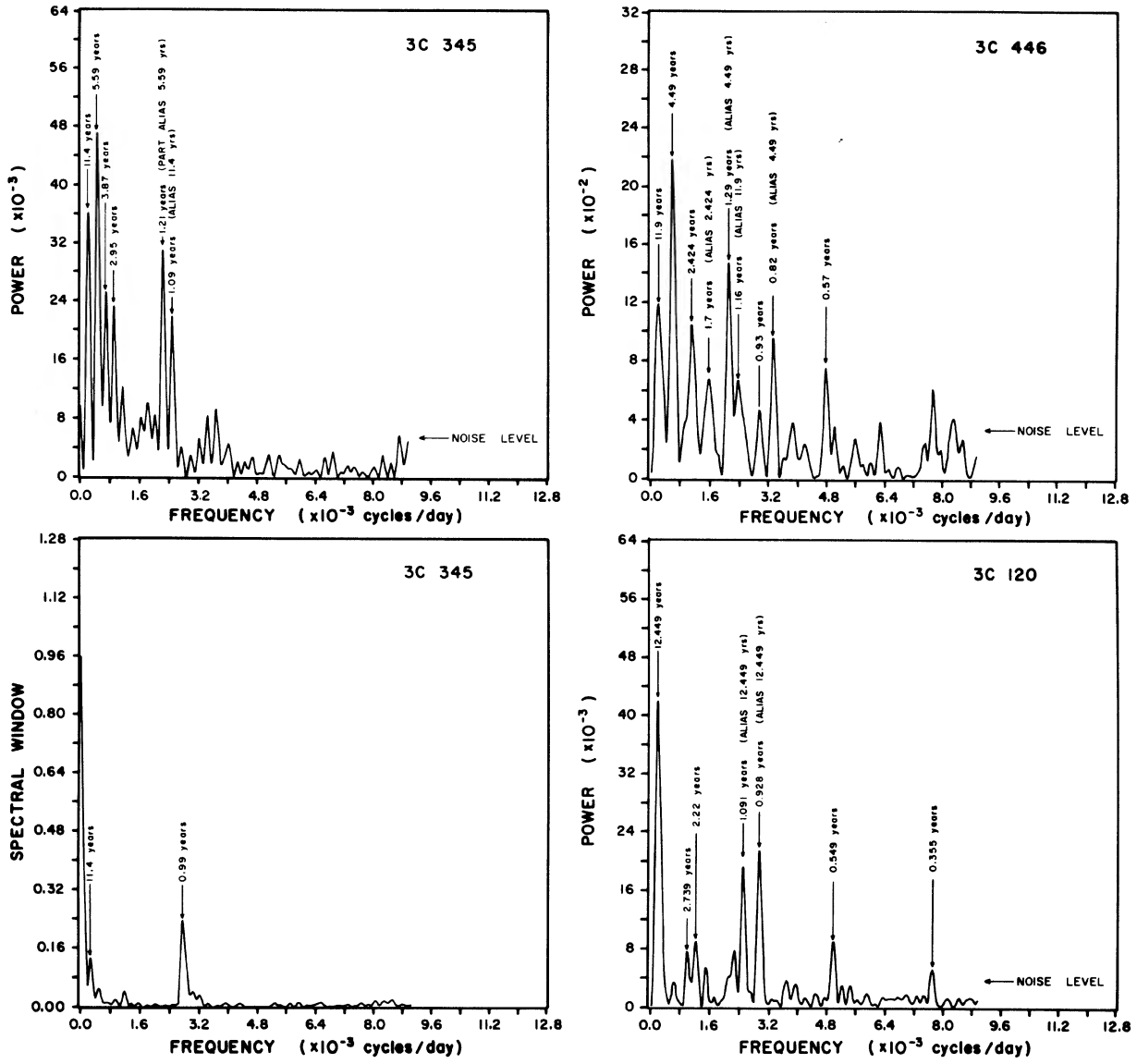


FIG. 2. Power spectra of 3C 120, 3C 345, and 3C 446. The spectral window of 3C 345 is similar to the spectral windows of the other sources. Each major peak is labeled with the corresponding period in years. The brackets associated with some peaks denote that the peak is an alias of the peak given in the brackets. The background-noise level determined by the Monte Carlo calculations is 0.004 for 3C 120, 0.004 for 3C 345, and 0.03 for 3C 446.

though no acceptable fit was found for 3C 466, the best-fit parameters are included in Table V. The 3C 446 data resisted fitting because of extremely rapid, high-amplitude variations whose durations were much less than the resolution of the Fourier analysis. Figure 3 shows the data for 3C 120 and 3C 345 with the fitted curves superimposed. The deviations from the fitted curve represent rapid variations with timescales smaller than the resolution of the Fourier analysis. As mentioned earlier, the resolution is set by the existence of large gaps in the data, some nearly 5 months long. Even with the scatter due to observational errors and high frequency variations, underlying structure is evident in the light curves of 3C 120 and 3C 345.

3C 120. A periodic analysis of the light variations in 3C 120 using a periodogram technique was reported by Jurkevich, Usher, and Shen (1971). Analyzing observations made between 1929 and 1970, they found periods of about 22.5 and 0.96 yr with high-frequency components of 0.05–0.002 day^{-1}.

Fourier analysis of the RHO data yielded only one significant peak in the power spectrum, corresponding to a period of 12.45 yr. The significance of this peak was $s \cong 22$. Although the data run is not sufficiently long to cover more than one cycle, it does reflect the presence of this sinusoidal component. Other peaks were a factor of 10 weaker than the 12.45 yr peak. The 0.96 yr period found by Jurkevich *et al.* is not seen in the power spectrum of the RHO data.

3C 345. A Fourier analysis of the light variations of 3C 345 was presented by Smyth and Wolstencroft (1970). They detected components having periods of 2.8, 1.52, and 0.45 yr

TABLE IV. Fourier transform results.

SOURCE	PERIOD (YRS)			POWER			COMMENTS
	1	2	3	1	2	3	
0215+01	2.17	0.73	----	0.220	0.133	-----	UNDERSAMPLED.
0235+164	2.79	1.53	1.29	0.135	0.096	0.086	
OE 110	2.88	0.29	----	0.049	0.067	-----	UNDERSAMPLED
0420-01	13.04	4.64	2.46	0.042	0.035	0.035	COMPLEX SP. WINDOW.
3C 120	12.45	----	----	0.041	-----	-----	S_1 = 22
NRAO 190	3.65	0.88	----	0.044	0.052	-----	
0735+17	4.89	1.20	----	0.153	0.111	-----	#2 POSSIBLY ALIASED.
OJ 287	11.90	5.30	2.79	0.254	0.187	0.059	
0906+01	3.70	2.79	----	0.009	0.009	-----	
1156+295	3.38	1.41	0.52	0.153	0.208	0.090	LIMITED DATA.
ON 231	3.91	1.94	0.78	0.042	0.029	0.033	
1308+32	5.59	1.59	1.28	0.047	0.045	0.025	COMPLEX SP. WINDOW.
1514-24	1.98	0.70	----	0.053	0.026	-----	
NRAO 512	2.46	0.66	----	0.025	0.034	-----	COMPLEX SP. WINDOW.
3C 345	11.40	5.60	----	0.036	0.047	-----	S_1 = 9, S_2 = 11.5
NRAO 530	4.80	1.71	1.03	0.119	0.140	0.759	UNDERSAMPLED.
3C 371	2.38	0.99	----	0.008	0.007	-----	BLENDED FEATURES.
OX 074	5.07	2.46	0.48	0.007	0.004	0.005	
BL LAC	0.88	0.60	0.31	0.010	0.012	0.022	
3C 446	4.70	2.40	1.29	0.217	0.105	?	S_1 = 7, S_2 = 3, S_3 = ?
3C 454.3	6.39	2.97	0.83	0.011	0.007	0.013	
2345-16	5.07	3.34	1.06	0.028	0.019	0.018	

S = IS THE RELATIVE STRENGTH OF THE FEATURE RELATIVE TO THE NOISE LEVEL AS DETERMINED BY MONTE CARLO SIMULATIONS.

TABLE V. Modeling results.

MODEL FORM: $M(T) = A + B*T + \sum C_i \cos(2\pi T/P_i + D_i)$

M = MAGNITUDE IN JOHNSON B BAND.
A = LINEAR CONSTANT (INTERCEPT IN TABLE 4).
B = LINEAR COEFFICIENT (SLOPE IN TABLE 4).
C = AMPLITUDE OF THE COSINE TERM.
D = PHASE OF THE COSINE TERM.
P = PERIOD OF THE COSINE TERM (PERIOD IN TABLE 5).
T = JULIAN DATE MINUS 2,400,000.
THE COSINE ARGUMENT IS IN RADIANS.

SOURCE	COEFFICIENT	STANDARD DEVIATION OF COEFFICIENT
3C 120	A = 12.99	0.52
	B = 5.52E-5	1.18E-5
	C = 0.400	0.024
	D = 0.30	0.07
3C 345	A = 18.09	0.52
	B = 4.06E-5	1.19E-5
	C_1 = 0.348	0.029
	D_1 = -1.25	0.08
	C_2 = 0.361	0.275
	D_2 = 0.48	0.07
3C 446	A = 20.76	2.19
	B = -8.56E-5	4.94E-5
	C_1 = 0.668	0.102
	D_1 = 0.14	0.18
	C_2 = 0.504	0.089
	D_2 = -1.45	0.17
	C_3 = 0.183	0.088
	D_3 = -0.72	0.63

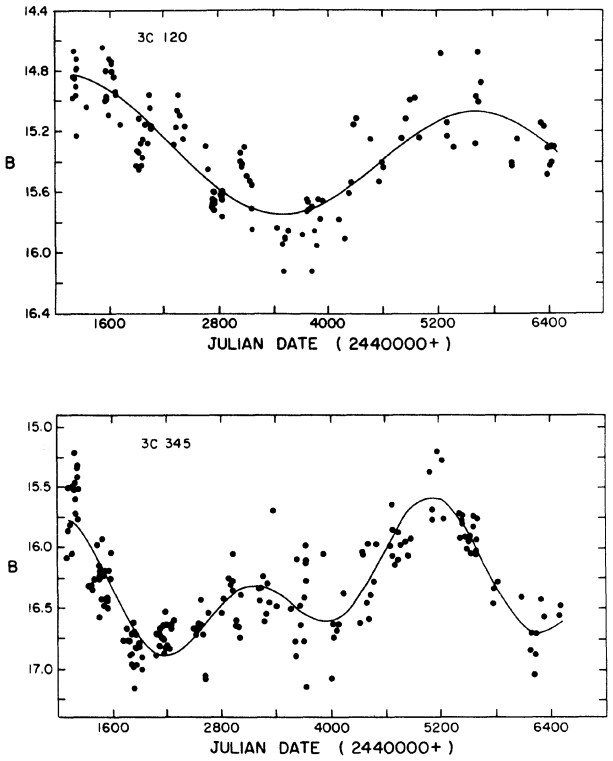


FIG. 3. Light curves of 3C 120 (top) and 3C 345 (bottom) with the fitted model superimposed. The functional form and fitted parameters of each model are listed in Table V. The data points are all *B* magnitudes from Table III.

in observations made between 1965 and 1969. Later work by Barbieri *et al.* (1977) analyzed observations made between 1964 and 1976 using the Deeming-type Fourier analysis. They concluded that the light curve can be characterized by three components with periods of 1600, 800, and 140 days. A more recent analysis was published by Babadzhanyants and Belokon (1984), who constructed a light curve composed of all available observations between 1965 and 1983. They found a systematic increase of the mean brightness of about 0.05 mag per year, a factor of 10 larger than that seen in the RHO data. They resolved the light curve into three periodic components. The first has a period of 15 yr, with an amplitude of 0.8 mag. Component II has a characteristic period of about 1 yr and an amplitude of 1 mag. The third component has a period of 10 days and a range of amplitudes between 0.3 and 1.5 mag, depending on the flare to be modeled. Kidger and Beckman (1986) extended Barbieri's work and found no periodicities were present.

The analysis of the RHO *B* band observations (Table III) yields two components. One has a period of 11.4 yr with $s = 9$, and the model fit requires an amplitude of 0.35 mag. The second component has a period of 5.6 yr with $s = 11.5$, and an amplitude of 0.36 mag. The data are insufficient to model high-frequency fluctuations with periods less than three months. These high-frequency outbursts have amplitudes in excess of 0.6 mag. The curve is a poor fit to the rapid rise of the 1971 outburst, but the fit to the data between 1972 and 1986 appears acceptable (Fig. 3). The 2.8 yr period found by Smyth and Wolstencroft is about half of the shorter period detected here. Other than this, none of the other previously identified periodicities are derived by our analysis.

The analysis was further extended by adding to the RHO observations historical data covering the years 1965–1973 (Pollock 1982). The overall data set now included 1052 observations from JD 38905.8 to JD 46523.8. Fourier analysis of the complete 21 yr data set yielded periods of 11.4 yr ($s = 2.5$), 2.16 yr ($s = 9$), and 3.9 yr ($s = 12$).

We then divided the 21 yr data set into two segments, a 6 yr segment prior to JD 41087.4 and a 15 yr segment following JD 41087.4. This division was chosen to coincide with the peak of the 1971 outburst so timescales before and after the event could be compared. The power spectrum of the 6 yr segment showed peaks at 4.03 yr ($s = 7.5$) and 1.98 yr ($s = 20$). The spectrum of the 15 yr segment showed peaks at 10.14 yr ($s = 10$), 5.47 yr ($s = 13.7$), and 3.9 yr ($s = 10$).

It can be seen that the only feature common to all three data sets (the 21 yr set, the 15 yr set, and the 6 yr set) is a peak near 4 yr. However, the amplitude and phase of this peak differ in each case. It should be noted that a weak period of about 4 yr ($s = 6$) also appeared in the spectrum of the RHO-only *B* band data; see Fig. 2.

Irregular variable star light curves show seemingly regular variations interrupted by periods of irregular activity. Some isolated segments even show no variability. Although no physical analogy can be made from this comparison, the morphological characteristics of the light curves can be compared if the amplitudes and timescales are properly scaled. The quasar light curves look remarkably similar to the transition periods seen in irregular variable star light curves. This comparison suggests that quasar light curves are still far too brief to be dissected accurately into periodic components.

3C 446. This highly variable BL Lac object exhibits rapid outbursts, dramatic declines, and long-term (4 yr) events over a 5 mag range. Barbieri *et al.* (1985) analyzed the light curve using data from 1965 through 1984. Using the Deeming algorithm to compute the power spectrum, they found strong peaks corresponding to periods of 4.22 and 5.83 yr. Many of their data points between 1971 and 1978 were observations from RHO, so we analyzed the same data using our Fourier transform program and confirmed their results. Then, Fourier analysis of the more extensive data reported here resulted in the identification of three periods; two are relatively strong and one is blended with an alias. These peaks in the power spectrum occur at 4.7 yr ($s = 7$), 2.4 yr ($s = 3$), and 1.29 yr. The significance of the 1.29 yr period cannot be obtained with any confidence because of the superimposed alias. The period of 4.7 yr is close to the period found by Barbieri and his co-workers, but there is no sign of the 5.83 yr period in our spectra.

If the periodic components identified in the power spectra of the foregoing light curves are manifestations of some periodic physical process, how can these processes be incorporated into current physical models? If the components represent true physical timescales in the object, we cannot use relativistic expansion to circumvent the $r \leqslant cP$ relationship, where P is the shortest observed timescale (Elliott and Shapiro 1974). In the quasar rest frames, the periods are shorter by a factor of $(1 + z)$. For 3C 345, with a redshift of $z = 0.595$, the periods from Table IV are 7.1 and 3.38 yr in the quasar rest frame. 3C 120 has a redshift of 0.032, and the period in the rest frame is 12.06 yr. The periods in the rest frame of 3C 446 are reduced even more due to its large redshift. A redshift of 1.404 reduces the observed periods to

1.95, 1.0, and 0.54 yr, respectively. The periods identified in this work place no severe constraints on emission models via the $R \leqslant cP$ relationship. The rapid flares seen in 3C 446 place much tighter constraints on possible models.

One of the first models proposed to explain periodic behavior in quasars was the massive-rotator model (Morrison 1969). This model is a scaled-up version of the pulsar model, characterized by a massive ($\mathcal{M} = 1 \times 10^5\ \mathcal{M}_\odot$) collapsed object with a strong magnetic field rotating with a period of about 1×10^7 s. Detailed analyses of magnetodynamic models have been performed by Ozernoi (1966), and Ozernoi and Chertoprud (1967, 1970). They suggest that the slow (cyclic) and rapid (fluctuating) components seen in quasar light curves can be explained in terms of a supermassive, rotating magnetoid. It is not clear how these rotating magnetoids can explain the existence of several cyclic components (such as those seen in 3C 446).

The current generic theory of AGN emission involves massive black holes and accretion disks. Thin-disk structure has been explored in detail (Shakura and Sunyaev 1973 and Novikov and Thorne 1973). These disks parametrize the viscosity in the form of a constant α and are hereafter referred to as alpha disks. In discussing alpha disks, we can calculate various characteristic timescales (Pringle 1981; Sitko 1986) for a particular disk. The basic disk timescale is related to the rotational angular velocity. Sitko (1986) calculates this timescale for a massive disk surrounding a $1 \times 10^8\ \mathcal{M}_\odot$ black hole with an accretion rate of $0.1\ \mathcal{M}_\odot$ per year. He finds that the rotational timescales for regions of the disk hot enough to contribute substantial flux in the optical band are on the order of hours to several days. This timescale is too short to account for the variations discussed here, even changing the masses and accretion rates over the limited ranges suggested by some observations.

Hydrostatic equilibrium in the z direction is established on the timescale t_z, which is nearly equal to the rotational timescale and thus not applicable here. The thermal timescale is the time it takes the disk material to establish thermal equilibrium if the rate of dissipation is changed. For disk radii of interest here (i.e., those radii where the temperature is high enough to radiate copiously in the optical region), the thermal timescale falls in the required range of days to several years, depending on the value of the viscosity parameter α. The final timescale is the viscous timescale, or the time needed for substantial change in the surface density of the disk. The viscous timescale of an alpha disk is of the order of several months to several years, for reasonable values of alpha. The viscosity controls the accretion rate and thus may be responsible for outbursts, and possibly the "periodic" variations identified in the RHO data. It is interesting to note that models utilizing the thermal and viscous timescales have been used to describe dwarf nova outbursts (Fran, King, and Raine 1986).

Vila (1979) analyzed pulsations perpendicular to the symmetry plane in self-gravitating accretion disks. He notes that the disk pulsates with different frequencies at different radii, so the model is capable of explaining multiple periodic components and he derives the following relationship between the period P of the light variation, the radius R across the disk at which the pulsations occur, and the mass $\mathcal{M}$ of the central hole:

$$PR^{-3/2}\mathcal{M}^{1/2} = 0.035\,. \qquad (3)$$

In Eq. (3), the mass is in grams and the radius is in centimeters. Pollock (1982) examined a number of outbursts of 3C 345 and 3C 446. The most rapid significant variation places limits on the size of the central object (presumably a black hole) through the $R < ct$ criterion. Since the emitted energy has to come from a volume with radius less than R, but greater than the Schwartzschild radius, Pollock was able to establish limits on the mass of the central object. Using the mass limits derived by Pollock, we can calculate the radii at which the pulsations occur. The radii calculated by Eq. (3) for reasonable values of the mass of the central black hole, and for the timescales found in the Fourier analyses of 3C 120, 3C 345, and 3C 446, are all about $1\text{–}4 \times 10^{17}$ cm. Again, this region of the disk contributes little to the flux in the optical band, so the oscillations would not be seen as the large-amplitude optical components derived here from the RHO data.

V. CONCLUSIONS

We have presented optical data for 22 OVV active galactic nuclei in both graphical and tabular form. These data resulted from over 18 yr of photographic monitoring of more than 200 variable extragalactic sources. Each OVV is assigned a variability subclass depending on the characteristics of its optical light curve. The data are then analyzed for linear trends by least squares. After the linear component is removed from the data, a Deeming-type Fourier analysis is used to investigate the possibility of periodic components in the light curves. The results of this analysis are given in tabular form for all 22 sources. Since several previous publications have identified periodic components in 3C 120, 3C 345, and 3C 446, these objects are discussed in detail, and models incorporating both linear and sinusoidal components are generated. The 3C 120 and 3C 345 curves fit the data well, but the 3C 446 model is not a good representation of the data. The poorer fit is primarily due to rapid, high-amplitude flares in the light curve of 3C 446. The sinusoidal component found for 3C 120 with a period of 12.45 yr, and the components for 3C 345 with periods of 11.4 and 5.6 yr, did not agree with any periodic components suggested by other authors. The previously reported period of 4.2 yr for 3C 446 is close to the 4.7 yr period found here. Two other periods, 2.4 and 1.29 yr, are present in the power spectrum of 3C 446.

The identification of periodic components in a finite data set does not prove the existence of "real" periods in the source caused by periodic physical processes. If the periodic components identified in the data persist in the future, then the theories must account for the quasiperiodic behavior of the light variations. The periodic components identified in a particular segment of the light curve could die out or be replaced by new components. Periodic analysis of later segments might reveal only the new components. This behavior is suggested by the fact that previous analyses found different periods using earlier data. The persistence of the 4.0 yr period in 3C 345 and the 4.7 yr period in 3C 446, while other periods died out and were replaced, might indicate a transition period. Monitoring programs, such as the one at RHO, can provide important evidence as to the nature of the optical activity by continuing to collect variability data on these sources.

Timescales related to accretion models are discussed and compared with the periods found here. The rotational and z timescales in the regions of the disk where the optical emissions originate are too short to account for the observed peri-

odic components. The thermal and viscous timescales are of the right order of magnitude, and variations on these timescales should be investigated.

Pulsations in accretion disks may provide a mechanism to account for periodic behavior in the case of thin disks, but at the radii at which these variations occur the disks are too cool to contribute substantial flux unless unusually hot clumps of material form.

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