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Search for and Study of Hot Circumstellar Dust Envelopes

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Abstract—Long-term (1984–2008) *JHKLM* photometry for 254 objects is presented. The observations were carried out in the standard *JHKLM* photometric system using an original method and a modern IR photometer designed and built at the Sternberg Astronomical Institute. Our program of studies included searches for and studies of relatively hot circumstellar dust envelopes. The most important results obtained using these observations include the following. We have detected relatively hot dust envelopes in a number of objects for the first time, including the RCB star UV Cas, RX Cas, several classical symbiotic stars, etc. A model has been calculated for the dust envelope of FG Sge, which formed around the star as a result of several successive cycles of dust condensation beginning in Autumn 1992. Several dust-condensation episodes have been traced in the envelopes of symbiotic systems (CH Cyg, V1016 Cyg, HM Sge, etc.), as well as the role of the hot component in the formation of the dust envelopes. We have established from variations of the IR emission that the cool components in the symbiotic novae V1016 Cyg and HM Sge, and possibly CH Cyg, are Miras. The binarity of V1016 Cyg and HM Sge has also been firmly established. The variability of a whole series of object has been studied, including the stellar components of close binary systems and several dozen Mira and semi-regular variables. The ellipsoidality of the components in the RX Cas system (a prototype W Ser star) and the cool component in the symbiotic systems CI Cyg and BF Cyg has been firmly established. We have obtained the first IR light curve for the eclipsing system V444 Cyg (WN5+O6), and determined the wavelength dependence of the obtained parameters of the WN5 star. Analysis of the IR light curves of several novae indicate the condensation of dust envelopes in the transition periods of Cygnus 1992, Aquila 1993, and Aquila 1995. The IR light curve of R CrB has been obtained over a long period and analyzed. IR observations of the nova-like variable V4334 Sgr have been carried out over four years, over which the star passed through four stages during its motion along its post-AGB evolutionary track; the star's bolometric flux and optical depth of its dust envelope have been estimated, and the structure and mass of the dust layer determined. We have analyzed the IR variability of the symbiotic star V407 Cyg over 14 years, and found its cool component to be a Mira with a period of 745 days. The observed pulsations and trend are associated with the luminosity and temperature variations of the Mira, as well as the optical depth of the dust envelope. The size of the dust grains and mass-loss rate of the Mira have been determined. We have obtained *JHKL* light curves for the Seyfert galaxy NGC 4151 over 23 years. The IR brightness of the galaxy grew from 1985 through 1996 (by $\sim 0.9^m$ at 1.25 μm, $\sim 1^m$ at 1.65 μm, $\sim 1.1^m$ at 2.2 μm, and $\sim 1.3^m$ at 3.5 μm), while the galaxy simultaneously reddened. The "cool" variable source in NGC 4151 was still in the active state in 1998, although its luminosity had decreased by approximately 15%–20%. If the "cool" component of the variable source in this galaxy is a dust envelope heated by the central "hot" source, it should be optically thin to the radiation of this source: its mean optical depth is in the range 0.05–0.15. Emission from dust particles heated to temperatures of 600–800 K was observed in the near IR at a distance of several parsecs from the nucleus during the period of activity in 1995–1998; the inferred mass of emitting dust was 5–20 $M_\odot$. In 1994–2003, we observed a tendency for NGC 4151 to become bluer at 1.25–1.65 μm while simultaneously reddening at 2.2–3.5 μm. Beginning in Autumn 2000, the galaxy began to emerge from a minimum, which lasted from March 2000 through April 2001 in the IR; a flare of the galactic nucleus was observed and followed in detail in the IR in this same period. We confirm the IR variability of the nucleus of the Seyfert galaxy NGC 1068, which can be located in various stages of activity. The variability of NGC 1068 is associated with a complex source. A periodic component has been detected in the *J* brightness variations of the oxygen Mira V2108 Oph; we have shown that this star is immersed in a fairly dense dust envelope, and have calculated a model for this envelope. We have cal-

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culated an (axially symmetrical) dust-envelope model for the carbon semi-regular variable RW LMi with a density distribution characteristic for the "superwind" stage. This envelope model is able to reproduce the observed fluxes over the entire observable spectrum, and displays a good agreement with the observational data. The three hot supergiants V482 Cas, QZ Sge, and HD 338926 may be variable in the IR. Long-term photometry of eight planetary nebulae in the near IR (1.25–5 μm) has enabled us to firmly establish the IR brightness and color variability of these nebulae on time scales from several tens of days to six-to-eight years. We have analyzed long-term *JK* photometry of the X-ray binary Cyg X-1 (V1357 Cyg). Periodicity with a characteristic time scale of ~11.5 years is visible in the *JK* brightness variations of Cyg X-1 in 1984–2007, possibly due to periodic variations of the temperature, radius and luminosity of the optical component of the binary with $P \sim 11.5$ yr. Fourteen-year IR light curves of five RV Tau stars (R Sge, RV Tau, AC Her, V Vul, and R Sct) and the yellow supergiant and protoplanetary-nebula candidate V1027 Cyg have been analyzed. A spherically symmetrical dust-envelope model has been calculated for V1027 Cyg.

1. INTRODUCTION

Observations of a variety of astrophysical objects in the near IR (1.25–5 μm) aimed at searches for and studies of relatively hot circumstellar dust envelopes began at the Sternberg Astronomical Institute at the beginning of the 1980s.

Circumstellar dust envelopes attracted the interest of astronomers at the onset of the 20th century, together with the realization of the fact that there exists a substantial amount of matter in the form of gas and dust particles between the stars. Trumpler [1] first related the observed color excess of stars with interstellar absorption of their light. The main reservoir from which the interstellar matter is supplied is the gas–dust component of galactic and extragalactic objects, in particular circumstellar dust envelopes, which represent an important component of the interstellar medium.

Theoretical and experimental studies in the 1960s proposed models in which the condensation cores of interstellar dust and the dust particles themselves are formed in the atmospheres of cool stars, with their subsequent ejection into interstellar space due to the action of light pressure. The first important work in this area was that of Hoyle and Wickramasingh [2], who considered the formation of sufficiently large ($\sim 10^{-5}$ cm) and abundant graphite particles to explain all the interstellar absorption. Kamijo [3] demonstrated the theoretical possibility that liquid (or solid) SiO_2 particles ($\sim 10^{-7}$ cm) could form in the envelopes surrounding long-period *M*-type variables. The primary condensation around *M* stars was also considered by Gail and Seldmayer [4], who analyzed this problem in detail and showed that the primary condensation occurs at temperatures of ~800 K for late *M* stars and ~600 K for early *M* stars with a chromosphere. The initial condensate in these stars is SiO_2.

The main physical processes leading to the formation of particles in stellar atmospheres and circumstellar gas envelopes are:

—the formation of cores of particles either directly during the formation of molecules or via condensation onto already present ions or molecules;

—subsequent condensation onto these cores as a consequence of a high partial pressure, exceeding the vapor-saturation pressure;

—collisions of the formed particles due to light pressure in interstellar space.

These conditions are satisfied in N and M giants. The indicated processes either lead to the formation of small particles, which serve as a flux of condensation cores in interstellar space, or directly produce a fairly large number of particles large enough that they themselves are able to play an important role in the optical properties of the interstellar medium. The possibility that interstellar particles are formed in stellar atmospheres has important cosmogenic implications, since it follows, for example, that particles could form in galaxies containing little (or no) gas [5].

IR observations of stars carried out over the last decade used as the basis for detecting dust envelopes around late-type stars provide indirect support for the hypothesis that dust particles form in the atmospheres of such stars. IR observations of the post-flare emission of novae and non-stationary phenomena in close binary systems with the ejection of matter from the stellar atmospheres, which lead to observed variations in the parameters of the associated circumstellar envelopes [6], indicate a direct link between the parameters of the circumstellar dust envelopes and of the central source (star).

A review of studies of dust envelopes up to the middle of the 1990s is considered in detail in [7], which presents an extensive bibliography. It is noted in [7], in particular, that the transfer of radiation by dust at various wavelengths can only be determined using numerical methods, and attempts to obtain analytical approximations to the semi-analytical solution must always make a series of assumptions and are based on the Eddington approximation that the radiation field is isotropic. The first full approximate solution was obtained by Rowan–Robinson and Harris [8], and was based on direct iteration of the radiative-transfer equation. A modification of this method was applied before the beginning of the 1990s (including in [8]).

Further progress was provided by the work of Egan et al. [9], who created the CSDUST3 program based on an algorithm described in [10] to solve the radiative-transfer equation numerically. We used this program to calculate a model for the dust envelope surrounding the carbon star RW LMi. Since the end of the 1990s, the DUSTY program (version 2.0) has been available for the solution of radiative transfer in a dust envelope. A description of the algorithm underlying this program is presented by Mathis et al. [11] and Ivezic and Elitsur [7]. It is obvious that the basis for the development of computational methods and theoretical studies of the dust component in galaxies and extragalactic objects is observations.

Up to the middle of the 1950s, studies of the circumstellar environments of stars were based on ground-based optical observations, which enabled, in the best case, investigations of absorption in circumstellar dust envelopes. The presence of dense circumstellar envelopes sometimes made studies of certain stars impossible. It became possible to “see” the emission of the circumstellar dust envelopes themselves, whose maxima lie in the IR ($\lambda > 1~\mu$m), only in the middle of the 1950s, when astronomers began using receivers based on PbS photoresistance. A revolution in the sensitivity of IR observations occurring at the beginning of the 1960s, with the use of InSb photoreceivers operating at 1–5 μm [12–17]. In recent years, ground-based IR (1–5 μm) observations have been actively conducted at many observatories [18], often using specialized IR telescopes, although long-term (over several decades) systematic series of observations remain a unique resource due to the technical difficulties associated with IR observations.

2. EQUIPMENT AND OBSERVATIONS

Our observations were carried out on the 125-cm telescope of the Crimean Laboratory of the Sternberg Astronomical Institute (SAI) of Moscow State University using a single-channel InSb photometer with a standard *JHKLM* photometric system [19]. These yielded a unique long-term series of observations of variable objects in a uniform photometric system.

The 125-cm reflector has a classic Cassegrain design, and was mounted at the Crimean Laboratory of the SAI in the early 1960s. The observatory is located at an altitude of about 600 m above sea level at a latitude of $+44°43'36''$ and longitude of $2^{h}16^{m}03^{s}$. The astronomical observing conditions in this location have a seasonal character, with the maximum number of photometric nights occuring in the Summer and Autumn months. Therefore, most of the objects in our catalog are in Summer and Autumn constellations in the Northern hemisphere.

The goal of our studies is to investigate the IR variability and physical characteristics of poorly studied and unusual astrophysical objects, in order to obtain an understanding of their variability; this requires long-term IR photometry. Some objects were also observed as part of joint coordinated studies in the optical, IR, and radio. This explains the large diversity of objects in our observing list, which contains 254 objects of various types and variability classes, including two Seyfert galaxies and eight planetary nebulae. Many of the studied objects display complex variability corresponding to several classes or variability types. For the majority of the studied objects, either no IR photometry or only episodic IR photometry was available before our observations.

A list of the objects observed is presented in Table 1. The type of variability given in the table is in accordance with the nomenclature of the General Catalog of Variable Stars [20]. If the variability type is not indicated, nothing is known about the variability of the object; if a question mark is given, the object is a suspected variable. The last column of the table gives the number of the standard used from the bright-star catalog [21].

The *JHKLM* photometric data are presented in Tables 2 and 3, which contain the original results of our observations, including those not yet published. Table 2 gives the mean observing epochs and corresponding magnitudes (with their accuracy in units of 0.01^{m}) for 101 objects from Table1. Completely the results for IR photometry are accessible on a site: http://www.sai.msu.ru, or it is possible to request them by the address: taranova@sai.msu.ru. Table 3 gives the analogous information for four short-period objects (with the accuracy in the magnitudes in units of 0.001^{m} and 0.01^{m}).

The results of our studies have been published in more than 200 scientific papers and reported at nearly 100 Russian and international conferences.

2.1. Photometer

Measurements of the IR fluxes from the observed objects were carried out using an InSb photometer designed and constructed by us at the beginning of the 1980s [19]. This photometer was equipped with a set of cooled, broadband *JHKLM* filters, whose characteristics are presented in Table 4. Interference filters stable at low temperatures were manufactured according to our technical specifications at the Institute of Physics of Belorussia (Minsk). The photovoltaic InSb detector was also manufactured according to our technical specifications at the Institute of Applied Physics (Moscow, Russia). The threshold parameters of the photometer are given in Table 5.

Table 1. List of objects

No.	Object	Type	Sp	Standard (BS)
1	α Her	SRC	M5Ib-II	6337
2	α Tau	LB:	K5III	1411
3	β And		M0 + IIIa	165
4	β Lyr	EB	B8II-IIIep	7178
5	β Peg	LB	M2.5II-IIIe	8684
6	γ Cas	GCAS	B0.5IVpe	21
7	ε Aur	EA/GS	A8Ia-F2epIa + BV	1454
8	ζ Aur	EA/GS	K5II + B7V	1454
9	ι Boo	EW/KW	G2V + G2V	5602
10	κ Dra	GCAS	B6IIIe	4434
11	μ Cep	SRC	M2eIa	7957
12	μ Gem	LB	M3.0IIIab	2134
13	ξOph	GCAS	B1.5IV-Vpe	6104
14	o Cet	M	M5e-M9e	804
15	χ Cyg	M	S6,2e-S10,4e(MSe)	7615
16	g Her	SRB	M6III	6220
17	AB Aur	INA	B9neqIV-V	1791
18	AC Her	RVA	F2pIb-K4e	6895
19	AFGL2591	Var		8079
20	AG Dra	ZAND	K3IIIep	6132
21	AX Per	ZAND	M3IIIep + A0	382
22	BD Vul	M	C6-7,3e(Ne)	7939
23	BE Cet	BY		334
24	BF Cyg	ZAND	Bep + M5III	7417
25	BF Ori	INA	A0:-FpII-Vea	1899
26	BS483		G1.5V	458
27	BS6060	?	G2Va	6075
28	BS7503		G1.5Vb	7328
29	BS7504		G2.5V	7328
30	BS7783		G3V	7957
31	BU Tau	GCAS	B8Vne	1165
32	CE Vir	RV:	G-K	5107
33	CH Cyg	ZAND + SR	M7IIIab + Be	7328
34	CI Cam	ZAND		1242
35	CI Cyg	EA/G + ZAND	Bep + M5III	7615
36	CO Ori	INSB	G5Vpe	1907
37	CQ Tau	INSA	A1-F5IVe	1791
38	CW Leo	M	C9,5	3980
39	CW Tau	INST	K0Ve-K5Ve(T)	1256
40	CY CMi	SRD	F5Iab	2854
41	DG Tau	INST	GVe(T)-M0Ve	1409
42	DY Per	SRB	C4,5(R8)	834
43	EH And	SRA	M7	458
44	EQ Cas	RVA	Fp(R)	8832
45	EZ Cet	BY	G*Ib-II	539
46	FG Sge	*	B4Ieq-K2Ib	7635
47	HD13974		G0.5V	622
48	HD14947		O5I	834
49	HD16691	?	O4I	834
50	HD18409		B/O9.7I	834

Table 1. (Contd.)

No.	Object	Type	Sp	Standard (BS)
51	HD19373		G0V	915
52	HD20630	?	G5V	1101
53	HD25680	?	G5V	1256
54	HD27685	?	G4V	1411
55	HD30614	?	O9.5Ia	1603
56	HD34411		G1.5IV-VFe-1	1791
57	HD34656		O7II	1729
58	HD72905		G1.5Vb	3775
59	HD76151	?	G2V	3748
60	HD86728		G3Va	3905
61	HD89010		G1.5IV-V	4031
62	HD109358	?	G0V	4915
63	HD115043		G1V	5191
64	HD117176		G4V	4932
65	HD141004	?	G0-V	5933
66	HD142267	?	G0VFe-0.5	5933
67	HD143761		G0 + VaFe-1	6212
68	HD144282		F2	6132
69	HD179218		B9	7176
70	HD187923	?	G0V	7557
71	HD188209		O9.5Ia	7796
72	HD189395		B9Vn	7615
73	HD190429A		O4I	7796
74	HD192639		O5e	7796
75	HD193514		O7e	7796
76	HD202124	?		8252
77	HD207198		O9Ib-II	8334
78	HD209975		O9.5Ib	8465
79	HD210809		O9I	8465
80	HD210839	?	O6I(n)fp	8465
81	HD213575		G2V	8499
82	HD217014	?	G2.5IVa	8684
83	HD218915	?	O9.5I	8860
84	HD221246		K3III	8860
85	HD225160		O8e	21
86	HD338926		O8e	7635
87	He2-442	Var		7417
88	HK Ori	INSA	B7-A4ep/f	1907
89	HM Sge	NC + M	pec(e) + M	7488
90	IC 2149	PN		2012
91	IC 4997	PN		7635
92	KV UMa	XND		4335
93	KX And	BE	B3pe + K1III	8860
94	LkHa101	IN:		1454
95	LP And	M:	C8, 3.5e	8860
96	MWC480	?		1791
97	MWC614	Var		7176
98	NGC 1068	Sy		804
99	NGC 1514	PN		1203
100	NGC 2392	PN		2777

Table 1. (Contd.)

No.	Object	Type	Sp	Standard (BS)
101	NGC 4151	Sy		4845
102	NGC 6572	PN		6603
103	NGC 6826	PN		7328
104	NGC 6857	PN		7615
105	NGC 7027	PN		8079
106	NGC 7076	PN		8079
107	NGC 7635	PN		8832
108	NGC 7662	PN		8860
109	NQ Cas	LB	C4, 5J(R5)	21
110	NQ Gem	SR + ZAND	C6, 2(R9)eV	2985
111	OH104.9 + 2.4	M:		8465
112	OY Gem	BE		2421
113	P Cyg	SDOR	B1Iapeq	7615
114	PU Vul	NC	A4II-F8Iab + M6IIIe	7635
115	QZ Sge	E:		7635
116	R And	M	S3, 5e-S8, 8e(M7e)	165
117	R Aql	M	M5e-M8.5e + pec	7429
118	R Boo	M	M3e-M8e	5505
119	R Cas	M	M6e-M10e	8860
120	R Cnc	M	M6e-M9e	3249
121	R CrB	RCB	C0, 0(F8pep)	5947
122	R Dra	M	M5e-M9eIII	6132
123	R Leo	M	M6e-M8IIIe-M9.5e	3982
124	R LMi	M	M6.5e-M9.0e(Tc:)	3705
125	R Mon	INA	A3:e-Fpe	2478
126	R Sct	RVA	G0Iae-K2p(M3)Ibe	7193
127	R Ser	M	M5IIIe-M9e	5933
128	R Sge	RVB	G0Ib-G8Ib	7635
129	R Tri	M	M4IIIe-M8e	622
130	R UMa	M	M3e-M9e	4434
131	RR Tau	INSA	B8e-A5eII-III	1791
132	RR UMi	SRB	M5III	5744
133	RS Oph	NR	OB + M2ep	6698
134	RS Vir	M	M6IIIe-M8e	5601
135	RT Vir	SRB	M8III	4932
136	RU Her	M	M6e-M9	5947
137	RV Tau	RVB	G2eIa-M2Ia	1791
138	RW LMi	SRA	C4, 3eV	4100
139	RX Boo	SRB	M6.5e-M8IIIe	5429
140	RX Cas	EB/GS	K1III + A5eIII	1035
141	RX Lep	SRB	M6.2III	1784
142	RX Peg	SRB	C4, 4J(N3)	8430
143	RY Tau	INT	F8Ve-K1IV-Ve(T)	1203
144	RZ Psc	ISB:	K0IV	165
145	S140	Var		8465
146	S Aur	SR	C4-5, 4-5(N3)	1791
147	S Cep	M	C7, 4e(N8e)	8694
148	S CrB	M	M6e-M8e	5947
149	SS Gem	RVA	F8Ib-G5Ib	2134
150	ST And	SRA	C4, 3e-C6, 4e	8860

Table 1. (Contd.)

No.	Object	Type	Sp	Standard (BS)
151	StHa190	ZAND:		8413
152	SU And	LC	C6, 4(C5II)	8860
153	SU Tau	RCB	G0-1Iep(C1, 0 HD)	2134
154	SV Cep	ISA	A0ea	8694
155	SW Vir	SRB	M7III	4910
156	SY Per	SRA	C6, 4e(N3e)	1017
157	T Cas	M	M6e-M9.0e	219
158	T Cep	M	M5.5e-M8.8e	7685
159	T CrB	NR	M3III + pec(NOVA)	5947
160	T Her	M	M2.5e-M8e	6703
161	T Lyn	M	C5, 2e-C7, 1e(NOe)	3474
162	TT Oph	RVA	G2e-K0	6498
163	TU Gem	SRB	C6, 4(N3)	2134
164	TU Tau	SRB	C5, 4(N3) + A2III-V	2134
165	TX Aur	LB	C5, 4(N3)	1454
166	TX CVn	ZAND	B1-B9Veq + K0III-M4	4915
167	TX Per	SRB	Gp(M2)-K0e(M2)	843
168	U Cyg	M	C7, 2e-C9, 2(Npe)	7924
169	U Her	M	M6.5e-M9.5e	6148
170	U Lyr	M	C4, 5e(N0e)	7615
171	U Ori	M	M6e-M9.5e	2134
172	UU Aur	SRB	C5, 3-C7, 4(N3)	2012
173	UV And	SRB		843
174	UV Aur	M	C6, 2-C8, 2Jep(Ne)	1791
175	UV Cas	RCB	F0Ib-G5Ib	8832
176	UX Ori	ISA(YY)	A2ea	1666
177	UY And	LB	C5, 4(N3)	843
178	V350 Ori	ISA	A0	2004
179	V354 Lac	LB	M0III:	8538
180	V360 Cyg	RVA	F5-G0e	8115
181	V360 Lac	EB/DM:	B3IV:eaV	8632
182	V366 Lac	M		8632
183	V367 Cyg	EB/GS/SD:	B8peIa + F4III	8079
184	V380 Cep	INA		7957
185	V380 Ori	INAT	B8-A2eq(T)	1784
186	V407 Cyg	M + NB:	Mep	8079
187	V437 Sct	M		7063
188	V441 Her	SRD	F2Ibe	6623
189	V443 Her	ZAND	M3ep + O	6895
190	V444 Cyg	EA/WR	O6 + WN5.5	BD + 38°4003
191	V458 Vul	NA	pec(NOVA)	7635
192	V482 Cas	BCEP	O9.5I-II	834
193	V594 Cas	INA	O9.5e	21
194	V627 Cas	SR:	M2eII-III	8079
195	V645 Cyg	INA	Eq	8252
196	V669 Cas	M:		382
197	V723 Cas	NB	pec(NOVA)	464
198	V725 Tau	XNGP	O9.7IIIe	2134
199	V831 Cas	XP		542
200	V887 Her	SRD:		6703

Table 1. (Contd.)

No.	Object	Type	Sp	Standard (BS)
201	V911 Tau	BY		1411
202	V920 Tau	BY		1411
203	V938 Tau	BY		1411
204	V1016 Cyg	NC + M	Pec	7796
205	V1027 Cyg	L	G7Ia	7615
206	V1057 Cyg	INT	B3-Ke(T)	7924
207	V1295 Aql	*	A0ep	7602
208	V1302 Aql	*	F8I-G0I	7525
209	V1329 Cyg	E + NC	Pec	7949
210	V1357 Cyg	ELL + XF	O9.7IabpeV	7615
211	V1366 Aql	M		7176
212	V1413 Aql	ZAND + E		7176
213	V1419 Aql	NA	pec(NOVA)	7377
214	V1425 Aql	NA	pec(NOVA)	7377
215	V1426 Cyg	M	C7, 2e(N)	8255
216	V1427 Aql	SRD		7193
217	V1478 Cyg	SDOR	Bep	7924
218	V1489 Cyg	*	M4.5-M7.9Ia-III	8079
219	V1493 Aql	NA	pec(NOVA)	7235
220	V1685 Cyg	INA	B2e	7796
221	V1687 Cyg	WR	WC7p + O5	7796
222	V1809 Cyg	ELL		8079
223	V1966 Cyg	E:/PN		7417
224	V1974 Cyg	NA + E:	pec(NOVA)	7924
225	V2028 Cyg	BE		7615
226	V2108 Oph	SR:	M7-M9.8	6337
227	V2324 Cyg	*		8079
228	V4334 Sgr	*		6698
229	V Cas	M	M5e-M8.5e	8684
230	V CrB	M	C6, 2e(N2e)	5932
231	V Vul	RVA	G4e-K3(M2)	7939
232	VV Cep	EA/GS + SRC	M2epIa-Iab + B8:eV	8334
233	VV Ser	INA	A2e	6869
234	VX And	SRA	C4, 5J(N7)	8860
235	VX Cas	ISA	A0ea	219
236	VY And	SRB	C3, 5J-C4, 4-5(R8)	8860
237	W Cas	M	C7, 1e	219
238	W Cyg	SRB	M4e-M6e(Tc:)III	8252
239	WW Vul	ISA	A3ea	7417
240	WX Gem	CST	F2	2478
241	WX Psc	M	M8	294
242	WY Gem	LC + E:	M2epIab + B2VB3V	2134
243	WZ Cas	SRB	C9, 2JLi(N1p)	21
244	X Cas	M	C5, 4e(N1e)	834
245	X Oph	M	M5e-M9e	7176
246	X Per	GCAS + XP	O9.5(III-V)ep	1203
247	X Sge	SR	C6, 5(N3)	7635
248	XX Oph	*	Bpeq + M5	6698
249	Y CVn	SRB	C5, 4J(N3)	4915
250	Y Tau	SRB	C6.5, 4e(N3)	2134
251	YY Her	ZAND	M2ep	6895
252	Z And	ZAND	M2III + B1eq	8860
253	Z Oph	M	K3ep-M7.5e	6498
254	ZZ CMi	SR	M6I-IIep	2854

Table 2. Results of $JHKLM$ photometry for 250 objects

JD	J	H	K	L	M
α Her					
2451684.5	−2.29 01	−3.22 01	−3.48 00	−3.63 01	−3.37 00
α Tau					
2453003.3	−1.86 01	−2.63 01	−2.86 01	−2.99 01	−2.73 01
β And					
2451770.5	−0.81 01	−1.65 02	−1.85 01	−2.06 01	−1.73 02
β Peg					
2451767.6	−1.08 01	−1.98 02	−2.25 01	−2.39 02	−2.13 02
γ Cas					
2451770.6	2.12 01	2.06 01	1.90 01	1.53 01	1.46 05
ε Aur					
2450699.6	1.85 00	1.58 00	1.47 00	1.23 01	1.18 01
2450753.5	1.86 01	1.54 00	1.40 00	1.18 01	1.16 01
2450754.5	1.84 00	1.55 00	1.43 00	1.18 01	1.16 01
2450765.5	1.78 01	1.52 00	1.40 01	1.15 01	1.15 02
2450817.5	1.85 01	1.56 01	1.44 00	1.22 00	1.24 01
2450853.4	1.77 01	1.43 00	1.46 02	1.31 00	1.21 02
2450859.3	1.88 02	1.54 01	1.48 02	1.18 01	1.19 03
2450869.2	1.81 01	1.54 01	1.45 02	1.21 01	1.20 02
2450874.3	1.81 00	1.55 00	1.45 01	1.23 01	1.19 01
2450908.2	1.82 01	1.57 02	1.44 02	1.23 01	1.22 01
2451062.6	1.83 01	1.58 01	1.46 01	1.23 01	1.22 02
2451088.6	1.80 01	1.51 02	1.39 01	1.19 01	1.19 01
2451092.6	1.83 01	1.57 01	1.44 01	1.21 01	1.18 01
2451128.5	1.80 01	1.54 01	1.41 01	1.19 00	1.19 01
2451164.5	1.82 01	1.57 01	1.44 01	1.20 02	1.14 01
2451180.4	1.79 01	1.71 01	1.42 00	1.18 01	1.18 01
2451199.3	1.79 00	1.56 01	1.39 00	1.17 01	1.14 01
2451205.3	1.81 00	1.55 01	1.43 00	1.18 01	1.18 01
2451206.3	1.82 00	1.56 01	1.43 00	1.20 01	1.18 01
2451222.2	1.82 01	1.52 02	1.44 01	1.19 01	1.17 01
2451447.5	1.86 00	1.55 01	1.42 01	1.22 01	1.22 01
2451454.6	1.78 02	1.51 02	1.40 01	1.19 01	1.22 01
2451475.6	1.82 01	1.54 02	1.42 01	1.22 01	1.19 00
2451502.5	1.89 00	1.64 00	1.52 01	1.26 01	1.28 00
2451514.5	1.89 01	1.61 01	1.48 01	1.26 01	1.28 00
2451522.6	1.91 01	1.62 01	1.50 01	1.20 01	1.27 01
2451524.5	1.85 01	1.60 01	1.47 01	1.24 01	1.24 01
2451525.5	1.86 01	1.60 01	1.47 01	1.22 01	1.24 01
2451548.3	1.82 01	1.55 01	1.43 01	1.24 01	1.20 00
2451581.3	1.82 01	1.58 01	1.44 01	1.23 01	1.20 00
2451641.3	1.85 02	1.60 02	1.47 01	1.23 02	1.21 01
2451650.2	1.82 01	1.56 01	1.44 00	1.22 01	1.20 01
2451652.2	1.83 02	1.56 02	1.40 03	1.22 01	1.20 01
2451802.6	1.86 00	1.60 01	1.46 00	1.27 01	1.25 01
2451832.6	1.86 01	1.58 01	1.48 01	1.26 01	1.24 01
2451862.5	1.80 00	1.52 01	1.40 01	1.18 01	1.17 01
2451863.5	1.81 01	1.51 01	1.41 01	1.20 00	1.19 00
2451866.4	1.78 00	1.56 01	1.40 01	1.20 00	1.18 01
2451867.4	1.82 01	1.51 01	1.43 01	1.18 00	1.20 00
2451902.5	1.78 00	1.54 01	1.41 00	1.19 00	1.20 00
2451926.3	1.84 00	1.58 01	1.47 00	1.22 00	1.22 00
2451951.3	1.86 00	1.59 00	1.48 00	1.26 00	1.23 00
2452009.2	1.83 01	1.57 00	1.44 01	1.22 01	1.22 00
2452208.6	1.83 01	1.58 01	1.45 01	1.19 01	1.18 01
2452309.4	1.78 00	1.54 00	1.42 00	1.18 00	1.19 01
2452566.6	1.85 00	1.57 01	1.46 00	1.23 00	1.27 01
2452613.5	1.78 00	1.54 00	1.42 00	1.22 00	1.23 01
2452684.4	1.81 01	1.62 00	1.45 01	1.24 00	1.21 01
2452984.5	1.85 01	1.59 01	1.48 01	1.27 01	1.24 00
2453820.3	1.80 01	1.53 01	1.43 01	1.22 01	1.22 01
2454156.2	1.79 01	1.54 01	1.42 01	1.20 01	1.24 01
2454428.5	1.85 01	1.57 01	1.49 01	1.28 01	1.26 00
2454476.3	1.81 01	1.58 00	1.48 00	1.29 01	1.27 01
2454481.4	1.83 00	1.60 01	1.46 01	1.25 01	1.25 01
2454762.6	1.85 01	1.55 01	1.46 01	1.26 00	1.25 01
2454804.5	1.75 01	1.52 01	1.42 00	1.21 00	1.17 01
ζ Aur					
2450699.6	1.13 00	0.34 01	0.11 00	−0.06 01	0.24 01
2450713.6	1.14 01	0.30 01	0.09 01	−0.04 02	0.22 02
2450753.5	1.11 00	0.32 00	0.10 00	−0.06 01	0.21 00
2450754.5	1.12 00	0.32 00	0.12 00	−0.08 00	0.26 01
2450765.6	1.10 00	0.31 00	0.10 01	−0.07 01	0.21 01
2450817.5	1.14 01	0.32 00	0.12 00	−0.06 00	0.24 01
2450853.3	1.03 00	0.25 00	0.22 01	−0.11 00	0.15 01
2450859.3	1.29 02	0.37 01	0.20 02	−0.03 02	0.34 03
2450869.2	1.12 01	0.30 00	0.11 01	−0.04 01	0.25 02
2450874.3	1.12 00	0.33 01	0.14 00	−0.03 01	0.25 01
2450908.2	1.10 01	0.32 01	0.12 01	−0.05 01	0.26 01
2451062.6	1.14 02	0.34 01	0.16 02	−0.04 00	0.26 02
2451088.6	1.07 01	0.30 02	0.07 01	−0.06 02	0.24 01
2451092.6	1.12 01	0.31 01	0.12 01	−0.08 01	0.25 02
2451128.5	1.10 01	0.31 01	0.10 01	−0.10 02	0.21 01
2451164.5	1.12 01	0.34 00	0.13 01	−0.05 01	0.20 01
2451180.4	1.13 01	0.49 01	0.13 01	−0.05 01	0.20 01
2451199.3	1.14 00	0.36 01	0.11 00	−0.03 01	0.22 01
2451205.3	1.10 00	0.33 01	0.13 00	−0.03 01	0.22 01
2451206.3	1.12 01	0.35 01	0.12 01	−0.04 01	0.22 01
2451227.2	1.12 00	0.33 01	0.14 00	−0.06 01	0.20 01
2451447.6	1.13 00	0.33 01	0.15 01	−0.05 01	0.23 01
2451454.6	1.12 01	0.30 02	0.14 02	−0.09 00	0.24 01
2451475.6	1.14 01	0.32 01	0.13 01	−0.05 01	0.22 01
2451502.5	1.12 00	0.34 00	0.13 00	−0.07 01	0.24 00
2451514.4	1.12 00	0.32 00	0.11 01	−0.04 01	0.24 00
2451522.5	1.12 01	0.34 01	0.10 01	−0.11 01	0.17 01
2451524.4	1.10 00	0.31 00	0.11 01	−0.05 01	0.22 00
2451525.5	1.13 01	0.34 01	0.12 01	−0.06 01	0.22 01
2451548.4	1.14 01	0.36 01	0.10 01	−0.07 01	0.23 01
2451581.3	1.14 01	0.35 01	0.12 01	−0.07 01	0.24 00
2451645.2	1.14 02	−	0.10 01	−0.07 01	0.22 01
2451650.2	1.06 00	0.30 01	0.09 01	−0.11 01	0.18 01
2451652.2	1.09 02	0.29 01	0.04 02	−0.09 02	0.26 02
2451802.6	1.12 00	0.32 01	0.13 00	−0.05 01	0.26 00
2451832.6	1.13 01	0.31 00	0.08 01	−0.08 01	0.23 01
2451862.5	1.10 01	0.32 01	0.09 01	−0.09 01	0.22 01
2451866.4	1.12 00	0.34 00	0.11 01	−0.05 00	0.25 01

Table 2. (Contd.)

JD	J	H	K	L	M
2451902.5	1.11 01	0.33 01	0.11 01	−0.06 00	0.22 00
2451926.3	1.14 00	0.35 00	0.15 00	−0.04 00	0.29 00
2451951.3	1.11 00	0.33 00	0.11 01	−0.06 00	0.24 00
2452009.2	1.13 01	0.34 01	0.12 01	−0.08 01	0.25 01
2452208.6	1.11 01	0.34 01	0.11 01	−0.10 01	0.19 01
2452309.3	1.13 00	0.34 00	0.12 00	−0.07 00	0.22 00
2452566.6	1.11 00	0.33 01	0.13 01	−0.08 01	0.22 01
2452613.5	1.13 00	0.34 00	0.13 00	−0.04 00	0.26 01
2452684.3	1.09 01	0.31 01	0.11 01	−0.07 01	0.21 01
2452984.5	1.16 01	0.34 01	0.15 01	−0.04 01	0.28 01
2453820.3	1.11 00	0.30 01	0.13 00	−0.06 01	0.22 01
2454156.3	1.12 01	0.32 01	0.11 01	−0.06 01	0.21 01
2454428.5	1.10 01	0.32 01	0.12 01	−0.06 01	0.21 01
2454476.3	1.10 01	0.34 00	0.13 00	−0.05 00	0.25 00
2454481.4	1.12 00	0.30 00	0.13 01	−0.07 01	0.22 00
2454762.6	1.14 01	0.34 00	0.14 01	−0.06 01	0.23 01
2454804.5	1.12 01	0.35 01	0.14 00	−0.05 01	0.24 01
κ Dra					
2452308.6	3.81 00	3.82 00	3.70 00	3.36 01	3.36 01
2452348.5	3.81 01	3.82 00	3.68 00	3.33 01	3.30 02
2452380.5	3.88 00	3.86 00	3.75 01	3.33 01	3.31 03
2452391.4	3.85 01	3.84 00	3.72 01	3.38 01	3.35 01
2452420.3	3.82 00	3.79 01	3.71 00	3.36 01	3.34 03
2452675.6	3.93 00	3.90 01	3.71 01	3.35 01	3.41 01
2452697.5	3.85 00	3.83 00	3.73 00	3.36 00	3.30 01
2452740.4	3.87 00	3.82 00	3.72 00	3.37 00	3.32 01
2453126.4	3.90 00	3.87 01	3.75 00	3.40 01	3.38 01
2453820.4	3.96 01	3.90 01	3.81 01	3.48 01	3.42 02
2453823.4	3.94 00	3.93 00	3.88 00	3.48 00	3.39 01
2453875.3	4.01 01	3.95 01	3.83 00	3.50 01	3.45 02
2454218.3	3.96 00	3.96 00	3.87 00	3.52 01	3.44 02
2454479.6	4.00 00	4.00 00	3.91 01	3.59 00	3.46 01
2454605.3	3.96 01	4.01 00	3.88 01	3.56 01	3.44 02
μ Cep					
2451768.5	−0.53 01	−1.33 01	−1.74 01	−2.20 01	−1.89 03
μ Gem					
2453003.5	−0.76 01	−1.64 01	−1.90 01	−2.06 01	−1.76 00
2453112.2	−0.78 01	−1.68 01	−1.89 01	−2.04 01	−1.76 02
ξ Oph					
2451321.5	3.25 01	3.17 04	2.81 02	2.43 02	–
2451327.4	3.27 02	3.16 04	2.85 01	2.47 02	–
o Cet					
2449595.6	−2.08 04	−2.40 03	−2.73 02	−3.24 01	−3.35 05
2449615.5	−1.54 03	−2.23 02	−2.71 01	−3.27 04	−3.20 04
2449654.4	−1.24 01	−2.01 02	−2.47 01	−3.14 01	−2.96 04
2450704.5	−0.52 00	−1.25 01	−1.84 01	−2.68 01	−2.59 02
2450754.4	−0.41 00	−1.18 01	−1.73 01	−2.56 01	−2.59 02
2450793.3	−0.88 01	−1.62 01	−2.02 00	−2.79 01	−2.88 02
2451062.5	−0.66 01	−1.43 01	−1.96 01	−2.76 01	−2.74 02
2451092.5	−0.71 01	−1.48 01	−2.01 01	−2.87 01	−2.80 02
2451164.3	−1.47 01	−2.24 01	−2.64 00	−3.35 01	−3.40 02
2451180.2	−1.55 01	−2.33 02	−2.74 01	−3.36 01	−3.43 02
2451184.2	−1.55 01	−2.38 01	−2.73 00	−3.32 03	−3.33 02
2451199.2	−1.67 00	−2.50 03	−2.85 00	−3.50 01	−3.53 02
2451420.6	−0.96 01	−1.71 01	−2.16 01	−2.89 01	−2.76 01
2451448.5	−1.13 00	−1.81 02	−2.34 02	−2.96 02	−2.87 01
2451526.3	−1.68 01	−2.52 01	−2.92 01	−3.44 01	−3.39 01
2451549.2	−1.74 00	−2.58 00	−2.96 00	−3.47 01	−3.37 01
2451767.6	−0.80 01	−1.47 02	−1.96 01	−2.71 01	−2.76 04
2451802.5	−1.31 01	−2.01 01	−2.33 00	−2.99 01	−2.99 02
2451824.5	−1.53 00	−2.21 01	−2.61 00	−3.13 01	−3.16 01
2451848.4	−1.70 01	−2.48 01	−2.80 01	−3.28 01	−3.28 01
2451863.3	−1.84 01	−2.52 01	−2.89 01	−3.33 01	−3.33 02
2451925.2	−1.61 01	−2.38 01	−2.74 01	−3.24 01	−3.20 01
2452149.6	−1.61 01	−2.36 00	−2.78 00	−3.42 01	−3.39 02
2452187.5	−1.74 01	−2.55 02	−2.98 00	−3.60 01	−3.42 03
2452209.4	−1.78 00	−2.60 01	−3.03 00	−3.60 01	−3.52 01
2452218.4	−1.74 00	−2.59 01	−3.05 01	−3.59 00	−3.45 01
2451526.3	−1.68 01	−2.52 01	−2.92 01	−3.44 01	−3.39 01
2451549.2	−1.74 00	−2.58 00	−2.96 00	−3.47 01	−3.37 01
2451767.6	−0.80 01	−1.47 02	−1.96 01	−2.71 01	−2.76 04
2451802.5	−1.31 01	−2.01 01	−2.33 00	−2.99 01	−2.99 02
2451824.5	−1.53 00	−2.21 01	−2.61 00	−3.13 01	−3.16 01
2451848.4	−1.70 01	−2.48 01	−2.80 01	−3.28 01	−3.28 01
2451863.3	−1.84 01	−2.52 01	−2.89 01	−3.33 01	−3.33 02
2451925.2	−1.61 01	−2.38 01	−2.74 01	−3.24 01	−3.20 01
2452149.6	−1.61 01	−2.36 00	−2.78 00	−3.42 01	−3.39 02
2452187.5	−1.74 01	−2.55 02	−2.98 00	−3.60 01	−3.42 03
2452209.4	−1.78 00	−2.60 01	−3.03 00	−3.60 01	−3.52 01
2452218.4	−1.74 00	−2.59 01	−3.05 01	−3.59 00	−3.45 01
2452223.4	−1.78 00	−2.59 01	−3.02 01	−3.59 01	−3.49 02
2452254.3	−1.69 00	−2.50 01	−2.95 00	−3.51 01	−3.43 01
2452309.2	−1.27 00	−2.01 00	−2.47 00	−3.13 01	−3.00 02
2452316.2	−1.17 01	−1.90 01	−2.38 01	−3.08 01	−2.97 02
2452513.6	−1.62 01	−2.40 01	−2.75 01	−3.31 01	−3.26 02
2452540.5	−1.72 01	−2.50 01	−2.90 00	−3.40 01	−3.29 01
2452565.4	−1.76 00	−2.57 01	−2.94 00	−3.42 00	−3.31 02
2452613.3	−1.57 00	−2.33 00	−2.74 00	−3.27 01	−3.12 00
2452870.6	−1.66 00	−2.47 00	−2.88 01	−3.44 01	−3.37 01
2452891.6	−1.63 01	−2.42 01	−2.77 01	−3.36 00	−3.36 02
2452958.4	−1.33 00	−2.08 01	−2.56 01	−3.18 01	−3.10 01
2453022.2	−0.82 01	−1.57 01	−2.09 00	−2.84 01	−2.79 01
2453357.3	−0.78 01	−1.54 01	−2.03 01	−2.80 00	−2.79 01
2453667.4	−1.12 01	−1.82 01	−2.31 00	−2.97 01	−2.84 02
2453729.2	−0.70 01	−1.50 01	−2.00 01	−2.77 01	−2.75 02
2453747.2	−0.75 01	−1.50 01	−2.06 00	−2.79 01	−2.69 01
2453964.6	−1.42 01	−2.19 01	−2.61 00	−3.14 01	−2.95 01
2454013.5	−1.06 00	−1.81 01	−2.28 01	−2.94 01	−2.75 02
2454118.2	−1.22 00	−1.93 01	−2.34 00	−3.03 00	−2.91 01
2454335.6	−0.93 01	−1.63 00	−2.13 01	−2.83 01	−2.70 03
2454369.5	−0.64 01	−1.36 01	−1.91 00	−2.66 00	−2.61 03
2454428.3	−0.59 00	−1.34 01	−1.86 01	−2.70 00	−2.70 02
2454458.2	−0.94 01	−1.68 00	−2.14 01	−2.90 01	−2.87 02
2454478.2	−1.20 00	−1.89 00	−2.32 01	−3.02 00	−3.07 01
2454481.2	−1.25 01	−1.95 01	−2.33 01	−3.07 01	−3.12 01
2454750.4	−0.97 01	−1.74 01	−2.24 01	−2.97 00	−2.84 02

Table 2. (Contd.)

JD	J	H	K	L	M
2454783.3	−1.17 01	−1.84 01	−2.33 00	−3.07 01	−3.02 01
2454804.3	−1.47 00	−2.16 00	−2.55 01	−3.26 01	−3.25 02
χ Cyg					
2449654.3	0.08 01	−1.11 01	−1.79 01	−2.69 01	−2.64 01
2449884.5	−0.11 01	−1.17 01	−1.77 01	−2.70 01	−2.78 02
2451710.5	−0.12 01	−1.22 01	−1.87 01	−2.56 01	−2.38 01
2451767.4	0.42 01	−0.78 01	−1.43 01	−2.27 01	−2.27 01
2451776.4	0.34 01	−0.78 01	−1.46 00	−2.28 01	−2.20 01
2452072.5	−0.50 01	−1.54 00	−2.11 01	−2.83 01	–
2452121.4	0.01 01	−1.18 00	−1.81 01	−2.54 01	−2.25 01
2452163.3	0.07 00	−1.05 00	−1.65 00	−2.44 00	−2.25 00
2452188.3	−0.19 01	−1.17 00	−1.75 00	−2.50 01	−2.32 01
2452217.2	−0.42 01	−1.27 01	−1.85 00	−2.62 00	−2.58 01
2452513.4	−0.10 00	−1.26 00	−1.82 01	−2.57 00	−2.32 00
2452773.5	−0.77 00	−1.77 01	−2.25 00	−2.92 00	−2.66 01
2452806.5	−0.81 00	−1.82 01	−2.34 01	−2.98 01	−2.71 01
2452832.5	−0.76 00	−1.80 01	−2.31 00	−2.98 00	−2.71 01
2452870.4	−0.55 00	−1.62 01	−2.16 00	−2.86 01	−2.61 01
2452892.3	−0.35 00	−1.47 00	−2.03 00	−2.74 00	−2.54 00
2452925.2	−0.05 01	−1.23 01	−1.82 00	−2.57 01	−2.40 01
2452950.2	0.15 01	−1.04 01	−1.69 01	−2.51 01	−2.28 01
2453126.5	−0.75 00	−1.63 01	−2.17 01	−2.98 01	−2.90 00
2453189.6	−1.03 01	−2.00 01	−2.53 01	−3.24 01	−3.07 01
2453214.5	−1.02 01	−2.03 00	−2.55 01	−3.27 01	−3.04 00
2453551.4	−0.86 01	−1.77 01	−2.29 01	−3.04 01	−2.90 01
2453571.4	−0.96 00	−1.94 00	−2.41 00	−3.09 01	−2.94 00
2453597.4	−1.04 01	−2.05 01	−2.49 01	−3.19 01	−2.95 01
2453669.3	−0.73 02	−1.83 02	−2.38 02	−3.10 02	−2.74 01
2453689.2	−0.68 00	−1.72 00	−2.28 00	−3.02 00	−2.87 01
2453873.4	−0.51 00	−1.36 01	−1.87 00	−2.65 00	−2.69 01
2453922.5	−0.64 01	−1.46 01	−1.92 01	−2.68 01	−2.76 04
2453953.5	−0.86 00	−1.75 00	−2.24 01	−2.93 00	−2.90 01
2453962.3	−0.91 01	−1.81 01	−2.28 01	−2.94 01	−2.90 01
2454022.3	−0.98 01	−1.98 00	−2.50 00	−3.12 01	−2.94 01
2454285.4	−0.05 00	−0.99 00	−1.54 00	−2.41 01	−2.46 01
2454309.4	0.01 01	−0.93 01	−1.51 01	−2.35 00	−2.33 01
2454337.3	−0.18 01	−1.10 00	−1.62 00	−2.45 00	−2.45 01
2454372.3	−0.56 01	−1.50 01	−2.02 01	−2.73 01	−2.74 01
2454428.2	−0.84 01	−1.86 01	−2.36 01	−3.02 00	−2.82 01
2454605.5	0.07 00	−1.10 00	−1.72 00	−2.48 01	−2.39 01
2454663.3	−0.38 01	−1.31 01	−1.82 00	−2.62 01	−2.54 01
2454686.3	−0.48 01	−1.34 01	−1.85 00	−2.64 01	−2.73 01
2454692.3	−0.53 00	−1.36 00	−1.88 00	−2.63 00	−2.65 01
2454757.2	−0.65 01	−1.49 01	−1.99 00	−2.73 01	−2.81 01
2454781.2	−0.82 01	−1.72 01	−2.21 00	−2.87 01	−2.94 00
2454815.1	−1.01 02	−1.89 01	−2.35 01	−3.02 01	−3.03 02
g Her					
2451686.4	−0.79 01	−1.71 01	−2.06 01	−2.33 00	−2.00 00
AB Aur					
2451926.4	6.15 01	5.38 03	4.47 01	3.39 01	3.20 01
2452190.6	6.26 01	5.47 01	4.57 00	3.49 01	–
2452191.7	6.30 00	5.47 00	4.58 01	3.47 01	3.28 02
2452192.6	6.26 00	5.50 01	4.58 01	3.48 00	3.22 02
2452211.5	6.22 00	5.44 00	4.56 00	3.48 01	3.27 02
2452218.5	6.19 00	5.42 00	4.53 00	3.42 00	3.29 01
2452254.4	6.13 00	5.31 00	4.42 00	3.37 01	3.17 01
2452307.3	6.18 01	5.37 01	4.48 01	3.38 01	3.24 02
2452540.5	6.23 00	5.43 01	4.52 01	3.40 00	3.20 01
2452597.5	6.17 01	5.37 01	4.49 00	3.36 01	3.19 02
2452666.3	6.23 01	5.44 01	4.54 01	3.48 01	3.16 02
2452694.3	6.21 00	5.47 00	4.54 00	3.44 00	3.26 01
2452950.5	6.28 00	5.57 00	4.76 01	3.67 01	3.49 01
2452958.5	6.31 00	5.59 01	4.74 00	3.65 00	3.42 01
2453003.4	6.24 01	5.47 01	4.58 01	3.50 00	3.29 01
2453284.5	6.18 01	5.36 01	4.45 01	3.34 01	3.07 01
2453357.5	6.26 00	5.42 01	4.49 00	3.34 01	3.10 01
2453667.5	6.10 01	5.27 00	4.34 01	3.21 01	3.06 02
2453747.2	6.20 00	5.44 01	4.58 00	3.48 01	3.30 01
2453821.3	6.35 01	5.68 01	4.77 01	3.68 01	3.42 02
2454011.6	6.18 01	5.35 00	4.44 00	3.37 01	3.18 02
2454086.5	6.16 01	5.38 01	4.45 01	3.44 03	3.13 02
2454100.3	6.24 01	5.36 01	4.46 01	3.31 01	3.09 01
2454156.2	6.11 00	5.25 01	4.27 01	3.13 01	2.90 01
2454373.5	6.13 01	5.21 01	4.27 01	3.18 01	2.92 02
2454428.4	6.12 01	5.26 01	4.33 01	3.22 00	2.92 01
2454444.4	6.10 01	5.28 01	4.31 01	3.14 01	2.92 02
2454458.3	6.24 01	5.32 00	4.35 01	3.21 00	2.96 01
2454476.4	6.19 01	5.34 00	4.39 01	3.23 00	2.94 01
2454480.3	6.15 00	5.30 00	4.33 00	3.19 01	2.87 01
2454483.2	6.14 01	5.32 00	4.34 00	3.18 00	2.85 02
2454756.5	6.19 01	5.38 00	4.43 00	3.24 00	2.96 02
2454781.5	6.22 01	5.39 01	4.43 00	3.28 00	2.95 01
2454804.4	6.24 01	5.45 00	4.32 01	3.18 01	2.95 02
AC Her					
2449944.4	6.07 01	5.61 01	5.35 01	4.77 01	4.22 10
2449973.2	5.94 02	5.53 01	5.25 00	4.68 02	3.94 05
2449975.2	5.97 01	5.55 00	5.30 01	4.64 02	4.12 04
2450002.2	5.78 00	5.34 00	5.14 01	4.46 01	3.79 04
2450005.2	5.70 01	5.31 01	5.07 00	4.41 01	–
2450200.5	5.86 01	5.45 00	5.22 01	4.58 02	–
2450204.5	6.04 01	5.57 00	5.37 01	4.72 02	–
2450207.6	6.27 01	5.77 02	5.55 01	4.88 04	–
2450210.5	6.50 01	6.00 01	5.77 01	5.04 05	–
2450213.5	6.68 01	6.16 01	5.89 02	5.29 03	4.69 10
2450233.5	5.76 01	5.37 01	5.14 01	4.48 02	3.70 05
2450242.4	5.97 01	5.52 01	5.28 01	4.65 02	4.10 06
2450257.4	6.08 03	5.63 05	5.38 02	4.69 02	3.84 05
2450265.4	5.77 01	5.35 01	5.13 01	4.44 03	3.66 04
2450266.5	5.79 01	5.35 02	5.06 02	4.32 01	3.64 03
2450294.4	6.37 02	5.87 01	5.69 01	4.94 02	4.27 17
2450302.3	5.71 00	5.31 00	5.10 00	4.48 05	3.91 11
2450339.3	5.80 02	5.35 02	5.27 04	4.70 05	–
2450624.4	6.09 01	5.59 01	5.30 00	4.68 01	3.99 03
2450627.4	6.19 01	5.69 01	5.36 00	4.70 02	4.11 05
2450642.3	5.84 01	5.33 01	5.09 02	4.46 03	–
2450675.3	6.00 01	5.61 01	5.32 01	4.55 03	–

Table 2. (Contd.)

JD	J	H	K	L	M	JD	J	H	K	L	M
2450679.3	5.80 01	5.36 01	5.12 01	4.40 02	3.76 04	2452871.3	5.73 01	5.35 01	5.04 00	4.34 01	3.65 04
2450867.6	5.96 01	5.46 00	5.17 01	4.55 01	3.84 02	2452890.2	6.30 01	5.84 01	5.49 01	4.78 02	4.19 03
2450874.6	5.78 01	5.30 02	5.11 01	4.47 02	3.92 04	2453112.6	6.20 01	5.70 01	5.39 01	4.82 01	4.47 05
2450942.5	5.92 01	5.44 02	5.13 01	4.44 01	3.68 03	2453127.5	5.94 00	5.46 01	5.16 00	4.45 01	3.72 02
2450977.5	6.08 00	5.60 01	5.34 00	4.65 02	4.05 04	2453134.4	5.77 00	5.33 01	5.05 00	4.35 01	3.70 02
2451006.4	6.16 02	5.70 01	5.38 03	4.81 04	–	2453188.4	6.17 01	5.70 01	5.39 01	4.75 01	4.27 03
2451033.3	5.80 01	5.32 03	5.06 02	4.45 04	3.60 16	2453194.4	6.15 01	–	5.43 01	4.71 02	4.21 07
2451036.3	5.90 02	5.40 01	5.17 02	4.56 02	3.94 04	2453216.3	5.93 01	5.51 01	5.23 01	4.65 02	4.01 06
2451039.4	6.10 03	5.58 03	5.34 01	4.70 02	4.18 08	2453226.3	6.45 02	5.94 01	5.63 01	5.00 03	–
2451058.3	5.86 02	5.38 03	5.10 01	4.50 02	3.65 06	2453539.5	6.05 01	5.61 01	5.36 00	4.65 02	4.09 04
2451066.3	5.61 01	5.22 02	4.95 02	4.29 01	3.50 04	2453550.4	5.74 01	5.36 01	5.14 02	4.41 01	3.85 06
2451068.2	5.63 01	5.22 02	5.02 02	4.37 03	–	2453566.3	6.23 01	5.81 01	5.48 00	4.85 02	4.22 04
2451072.3	5.76 01	5.32 01	5.07 02	4.48 01	4.06 07	2453597.3	6.05 01	5.59 01	5.35 01	4.70 01	4.21 04
2451095.2	5.92 02	5.42 01	5.14 02	4.48 02	3.70 03	2453657.2	5.78 01	5.35 01	5.07 01	4.39 01	3.59 02
2451152.1	6.02 01	5.56 01	5.29 02	4.69 03	4.11 04	2453684.2	6.47 00	6.04 01	5.68 01	4.96 02	4.31 04
2451300.5	5.84 01	5.41 00	5.16 01	4.54 01	4.03 05	2453821.5	5.95 01	5.46 01	5.26 01	4.62 01	3.97 02
2451328.5	5.71 00	5.29 01	5.01 00	4.32 01	3.74 02	2453823.5	6.17 01	5.62 01	5.35 00	4.74 01	4.24 03
2451355.4	5.93 01	5.59 02	5.25 01	4.50 01	3.73 03	2453870.5	6.19 00	5.75 00	5.44 01	4.76 02	4.09 03
2451365.3	5.07 01	4.56 01	4.40 01	4.25 02	4.45 03	2453923.4	5.73 01	5.30 01	5.05 01	4.24 02	3.60 03
2451366.4	5.67 01	5.30 01	5.00 01	4.28 02	3.66 02	2453951.4	5.92 01	5.56 00	5.28 01	4.46 01	3.71 02
2451383.3	6.34 01	5.83 02	5.55 01	4.92 02	4.45 04	2453958.4	5.74 01	5.29 01	5.06 01	4.35 02	3.76 03
2451387.3	6.10 02	5.69 01	5.38 01	4.60 02	3.90 03	2453987.3	–	5.63 02	5.42 01	4.89 02	4.13 05
2451420.3	6.39 01	5.93 01	5.61 01	4.92 01	4.42 02	2454251.4	6.15 01	5.71 01	5.41 01	4.68 02	3.97 04
2451453.2	5.93 01	5.46 01	5.21 01	4.67 02	4.01 03	2454281.5	6.54 02	5.97 02	5.87 02	5.23 05	–
2451645.6	6.43 00	6.02 01	5.75 00	5.03 01	4.47 04	2454283.3	6.62 01	6.18 01	5.94 01	5.22 01	–
2451685.5	6.16 00	5.72 00	5.42 00	4.81 01	4.29 04	2454305.3	5.77 00	5.41 00	5.13 00	4.44 01	3.80 04
2451707.4	5.82 01	5.42 02	5.13 01	4.44 01	3.83 02	2454311.3	5.98 01	5.52 00	5.25 01	4.66 01	4.08 04
2451768.2	6.15 02	5.63 02	5.31 01	4.57 02	3.55 06	2454336.3	5.80 01	5.35 01	5.09 00	4.36 01	3.68 03
2451769.2	6.06 02	5.62 01	5.29 01	4.49 02	3.90 10	2454341.3	5.86 01	5.44 01	5.16 01	4.49 01	3.92 03
2451773.3	5.93 01	5.47 02	5.17 00	4.46 02	–	2454372.2	5.89 02	5.39 01	5.13 01	4.46 01	3.57 03
2451779.3	5.79 01	5.34 00	5.06 01	4.38 01	3.74 05	2454577.5	6.29 01	5.80 01	5.60 01	4.96 02	–
2451865.2	6.02 01	5.50 00	5.24 01	4.64 01	4.14 03	2454659.4	6.50 01	6.04 00	5.74 01	5.09 01	4.66 06
2452012.6	5.86 01	5.38 01	5.12 01	4.49 01	3.90 02	2454668.4	6.04 01	5.59 00	5.35 00	4.59 02	3.93 04
2452072.5	5.87 00	5.43 01	5.10 01	4.40 01	–	2454689.3	5.98 02	5.52 01	5.29 01	4.63 01	4.16 04
2452119.4	5.78 01	5.37 01	5.10 01	4.42 01	3.93 04	2454696.3	6.19 01	5.73 02	5.48 01	4.86 02	4.41 06
2452126.3	5.96 01	5.57 01	5.27 01	4.68 02	4.17 03	2454703.3	6.12 01	–	5.44 01	–	–
2452131.3	6.20 02	5.70 03	5.43 02	4.81 01	4.33 05	AFGL 2591					
2452157.3	5.79 01	5.35 01	5.07 01	4.39 01	3.86 02	2453214.5	–	–	6.15 01	1.74 00	0.15 01
2452163.2	5.99 00	5.50 00	5.21 01	4.62 01	4.07 02	2453311.3	–	–	6.25 01	1.73 01	0.30 01
2452191.2	5.66 01	5.24 01	4.98 01	4.26 01	3.67 03	2453550.4	–	–	5.95 01	1.53 01	−0.07 01
2452220.2	5.89 00	5.46 01	5.18 01	4.50 01	3.85 02	2453600.4	–	–	6.09 01	1.59 01	0.07 01
2452421.5	5.87 00	5.43 01	5.18 01	4.49 01	3.92 04	2453922.5	–	–	6.06 01	1.60 01	−0.08 02
2452450.4	5.80 01	5.33 01	5.08 01	4.37 00	3.51 04	2453923.4	–	–	6.03 01	1.62 01	−0.10 01
2452483.4	5.95 01	5.53 01	5.23 01	4.52 01	3.86 03	2453957.5	–	–	6.15 00	1.68 01	0.14 01
2452511.4	6.30 00	5.81 01	5.50 01	4.89 01	4.33 09	2453964.5	–	–	6.18 01	1.70 00	0.20 01
2452516.3	6.12 01	5.68 01	5.37 01	4.72 02	4.02 03	2454021.3	–	–	6.13 01	1.69 01	0.00 01
2452540.2	6.12 00	5.67 00	5.42 00	4.76 00	4.25 03	2454283.5	–	–	6.12 01	1.65 00	−0.04 01
2452606.1	5.78 01	5.38 01	5.10 00	4.38 00	4.27 07	2454311.5	–	–	6.05 01	1.62 00	0.02 01
2452778.5	6.47 01	6.01 01	5.72 01	4.97 02	4.42 04	2454338.4	–	–	6.25 00	1.75 01	0.15 01
2452801.4	5.89 00	5.44 00	5.22 01	4.51 01	3.93 03	2454370.3	–	–	6.14 01	1.71 00	−0.01 01
2452834.3	5.77 00	5.35 00	5.08 01	4.37 01	3.65 03	2454427.2	–	–	6.04 01	1.66 01	−0.04 01
2452842.3	6.02 00	5.53 00	5.28 01	4.62 02	4.09 04	2454666.5	–	–	6.07 00	1.62 01	0.06 01
2452866.3	5.66 00	5.26 00	4.98 00	4.27 01	3.58 02	2454695.4	–	–	5.97 01	1.58 01	−0.03 00

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*
2454757.3	–	–	5.98 01	1.60 00	−0.11 00
2454783.2	–	–	6.01 01	1.60 00	−0.12 00
AG Dra					
2450260.4	6.95 02	–	6.00 02	–	–
2450293.3	7.04 03	6.33 03	6.06 03	5.74 14	–
2452031.5	7.18 01	–	6.20 00	–	–
2452037.4	7.17 01	–	6.20 00	–	–
2452125.3	7.20 01	–	6.21 01	–	–
2452421.5	7.18 01	–	6.19 01	–	–
2452515.3	7.19 01	–	6.19 01	–	–
2452697.7	7.18 01	–	6.21 00	–	–
2452700.6	7.20 01	–	6.21 01	–	–
2452716.6	6.76 01	–	5.74 01	–	–
2452724.6	7.18 01	–	6.20 00	–	–
2452739.6	7.19 01	–	6.22 01	–	–
2452751.5	7.18 00	–	6.22 00	–	–
2452778.4	7.18 01	–	6.21 01	–	–
2452804.4	7.21 01	–	6.22 01	–	–
2452841.4	7.20 00	–	6.20 00	–	–
2453096.5	7.18 01	6.43 01	6.20 00	6.02 02	6.11 06
2453100.5	7.22 00	6.43 00	6.23 01	5.97 01	5.98 07
2453112.5	7.22 01	6.42 01	6.24 00	6.03 02	6.21 15
2453126.4	7.16 00	6.39 00	6.21 00	5.96 02	6.22 10
2453128.5	7.15 00	–	6.19 01	–	–
2453133.5	7.18 01	6.41 01	6.20 00	5.96 02	–
2453194.4	7.22 01	–	6.21 00	–	–
2453550.3	7.12 01	–	6.12 02	–	–
2453571.3	7.04 01	–	6.07 01	–	–
2453816.6	7.14 01	–	6.16 01	–	–
2453823.5	7.14 01	–	6.16 01	–	–
2453870.5	7.19 01	–	6.21 01	–	–
2453922.4	6.98 02	–	6.00 01	–	–
2453958.3	6.82 01	–	5.93 01	–	–
2453964.3	6.83 01	–	5.94 00	–	–
2454022.2	–	–	5.92 01	5.62 05	–
2454219.5	7.08 01	–	6.13 00	–	–
2454284.3	7.12 00	–	6.15 01	–	–
2454306.3	7.10 01	–	6.15 01	–	–
2454336.3	7.08 01	–	6.13 01	–	–
2454341.3	7.09 01	–	6.14 01	–	–
2454605.4	7.22 01	–	6.22 00	–	–
2454660.3	7.18 01	–	6.20 01	–	–
2454667.3	7.16 01	–	6.18 00	–	–
2454693.2	7.18 01	–	6.19 01	–	–
2454695.3	7.19 01	–	6.21 01	–	–
AX Per					
2450004.4	6.68 01	–	5.46 01	–	–
2450070.4	6.66 01	–	5.45 01	–	–
2450699.6	6.71 01	5.80 00	5.47 00	5.27 01	5.38 08
2450715.5	6.70 01	5.72 01	5.46 01	5.27 01	5.47 07
2451449.5	6.61 00	5.67 02	5.40 01	5.13 02	–
BD Vul					
2452192.3	4.98 01	3.74 01	2.95 01	2.09 02	2.58 05
2452222.3	5.24 00	3.95 00	3.12 00	2.16 01	2.75 02
2452515.4	4.85 01	3.75 01	3.02 01	2.21 01	2.44 02
2452801.5	5.06 00	3.89 00	3.07 01	2.22 00	2.54 02
2452838.5	4.97 00	3.84 00	3.08 01	2.25 01	2.52 01
2452869.5	4.98 00	3.88 01	3.12 00	2.30 00	2.59 02
2452890.4	4.93 01	3.80 01	3.12 01	2.28 01	2.56 01
BE Cet					
2450699.5	5.28 01	4.91 02	4.81 01	4.85 02	–
2450700.5	–	–	–	–	4.90 04
2450704.5	5.28 02	4.88 02	4.85 01	4.90 02	5.00 08
2450715.4	5.32 01	4.95 00	4.86 01	4.88 02	4.79 04
BF Cyg					
2449502.6	7.69 02	6.75 02	6.33 02	6.03 05	–
2449525.5	7.64 03		6.36 06	5.93 08	–
2449529.4	7.68 03	6.67 02	6.30 02	5.97 03	–
2449534.4	7.61 02	6.67 01	6.30 02	5.94 04	–
2449855.5	7.68 04	6.72 02	6.42 04	6.04 06	–
2449883.4	7.68 02	–	6.34 02	5.94 03	–
2449937.5	7.61 05	6.66 02	6.30 03	5.77 11	–
2449939.4	7.70 04	–	6.28 01	–	–
2449974.4	7.59 02	–	6.31 02	–	–
2449997.2	7.54 02	–	6.26 01	–	–
2450002.2	7.56 01	–	6.26 01	–	–
2450064.1	7.55 01	–	6.21 01	–	–
2450199.6	7.66 01	6.66 01	6.25 02	6.05 08	–
2450204.6	7.64 01	6.67 01	6.27 01	5.98 06	–
2450211.5	7.70 02	6.66 02	6.26 03	5.62 17	–
2450233.5	7.70 03	6.66 01	6.30 01	5.95 06	–
2450242.6	7.64 03	–	6.28 02	–	–
2450261.4	7.64 02	–	6.32 02	–	–
2450294.4	7.69 03	–	6.33 03	–	–
2450623.4	7.64 01	–	6.28 01	–	–
2450699.3	7.60 01	6.63 01	6.28 01	5.99 03	–
2450754.2	7.58 01	–	6.20 01	–	–
2450765.9	7.54 00	6.57 01	6.19 01	5.91 03	–
2450868.6	7.51 01	6.56 01	6.19 00	5.85 02	–
2450978.4	7.57 01	–	6.20 01	–	–
2451009.5	7.68 02	–	6.34 02	–	–
2451037.4	7.71 01	–	6.32 01	–	–
2451095.3	7.63 01	–	6.25 01	–	–
2451300.5	7.51 01	–	6.17 01	–	–
2451336.5	7.52 01	–	6.18 01	–	–
2451351.5	7.57 04	–	6.32 02	–	–
2451355.5	7.54 02	–	6.20 01	–	–
2451358.5	7.55 02	–	6.19 01	–	–
2451359.4	7.55 01	–	6.20 01	–	–
2451360.5	7.56 01	–	6.19 02	–	–
2451361.5	7.54 01	–	6.19 01	–	–
2451365.5	7.55 01	–	6.20 02	–	–
2451383.4	7.54 01	–	6.20 01	–	–
2451384.4	7.55 01	–	6.19 01	–	–
2451385.3	7.54 01	–	6.22 04	–	–
2451387.4	7.55 01	–	6.22 01	–	–

Table 2. (Contd.)

JD	J	H	K	L	M
2451390.4	7.51 01	–	6.17 01	–	–
2451393.3	7.54 01	–	6.18 02	–	–
2451420.3	7.55 01	–	6.18 01	–	–
2451421.3	7.55 01	–	6.21 02	–	–
2451423.3	7.54 01	–	6.21 01	–	–
2451453.3	7.56 01	–	6.23 01	–	–
2451686.5	7.59 02	6.61 01	6.22 01	5.97 04	–
2451687.5	7.60 02	–	6.24 01	–	–
2451707.5	7.60 01	–	6.26 01	–	–
2451738.5	7.69 02	–	6.32 01	–	–
2451740.4	7.70 03	–	6.31 02	–	–
2451741.4	7.68 01	–	6.30 01	–	–
2451768.4	7.71 02	–	6.36 01	–	–
2451770.4	7.72 01	–	6.36 01	–	–
2451777.3	7.71 01	–	6.33 01	–	–
2451779.4	7.71 01	–	6.33 01	–	–
2451780.3	7.72 01	–	6.33 01	–	–
2451782.3	7.73 02	–	6.34 01	–	–
2451802.3	7.72 01	–	6.34 01	–	–
2451834.2	7.69 01	–	6.31 01	–	–
2451865.2	7.58 01	–	6.24 01	–	–
2451867.2	7.57 01	–	6.21 01	–	–
2452007.6	7.59 01	–	6.23 00	–	–
2452012.6	7.57 01	–	6.24 00	–	–
2452031.6	7.57 01	–	6.24 00	–	–
2452037.6	7.57 00	–	6.22 00	–	–
2452125.4	7.63 01	–	6.28 01	–	–
2452126.4	7.67 02	–	6.30 01	–	–
2452127.4	7.66 02	–	6.28 01	–	–
2452131.4	7.67 03	–	6.30 01	–	–
2452132.3	7.66 02	–	6.31 01	–	–
2452153.3	7.69 01	–	6.33 01	–	–
2452157.4	7.68 02	–	6.34 01	–	–
2452158.3	7.68 01	–	6.33 00	–	–
2452187.3	7.64 01	–	6.34 01	–	–
2452190.3	7.67 01	–	6.34 01	–	–
2452192.2	7.71 02	–	6.32 01	–	–
2452211.2	7.69 01	–	6.33 01	–	–
2452220.2	7.66 01	–	6.32 01	–	–
2452348.6	7.58 02	–	6.25 01	–	–
2452367.6	7.57 01	–	6.24 00	–	–
2452391.5	7.59 02	–	6.25 01	–	–
2452420.5	7.59 01	–	6.24 01	–	–
2452455.5	7.58 01	–	6.25 01	–	–
2452483.4	7.64 02	–	6.27 01	–	–
2452510.3	7.70 03	–	6.28 01	–	–
2452537.3	7.62 01	–	6.28 00	–	–
2452540.3	7.63 01	–	6.28 00	–	–
2452740.6	7.51 00	–	6.18 00	–	–
2452751.6	7.53 00	–	6.20 01	–	–
2452774.5	7.53 01	–	6.19 01	–	–
2452778.5	7.52 01	–	6.19 01	–	–
2452800.5	7.52 01	–	6.21 00	–	–

JD	J	H	K	L	M
2452806.5	7.54 01	–	6.20 01	–	–
2452809.4	7.54 01	–	6.22 00	–	–
2452831.4	7.57 01	–	6.24 01	–	–
2452836.5	7.58 01	–	6.24 00	–	–
2452840.4	7.57 01	–	6.25 00	–	–
2452843.4	7.57 01	–	6.24 01	–	–
2452866.4	7.61 01	–	6.28 01	–	–
2452867.4	7.61 01	–	6.28 00	–	–
2452869.4	7.60 00	–	6.28 00	–	–
2452871.4	7.60 01	–	6.28 01	–	–
2452889.4	–	–	6.31 01	–	–
2452890.3	7.66 01	–	6.32 01	–	–
2452925.2	7.69 01	–	6.33 01	–	–
2452961.2	7.66 00	–	6.31 01	–	–
2454696.4	7.23 01	–	6.12 01	–	–
BF Ori					
2451864.5	9.27 02	8.75 01	7.95 01	6.79 02	–
2451865.5	9.18 01	8.67 01	7.94 01	6.81 02	–
2451902.4	9.37 02	8.79 01	7.93 01	6.80 02	–
2451926.3	9.09 02	8.62 02	7.86 01	6.76 02	–
2451935.3	9.08 02	8.61 01	–	–	–
2452223.5	9.18 01	8.66 01	7.91 02	6.85 03	–
2452313.3	9.40 01	8.81 01	7.98 01	6.73 03	–
2452540.6	9.33 00	–	7.94 01	6.62 03	–
2452613.5	9.43 02	8.78 01	7.82 01	6.56 02	–
2452675.3	9.26 01	8.70 01	7.89 01	6.65 02	–
2452684.3	9.09 01	8.65 01	7.84 02	6.54 03	–
2452694.2	9.20 02	8.62 01	7.88 01	6.62 02	–
2453022.3	9.15 01	8.69 02	7.90 02	6.67 03	–
2453357.4	9.26 02	8.74 02	8.04 02	6.63 04	–
2453434.2	9.25 03	8.77 02	7.95 01	6.81 04	–
2453667.6	9.74 04	8.98 02	7.92 02	6.63 03	–
2453683.5	10.09 02	9.24 02	8.07 01	6.80 03	–
2453688.5	10.04 03	9.20 03	8.07 02	6.76 04	–
2453747.4	9.54 02	8.90 02	7.99 01	6.70 03	–
2453817.2	9.32 03	8.73 02	7.91 02	6.70 04	–
2454013.6	9.90 04	9.05 03	8.12 02	6.80 05	–
2454021.6	9.85 03	9.02 02	8.04 02	6.79 03	–
2454111.4	9.52 02	8.79 02	7.91 01	6.76 04	–
2454150.3	9.32 02	8.67 02	7.89 02	6.68 02	–
2454373.6	9.43 03	8.78 02	7.86 02	6.68 04	–
2454426.5	9.44 02	8.79 01	7.94 01	6.71 05	–
2454476.3	9.76 03	8.99 03	8.01 01	6.75 02	–
2454480.4	9.67 02	8.94 02	8.06 02	6.76 02	–
2454483.3	9.71 02	8.93 02	7.98 01	6.75 02	–
BS 483					
2450388.4	3.86 02	3.62 02	3.53 02	3.42 02	3.52 04
2450389.5	3.88 00	3.58 01	3.50 00	3.45 02	3.56 04
2450392.4	3.89 00	3.60 01	3.56 00	–	3.55 03
2450401.4	3.95 00	3.56 01	3.51 01	3.44 01	3.55 02
2450403.4	3.90 00	3.57 01	3.60 00	3.44 02	3.57 04
2450404.4	3.91 01	3.56 01	3.49 00	3.43 02	3.54 03
2450430.3	3.87 00	3.56 01	3.51 00	3.43 01	3.60 03

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*	JD	*J*	*H*	*K*	*L*	*M*
BS 6060						2451164.3	5.05 00	5.02 01	4.94 01	4.71 01	–
2450266.4	4.40 02	4.15 04	4.02 02	4.03 01	4.07 12	2451175.3	5.02 01	5.00 01	4.94 01	4.69 01	–
2450615.3	4.39 01	4.05 02	3.98 01	3.99 01	4.11 05	2451176.3	5.07 01	5.04 01	4.95 01	4.72 01	–
2450617.3	4.40 02	4.06 02	4.00 00	4.04 02	4.10 04	2451180.3	5.04 01	5.03 01	4.94 01	4.72 01	–
2450968.4	4.35 01	4.02 02	3.98 02	3.98 01	4.01 07	2451199.2	5.03 01	5.02 02	4.95 01	4.69 01	–
2451011.3	4.36 02	4.04 02	3.97 01	4.06 02	–	2451205.2	5.03 01	4.96 00	4.93 01	4.70 01	–
BS 7503						2451206.2	5.04 01	5.00 00	4.94 00	4.70 02	–
2450614.5	4.90 02	4.54 01	4.47 01	4.38 01	–	2451222.2	5.05 00	5.03 01	4.95 00	4.71 01	–
2450615.5	4.89 01	4.44 00	4.47 00	4.43 02	–	2451227.2	5.02 00	5.04 02	4.95 00	4.70 01	–
2450619.5	4.90 01	4.48 01	4.48 01	4.35 01	–	2451235.2	5.05 02	5.01 02	4.96 01	4.70 01	–
2450623.5	4.88 01	4.52 02	4.47 00	4.38 01	–	2451420.5	5.01 00	5.00 01	4.96 01	4.68 01	–
2450624.5	–	4.53 01	–	4.40 02	–	2451448.5	5.00 01	5.00 01	4.95 01	4.68 01	–
2450648.3	–	–	–	–	4.61 04	2451452.5	5.03 01	5.01 01	4.95 01	4.70 01	–
BS 7504						2451454.6	5.01 01	5.00 01	4.94 02	4.68 01	–
2450614.5	5.10 02	4.71 01	4.64 01	4.57 02	–	2451502.5	5.05 01	5.01 01	4.96 01	4.74 01	–
2450615.5	5.10 00	4.65 00	4.69 00	4.64 02	–	2451504.4	5.06 01	5.04 01	4.98 01	4.73 01	–
2450619.5	5.12 01	4.71 02	4.69 01	4.61 01	–	2451516.4	5.07 02	5.03 02	4.96 01	4.71 02	–
2450623.5	5.12 01	4.72 01	4.70 01	4.61 02	–	2451522.4	5.06 01	5.04 01	4.97 01	4.71 01	–
2450624.5	–	4.74 01	–	4.64 02	–	2451524.4	5.03 01	5.00 00	4.96 01	4.72 01	–
2450648.3	–	–	–	–	4.84 03	2451525.4	5.05 01	5.01 01	4.94 01	4.72 01	–
BS 7783						2451526.4	5.05 01	5.00 01	4.95 01	4.72 01	–
2450698.4	4.90 02	4.61 01	4.52 01	4.46 01	–	2451549.3	5.05 01	5.03 00	4.96 00	4.73 01	–
2450704.4	4.92 00	4.60 01	4.52 01	4.45 01	4.66 06	2451832.5	5.04 01	5.01 00	4.97 01	4.73 01	–
2450714.3	4.96 01	4.62 00	4.54 01	4.48 01	4.64 04	2451848.5	5.06 01	5.04 01	4.97 01	4.70 01	–
2450715.4	4.96 01	–	–	–	4.61 04	2451850.5	5.06 00	5.02 00	4.96 01	4.71 00	–
BU Tau						2451853.4	5.08 01	5.02 01	4.97 01	4.74 01	–
2449613.6	5.10 01	5.06 01	4.99 02	4.71 02	–	2451863.4	5.04 01	5.03 01	4.97 01	4.74 01	–
2449619.5	5.10 01	5.08 02	5.01 02	4.75 02	–	2451864.4	5.05 01	5.02 01	4.96 01	4.73 01	–
2449641.5	5.06 01	5.05 01	5.00 01	4.75 02	–	2451865.4	5.05 00	5.04 01	4.98 00	4.74 01	–
2449654.5	5.09 00	5.08 01	4.98 01	4.78 02	–	2451866.4	5.05 00	5.02 01	4.96 01	4.72 00	–
2449751.3	5.04 01	5.02 01	4.94 01	4.72 02	–	2451867.4	5.06 01	5.03 01	4.95 00	4.73 00	–
2449995.6	5.08 01	5.03 01	4.97 01	4.73 02	–	2451868.4	5.06 01	5.01 01	4.96 01	4.73 01	–
2450048.4	5.07 01	5.06 01	4.99 02	4.73 02	–	2451902.3	5.06 01	5.02 01	4.97 00	4.74 01	–
2450117.3	5.05 00	5.04 01	4.99 00	4.75 00	–	2451917.4	5.03 02	5.00 01	4.95 01	4.70 01	–
2450389.5	5.06 02	5.03 01	4.96 01	–	–	2451918.3	5.06 01	5.01 01	4.97 01	4.76 01	–
2450403.5	5.04 00	5.00 01	4.96 00	4.64 02	–	2451925.2	5.04 00	5.02 01	4.96 01	4.72 01	–
2450430.4	5.06 00	5.02 00	4.98 01	4.71 01	–	2451926.3	5.06 01	5.02 01	4.95 01	4.74 01	–
2450484.3	5.03 01	4.98 01	4.97 00	4.69 01	–	2451934.2	5.05 01	5.04 01	4.97 01	4.73 00	–
2450753.5	5.04 00	5.03 01	4.94 00	4.71 01	–	2452157.6	5.06 01	5.04 00	4.97 00	4.71 01	–
2450754.5	5.04 00	5.02 00	4.94 00	4.71 01	–	2452191.5	5.03 01	5.02 01	4.98 01	4.75 01	–
2450755.5	5.04 00	5.01 00	4.94 00	4.70 01	–	2452209.5	5.07 00	5.04 00	4.99 00	4.76 01	–
2450783.4	5.04 01	5.04 01	4.94 01	4.72 02	–	2452218.4	5.05 00	5.04 00	4.98 00	4.74 01	–
2450793.4	5.06 00	5.00 00	4.95 01	4.72 01	–	2452254.4	5.07 00	5.04 00	5.00 00	4.77 00	–
2450817.3	5.02 01	5.01 00	4.93 00	4.70 01	–	2452308.2	5.07 01	5.07 01	4.99 00	4.73 01	–
2450869.2	5.07 00	5.04 01	5.00 02	4.78 02	–	2452348.2	5.06 01	5.03 01	4.98 01	4.76 01	–
2450874.2	5.00 01	4.98 01	4.93 01	4.72 02	–	2452518.6	5.08 00	–	5.02 00	4.78 01	–
2451062.6	5.05 01	5.01 01	4.95 01	4.70 01	–	2452619.4	5.07 00	5.03 00	4.98 01	4.77 00	–
2451065.6	5.02 01	5.02 01	4.98 01	4.69 01	–	2452683.2	5.08 01	5.03 01	4.99 01	4.76 01	–
2451088.5	5.03 02	5.02 02	4.94 02	4.71 01	–	2452698.2	5.06 00	5.05 01	4.99 01	4.76 01	–
2451092.5	5.04 01	5.02 01	4.95 01	4.71 01	–	2453015.3	5.08 01	5.06 01	5.02 00	4.82 01	–
2451095.5	5.05 01	4.99 01	4.96 01	4.72 01	–	2453788.3	5.15 01	5.09 01	5.12 01	4.90 02	–
2451128.4	5.04 02	5.01 01	4.96 01	4.69 01	–	2453962.6	5.24 01	5.18 01	5.14 01	4.99 01	–
2451152.3	5.06 01	5.03 01	4.96 01	4.73 02	–	2453965.6	5.26 00	5.21 01	5.14 01	4.98 01	–

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*	JD	*J*	*H*	*K*	*L*	*M*
2454011.5	5.24 00	5.18 00	5.13 00	4.97 01	–	2450360.2	1.70 02	0.36 02	−0.26 02	−1.60 04	−1.71 05
2454020.5	5.25 01	5.18 01	5.13 01	4.94 01	–	2450402.2	1.64 00	0.29 01	−0.35 00	−1.46 01	−1.65 01
2454080.5	5.23 01	5.15 01	5.13 01	4.96 02	–	2450404.2	1.56 02	0.29 00	−0.40 02	−1.52 01	−1.70 01
2454092.3	5.27 00	5.19 01	5.12 01	4.98 01	–	2450559.5	1.34 01	0.08 00	−0.51 00	−1.45 01	−1.54 00
2454111.2	5.25 00	5.19 00	5.14 00	4.97 01	–	2450565.6	1.26 02	0.09 01	−0.50 01	−1.46 01	−1.57 01
2454145.1	5.28 00	5.21 00	5.14 00	4.97 00	–	2450615.5	1.24 00	−0.03 00	−0.54 00	−1.46 02	−1.53 00
2454337.6	5.26 01	5.16 01	5.11 01	4.94 01	–	2450623.5	1.19 00	0.00 01	−0.57 01	−1.46 02	−1.52 01
2454369.5	5.28 01	5.18 01	5.14 01	4.93 01	–	2450648.3	1.16 00	−0.05 00	−0.59 00	−1.49 01	−1.54 02
2454426.4	5.27 01	5.19 01	5.12 00	4.92 01	–	2450675.5	1.14 00	−0.05 01	−0.61 01	−1.50 01	−1.87 05
2454444.3	5.26 00	5.18 01	5.11 01	4.91 02	–	2450677.5	1.15 00	−0.06 01	−0.61 00	−1.46 02	−1.44 01
2454476.2	5.23 01	5.17 00	5.14 00	4.93 01	–	2450698.4	1.19 01	−0.05 01	−0.59 01	−1.46 02	−1.54 02
2454480.2	5.27 00	5.21 01	5.14 01	4.94 01	–	2450704.3	1.11 00	−0.04 00	−0.62 00	−1.52 01	−1.64 01
2454481.3	5.26 01	5.16 01	5.10 01	4.92 01	–	2450713.3	1.15 01	−0.01 02	−0.59 00	−1.45 01	−1.49 02
2454483.2	5.26 01	5.16 01	5.10 01	4.91 01	–	2450714.3	1.11 01	−0.08 01	−0.63 01	−1.51 01	−1.55 01
2454522.2	5.25 01	5.16 01	5.12 01	4.92 02	–	2450753.3	1.17 01	−0.02 00	−0.58 01	−1.46 01	−1.47 02
2454756.4	5.21 01	5.12 01	5.07 01	4.87 01	–	2450763.8	1.13 00	−0.02 00	−0.60 00	−1.49 01	−1.72 01
2454762.5	5.26 01	5.11 01	5.08 01	4.88 01	–	2450777.3	1.18 00	0.02 00	−0.55 00	−1.46 00	−1.66 01
2454781.4	5.23 01	5.16 01	5.11 01	4.88 01	–	2450867.7	1.15 00	0.00 00	−0.57 00	−1.41 01	−1.50 01
2454804.3	5.24 01	5.15 01	5.06 01	4.83 01	–	2450910.5	1.16 02	0.02 02	−0.55 02	−1.35 01	−1.40 03
CE Vir						2450918.5	1.13 02	−0.03 01	−0.56 01	−1.42 01	−1.41 01
2450199.4	6.25 01	5.67 01	5.47 01	–	–	2450942.5	1.07 02	−0.08 02	−0.54 00	−1.48 02	−1.50 02
2450200.4	6.24 01	5.66 00	5.51 00	5.25 06	–	2450975.5	1.05 01	−0.08 02	−0.63 03	−1.46 02	−1.40 01
2450204.4	6.27 01	5.68 01	5.50 00	5.26 05	–	2450980.4	1.06 02	−0.01 02	−0.54 03	−1.37 02	−1.52 03
2450210.4	6.30 02	5.70 01	5.55 01	5.39 08	–	2451006.5	1.02 01	−0.05 01	−0.57 01	−1.43 01	−1.47 02
2450233.4	6.38 02	5.76 02	5.52 01	5.31 04	–	2451033.4	0.98 01	−0.09 01	−0.65 01	−1.46 02	−1.57 03
CH Cyg						2451059.4	1.04 02	−0.04 03	−0.59 01	−1.40 02	−1.45 02
2449457.5	1.24 02	0.18 03	−0.46 01	−1.38 01	−1.47 04	2451068.3	1.05 02	−0.02 02	−0.56 02	−1.36 02	−1.50 02
2449499.5	1.09 02	0.03 01	−0.53 01	−1.43 02	−1.54 01	2451095.3	1.07 01	−0.04 02	−0.52 02	−1.42 02	−1.45 01
2449527.4	1.09 01	0.02 02	−0.53 01	−1.41 02	–	2451124.2	1.07 04	−0.09 02	−0.62 02	−1.39 04	−1.55 05
2449588.4	1.40 01	0.25 01	−0.30 02	−1.33 01	–	2451164.2	0.85 01	−0.23 01	−0.72 01	−1.53 01	−1.55 02
2449609.3	1.40 02	0.24 02	−0.38 02	−1.42 01	−1.56 03	2451174.1	0.84 01	−0.24 01	−0.71 01	−1.46 01	−1.41 01
2449858.5	1.72 01	0.47 01	−0.29 01	−1.51 02	−1.64 03	2451180.1	0.80 01	−0.26 02	−0.73 01	−1.50 01	−1.44 02
2449880.4	1.63 01	0.37 01	−0.34 00	−1.49 01	−1.66 02	2451299.6	0.74 02	−0.22 04	−0.76 02	−1.38 02	−1.48 02
2449885.5	1.60 00	0.36 00	−0.37 00	−1.53 00	−1.66 01	2451336.4	0.76 01	−0.24 02	−0.75 00	−1.45 01	−1.32 01
2449939.4	1.52 01	0.32 01	−0.40 01	−1.58 01	−1.74 01	2451351.5	0.79 04	−0.29 01	−0.76 00	−1.51 01	−1.37 01
2449944.4	1.58 00	0.37 00	−0.35 00	−1.50 02	−1.77 02	2451358.5	0.78 02	0.29 01	−0.77 01	−1.48 00	−1.39 01
2449969.4	1.57 01	0.32 01	−0.40 00	−2.10 02	−2.32 03	2451366.5	0.79 01	−0.25 02	−0.74 00	−1.52 01	−1.41 01
2449970.3	1.58 01	0.34 01	−0.36 01	−1.60 02	−1.72 02	2451383.6	0.82 01	−0.26 00	−0.72 01	−1.47 01	−1.38 02
2449973.4	1.61 02	0.38 02	−0.31 01	−1.56 01	−1.73 02	2451387.4	0.82 02	−0.23 01	−0.67 01	−1.49 02	−1.44 01
2449975.4	1.56 01	0.34 02	−0.39 01	−1.56 01	−1.78 02	2451420.4	0.82 01	−0.24 01	−0.73 01	−1.48 01	−1.34 00
2449976.3	1.56 00	0.34 00	−0.39 00	−1.55 01	−1.81 01	2451448.3	0.77 01	−0.28 02	−0.77 01	−1.51 01	−1.38 01
2450061.1	1.52 01	0.32 01	−0.39 01	−1.53 02	−1.75 04	2451452.3	0.73 01	−0.32 01	−0.79 02	−1.51 02	−1.45 01
2450200.5	1.50 00	0.30 00	−0.37 00	−1.52 01	−1.72 02	2451456.2	0.72 01	−0.27 00	−0.76 01	−1.52 02	−1.48 01
2450233.6	1.56 01	0.38 00	−0.32 00	−1.48 01	−1.76 02	2451475.3	0.82 01	−0.27 01	−0.73 01	−1.55 01	−1.64 01
2450242.6	1.62 01	0.43 01	−0.30 01	−1.45 02	−1.65 01	2451505.1	0.70 00	−0.35 00	−0.83 01	−1.59 01	−1.51 00
2450258.5	1.66 02	0.34 00	−0.25 01	−1.50 02	−1.67 01	2451524.2	0.71 00	−0.33 01	−0.80 01	−1.56 01	−1.52 01
2450264.5	1.70 01	–	−0.27 02	–	–	2451549.1	0.76 00	−0.28 01	−0.77 01	−1.53 01	−1.45 00
2450269.5	1.75 01	0.50 01	−0.27 01	−1.51 01	−1.69 01	2451641.5	0.73 01	−0.32 01	−0.74 02	−1.60 02	−1.52 01
2450295.5	1.74 02	0.50 01	–	–	–	2451684.5	0.87 01	−0.14 01	−0.67 00	−1.51 01	−1.52 01
2450296.5	1.77 02	–	–	–	–	2451706.4	0.85 01	−0.13 01	−0.58 01	−1.49 01	−1.56 01
2450303.4	1.74 02	0.52 01	−0.26 02	−1.50 01	−1.69 03	2451710.5	0.86 00	−0.12 01	−0.60 01	−1.49 00	−1.50 01
2450357.4	1.70 03	0.53 02	−0.22 02	−1.42 02	−1.55 04	2451737.4	0.86 01	−0.11 00	−0.62 00	−1.46 01	−1.49 01
2450359.3	1.72 01	0.44 02	−0.25 01	−1.61 05	−1.70 02	2451742.5	0.89 01	−0.15 01	−0.60 01	−1.46 00	−1.47 01

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*	JD	*J*	*H*	*K*	*L*	*M*
2451769.4	0.93 01	−0.09 00	−0.58 01	−1.46 01	−1.47 02	2454092.2	2.33 01	1.05 01	0.19 01	−1.17 01	−1.40 01
2451778.4	0.93 00	−0.09 01	−0.56 00	−1.44 01	−1.51 01	2454156.7	2.07 01	0.78 00	−0.06 01	−1.35 01	−1.54 01
2451824.2	0.86 00	−0.15 00	−0.62 01	−1.48 00	−1.51 01	2454219.5	1.94 01	0.66 01	−0.14 00	−1.47 00	−1.65 01
2451853.3	0.90 01	−0.13 01	−0.60 01	−1.44 01	−1.40 01	2454251.5	1.94 00	0.64 01	−0.17 00	−1.46 01	−1.58 01
2451866.1	0.90 00	−0.14 00	−0.60 00	−1.42 00	−1.45 01	2454283.3	1.83 00	0.54 00	−0.23 01	−1.51 00	−1.68 01
2451887.2	0.91 01	−0.11 01	−0.57 01	−1.50 01	−1.48 01	2454305.4	1.78 00	0.51 01	−0.27 01	−1.52 00	−1.65 01
2451902.1	0.84 00	−0.18 01	−0.64 00	−1.46 01	−1.44 01	2454311.4	1.76 00	0.49 01	−0.28 01	−1.52 00	−1.67 01
2451951.7	0.77 01	−0.27 00	−0.73 00	−1.47 01	−1.47 00	2454335.3	1.72 00	0.43 00	−0.30 01	−1.54 00	−1.65 01
2451982.6	0.76 00	−0.28 00	−0.73 00	−1.52 01	−1.50 00	2454339.4	1.73 01	0.47 01	−0.34 01	−1.57 01	−1.66 01
2452007.5	0.68 00	−0.35 01	−0.79 00	−1.52 00	−1.48 01	2454370.2	1.72 01	0.47 01	−0.20 01	−1.45 01	−1.71 02
2452031.6	0.66 01	−0.35 00	−0.78 00	−1.50 00	−1.53 01	2454375.2	1.72 01	0.46 01	−0.26 01	−1.49 01	−1.72 02
2452071.4	0.75 01	−0.28 00	−0.72 01	−1.46 01	–	2454397.2	1.56 01	0.38 01	−0.34 01	−1.49 01	−1.71 01
2452121.6	0.75 01	−0.29 01	−0.70 01	−1.39 01	−1.22 02	2454427.0	1.54 01	0.31 01	−0.36 01	−1.54 01	−1.63 01
2452133.5	0.69 01	−0.32 01	−0.73 01	−1.46 01	−1.40 01	2454427.1	1.56 01	0.34 01	−0.36 01	−1.55 00	−1.71 01
2452158.4	0.66 01	−0.35 01	−0.81 01	−1.44 00	−1.40 01	2454438.2	1.55 01	0.35 00	−0.34 00	−1.55 00	−1.67 00
2452188.3	0.64 00	−0.36 00	−0.78 01	−1.46 00	−1.35 01	2454444.2	1.56 00	0.33 01	−0.32 01	−1.54 00	−1.61 01
2452210.3	0.65 01	−0.34 00	−0.76 00	−1.42 01	−1.39 00	2454458.1	1.56 00	0.38 00	−0.35 00	−1.53 00	−1.70 01
2452420.6	0.78 00	−0.19 00	−0.62 01	−1.31 00	−1.26 00	2454577.5	1.38 00	0.21 00	−0.40 00	−1.52 01	−1.66 01
2452455.5	0.78 00	−0.20 00	−0.61 00	−1.37 02	−1.24 02	2454605.4	1.26 01	0.14 00	−0.46 00	−1.57 00	−1.73 01
2452488.5	0.74 00	−0.26 01	−0.66 00	−1.37 01	−1.25 01	2454659.5	1.30 00	0.20 01	−0.40 00	−1.47 00	−1.56 00
2452511.4	0.80 01	−0.19 00	−0.64 01	−1.35 00	−1.32 01	2454667.4	1.30 00	0.18 00	−0.40 00	−1.46 00	−1.56 00
2452518.4	0.78 01	−0.23 01	−0.60 01	−1.33 01	−1.26 01	2454686.3	1.27 01	0.16 01	−0.41 01	−1.46 01	−1.70 01
2452539.4	0.84 00	−0.16 00	−0.60 00	−1.29 00	−1.22 01	2454694.3	1.28 01	0.20 01	−0.39 00	−1.43 00	−1.60 01
2452600.1	0.75 00	−0.24 00	−0.72 00	−1.39 00	−1.29 00	2454699.4	1.25 00	0.18 00	−0.42 00	−1.46 00	−1.57 01
2452716.6	0.70 00	−0.31 01	−0.73 00	−1.40 00	−1.34 00	2454750.2	1.34 00	0.22 00	−0.35 01	−1.39 01	−1.56 00
2452751.6	0.73 00	−0.31 00	−0.71 01	−1.40 00	−1.32 01	2454779.2	1.25 01	0.17 01	−0.37 01	−1.42 01	−1.63 01
2452774.5	0.73 01	−0.30 01	−0.72 01	−1.37 01	−1.35 01	2454781.1	1.24 01	0.16 01	−0.39 00	−1.42 01	−1.62 01
2452800.5	0.65 00	−0.35 00	−0.77 01	−1.43 01	−1.35 01	2454804.1	1.22 01	0.14 01	−0.45 01	−1.42 00	−1.55 01
2452832.5	0.63 00	−0.38 01	−0.80 00	−1.45 00	−1.39 01	CI Cam					
2452870.4	0.66 00	−0.36 00	−0.78 00	−1.46 01	−1.38 01	2451164.5	7.11 01	5.65 00	4.44 01	2.90 02	2.43 04
2452892.4	0.65 01	–	0.78 00	−1.43 01	−1.39 01	2451176.3	7.15 00	5.68 01	4.49 00	2.93 01	2.52 02
2452921.3	0.63 01	−0.38 01	−0.78 01	−1.47 01	−1.42 01	2451180.3	7.05 01	5.60 01	4.42 00	2.88 01	2.49 01
2452984.2	0.64 01	−0.33 01	−0.72 01	−1.46 01	−1.40 00	2451199.3	7.06 00	5.57 00	4.36 01	2.87 01	2.34 02
2453112.6	0.65 00	−0.32 01	−0.74 00	−1.45 00	−1.38 01	2451205.3	7.07 01	5.61 01	4.39 00	2.86 01	2.51 02
2453188.6	0.71 00	−0.30 01	−0.72 01	−1.41 01	−1.38 01	2451420.6	7.04 00	5.64 01	4.30 01	2.71 01	2.49 02
2453222.4	0.73 01	−0.23 01	−0.71 01	−1.43 01	−1.31 01	2451447.5	7.07 01	5.62 01	4.30 00	2.70 00	2.40 02
2453543.4	0.80 01	−0.23 01	−0.66 00	−1.39 01	−1.36 01	2451475.6	7.04 01	5.56 01	4.27 03	2.70 01	2.30 01
2453598.4	0.82 00	−0.23 00	−0.73 00	−1.44 01	−1.36 01	2451502.4	7.12 00	5.61 01	4.31 01	2.69 02	2.34 02
2453667.3	0.76 01	−0.27 01	−0.72 00	−1.46 01	−1.45 01	2451525.4	7.13 01	5.61 01	4.28 01	2.66 01	2.31 02
2453683.2	0.77 00	−0.26 00	−0.73 00	−1.44 00	−1.49 01	2451548.3	7.20 01	5.67 01	4.32 01	2.68 01	–
2453821.6	0.77 00	−0.27 00	−0.72 01	−1.41 00	−1.44 00	2451831.5	7.51 00	5.92 01	4.51 01	2.73 01	2.21 02
2453870.6	0.73 01	−0.27 00	−0.71 00	−1.44 00	−1.41 01	2451862.4	7.56 01	6.00 01	4.54 01	2.71 01	2.32 02
2453953.3	0.93 01	−0.12 00	−0.58 00	−1.40 00	−1.35 01	2451918.3	7.54 01	5.98 01	4.56 01	2.76 01	2.42 02
2453959.3	1.00 01	−0.05 01	−0.56 00	−1.40 01	−1.32 01	2451950.3	7.52 00	5.96 00	4.56 01	2.81 00	2.35 01
2453989.3	1.30 01	0.27 01	−0.30 01	−1.29 01	−1.35 01	2451982.2	7.46 01	5.96 01	4.58 00	2.81 01	2.39 02
2454010.3	1.68 01	0.62 00	−0.04 01	−0.95 00	−1.21 01	2452157.6	7.52 01	6.00 00	4.65 01	2.92 01	2.66 01
2454013.2	1.76 01	0.63 01	0.03 00	−1.10 01	−1.24 01	2452187.6	7.52 01	6.00 01	4.63 01	2.94 01	2.63 03
2454019.2	1.85 01	0.76 01	0.10 01	−1.10 00	−1.26 01	2452217.5	7.50 01	6.01 01	4.64 01	2.94 01	2.67 02
2454021.2	1.92 01	0.81 01	0.13 00	−1.08 01	−1.27 01	2452249.4	7.54 01	5.98 01	4.68 01	2.95 02	2.57 02
2454022.2	1.94 01	0.83 01	0.13 00	−1.11 01	−1.26 01	2452309.2	7.49 00	6.01 01	4.67 00	2.95 01	2.67 02
2454023.2	1.97 02	0.80 01	0.15 00	−1.13 01	−1.40 01	2452339.2	7.45 00	5.99 01	4.67 00	2.97 01	2.61 01
2454049.2	2.40 01	1.18 01	0.35 01	−1.05 01	−1.24 01	2452541.6	7.25 01	5.81 01	4.56 00	2.92 01	2.67 03
2454086.2	2.37 01	1.08 01	0.22 01	−1.17 00	−1.36 01	2452606.5	7.29 00	5.89 01	4.61 00	3.02 01	2.67 02

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*	JD	*J*	*H*	*K*	*L*	*M*
2452697.3	7.22 01	5.79 01	4.56 00	2.95 00	2.58 01	2452840.5	5.86 00	–	4.54 01	–	–
2452984.4	7.42 01	5.95 01	4.63 01	3.03 01	2.55 01	2452870.4	5.90 00	–	4.58 00	–	–
2453688.6	7.21 00	5.77 01	4.49 00	2.89 00	2.48 02	2452892.3	5.86 00	–	4.55 00	–	–
2453963.6	7.24 00	5.79 01	4.52 01	2.86 01	2.63 02	2453135.5	5.85 00	4.87 01	4.54 00	4.23 01	4.51 05
2454434.4	7.28 01	5.90 01	4.62 00	3.01 01	2.65 02	2453193.5	5.86 01	–	4.53 01	–	–
2454479.3	7.30 00	5.88 00	4.65 00	3.02 00	2.60 01	2453222.4	5.88 01	–	4.56 01	–	–
2454762.6	7.35 01	5.96 01	4.74 01	3.13 01	2.71 02	2453548.5	5.86 00	4.89 01	4.54 01	4.26 01	–
2454812.3	7.34 01	5.98 01	4.77 01	3.16 00	2.63 04	2453571.4	5.91 01	–	4.59 01	–	–
CI Cyg						2453606.4	5.85 01	–	4.52 01	–	–
2449975.3	5.94 02	4.95 02	4.80 02	4.23 02	4.55 08	2453669.2	5.81 01	–	4.50 01	–	–
2450700.3	5.89 01	4.89 02	4.54 01	4.26 02	4.47 04	2453689.2	5.81 00	–	4.50 00	–	–
2450918.5	5.82 01	4.87 01	4.53 01	4.24 01	4.59 07	2453823.6	5.88 01	4.88 01	4.53 00	4.28 01	4.55 05
2451010.5	5.81 01	4.82 01	4.49 01	4.24 01	4.49 07	2453957.4	5.74 01	–	4.44 01	–	–
2451067.4	5.71 01	4.81 01	4.48 01	4.24 01	4.59 06	2453963.3	5.76 01	–	4.46 00	–	–
2451097.3	5.94 02	5.00 02	4.67 02	4.34 01	4.46 11	2454022.3	5.86 01	4.90 01	4.53 01	4.25 01	4.55 04
2451302.5	5.84 01	4.84 01	4.52 01	4.21 01	4.62 05	2454285.4	5.86 00	–	4.54 00	–	–
2451336.4	5.76 01	4.81 01	4.49 01	4.21 02	4.49 04	2454310.4	5.87 00	–	4.56 01	–	–
2451359.5	5.79 01	–	4.48 00	–	–	2454337.4	5.86 00	–	4.53 01	–	–
2451361.5	5.80 01	–	4.48 01	–	–	2454428.2	5.87 01	–	4.55 01	–	–
2451362.5	5.80 01	–	4.48 01	–	–	2454667.4	5.85 01	–	4.54 00	–	–
2451366.5	5.78 01	–	4.48 01	–	–	2454692.4	5.81 01	–	4.51 01	–	–
2451384.4	5.79 01	4.81 01	4.49 00	4.18 01	4.44 03	2454757.2	5.76 01	–	4.48 01	–	–
2451385.5	5.81 02	–	4.50 01	–	–	2454781.2	5.77 01	–	4.49 01	–	–
2451387.5	5.79 01	–	4.47 02	–	–	CO Ori					
2451420.4	5.77 01	–	4.47 01	–	–	2451950.3	8.54 01	7.63 01	6.77 00	5.63 02	5.44 05
2451451.3	5.82 01	4.82 01	4.50 01	4.22 01	4.52 04	2452218.6	8.44 01	7.58 00	6.74 01	5.59 01	5.46 07
2451454.3	5.81 01	–	4.50 01	–	–	2452310.3	9.15 02	8.06 01	7.02 01	5.79 01	–
2451455.3	5.81 00	–	4.48 01	–	–	2452313.3	9.13 01	8.05 01	7.04 00	5.76 01	–
2451456.3	5.80 01	–	4.48 01	–	–	2452339.3	8.12 01	7.40 01	6.64 01	5.64 02	–
2451520.2	5.89 02	4.92 02	4.57 02	4.26 01	4.49 04	2452569.5	8.09 01	7.31 01	6.59 01	5.48 01	–
2451645.6	5.88 00	4.89 00	4.57 00	4.29 00	4.53 02	2452619.4	8.17 00	7.44 01	7.18 01	7.04 02	–
2451707.5	5.82 01	4.84 01	4.49 00	4.23 01	4.52 05	2452658.3	8.72 01	7.79 01	6.88 01	5.65 01	–
2451741.5	5.84 01	4.84 01	4.51 01	4.20 01	4.42 06	2452691.2	8.36 01	7.54 01	6.72 01	5.63 01	–
2451768.4	5.84 02	4.83 01	4.50 01	4.24 01	4.62 10	2452716.2	8.35 01	7.52 01	6.74 01	5.61 02	–
2451770.4	5.83 01	–	4.51 01	–	4.48 11	2453308.6	8.72 02	7.81 01	6.88 00	5.70 01	–
2451772.4	5.85 01	4.85 02	4.53 00	4.25 01	4.54 10	2453357.3	8.78 02	7.81 01	6.91 01	5.74 03	–
2451780.4	5.84 01	4.87 00	4.52 00	4.21 01	4.46 08	2453412.2	8.70 01	7.69 01	6.69 01	5.49 02	–
2451782.4	5.83 01	–	4.55 01	–	–	2453423.3	8.92 02	7.82 02	6.76 01	5.48 02	–
2451802.3	5.85 01	4.87 01	4.55 00	4.22 00	4.42 04	2453437.2	8.84 01	7.78 01	6.79 01	5.53 03	–
2451832.2	5.84 01	4.85 01	4.54 01	4.24 01	4.56 04	2453683.5	8.05 01	7.35 01	6.57 01	5.57 01	–
2451850.3	5.80 01	4.84 01	4.52 01	4.22 01	4.58 05	2453820.2	8.42 02	7.51 02	6.78 01	5.61 02	–
2451864.2	5.85 00	4.88 01	4.54 01	4.26 01	4.58 03	2454011.6	8.22 01	7.44 01	6.65 01	5.52 01	–
2451867.2	5.84 01	–	4.56 00	–	–	2454111.4	9.30 02	8.04 01	6.88 01	5.55 02	–
2451887.2	5.85 01	–	4.54 01	–	–	2454150.3	8.99 02	7.88 01	6.83 01	5.54 01	–
2452125.4	5.83 01	–	4.54 01	–	–	2454426.5	8.27 01	7.51 02	6.71 01	5.62 02	–
2452127.4	5.86 01	–	4.53 01	–	–	2454478.4	–	–	6.77 01	5.69 01	–
2452153.4	5.86 00	–	4.54 01	–	–	2454479.3	8.40 01	7.60 01	6.78 00	5.67 02	–
2452158.3	5.85 01	–	4.53 01	–	–	2454481.3	8.49 01	7.61 01	6.80 01	5.68 02	–
2452163.4	5.85 01	–	4.53 00	–	–	CQ Tau					
2452188.3	5.82 01	–	4.50 00	–	–	2451834.6	8.36 01	7.41 01	6.40 01	5.12 02	–
2452209.2	5.81 00	–	4.51 00	–	–	2451850.6	9.10 02	7.88 01	6.66 00	5.25 01	–
2452513.4	5.89 01	4.92 01	4.57 01	4.28 01	–	2451853.5	8.65 01	7.66 01	6.61 00	5.26 01	–
2452539.4	5.87 00	–	4.55 00	–	–	2451863.5	8.50 01	7.58 00	6.56 01	5.25 01	–

Table 2. (Contd.)

JD	J	H	K	L	M	JD	J	H	K	L	M
2451865.4	8.57 01	7.58 01	6.56 00	5.24 01	–	2451902.6	6.46 01	4.02 01	1.02 01	−2.96 00	−4.35 01
2451866.5	8.61 01	7.63 01	6.59 00	5.26 01	–	2451925.5	6.30 01	3.85 01	0.87 01	−3.08 00	−4.49 01
2451867.5	8.49 01	7.56 01	6.59 01	5.25 01	–	2451934.5	6.18 00	3.79 01	0.79 01	−3.18 01	−4.58 01
2451902.4	8.39 00	7.49 01	6.49 00	5.24 01	–	2451950.4	6.19 00	3.67 01	0.72 01	−3.24 00	−4.61 01
2451925.3	8.69 01	7.67 01	6.64 01	5.34 01	–	2451976.4	5.98 01	3.51 01	0.52 01	−3.40 01	−4.76 01
2451932.3	8.56 01	7.58 01	6.58 01	5.30 01	–	2451986.3	6.04 01	3.53 01	0.55 01	−3.39 01	−4.66 01
2451934.4	8.10 01	7.34 01	6.47 01	5.24 02	4.93 04	2452007.3	5.99 00	3.52 00	0.54 00	−3.40 01	−4.69 00
2452209.6	8.12 01	7.33 00	6.41 00	5.14 01	–	2452037.3	6.04 00	3.55 01	0.57 00	−3.37 00	−4.65 01
2452281.3	8.88 01	7.72 00	6.60 01	5.21 01	–	2452301.5	7.67 02	5.35 01	2.35 00	−1.98 01	−3.49 01
2452308.4	8.80 01	7.66 01	6.55 01	5.17 01	–	2452309.5	7.71 01	5.37 00	2.38 00	−1.91 01	−3.40 01
2452536.6	8.22 02	7.48 01	–	–	–	2452313.5	7.56 01	5.24 01	2.25 00	−2.07 00	−3.56 01
2452539.6	8.37 01	7.56 00	6.60 01	5.31 01	4.98 04	2452335.4	7.79 01	5.46 00	2.44 01	−1.84 01	−3.30 01
2452597.6	8.45 01	7.45 01	6.44 00	5.16 01	–	2452346.4	7.70 04	5.46 00	2.44 00	−1.90 00	−3.62 01
2452666.3	8.56 02	7.54 01	6.53 01	5.28 01	–	2452367.3	7.81 01	5.48 01	2.48 01	−1.86 01	−3.45 01
2452691.3	8.68 02	7.71 01	6.67 00	5.35 01	–	2452381.3	7.66 02	5.46 01	2.45 01	−1.88 01	−3.56 01
2452694.3	8.71 01	7.72 01	6.67 00	5.34 01	–	2452599.6	6.00 01	3.64 00	0.61 00	−3.36 01	−4.67 01
2452698.3	8.72 01	7.73 01	6.70 01	5.36 01	–	2452675.5	5.88 01	3.59 01	0.56 00	−3.42 00	−4.73 01
2452724.2	8.60 02	7.64 00	6.67 01	5.40 01	–	2452684.4	5.90 01	3.60 01	0.58 01	−3.41 01	−4.81 01
2452958.5	8.63 00	7.62 00	6.58 00	5.26 01	–	2452694.4	5.98 01	3.64 01	0.60 01	−3.36 01	−4.64 00
2453003.4	8.79 01	7.67 00	6.58 01	5.20 01	–	2452723.4	6.08 00	3.86 01	0.80 00	−3.26 00	−4.65 00
2453355.5	8.64 01	7.62 01	6.52 02	5.19 01	–	2452739.3	6.22 01	3.97 01	0.89 01	−3.16 01	−4.49 01
2453423.3	8.45 02	7.58 03	6.50 01	5.13 01	–	2453003.6	7.97 02	5.66 01	2.61 01	−1.76 01	−3.33 01
2453667.5	8.69 02	7.73 01	6.57 01	5.21 01	–	2453096.3	7.41 01	5.35 01	2.23 01	−2.10 01	−3.51 01
2453688.5	8.06 01	7.34 01	6.46 01	5.20 01	–	2453112.3	7.21 01	5.23 01	2.12 01	−2.21 01	−3.80 01
2453747.5	8.43 01	7.47 01	6.51 01	5.26 01	–	2453127.3	7.08 01	5.03 01	1.94 01	−2.40 00	−3.79 01
2453816.3	8.80 01	7.70 01	6.56 01	5.20 01	–	2453308.6	6.04 00	3.84 00	0.75 01	−3.27 01	−4.58 01
2454011.5	8.70 01	7.60 01	6.50 01	5.17 01	–	2453356.6	6.12 01	3.98 00	0.89 00	−3.15 00	−4.49 01
2454111.4	8.28 01	7.36 01	6.40 01	5.14 01	–	2453434.4	6.49 00	4.44 01	1.36 01	−2.82 01	−4.22 01
2454150.2	8.28 01	7.39 01	6.40 01	5.08 01	–	2453485.3	6.88 02	4.84 01	1.77 01	−2.50 01	−4.04 01
2454369.6	7.96 01	7.13 00	6.19 01	4.95 01	–	2453747.5	7.21 01	4.93 01	1.76 00	−2.49 00	−3.95 00
2454426.4	8.09 01	7.21 01	6.22 01	4.97 01	–	2453788.4	6.80 01	4.51 01	1.34 00	−2.84 01	−4.24 01
2454476.4	8.03 01	7.12 00	6.18 00	5.02 01	–	2453820.4	6.22 24	4.17 01	1.03 01	−3.10 01	−4.50 01
2454480.3	7.69 01	6.97 01	6.13 00	5.01 01	–	2453828.3	6.41 01	4.10 01	0.92 01	−3.14 01	−4.56 00
2454481.3	7.70 01	6.98 00	6.18 00	5.05 00	–	2454111.5	6.96 01	4.66 00	1.54 00	−2.63 00	−4.00 00
2454483.4	7.69 01	6.98 01	6.16 00	5.02 01	–	2454150.4	7.17 01	4.96 01	1.84 01	−2.36 01	−3.82 00
2454502.4	7.72 01	6.99 00	6.14 01	4.96 01	–	2454190.4	7.45 01	5.26 01	2.13 01	−2.10 01	−3.57 01
2454522.3	7.79 00	7.05 00	6.17 00	4.94 02	–	2454428.6	6.52 01	4.20 00	1.08 00	−2.97 00	−4.33 01
2454530.3	7.72 02	7.02 01	6.14 01	4.94 02	–	2454476.6	6.02 01	3.78 01	0.69 00	−3.31 01	−4.67 00
2454553.3	8.12 01	7.19 01	6.21 01	5.02 02	–	2454483.5	6.07 01	3.74 01	0.63 01	−3.33 00	−4.69 01
2454756.6	8.85 02	7.74 01	6.54 01	5.06 01	–	2454522.4	6.08 01	3.66 00	0.57 00	−3.40 00	−4.71 01
2454783.4	8.38 01	7.50 00	6.51 01	5.12 01	–	2454577.3	5.95 01	3.59 00	0.52 01	−3.42 01	−4.67 01
2454804.4	8.07 02	7.34 02	6.47 01	5.23 03	–	2454781.6	7.07 01	4.85 01	1.77 01	−2.36 01	−3.89 01
CW Leo						CW Tau					
2451522.6	6.50 01	4.03 01	1.15 01	−2.87 00	−4.24 00	2451862.5	9.15 02	7.87 01	6.80 01	5.45 02	–
2451524.6	6.53 00	4.12 01	1.08 01	−2.94 01	−4.31 00	2452210.5	8.81 01	7.68 00	6.68 00	5.44 01	5.25 05
2451548.5	6.60 01	4.30 01	1.31 00	−2.78 00	−4.28 00	CY CMi					
2451581.4	6.91 02	4.58 00	1.57 00	−2.61 01	−4.07 00	2453022.5	6.76 01	6.58 02	6.52 01	6.36 02	–
2451608.4	7.33 02	4.98 02	2.00 01	−2.18 03	−3.82 02	DG Tau					
2451619.4	7.38 02	4.93 00	1.94 00	−2.25 01	−3.81 01	2451848.5	9.09 02	7.96 01	7.03 00	5.71 02	–
2451645.3	7.46 01	5.08 02	2.11 00	−2.12 01	−3.67 01	2451850.5	9.06 01	7.90 01	6.98 01	5.64 02	5.03 06
2451650.3	7.56 02	5.14 01	2.16 01	−2.13 01	−3.70 01	2452210.6	8.96 01	7.82 01	6.95 01	5.73 01	5.20 02
2451834.6	7.33 02	4.93 01	1.88 01	−2.29 00	−3.82 01	2452539.5	8.82 01	7.76 01	6.97 00	5.81 01	5.34 05
2451866.6	6.82 00	4.39 01	1.40 01	−2.66 00	−4.10 01	2453380.3	8.86 01	7.71 01	6.93 00	5.85 02	5.28 05

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*
2454020.5	8.85 02	7.78 01	6.98 01	5.83 02	5.29 06
2454115.3	8.91 02	7.80 01	6.96 01	5.60 01	4.92 04
2454434.5	8.87 02	7.72 01	6.82 01	5.58 01	5.07 05
2454478.2	8.99 02	7.77 01	6.95 01	5.74 01	5.19 04
2454762.5	8.85 02	7.80 02	6.95 01	5.92 02	5.21 06
DY Per					
2451549.3	6.29 00	5.11 00	4.31 00	3.26 01	–
2451557.2	6.37 01	–	–	–	3.52 02
2451776.5	6.08 00	4.93 01	4.16 01	3.07 02	3.08 23
2451833.5	5.91 00	4.81 01	4.10 01	3.05 01	2.95 01
2451853.4	5.92 00	4.79 00	4.08 01	3.02 01	2.96 01
2451867.4	5.90 01	4.80 01	4.08 00	3.01 01	2.87 02
2451918.2	5.90 01	4.77 01	4.07 00	3.02 00	2.98 01
2451935.2	5.90 00	4.81 01	4.11 01	3.04 01	2.93 01
2452132.5	5.79 01	4.67 01	3.97 01	2.85 01	2.83 01
2452157.5	5.82 01	4.69 01	3.95 01	2.82 01	2.87 01
2452186.5	5.88 01	4.73 01	3.96 00	2.79 00	2.88 01
2452208.5	5.88 01	4.72 01	3.97 01	2.79 01	2.72 00
2452217.4	5.89 01	4.74 01	3.98 01	2.82 01	2.86 01
2452249.4	5.96 01	4.84 01	4.04 01	2.90 01	2.95 02
2452306.2	6.03 01	4.94 01	4.12 01	2.90 01	2.92 02
2452514.6	6.62 01	5.30 00	4.39 00	3.04 00	2.95 01
2452541.5	6.48 01	5.17 01	4.33 01	3.05 01	3.01 02
2452619.4	5.96 00	4.83 00	4.08 00	2.93 00	2.99 01
2452684.3	5.91 01	4.75 00	4.03 01	2.85 00	2.80 02
2453284.5	9.03 02	7.18 02	5.31 01	3.18 01	2.68 02
2453356.4	8.50 01	6.67 01	5.10 01	3.11 01	2.80 01
2453437.2	7.58 02	6.03 01	4.84 01	3.13 01	2.86 02
2453657.5	6.10 01	4.88 01	4.03 00	2.74 01	2.61 02
2453963.5	6.60 01	5.34 00	4.41 01	3.00 01	2.94 02
2454020.4	7.02 01	5.70 01	4.71 00	3.14 01	2.93 02
2454336.6	5.98 01	4.77 01	3.90 01	2.59 00	2.48 01
2454370.5	5.93 01	4.74 00	3.89 01	2.60 01	2.42 01
2454434.3	5.96 01	4.82 01	3.96 00	2.64 01	2.51 01
2454479.2	6.08 00	4.88 00	4.02 00	2.70 00	2.52 01
2454484.2	6.12 01	4.91 00	4.06 00	2.73 01	2.44 01
2454762.4	6.98 01	5.64 01	4.67 00	3.13 01	2.86 01
2454781.4	7.58 01	6.15 01	5.03 01	3.30 00	2.95 01
2454812.3	8.90 02	7.18 01	5.61 01	3.59 00	3.03 01
EH And					
2452211.4	3.95 00	3.03 00	2.70 00	2.36 00	2.59 02
2452310.2	3.96 00	3.04 00	2.68 00	2.34 01	2.59 02
2452513.6	4.07 00	3.14 00	2.80 00	2.47 01	2.71 02
2452541.5	4.02 00	3.10 00	2.77 01	2.45 01	2.62 03
2452566.4	4.00 00	3.08 00	2.74 00	2.39 00	2.56 02
2452620.3	4.00 00	3.09 00	2.74 00	2.38 00	2.62 01
2452697.2	4.06 01	3.09 01	2.72 00	2.39 00	2.60 01
2452950.4	3.96 00	3.06 01	2.71 00	2.38 01	2.60 02
EQ Cas					
2451040.5	9.62 03	–	8.75 04	–	–
EZ Cet					
2451092.4	5.62 02	5.27 02	5.17 01	5.16 02	–
2451093.5	5.57 02	5.25 02	5.14 01	5.14 02	–

JD	*J*	*H*	*K*	*L*	*M*
2451121.4	5.53 02	5.23 01	5.15 01	5.18 02	–
2451180.2	5.56 01	5.20 05	5.16 01	5.12 03	–
2451184.2	5.56 01	5.22 02	5.15 01	5.12 02	–
FG Sge					
2449492.5	–	–	–	3.84 04	–
2449495.5	9.28 09	7.85 06	6.26 08	3.84 03	3.19 08
2449524.6	8.75 05	–	6.10 04	3.74 02	3.88 09
2449527.2	–	–	6.07 03	3.96 06	–
2449530.5	8.51 03	7.44 00	6.03 02	3.78 03	–
2449531.8	–	–	–	3.77 02	3.02 02
2449533.4	8.56 03	7.49 03	–	–	–
2449534.4	–	–	6.04 04	3.80 03	3.18 02
2449535.4	8.51 02	7.40 02	–	–	–
2449539.4	8.43 02	7.35 02	6.00 01	3.85 02	3.21 04
2449588.3	10.45 12	–	–	–	–
2449593.3	9.36 09	7.95 02	6.14 01	–	–
2449610.3	9.59 09	–	–	–	–
2449611.3	9.48 06	8.00 05	6.22 02	4.12 05	–
2449614.3	9.24 05	–	6.17 02	–	3.75 09
2449617.3	9.09 05	7.85 03	6.34 01	4.19 03	–
2449854.5	8.10 03	6.97 02	5.65 02	3.69 01	3.01 02
2449855.5	8.21 08	7.06 01	5.72 01	4.11 12	–
2449859.5	–	–	5.62 02	3.60 02	–
2449874.4	8.04 02	–	5.63 01	–	–
2449883.5	7.83 02	6.80 02	5.62 02	3.62 02	3.01 02
2449941.5	8.95 04	7.41 03	6.11 08	3.83 08	–
2449942.4	8.96 04	7.42 02	5.88 01	3.86 03	–
2449945.4	8.86 04	7.54 05	6.00 03	4.43 06	–
2449966.4	8.04 02	–	5.63 01	–	–
2449974.3	7.78 02	6.77 01	5.59 01	3.75 02	3.17 04
2449998.2	7.78 03	6.80 01	5.65 01	3.76 01	3.29 01
2450003.2	7.70 02	6.76 00	5.63 01	3.72 02	3.23 02
2450064.1	7.19 02	6.44 02	5.49 01	3.79 03	–
2450211.6	10.28 14	8.26 06	6.21 02	4.06 09	–
2450213.6	–	–	–	–	3.48 11
2450233.6	10.36 11	8.12 03	6.29 02	4.01 02	–
2450241.6	–	–	6.32 02	3.96 01	–
2450257.5	–	–	6.15 01	3.91 02	–
2450261.5	9.92 07	7.85 01	6.08 01	3.86 01	–
2450270.4	9.22 06	7.62 02	6.06 02	3.82 03	3.24 05
2450293.4	8.73 05	7.50 08	5.92 02	4.04 03	–
2450302.4	8.62 04	7.37 02	5.96 01	3.96 03	–
2450339.4	7.98 13	–	6.18 03	–	–
2450359.3	8.61 16	–	–	–	3.96 22
2450402.2	7.97 02	6.98 03	5.75 02	3.96 02	–
2450619.6	7.10 01	6.27 01	5.36 01	3.69 01	3.37 04
2450623.5	7.14 01	6.32 02	5.40 01	3.72 02	3.24 03
2450642.5	7.08 01	6.36 02	5.42 01	3.69 01	3.50 03
2450648.4	7.15 01	6.40 00	5.46 00	3.79 02	3.26 04
2450676.4	7.04 01	6.36 01	5.48 00	3.77 01	3.28 04
2450677.4	7.03 01	6.35 01	5.48 00	3.75 02	3.39 02
2450680.4	7.01 01	6.30 01	5.47 01	3.77 02	3.46 02
2450698.3	6.98 00	6.33 01	5.56 01	4.18 04	3.41 03

Table 2. (Contd.)

JD	J	H	K	L	M	JD	J	H	K	L	M
2450704.3	6.96 01	6.35 01	5.58 01	3.91 01	3.32 03	2452093.5	–	7.84 02	5.88 02	3.63 02	3.08 02
2450713.4	6.94 03	6.14 02	5.59 02	3.73 01	3.35 03	2452117.5	10.42 08	8.04 02	6.08 02	3.67 01	3.19 04
2450753.2	6.93 01	6.33 01	5.58 01	3.92 01	3.41 02	2452130.3	–	–	6.19 03	3.81 02	–
2450765.8	6.93 01	6.31 01	5.58 01	3.89 02	3.36 03	2452132.4	10.16 12	8.15 02	6.15 01	3.74 01	3.28 04
2450783.2	6.96 01	6.35 01	5.63 01	4.00 00	3.46 02	2452133.4	10.38 11	8.16 02	6.16 01	3.74 02	3.23 02
2450802.2	6.89 01	6.55 00	–	–	–	2452154.3	10.20 09	8.29 02	6.18 01	3.74 01	3.15 03
2450977.5	9.65 04	8.12 02	6.26 01	4.17 03	4.60 09	2452163.3	10.18 08	8.29 02	6.20 01	3.75 01	3.36 03
2450978.5	–	–	6.24 01	–	3.82 04	2452186.3	10.69 16	8.34 02	6.23 01	3.83 00	3.31 03
2450981.5	–	–	6.28 01	4.22 01	–	2452210.2	–	8.58 02	6.43 01	3.89 01	3.25 01
2451006.5	9.72 05	8.16 07	6.02 01	3.92 03	3.55 11	2452223.2	–	8.40 02	6.38 01	3.86 01	3.33 03
2451009.4	9.93 03	8.16 03	6.20 01	4.09 01	3.75 04	2452458.4	9.27 03	7.87 01	6.27 01	3.97 01	3.38 03
2451010.4	9.97 06	8.31 05	6.20 01	4.39 05	3.92 09	2452486.4	9.65 02	7.96 02	6.16 01	3.78 02	3.21 02
2451034.4	9.89 09	8.27 04	6.11 02	4.05 01	3.56 05	2452510.4	9.81 05	8.06 02	6.17 01	3.74 01	3.11 02
2451036.4	10.01 05	8.05 03	6.07 02	3.98 02	3.59 04	2452512.4	–	–	6.10 02	3.77 02	–
2451038.4	10.02 05	8.01 01	6.14 01	4.15 04	3.52 04	2452539.3	10.44 02	8.29 01	6.29 00	3.85 01	3.29 01
2451040.4	10.12 07	8.14 03	6.03 02	4.06 04	3.44 11	2452569.2	10.36 04	8.28 02	6.28 01	3.72 01	3.15 02
2451062.3	10.01 05	8.14 02	6.26 02	4.05 01	3.42 05	2452600.2	11.06 04	8.73 01	6.51 01	3.86 01	3.20 01
2451068.3	9.83 05	8.24 02	6.27 03	4.11 03	3.38 04	2452773.6	10.92 02	8.91 01	6.58 01	3.79 01	3.14 02
2451069.3	9.81 05	8.10 04	6.32 02	4.17 02	3.59 04	2452804.5	10.48 09	8.86 02	6.54 00	3.78 01	3.06 02
2451071.3	–	–	6.24 02	4.20 02	–	2452831.5	11.26 09	8.88 02	6.56 00	3.76 01	3.12 02
2451072.3	9.75 05	–	6.24 02	–	–	2452869.4	10.48 08	8.57 02	6.50 01	3.79 01	3.15 02
2451093.3	9.24 02	7.76 01	6.08 01	4.04 00	3.40 04	2452890.3	9.55 02	8.01 01	6.33 01	3.81 01	3.08 02
2451124.2	–	7.98 07	6.22 04	4.10 02	–	2452921.2	9.34 03	7.84 01	6.36 01	3.95 00	3.38 02
2451152.2	9.19 05	7.56 02	5.92 01	4.06 02	3.59 04	2452961.3	8.58 01	7.38 01	6.00 00	3.72 01	3.11 01
2451174.2	8.39 02	7.28 02	5.95 01	4.11 01	3.59 04	2453004.1	7.95 01	7.00 01	5.82 00	3.68 00	3.06 02
2451300.6	7.11 01	6.35 00	5.52 00	3.95 01	3.55 02	2453126.6	8.35 01	7.10 01	5.67 00	3.41 01	2.84 01
2451328.5	7.23 00	6.36 02	5.53 00	3.85 01	3.40 01	2453189.5	7.22 01	6.41 01	5.32 01	3.32 01	2.67 03
2451352.5	7.05 02	6.28 01	5.24 02	3.69 03	3.46 02	2453214.4	7.23 01	6.35 01	5.34 00	3.32 00	2.77 02
2451359.5	7.14 01	6.24 01	5.24 01	3.67 01	3.36 02	2453224.5	7.14 09	6.33 01	5.30 01	3.34 01	2.87 03
2451360.5	7.14 01	6.19 01	5.27 01	3.67 02	3.38 02	2453305.2	6.88 02	6.00 02	5.02 02	3.18 02	2.56 03
2451366.5	7.18 02	6.18 02	5.25 02	3.65 01	3.33 02	2453543.5	11.27 13	–	6.73 02	3.76 02	2.94 02
2451383.4	7.24 01	6.26 01	5.27 00	3.63 01	3.34 02	2453550.5	10.98 09	9.12 06	6.75 03	3.76 01	3.17 02
2451393.4	7.32 01	6.32 01	5.32 02	3.62 01	3.39 02	2453564.5	10.67 06	8.57 04	6.63 02	3.74 01	2.97 03
2451420.3	7.20 01	6.30 01	5.22 01	3.53 01	3.23 01	2453599.4	10.06 09	8.15 04	6.47 01	3.78 02	2.97 03
2451451.2	8.92 03	7.15 01	5.56 02	3.60 02	3.25 02	2453667.2	11.90 28	8.69 05	6.48 01	3.67 01	2.86 02
2451452.3	9.22 05	7.30 02	5.54 03	3.61 02	3.28 03	2453688.2	12.27 16	8.99 04	6.72 02	3.83 01	3.11 02
2451455.2	8.96 02	7.24 02	5.51 01	3.61 02	3.13 02	2453873.5	10.05 01	8.49 03	6.64 01	3.92 00	3.16 01
2451505.2	9.29 03	7.46 01	5.75 01	3.67 01	3.25 02	2453921.4	9.21 02	7.71 02	6.18 01	3.85 01	3.15 03
2451649.6	7.35 01	6.54 01	5.54 00	3.70 01	3.22 02	2453952.4	9.15 01	7.66 01	6.14 01	3.80 00	3.18 02
2451685.5	7.32 01	6.53 01	5.57 01	3.74 01	3.27 02	2453960.4	9.41 02	7.87 01	6.14 01	3.74 01	3.10 02
2451706.5	7.26 01	6.48 01	5.46 01	3.70 01	3.09 02	2453964.4	9.59 03	7.93 02	6.23 01	3.79 01	3.12 03
2451711.5	7.23 01	6.45 01	5.46 01	3.68 02	3.16 02	2453987.4	9.99 03	8.41 04	6.40 02	3.85 01	3.00 02
2451737.5	6.93 01	6.20 01	5.35 01	3.63 02	3.14 02	2454013.3	9.96 02	8.15 02	6.33 01	3.81 01	3.05 01
2451767.4	6.90 02	6.19 02	5.35 02	3.64 02	3.17 04	2454219.6	7.59 01	6.66 01	5.63 01	3.57 00	2.85 01
2451773.4	6.91 01	6.22 02	5.32 01	3.68 02	3.22 06	2454251.5	8.20 02	7.10 01	5.83 01	3.60 01	2.94 02
2451779.3	6.94 00	6.22 01	5.29 01	3.62 01	3.14 04	2454283.4	9.86 03	8.14 01	6.28 01	3.70 00	2.99 02
2451801.3	7.13 01	6.30 01	5.32 01	3.60 01	3.16 02	2454306.4	10.26 04	8.22 01	6.21 01	3.62 01	2.90 02
2451831.2	7.25 02	6.44 02	5.34 02	3.78 02	3.26 02	2454312.4	10.08 04	8.20 02	6.17 01	3.64 01	3.00 02
2451834.2	7.24 01	6.40 01	5.42 01	3.70 01	3.19 02	2454335.4	10.08 04	8.11 01	6.13 01	3.55 00	2.96 02
2451856.2	6.98 01	6.27 00	5.36 00	3.66 01	3.24 01	2454339.3	9.96 02	8.18 01	6.15 01	3.61 01	2.93 02
2451865.2	6.88 01	6.18 01	5.30 01	3.60 01	3.21 01	2454370.3	9.79 03	8.04 02	6.11 02	3.59 01	2.78 01
2451868.2	6.88 01	6.17 01	5.33 01	3.65 01	3.10 02	2454427.2	9.81 03	7.92 01	6.00 01	3.54 01	2.81 01
2451888.2	6.94 01	6.26 01	5.42 01	3.64 00	3.17 02	2454605.5	11.79 20	9.51 04	6.83 01	3.70 01	2.79 01

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*
2454659.5	11.11 09	9.14 03	6.70 01	3.57 01	2.80 02
2454695.3	11.28 12	9.53 04	6.85 02	3.68 01	2.74 01
2454698.4	11.16 19	9.46 02	6.95 05	3.74 01	2.88 03
2454699.4	12.2:	9.67 04	6.92 07	3.77 01	2.89 02
2454700.4	–	9.61 03	6.94 02	3.75 01	2.91 02
2454702.4	12.0:	9.69 03	7.02 03	3.88 02	–
2454703.3	12.0:	–	7.07 02	3.82 01	–
2454757.2	–	9.88 05	7.26 04	3.80 02	2.83 02
2454763.2	–	9.67 05	6.94 01	3.76 00	2.82 01
2454783.2	–	9.48 03	6.85 01	3.72 00	2.76 01
HD 13974					
2451449.5	3.69 00	3.29 01	3.26 01	3.22 01	3.29 02
2451450.5	3.71 00	3.33 01	3.26 02	3.23 01	3.34 02
2451452.5	3.71 00	3.33 01	3.25 01	3.23 01	3.31 02
HD 14947					
2453067.2	7.17 02	6.95 02	6.88 01	6.85 04	–
2453307.5	7.10 01	6.98 01	6.85 04	6.67 08	–
HD 16691					
2453303.5	7.67 01	7.47 01	7.24 00	7.16 08	–
2453307.5	7.63 02	7.46 01	7.31 01	7.26 10	–
HD 18409					
2453303.5	7.40 01	7.32 00	7.17 01	7.00 05	–
2453308.5	7.48 01	7.32 00	7.28 01	7.14 08	–
HD 19373					
2451453.4	3.05 02	2.82 01	2.74 01	2.71 01	2.74 01
2451455.6	3.04 00	2.79 00	2.72 01	2.72 01	2.75 01
HD 20630					
2450793.4	3.70 01	3.40 01	3.30 01	3.27 01	3.32 02
2450817.3	3.70 00	3.39 01	3.30 00	3.26 02	3.35 03
HD 25680					
2450777.4	4.78 00	4.50 01	4.40 00	4.38 01	4.43 07
2450853.3	4.70 01	4.50 01	4.37 00	4.33 01	4.50 08
2450874.2	4.79 00	4.47 01	4.40 01	4.35 01	4.39 08
2451088.5	4.78 02	4.47 02	4.39 02	4.38 01	4.50 08
2451092.5	4.78 01	4.45 01	4.40 01	4.38 02	4.40 06
2451093.5	4.77 01	4.48 02	4.40 01	4.41 01	4.37 05
HD 27685					
2451448.6	6.62 01	6.31 02	6.22 00	6.18 03	–
2451449.6	6.62 01	6.28 01	6.20 01	6.18 03	–
2451452.6	6.61 01	6.29 00	6.22 01	6.18 02	–
HD 30614					
2453073.2	4.32 02	4.25 02	4.20 02	4.20 01	–
2453100.2	4.30 01	4.26 01	4.27 01	4.23 01	–
HD 34411					
2451453.6	3.61 01	3.34 01	3.24 01	3.21 01	3.29 02
2451504.5	3.68 01	3.41 01	3.31 01	3.28 01	3.31 01
2451514.5	3.67 01	3.38 01	3.33 01	3.30 01	3.29 01
2451516.5	3.74 01	3.40 01	3.35 01	3.30 01	3.33 02
2451524.4	3.65 01	3.38 01	3.31 01	3.30 01	3.30 02
HD 34656					
2453072.4	6.67 01	6.71 01	6.61 01	6.60 04	–
2453100.2	6.69 02	6.71 01	6.69 01	6.65 03	–
HD 72905					
2451240.3	4.53 01	4.25 01	4.21 00	4.17 01	–
HD 76151					
2450874.4	5.17 00	5.56 01	5.67 01	5.75 01	–
2450908.3	5.19 01	5.56 02	5.64 02	5.73 02	–
HD 86728					
2450853.5	4.21 01	3.88 01	3.81 01	3.79 01	3.75 02
2450867.4	4.21 01	3.89 01	3.81 01	3.83 01	3.82 03
2450868.5	4.22 00	3.88 01	3.81 01	3.81 01	3.81 04
2450869.4	–	–	–	3.83 02	3.76 05
2450873.4	–	–	–	–	3.85 04
HD 89010					
2450487.5	4.80 00	4.49 01	4.43 01	4.45 03	4.50 04
2450504.5	–	4.49 01	4.42 00	–	–
2450521.4	4.81 00	4.50 00	4.44 00	4.40 01	4.52 04
2450853.5	4.78 01	4.49 01	4.42 00	4.40 01	4.54 03
2450866.5	4.78 00	4.47 01	4.42 01	4.41 02	–
2450867.4	–	–	–	–	4.51 06
2450868.5	–	–	–	–	4.58 06
2450869.4	–	–	–	–	4.50 09
HD 109358					
2451682.3	2.82 02	2.42 01	2.32 01	2.26 01	2.24 03
2451683.3	2.82 01	2.38 01	2.32 01	2.26 01	2.29 03
2451684.3	2.81 01	2.43 01	2.31 01	2.27 01	2.27 02
2451685.3	2.83 01	2.42 00	2.34 00	2.28 01	2.29 04
2451686.3	2.86 01	2.42 01	2.33 01	2.26 01	2.27 03
HD 115043					
2451683.3	5.70 01	5.45 01	5.38 01	5.23 02	–
2451684.4	5.76 01	5.45 01	5.38 01	5.26 01	–
2451685.4	5.73 01	5.48 00	5.46 01	5.27 02	–
2451686.4	5.72 01	5.47 01	5.38 01	5.27 01	–
HD 117176					
2451240.5	3.69 01	3.31 01	3.23 01	3.22 01	3.30 02
2451661.4	3.64 01	3.27 01	3.19 01	3.16 01	3.17 02
2451687.3	3.70 01	3.31 01	3.25 02	3.21 01	3.30 03
2451707.3	3.71 01	3.34 01	3.25 01	3.21 01	3.27 02
HD 141004					
2451683.4	3.36 01	3.09 01	3.04 01	2.99 01	3.08 02
2451684.4	3.37 01	3.11 01	3.03 00	2.97 01	3.14 02
2451685.4	3.36 01	3.08 01	3.04 01	3.10 02	3.06 04
2451687.4	3.35 01	3.09 02	3.01 01	2.98 02	3.06 03
HD 142267					
2451387.3	4.99 02	4.65 01	4.56 02	4.52 02	–
2451393.3	4.93 01	4.61 01	4.51 06	4.50 03	–
2451684.4	4.96 01	4.65 01	4.59 00	4.52 01	–
2451685.5	4.97 01	4.64 01	4.57 00	4.49 02	–
HD 143761					
2451384.3	4.33 01	3.96 01	3.89 01	3.70 01	–
2451385.3	4.36 01	3.96 01	3.89 01	3.68 01	–
2451386.3	4.38 02	3.98 03	3.89 01	3.72 01	–
2451387.3	4.33 01	3.96 01	3.90 01	3.67 02	–
2451647.5	4.30 01	3.96 01	3.89 00	3.72 01	3.86 02
2451649.5	4.32 01	3.99 01	3.91 00	3.76 00	3.94 03
2451650.6	4.28 01	3.97 00	3.90 00	3.75 01	3.83 01
HD 144282					
2453096.6	6.22 00	–	5.93 00	–	–

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*
2453100.5	6.22 00	–	5.94 00	–	–
2453112.5	6.25 00	–	5.96 00	–	–
2453126.4	6.20 00	–	5.94 00	–	–
2453133.5	6.23 01	–	5.97 00	–	–
2453816.6	6.21 01	–	5.95 01	–	–
2453823.5	6.24 01	–	5.98 00	–	–
2453870.5	6.25 00	–	5.95 00	–	–
2453964.3	6.24 01	–	5.94 00	–	–
HD 179218					
2450257.4	–	–	–	–	4.36 08
2452801.5	7.07 00	6.70 00	6.02 00	4.69 02	–
2452831.4	7.09 01	6.71 01	6.02 00	4.70 01	4.42 04
2452868.3	7.09 01	6.71 00	6.01 00	4.69 01	–
2452891.3	7.13 01	6.74 01	6.03 00	4.72 01	–
2453128.6	7.09 00	6.72 00	6.06 00	4.72 01	4.31 02
2453192.4	7.09 00	6.73 00	6.03 00	4.70 02	–
2453217.4	7.09 01	6.74 01	6.02 01	4.68 01	–
2454666.4	7.06 01	6.73 01	6.04 00	4.72 01	–
HD 187923					
2451063.3	5.00 01	4.64 01	4.62 01	4.52 01	–
2451065.3	5.00 02	4.66 01	4.60 01	4.59 01	–
2451066.3	5.03 01	4.68 01	4.60 01	4.57 02	–
2451069.3	5.04 03	4.71 02	4.60 02	4.56 02	–
2451071.2	5.00 02	4.66 02	4.58 02	4.55 03	–
HD 188209					
2453163.4	5.88 01	5.82 01	5.85 01	5.84 03	–
2453225.4	5.73 01	5.60 02	5.84 00	5.73 02	–
2453226.4	5.89 00	5.75 01	5.85 00	5.86 01	–
HD 189395					
2452537.3	5.64 00	5.62 00	5.65 01	5.58 01	–
HD 190429A					
2453163.5	6.19 01	6.07 01	6.09 01	6.01 03	–
2453216.4	6.28 01	6.12 01	6.14 01	6.13 04	–
2453225.4	6.18 01	6.01 01	6.19 01	5.98 08	–
HD 192639					
2453216.4	6.45 01	6.23 01	6.20 01	6.25 04	–
2453307.3	6.45 01	6.40 02	6.26 01	6.24 04	–
HD 193514					
2453216.5	6.54 00	6.33 01	6.31 01	6.27 03	–
2453226.4	6.56 00	6.34 01	6.34 01	6.40 06	–
HD 202124					
2453218.6	7.27 00	7.16 01	7.09 01	6.97 08	–
2453308.2	7.21 01	7.13 01	7.06 01	7.12 09	–
HD 207198					
2453223.5	5.51 01	5.35 02	5.39 01	5.37 04	5.58 10
HD209975					
2453223.5	5.01 01	4.97 01	5.00 01	5.12 05	5.00 07
HD 210809					
2453224.5	7.46 01	7.41 01	7.38 02	7.55 09	–
HD 210839					
2453223.6	4.62 01	4.52 01	4.54 01	4.57 02	4.44 05
HD 213575					
2450699.4	5.73 01	5.38 02	5.32 01	5.27 02	–
2450700.4	5.74 01	5.38 01	5.33 01	5.32 03	–
2450704.4	5.75 01	5.39 02	5.32 01	5.28 03	–
HD 217014					
2451059.4	4.37 02	4.07 03	3.99 02	3.96 01	4.18 17
2451060.5	4.39 02	4.09 02	3.96 02	3.95 02	4.11 09
2451061.4	4.39 02	4.06 01	3.97 01	3.95 02	4.08 06
2451062.5	4.35 02	4.05 00	4.00 02	3.94 00	4.12 04
HD 218915					
2453305.4	7.19 02	7.29 02	7.26 03	7.13 08	–
2453307.4	7.25 01	7.25 02	7.30 02	7.16 08	–
HD 221246					
2452958.3	3.78 00	–	2.91 00	–	–
2454306.6	3.79 00	–	2.90 01	–	–
2454335.5	3.78 00	–	2.89 01	–	–
2454369.5	3.77 00	–	2.90 00	–	–
2454373.4	3.76 01	–	2.90 01	–	–
HD 225160					
2453305.4	7.56 02	7.49 03	7.42 04	–	–
2453307.4	7.57 02	7.51 01	7.46 03	7.41 09	–
HD 338926					
2453192.4	7.02 00	6.70 00	6.50 01	–	–
2453224.4	6.93 09	6.64 01	6.48 01	6.28 07	–
HE 2-442					
2451776.3	–	9.44 10	7.02 01	4.48 01	–
2453959.4	10.84 06	–	6.29 02	4.40 03	–
HK Ori					
2453308.6	9.46 01	8.44 02	7.38 01	5.92 03	5.51 09
2453356.5	9.43 02	8.49 01	7.44 02	5.98 02	5.57 05
2453437.3	9.68 04	–	7.69 02	6.16 03	5.75 08
2453683.6	9.67 03	8.67 02	7.65 01	6.27 02	5.62 08
2453822.3	9.84 04	8.89 02	7.88 03	6.36 03	5.65 04
2454019.6	9.56 01	8.59 02	7.62 01	6.12 03	–
2454111.4	9.68 03	8.78 02	7.78 01	6.28 02	–
2454434.5	9.75 04	8.77 03	7.72 02	6.09 03	–
2454479.4	9.57 02	8.56 01	7.51 01	6.02 02	5.34 06
2454481.4	–	8.60 01	7.53 01	6.04 02	5.35 05
2454756.5	9.65 03	8.71 01	7.66 01	6.16 02	5.36 06
2454783.5	9.62 02	8.74 03	7.68 01	6.12 03	–
HM Sge					
2449884.5	7.28 01	5.46 01	3.92 01	1.83 01	1.38 01
2449974.3	7.59 05	5.77 03	4.25 01	2.17 01	1.63 04
2449975.3	7.62 03	5.80 01	4.27 02	2.17 02	1.79 03
2450260.5	7.48 02	5.71 02	4.24 00	2.10 02	1.49 02
2450625.5	7.68 02	6.07 01	4.66 00	2.69 02	2.18 01
2450698.3	7.43 01	5.97 02	4.52 01	2.62 03	2.07 03
2450714.3	7.29 01	5.79 01	4.45 01	2.53 01	1.98 02
2450754.2	7.01 01	5.56 00	4.29 00	2.42 01	1.91 02
2450980.5	5.72 01	4.26 03	3.38 02	1.79 02	1.47 03
2451008.4	5.91 02	4.51 01	3.49 01	1.94 05	1.64 02
2451036.5	6.15 03	4.69 03	3.72 03	2.10 02	1.64 04
2451062.3	6.38 02	4.94 01	3.89 01	2.17 02	1.67 04
2451097.2	6.68 01	5.20 02	4.10 01	2.35 02	1.78 03
2451299.6	6.70 01	5.31 01	4.02 02	2.14 01	1.74 03

Table 2. (Contd.)

JD	J	H	K	L	M	JD	J	H	K	L	M
2451336.5	6.31 01	4.92 01	3.72 01	1.87 01	1.56 01	2454667.4	7.42 01	5.52 00	3.84 00	1.75 00	1.39 01
2451364.4	6.28 01	4.90 02	3.59 01	1.81 01	1.43 02	2454693.3	7.52 01	5.62 01	3.93 01	1.82 01	1.35 01
2451384.4	6.24 01	4.80 00	3.53 01	1.72 01	1.34 01	2454750.3	7.90 02	5.94 01	4.24 01	2.09 02	1.53 02
2451420.3	6.25 01	4.73 01	3.49 01	1.71 01	1.43 01	2454763.2	8.03 01	6.07 01	4.36 00	2.19 00	1.59 01
2451451.2	6.32 01	4.85 01	3.53 00	1.75 01	1.35 01	2454781.2	8.16 01	6.18 01	4.48 01	2.26 01	1.64 01
2451454.2	6.33 01	4.82 02	3.55 01	1.68 02	1.33 01	ICC 2149					
2451647.6	7.94 01	6.18 01	4.61 00	2.52 01	2.04 01	2451514.5	10.57 04	10.60 04	10.08 04	–	–
2451685.6	8.05 01	6.36 01	4.73 00	2.58 01	2.07 01	2451524.5	10.47 04	–	9.91 05	–	–
2451706.5	8.17 01	6.42 02	4.76 01	2.59 01	1.99 01	2451866.6	10.58 03	10.54 03	10.11 02	–	–
2451711.4	8.19 02	6.39 01	4.77 01	2.58 01	2.06 02	2451925.4	10.64 04	10.68 03	10.14 05	–	–
2451719.5	8.17 02	6.39 01	4.73 01	2.52 01	2.05 02	2452192.6	10.41 05	10.50 08	9.90 03	–	–
2451737.4	8.12 02	6.35 01	4.71 01	2.50 02	1.96 02	2452309.4	10.51 05	10.58 05	10.02 05	–	–
2451772.3	7.98 02	6.27 01	4.63 01	2.42 02	1.99 04	2452683.4	10.46 04	10.44 04	10.03 05	–	–
2451778.3	7.93 01	6.22 01	4.55 00	2.39 01	1.86 03	2453820.3	10.55 04	10.64 03	10.10 05	–	–
2451824.3	7.56 01	5.84 00	4.24 00	2.15 01	1.66 02	2453822.3	10.53 04	10.57 06	10.10 07	–	–
2451856.2	7.18 01	5.49 01	3.95 00	1.94 01	1.49 01	IC 4997					
2451864.2	7.08 01	5.41 01	3.89 01	1.87 01	1.47 01	2451455.3	10.14 03	10.27 04	9.64 04	8.22 14	–
2451868.2	6.98 01	5.31 01	3.78 01	1.83 01	1.33 01	2451708.5	10.32 06	–	9.89 04	8.12 14	–
2452092.4	6.82 03	5.31 01	4.00 01	2.18 03	1.62 01	2451716.5	10.16 08	–	–	–	–
2452126.4	7.14 01	5.56 02	4.19 02	2.25 01	1.77 02	2451719.5	10.22 05	10.41 04	9.72 05	8.44 13	–
2452154.3	7.35 01	5.75 01	4.40 01	2.39 01	2.04 02	2451778.4	10.24 05	10.60 06	9.78 05	–	–
2452163.3	7.45 01	5.83 00	4.45 00	2.44 00	2.00 01	2451868.2	10.31 06	10.44 05	9.80 06	–	–
2452187.2	7.61 01	5.96 01	4.53 00	2.48 01	2.12 02	2452191.3	10.18 07	10.36 06	9.89 05	–	–
2452211.2	7.72 01	6.04 00	4.57 00	2.52 01	2.06 01	2452488.5	10.22 06	–	9.37 05	–	–
2452223.2	7.70 01	6.05 00	4.56 01	2.51 01	2.08 01	2452514.4	10.21 05	10.35 08	9.77 07	–	–
2452458.5	6.76 01	5.15 01	3.70 00	1.70 01	1.39 01	2452839.5	10.12 02	10.56 06	9.66 03	8.17 09	–
2452511.4	6.77 01	5.14 00	3.71 01	1.75 01	1.33 01	2453689.2	10.22 03	10.61 05	9.76 03	–	–
2452540.3	6.88 00	5.22 00	3.78 01	1.81 00	1.46 01	2453957.4	10.21 03	10.58 05	9.89 03	–	–
2452778.5	8.36 02	6.52 02	4.78 01	2.55 01	2.00 02	KV UMa					
2452801.5	8.33 01	6.38 01	4.67 00	2.46 00	1.96 01	2451647.3	12.4:	–	10.79 09	–	–
2452834.4	8.15 00	6.27 01	4.62 01	2.40 01	1.85 01	2451649.5	12.1:	12.0:	10.93 12	9.1:	–
2452842.4	8.23 01	6.34 01	4.59 01	2.38 01	1.96 02	2451650.3	12.5:	11.8:	10.80 07	9.3:	–
2452868.4	7.98 01	6.11 01	4.44 00	2.25 01	1.81 02	2451659.3	–	–	10.98 17	–	–
2452925.3	6.67 01	4.93 03	3.27 01	1.29 02	0.89 02	2451660.3	11.9:	11.7:	10.89 11	–	–
2453193.4	7.12 00	5.52 01	4.19 01	2.28 01	1.83 02	2451661.3	12.5:	11.8:	11.02 15	–	–
2453217.4	7.18 01	5.68 01	4.31 01	2.37 01	1.84 02	2451684.3	12.4:	11.5:	10.94 15	–	–
2453547.5	5.99 01	4.61 01	3.38 01	1.58 01	1.26 01	2451707.3	12.4:	–	11.20 18	–	–
2453569.4	6.05 01	4.59 00	3.42 01	1.63 01	1.33 01	KX And					
2453599.4	6.12 01	4.69 01	3.46 01	1.68 01	1.29 02	2449974.4	5.73 01	5.31 01	5.14 01	4.93 02	4.91 08
2453667.2	6.66 01	5.15 01	3.92 01	2.02 01	1.58 01	2449975.5	5.66 01	5.34 01	5.12 01	4.97 02	4.83 10
2453684.2	6.82 01	5.28 01	3.98 00	2.08 01	1.63 02	2449976.5	5.75 03	5.26 01	5.12 01	4.83 02	4.81 07
2453905.5	7.96 01	6.12 01	4.48 01	2.32 01	1.91 01	2450361.4	5.88 03	5.39 01	5.26 01	5.00 03	4.88 11
2453932.5	7.71 02	5.87 01	4.22 01	2.12 02	1.72 02	2450362.4	5.88 03	5.39 01	5.26 01	5.00 03	4.88 11
2453953.4	7.27 01	5.56 00	3.95 01	1.86 00	1.43 01	2451033.6	5.84 01	5.40 01	5.16 00	5.01 03	–
2453962.4	7.19 01	5.49 01	3.91 01	1.80 01	1.43 01	2451060.5	5.83 03	5.30 02	5.13 01	4.97 02	–
2454010.3	6.90 01	5.24 01	3.65 00	1.64 01	1.32 01	2451069.5	5.77 02	5.28 01	5.10 02	4.94 03	4.94 08
2454283.5	8.44 02	6.41 01	4.67 01	2.46 01	1.93 02	2451088.5	5.75 02	5.31 02	5.11 02	4.95 02	5.03 06
2454305.4	8.57 01	6.55 01	4.77 00	2.54 01	2.02 02	2451095.4	5.81 01	5.37 02	5.15 01	5.02 02	5.16 07
2454336.4	8.65 02	6.57 01	4.77 00	2.53 01	2.05 02	2451128.3	5.77 01	5.32 02	5.16 01	5.03 03	5.17 05
2454370.2	8.62 02	6.56 01	4.76 01	2.52 01	1.93 01	2451152.3	5.83 02	5.36 01	5.19 00	5.02 02	5.06 06
2454426.1	8.60 02	6.53 01	4.72 01	2.47 01	1.97 01	2451184.2	5.70 00	5.29 00	5.06 00	4.93 01	5.09 05
2454606.5	7.42 01	5.50 01	3.83 00	1.73 00	1.28 01	2451385.6	5.83 01	5.40 01	5.18 01	5.01 02	5.07 03
2454659.4	7.40 01	5.46 01	3.85 00	1.75 01	1.37 02	2451420.5	5.74 01	5.33 01	5.08 01	4.94 02	5.08 04

Table 2. (Contd.)

JD	*J*	*H*	*K*	*L*	*M*	JD	*J*	*H*	*K*	*L*	*M*
2451446.5	5.78 00	5.35 01	5.13 02	4.99 01	5.19 09	2452984.3	8.26 01	5.69 01	3.21 00	0.05 01	−1.10 01
2451447.5	5.68 02	5.14 01	5.02 02	4.75 02	5.09 06	2453022.2	8.14 02	5.58 00	3.08 00	−0.08 01	−1.11 01
2451448.4	5.83 01	5.38 02	5.22 01	5.06 02	5.16 07	2453192.5	8.36 02	5.66 01	3.22 00	0.12 01	−0.86 01
2451449.5	5.86 01	5.40 01	5.20 01	5.02 01	5.14 06	2453217.5	8.35 02	5.76 00	3.32 00	0.21 00	−0.69 01
2451450.4	5.84 01	5.37 02	5.18 01	5.05 02	5.10 08	2453284.4	8.76 03	6.13 01	3.71 01	0.63 01	−0.51 01
2451451.5	5.82 02	5.35 03	5.19 02	4.94 02	5.16 05	2453305.4	8.86 03	6.31 01	3.85 00	0.74 00	−0.32 01
2451452.4	5.81 01	5.34 02	5.14 01	4.99 03	4.97 03	2453356.4	9.24 02	6.57 01	4.12 01	1.03 01	0.12 02
2451453.4	5.79 01	5.29 03	5.14 02	5.03 02	4.95 07	2453548.5	8.75 03	6.01 01	3.61 01	0.66 01	−0.33 01
2451454.4	5.74 02	5.36 03	5.11 01	4.94 02	5.09 04	2453600.6	8.02 02	5.47 01	3.08 01	0.01 01	−0.92 01
2451455.4	5.71 01	5.29 01	5.09 01	5.08 02	4.94 04	2453657.4	7.82 02	5.32 01	2.92 01	−0.14 01	−1.16 01
2451475.4	5.79 01	5.32 01	5.12 01	5.00 01	5.13 05	2453683.3	7.84 00	5.27 00	2.87 00	−0.17 00	−1.24 00
2451505.3	–	–	–	5.05 01	–	2453952.6	9.03 02	6.29 01	3.90 00	1.01 01	−0.01 01
2451520.3	5.80 02	5.36 02	5.15 01	4.98 01	5.12 04	2453964.5	8.97 03	6.35 01	3.94 01	1.05 00	0.08 01
2451548.2	5.73 01	5.30 02	5.12 02	4.95 02	5.00 03	2454013.4	9.20 04	6.53 01	4.09 00	1.26 00	0.22 01
2451552.2	5.76 01	5.34 01	5.14 01	4.95 01	5.06 02	2454086.4	9.09 05	6.48 05	4.14 03	1.26 01	−0.01 04
2451775.5	5.83 01	5.40 00	5.21 01	5.00 02	–	MWC 480					
2451779.5	5.86 01	5.41 01	5.23 00	5.03 02	–	2451850.5	7.05 00	6.45 01	5.69 01	4.51 01	4.11 03
2451802.5	5.76 00	5.34 01	5.14 01	4.94 01	5.06 04	2452191.6	7.05 01	6.45 00	5.66 01	4.48 01	4.15 02
2451824.4	5.81 01	5.36 01	5.12 01	4.93 01	–	2452209.6	7.06 00	6.47 00	5.65 00	4.49 01	4.21 02
2451831.4	5.77 01	5.28 01	5.15 01	4.95 02	5.05 04	2452252.4	7.12 01	6.48 01	5.67 01	4.45 02	4.05 02
2451832.4	5.77 00	5.30 00	5.14 00	4.97 01	5.03 04	2452254.4	7.05 00	6.45 00	5.63 00	4.46 01	4.09 02
2451833.4	5.72 01	5.30 01	5.08 01	4.95 01	5.03 04	2452307.3	7.04 01	6.50 01	5.68 01	4.47 01	4.17 03
2451834.4	5.76 00	5.31 01	5.13 01	4.95 01	4.96 05	2452597.5	7.13 01	6.58 01	5.80 00	4.60 01	4.30 05
2451848.3	5.75 01	5.30 01	5.10 00	4.92 01	5.03 04	2452666.3	7.04 01	6.43 01	5.62 01	4.54 02	4.19 03
2451853.4	5.85 00	5.40 01	5.20 01	5.02 01	5.06 06	2452698.3	7.02 00	6.44 01	5.66 01	4.53 01	4.14 02
2451862.3	5.79 01	5.35 01	5.16 01	4.95 01	5.06 03	2452950.5	7.10 01	6.54 01	5.76 01	4.56 01	4.29 03
2451864.3	5.78 00	5.33 00	5.15 00	4.96 01	5.06 04	2452958.5	7.12 00	6.57 01	5.74 01	4.52 01	4.24 01
2451866.3	5.78 01	5.32 01	5.15 01	4.97 01	5.03 03	2453284.6	6.99 01	6.40 01	5.60 01	4.41 01	3.95 02
2451867.3	5.76 01	5.31 01	5.11 01	4.91 01	4.99 04	2453357.5	7.07 01	6.51 01	5.72 01	4.52 01	4.20 02
2451868.3	5.74 01	5.32 01	5.13 01	4.94 01	5.06 04	2454781.5	7.07 01	6.48 01	5.68 01	4.52 00	4.04 02
2451902.2	5.73 00	5.28 01	5.09 00	4.91 01	4.97 03	2454804.4	7.05 01	6.49 01	5.66 01	4.51 01	4.13 05
2451917.2	5.75 01	5.31 00	5.11 01	4.94 01	5.08 03	MWC 614					
2452129.5	5.84 01	5.42 00	5.22 01	5.01 01	5.16 05	2452071.5	7.08 01	6.74 01	6.00 00	4.68 01	–
2452154.5	5.72 01	5.31 00	5.14 01	4.96 01	4.96 04	NGC 1068					
2453284.4	5.79 01	5.38 02	5.19 01	4.96 02	4.96 05	2451060.6	–	–	7.19 03	–	–
2453605.6	5.79 01	5.35 01	5.18 01	4.99 02	5.03 06	2451061.6	9.25 03	8.35 03	7.19 02	4.91 03	3.68 14
2453689.3	5.87 00	5.44 00	5.23 00	5.06 01	5.02 07	2451164.3	9.15 01	8.22 02	7.11 01	4.76 02	–
LkHa 101						2451175.3	9.16 02	8.22 02	7.13 02	4.86 01	–
2451834.5	8.19 02	5.75 01	3.16 01	0.34 01	−0.49 01	2451451.5	9.10 02	8.24 02	7.10 01	4.82 02	3.69 03
2452217.5	8.04 01	5.78 01	3.18 00	0.38 00	−0.34 01	2451454.5	9.19 03	8.29 02	7.13 02	4.78 02	3.73 05
2452536.5	8.01 03	5.79 01	3.25 01	0.43 00	−0.38 01	2451522.3	9.13 02	8.27 01	7.12 02	4.82 01	3.76 06
2453356.4	8.02 01	–	–	0.44 00	−0.40 01	2451526.4	9.11 03	8.28 01	7.14 01	4.82 01	3.70 03
2454021.5	7.99 01	5.88 01	3.31 01	0.50 00	−0.29 01	2451549.3	9.11 02	8.24 01	7.15 01	4.85 02	3.87 02
2454111.3	8.03 01	5.87 00	3.29 00	0.46 00	−0.33 01	2451802.6	9.14 02	8.25 01	7.18 01	4.83 01	3.84 04
2454370.6	7.95 01	5.87 00	3.34 01	0.49 01	−0.38 01	2451824.5	9.07 03	8.24 02	7.17 01	4.92 04	3.69 03
2454428.5	7.94 01	5.83 01	3.34 01	0.51 01	−0.34 01	2451848.4	9.15 02	8.26 01	7.17 01	4.85 01	3.78 02
2454476.2	7.84 01	5.84 00	3.40 00	0.57 00	−0.32 01	2451865.4	9.10 01	8.24 01	7.17 01	4.85 01	3.73 03
2454762.5	7.93 01	5.82 01	3.33 01	0.50 01	−0.42 01	2451951.2	9.17 03	8.28 02	7.19 00	4.82 01	3.74 03
2454783.4	7.96 01	5.90 01	3.39 00	0.53 00	−0.34 01	2452153.6	9.12 02	–	–	4.89 01	3.92 02
LP And						2452154.6	9.12 01	8.29 02	7.22 01	4.88 02	3.91 03
2452866.5	–	6.78 02	4.23 00	1.07 00	−0.13 00	2452186.5	9.11 02	8.33 03	7.28 02	4.83 05	4.04 05
2452891.5	9.22 04	6.63 01	4.06 01	0.88 00	−0.37 02	2452209.4	9.11 01	8.26 01	7.22 01	4.89 01	3.80 01
2452958.4	8.44 01	5.82 01	3.33 01	0.15 01	−0.89 00	2452223.4	9.12 02	8.28 01	7.26 01	4.88 01	3.87 03

Table 2. (Contd.)

JD	J	H	K	L	M	JD	J	H	K	L	M
2452515.6	9.14 02	8.37 01	7.26 02	4.86 01	3.88 04	2450624.3	10.15 03	9.32 03	8.39 03	6.50 04	–
2452565.5	9.15 01	8.39 02	7.25 01	4.89 01	3.91 04	2450853.6	10.07 02	9.16 02	8.33 01	6.55 04	–
2452613.3	9.13 01	8.29 01	7.24 01	4.84 01	3.91 02	2450866.6	10.08 02	9.22 02	8.36 02	6.69 04	–
2452958.4	9.11 01	8.31 01	7.30 01	4.98 01	3.95 02	2450873.5	10.03 03	9.28 01	8.36 02	6.71 04	–
2453032.2	9.11 02	8.33 02	7.33 01	4.96 01	3.86 02	2450874.5	10.06 03	9.20 02	8.35 02	6.58 04	–
2453305.5	9.10 02	8.30 02	7.40 02	5.01 03	3.88 06	2450908.4	10.24 08	9.24 03	8.36 03	6.64 04	–
2453357.3	9.13 02	8.39 01	7.38 01	5.01 01	3.84 03	2450910.4	10.26 06	9.37 04	8.49 04	6.65 06	–
2453747.2	9.20 02	8.35 01	7.36 01	5.01 01	3.94 02	2450917.5	10.43 06	9.50 05	8.64 08	–	–
2454013.5	9.20 01	8.36 01	7.43 01	5.04 01	4.08 05	2450918.4	10.28 04	9.46 03	8.51 02	6.53 05	–
2454118.2	9.23 02	8.46 03	7.41 02	5.04 01	3.99 02	2450920.4	–	–	–	–	–
2454373.5	9.11 02	8.34 02	7.39 02	4.98 02	3.84 05	2450942.3	10.20 03	9.33 03	8.50 02	6.63 04	–
2454428.3	9.10 01	8.36 01	7.43 01	5.06 01	3.91 04	2450949.4	10.22 06	9.43 03	8.52 04	6.89 06	–
2454478.2	9.17 02	8.34 02	7.37 01	5.05 01	3.88 02	2450968.3	10.11 08	9.44 03	8.54 02	6.71 06	–
2454481.2	9.19 02	8.30 01	7.39 01	5.00 01	3.84 02	2450976.3	10.09 07	9.38 02	8.53 03	6.69 09	–
2454750.5	–	8.33 01	–	–	3.80 04	2451007.3	10.00 07	9.29 02	8.39 02	6.61 10	–
2454752.5	9.11 02	8.33 02	7.33 01	4.95 01	3.90 03	2451008.3	10.24 03	9.32 04	8.41 03	6.51 05	–
2454762.4	9.10 03	8.30 02	7.33 02	4.98 01	3.84 04	2451176.6	10.05 03	9.30 03	8.44 03	6.58 03	–
2454804.3	9.22 03	8.32 02	7.32 01	4.95 01	3.84 04	2451180.6	10.07 02	9.32 02	8.42 01	6.70 05	–
NGC 1514						2451199.5	10.10 03	9.28 03	8.34 01	6.70 05	–
2452191.6	8.23 01	–	8.02 02	7.89 13	–	2451205.5	10.00 04	9.28 03	8.40 01	6.62 04	–
2452210.5	8.26 01	8.11 01	8.02 01	7.95 06	–	2451336.3	10.18 03	9.40 03	8.52 01	6.66 05	–
2452308.3	8.18 01	8.08 02	8.00 01	7.86 10	–	2451351.3	–	–	8.46 09	–	–
2452597.4	8.26 01	8.10 01	8.02 01	7.83 10	–	2451352.3	10.30 08	9.54 03	8.65 04	7.16 16	–
2452683.3	8.23 01	8.08 01	8.07 02	7.91 04	–	2451504.7	10.31 04	9.71 04	9.04 03	7.09 07	–
2452926.5	8.25 01	8.15 00	8.06 01	8.09 08	–	2451516.6	10.42 06	9.78 05	9.03 02	7.17 05	–
2453657.6	8.24 01	8.24 03	8.05 02	–	–	2451522.7	10.16 08	9.85 03	9.01 03	6.95 04	–
2453965.6	8.25 01	8.13 01	8.05 01	7.96 09	–	2451548.6	10.40 03	9.73 02	9.01 02	7.15 03	–
NGC 2392						2451619.4	10.42 04	–	9.05 02	7.00 06	–
2451524.5	10.68 05	–	10.59 11	–	–	2451641.4	10.38 04	9.83 04	9.00 03	7.20 06	–
2451866.7	10.68 05	–	10.56 06	–	–	2451645.4	10.54 05	9.80 02	9.07 02	7.04 07	–
2452217.6	10.76 04	10.78 03	10.59 05	–	–	2451647.3	10.51 04	9.80 02	9.05 03	7.14 05	–
2452308.5	10.80 05	–	10.46 04	–	–	2451650.4	10.51 05	–	8.99 03	7.15 06	–
2452724.3	10.78 03	–	10.58 04	–	–	2451658.4	10.46 06	9.78 03	9.06 04	7.28 08	–
2453817.3	–	–	10.58 04	–	–	2451682.4	10.66 04	9.77 02	9.13 04	7.18 11	–
2453830.3	10.81 05	–	10.55 06	–	–	2451685.3	10.61 05	9.84 02	9.10 01	7.15 08	–
2454153.4	10.72 05	–	10.43 06	–	–	2451706.3	10.74 07	9.94 04	9.31 05	7.05 07	–
NGC 4151						2451716.3	10.68 07	9.95 06	9.27 05	7.48 07	–
2449491.4	10.22 11	9.25 03	8.38 04	6.65 09	–	2451719.3	10.63 05	10.06 03	9.32 05	7.33 09	–
2449505.3	10.00 09	–	8.48 06	–	–	2451738.3	10.55 05	–	–	7.56 10	–
2449526.3	10.04 07	9.25 06	8.29 04	6.49 06	–	2451739.3	–	10.00 07	9.46 07	–	–
2449778.6	9.63 06	9.14 04	8.29 06	6.62 10	–	2451741.3	–	10.01 05	9.23 03	–	–
2449856.3	9.83 18	8.96 08	–	–	–	2451742.3	10.51 06	–	–	7.11 08	–
2449885.3	9.85 07	9.00 02	8.15 02	6.56 07	–	2451743.3	–	9.90 04	9.33 05	–	–
2449886.3	9.85 08	8.96 02	8.19 04	6.49 04	–	2451744.3	10.47 07	–	–	7.32 07	–
2450177.5	9.81 04	8.97 03	8.07 03	6.43 07	–	2451864.6	10.33 03	9.46 02	8.58 02	6.96 03	–
2450210.3	9.82 06	9.06 05	8.05 03	6.37 09	–	2451865.6	10.32 04	9.40 02	8.58 02	6.89 04	–
2450213.3	9.74 09	9.19 05	8.08 04	6.75 15	–	2451901.6	10.44 04	9.68 02	8.80 02	7.01 03	–
2450246.3	9.86 07	8.99 04	8.18 04	6.35 06	–	2451902.6	10.58 04	9.64 02	8.88 02	7.06 03	–
2450487.6	10.13 06	9.16 03	8.29 02	6.55 03	–	2451925.6	10.61 04	9.76 02	9.04 02	7.19 03	–
2450521.5	10.17 05	9.31 04	8.32 03	6.52 04	–	2451934.6	10.58 04	9.87 01	9.15 02	7.17 02	–
2450565.5	10.11 05	9.30 06	8.38 04	6.19 06	–	2451950.5	10.55 04	9.92 03	9.20 02	7.30 06	–
2450567.4	10.24 05	9.25 04	8.36 04	6.41 07	–	2451951.5	10.62 03	9.91 03	9.15 02	7.25 06	–
2450569.4	10.12 07	9.34 04	8.43 05	6.47 05	–	2451976.5	10.61 03	9.88 02	9.24 03	7.25 03	–

The photometer was equipped with a single cooled aperture diaphragm with an angular diameter of about 12″ projected onto the sky. We initially experienced some difficulties in guiding the telescope using optically weak objects, since observing time for IR observations was usually given on nights that were not moonless. Therefore, we mounted an additional viewer with an IR receiver array, which substantially eased the problem of guiding on weak objects. The photometer was equipped with a focal mirror modulator mounted in the plane of the intermediate image of the exit pupil of the telescope. The modulator provided switching of the optical axis of the photometer between two fields of view—"sky without stars" and "object + sky without stars"—at a frequency of about 31 Hz and an amplitude of about 20″ (projected onto the sky). This modulation was carried out in the direction of right ascension.

To reduce errors associated with inhomogeneity of the sky background emission on either side of an object, we used a standard procedure that periodically shifted the optical axis of the telescope (there and back) through an angular distance equal to the modulation amplitude. In each such shift, a section of sky located in various directions from the object fell into the photometer aperture. The signal obtained was amplified, synchronously detected, digitized, accumulated in a pulse counter, and transmitted to a control computer. Signal counts were carried out with exposure times of 4–60 s, depending on the brightness of the source; to obtain a long integration time, a series of individual counts was collected. The mean signal was subtracted from the resulting series of counts.

Over the past roughly three decades, we changed the detector only once, when it was out of order, and we replaced some of the filters whose interference coating had begun to be disrupted. Studies have shown that these changes did not affect the photometric characteristics of the photometer, maintaining the uniformity of the photometric system.

2.2. Standard Stars. Photometric System

The standard stars were chosen primarily from the *UBVRIJKL* catalog of Johnson et al. [22]. Since this catalog does not include *H* and *M* magnitudes, these values and some *L* magnitudes were calculated using the formula presented by Koornneef [23]. When selecting standards, we observed two conditions when possible: a minimum angular distance between the object and standard, and approximate agreement in their spectral types. These conditions were satisfied in most cases. Moreover, the standard must not be variable, or at least must display only variability with a minimum amplitude. Of the standards used, only BS 21, BS 4915, and BS 7924 appear in [20]; the amplitude of their variability is several hundredths of a magnitude in the visible.

Table 6 presents a list of the standard stars; the first column gives the number of the standard from the bright-star catalog [21], and the remaining columns its *JHKLM* magnitudes. The *JKL* magnitudes of the standard stars presented by Johnson et al. [22] define the standard photometric system. Naturally, our photometric system differs from this standard system, and our data are systematically shifted from their values in the standard system. To tie our photometric system to the standard system, we carried out photometry of several dozen standard stars of various spectral types using the 1.25-m telescope of the Crimean Laboratory of the SAI, together with our program of observations of non-stationary stars on this telescope. Our main photometric standard was α Lyr, whose *JHKLM* magnitudes we took to be zero.

We used our data and the *JKL* magnitudes of stars from the catalog of Johnson et al. [22] to obtain a relation between our *JKL* photometric system and the standard system, via a least-squares fit. This indicates that the J and K magnitudes of objects obtained in our photometric system coincide with their values in the standard Johnson system with accuracy no worse than 0.02^m.

2.3. Correction for Atmospheric Transparency

The main factors determining the transparency of the Earth's atmosphere at 1–5 μm are the spatial and temporal variations of the density of water vapor, whose absorption bands are present to greater or lesser degrees throughout the IR windows of transparency.

We studied the IR transparency of the Earth's atmosphere at the location of the Crimean Laboratory of the SAI using observations of the standard stars used in our IR photometric observations in 1976–2008. We analyzed data for about 900 observing nights obtained on the 1.25-m telescope using the InSb photometer in the *JHKLM* photometric system. As a rule, up to 25 standard stars at various zenith and azimuthal angles were observed in a night. The observations of a standard star or a pair of standards in each filter can be used to determine the spectral transparency of the Earth's atmosphere in the usual way, assuming that these stars did not vary during the observations and that the absorption of light in the Earth's atmosphere obeys the Buger law (it has been established empirically that this approximation is sufficient if the observations are made at zenith distances of less than 60°).

We can write for observations of a standard star at two zenith distances $F(\lambda, z_i)/F(\lambda, z_j) \approx$

Table 3. Results of $JHKLM$ photometry for four short-period variables

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
					β Lyr					
2452782	0.482	–	0.462	3.577 012	0.464	3.621 022	0.466	3.316 022	0.476	3.335 055
2452804	0.427	3.215 005	0.419	3.145 005	0.420	3.005 005	0.421	2.747 013	0.424	2.709 020
2452809	0.369	3.354 008	0.361	3.308 006	0.362	3.164 005	0.363	2.877 011	0.366	2.794 035
2452832	0.392	3.461 004	0.393	3.393 006	0.386	3.266 008	0.387	3.018 010	0.389	2.958 037
2452834	0.374	3.685 003	0.363	3.605 006	0.364	3.471 005	0.365	3.165 010	0.370	3.104 031
2452836	0.416	3.228 006	0.416	3.168 007	0.410	3.060 007	0.410	2.785 007	0.413	2.715 018
2452839	0.448	3.498 004	0.449	3.456 004	0.441	3.344 003	0.442	3.073 012	0.445	3.076 029
2452840	0.414	3.663 004	0.415	3.622 007	0.408	3.506 005	0.408	3.257 007	0.411	3.160 028
2452841	0.375	3.335 003	0.376	3.276 004	0.368	3.176 002	0.369	2.916 007	0.372	2.874 019
2452842	0.375	3.233 007	0.376	3.144 004	0.364	3.053 005	0.365	2.769 009	0.370	2.728 025
2452843	0.342	3.202 005	0.335	3.117 008	0.336	3.016 003	0.336	2.750 010	0.339	2.772 020
2452866	0.324	3.638 003	0.325	3.597 005	0.316	3.496 002	0.317	3.238 009	0.321	3.154 032
2452867	0.367	3.332 003	0.368	3.294 005	0.360	3.180 003	0.361	2.949 012	0.364	2.861 021
2452869	0.331	3.169 001	0.332	3.110 007	0.324	3.007 003	0.325	2.763 013	0.328	2.671 027
2452891	0.329	3.546 006	0.329	3.519 006	0.322	3.394 005	0.322	3.172 010	0.326	3.126 017
2452892	0.302	3.654 003	0.303	3.599 005	0.295	3.510 002	0.296	3.249 008	0.299	3.179 026
2453193	0.384	3.222 004	0.376	3.152 005	0.376	3.043 004	0.377	2.810 010	0.381	2.784 028
2453194	0.466	3.391 008	0.467	3.333 010	0.455	3.244 010	0.457	3.016 028	0.461	3.059 078
2453214	0.338	3.458 003	0.339	3.394 007	0.330	3.300 006	0.331	3.087 010	0.335	3.049 029
2453215	0.410	3.702 009	0.410	3.647 009	0.402	3.522 010	0.403	3.274 013	0.406	3.174 037
2453216	0.376	3.448 005	0.377	3.383 009	0.367	3.320 005	0.368	2.973 009	0.372	3.069 041
2453217	0.398	3.301 009	0.398	3.236 005	0.390	3.117 013	0.391	2.834 009	0.394	2.837 037
2453218	0.370	3.209 009	0.370	3.171 006	0.361	3.043 011	0.362	2.812 012	0.366	2.844 033
2453219	0.375	3.300 010	0.376	3.207 008	0.365	3.100 009	0.367	2.850 023	0.371	2.865 023
2453222	0.302	3.920 050	0.303	3.822 010	0.289	3.644 008	0.291	3.322 014	0.297	3.325 027
2453223	0.366	3.445 005	0.367	3.353 006	0.357	3.243 006	0.358	2.977 009	0.362	2.998 029
2453224	0.383	3.248 008	0.384	3.178 008	0.375	3.077 005	0.376	2.821 007	0.380	2.807 022
2453225	0.327	3.301 002	0.328	3.224 003	0.323	3.116 006	0.323	2.857 007	0.336	2.867 021
2453226	0.312	3.316 007	0.314	3.293 006	0.315	3.149 007	0.316	2.902 010	–	–
2453283	0.219	3.263 014	0.220	3.128 011	0.207	3.040 006	0.209	2.764 023	0.214	2.773 042
2453307	0.178	3.391 014	0.179	3.288 015	0.168	3.253 014	0.169	3.047 041	0.174	2.975 037
2453311	0.170	3.478 010	0.171	3.370 006	0.160	3.290 011	0.161	2.999 011	0.166	2.938 033
2453486	0.499	3.496 001	0.500	3.441 003	0.500	3.349 006	0.501	3.087 006	0.506	2.995 021
					ι Boo					
2451650	0.447	3.491 004	0.448	3.146 005	0.463	3.023 002	0.450	2.713 009	0.454	3.187 059
	0.477	3.531 004	0.448	3.146 005	0.470	3.030 005	0.475	2.962 007	0.454	3.187 059
	0.487	3.521 005	–	–	0.472	3.036 002	0.485	2.975 006	–	–
	0.495	3.559 004	–	–	0.479	3.042 005	0.494	3.020 008	–	–
	0.501	3.605 005	–	–	0.488	3.061 004	0.499	3.037 007	–	–
	0.447	3.491 004	–	–	0.497	3.096 004	0.450	2.713 009	–	–
	0.477	3.531 004	–	–	0.502	3.119 003	0.475	2.962 007	–	–
	0.487	3.521 005	–	–	0.463	3.023 002	0.485	2.975 006	–	–
	0.495	3.559 004	–	–	0.47	3.030 005	0.494	3.020 008	–	–
	0.501	3.605 005	–	–	0.472	3.036 002	0.499	3.037 007	–	–
	–	–	–	–	0.479	3.042 005	–	–	–	–
	–	–	–	–	0.488	3.061 004	–	–	–	–
	–	–	–	–	0.497	3.096 004	–	–	–	–
	–	–	–	–	0.502	3.119 003	–	–	–	–
2451652	0.393	3.605 020	–	–	0.389	3.174 012	0.391	3.126 010	–	–
	0.402	3.645 027	–	–	0.398	3.178 010	0.400	3.128 016	–	–
	0.408	3.647 031	–	–	0.404	3.174 016	0.406	3.118 017	–	–
	0.413	3.567 020	–	–	0.409	3.144 006	0.411	3.076 015	–	–
	0.419	3.573 036	–	–	0.415	3.121 008	0.417	3.073 013	–	–

Table 3. (Contd.)

JD	Δ JD	*J*	ΔJD	*H*	ΔJD	*K*	ΔJD	*L*	ΔJD	*M*
	0.424	3.560 030	–	–	0.420	3.095 008	0.422	3.046 011	–	–
	0.444	3.564 036	–	–	0.440	3.061 014	0.442	2.977 016	–	–
	0.450	3.548 030	–	–	0.446	3.071 019	0.448	2.994 019	–	–
	0.456	3.474 014	–	–	0.452	3.041 011	0.454	2.969 018	–	–
	0.461	3.539 028	–	–	0.457	3.025 013	0.459	2.947 010	–	–
	0.466	3.522 031	–	–	0.463	3.077 024	0.464	2.963 015	–	–
	0.471	3.520 022	–	–	0.468	3.024 014	0.470	2.949 025	–	–
	0.493	3.502 036	–	–	0.487	3.025 016	0.489	2.996 014	–	–
	0.500	3.492 037	–	–	0.495	3.068 020	0.497	3.050 017	–	–
	0.507	3.526 057	–	–	0.502	3.059 029	0.504	3.030 013	–	–
	0.513	3.550 037	–	–	0.509	3.126 030	0.511	3.083 013	–	–
	0.518	3.593 041	–	–	0.515	3.140 020	0.516	3.122 025	–	–
	0.525	3.625 043	–	–	0.520	3.153 021	0.522	3.152 017	–	–
	0.444	3.564 036	–	–	0.440	3.061 014	0.442	2.977 016	–	–
	0.450	3.548 030	–	–	0.446	3.071 019	0.448	2.994 019	–	–
	0.456	3.474 014	–	–	0.452	3.041 011	0.454	2.969 018	–	–
	0.461	3.539 028	–	–	0.457	3.025 013	0.459	2.947 010	–	–
	0.466	3.522 031	–	–	0.463	3.077 024	0.464	2.963 015	–	–
	0.471	3.520 022	–	–	0.468	3.024 014	0.470	2.949 025	–	–
	0.493	3.502 036	–	–	0.487	3.025 016	0.489	2.996 014	–	–
	0.500	3.492 037	–	–	0.495	3.068 020	0.497	3.050 017	–	–
	0.507	3.526 057	–	–	0.502	3.059 029	0.504	3.030 013	–	–
	0.513	3.550 037	–	–	0.509	3.126 030	0.511	3.083 013	–	–
	0.518	3.593 041	–	–	0.515	3.140 020	0.516	3.122 025	–	–
	0.525	3.625 043	–	–	0.520	3.153 021	0.522	3.152 017	–	–
	0.444	3.564 036	–	–	0.440	3.061 014	0.442	2.977 016	–	–
	0.450	3.548 030	–	–	0.446	3.071 019	0.448	2.994 019	–	–
	0.456	3.474 014	–	–	0.452	3.041 011	0.454	2.969 018	–	–
	0.461	3.539 028	–	–	0.457	3.025 013	0.459	2.947 010	–	–
	0.466	3.522 031	–	–	0.463	3.077 024	0.464	2.963 015	–	–
	0.471	3.520 022	–	–	0.468	3.024 014	0.470	2.949 025	–	–
	0.493	3.502 036	–	–	0.487	3.025 016	0.489	2.996 014	–	–
	0.500	3.492 037	–	–	0.495	3.068 020	0.497	3.050 017	–	–
	0.507	3.526 057	–	–	0.502	3.059 029	0.504	3.030 013	–	–
	0.513	3.550 037	–	–	0.509	3.126 030	0.511	3.083 013	–	–
	0.518	3.593 041	–	–	0.515	3.140 020	0.516	3.122 025	–	–
	0.525	3.625 043	–	–	0.520	3.153 021	0.522	3.152 017	–	–
2451658	0.509	3.471 015	–	–	0.510	3.039 009	0.512	2.984 012	–	–
	0.514	3.478 011	–	–	0.516	3.051 011	0.517	2.995 011	–	–
	0.519	3.493 014	–	–	0.521	3.080 009	0.523	3.006 011	–	–
	0.528	3.556 025	–	–	0.530	3.106 006	0.532	3.067 013	–	–
	0.536	3.598 014	–	–	0.537	3.165 011	0.539	3.104 012	–	–
	0.541	3.604 014	–	–	0.542	3.177 009	0.544	3.124 015	–	–
2452008	0.327	3.670 004	–	–	0.324	3.186 004	0.325	3.167 009	–	–
	0.330	3.662 004	–	–	0.327	3.193 005	0.329	3.160 008	–	–
	0.333	3.664 006	–	–	0.331	3.191 006	0.332	3.137 009	–	–
	0.336	3.644 005	–	–	0.334	3.176 004	0.335	3.137 009	–	–
	0.340	3.629 005	–	–	0.338	3.152 003	0.339	3.116 008	–	–
	0.352	3.592 002	–	–	0.350	3.125 005	0.351	3.069 007	–	–
	0.355	3.576 004	–	–	0.353	3.112 005	0.354	3.049 006	–	–
	0.359	3.563 004	–	–	0.356	3.088 003	0.357	3.036 004	–	–
	0.362	3.559 003	–	–	0.360	3.077 005	0.361	3.022 009	–	–
	0.365	3.527 006	–	–	0.363	3.061 005	0.364	3.008 005	–	–
	0.374	3.529 005	–	–	0.375	3.039 005	0.376	2.993 008	–	–

Table 3. (Contd.)

JD	Δ JD	*J*	ΔJD	*H*	ΔJD	*K*	ΔJD	*L*	ΔJD	*M*
	0.377	3.511 005	–	–	0.378	3.034 003	0.379	2.992 005	–	–
	0.380	3.523 005	–	–	0.381	3.032 005	0.382	2.987 008	–	–
	0.383	3.511 004	–	–	0.384	3.025 003	0.385	2.977 004	–	–
	0.387	3.504 007	–	–	0.388	3.017 005	0.389	2.973 003	–	–
	0.398	3.513 006	–	–	0.398	3.030 003	0.400	2.987 007	–	–
	0.401	3.525 005	–	–	0.402	3.037 006	0.403	2.986 007	–	–
	0.405	3.515 006	–	–	0.405	3.036 004	0.406	2.987 004	–	–
	0.408	3.527 005	–	–	0.409	3.047 007	0.410	2.997 005	–	–
	0.411	3.526 005	–	–	0.412	3.045 007	0.413	2.995 006	–	–
	0.423	3.533 005	–	–	0.424	3.061 004	0.425	3.021 006	–	–
	0.427	3.553 004	–	–	0.427	3.079 006	0.429	3.025 006	–	–
	0.430	3.560 005	–	–	0.431	3.087 004	0.432	3.037 005	–	–
	0.433	3.577 006	–	–	0.434	3.095 003	0.435	3.048 003	–	–
	0.437	3.587 004	–	–	0.437	3.105 004	0.438	3.056 006	–	–
	0.448	3.627 006	–	–	0.449	3.160 005	0.450	3.119 005	–	–
	0.451	3.633 004	–	–	0.452	3.179 005	0.453	3.140 006	–	–
	0.455	3.663 006	–	–	0.456	3.195 003	0.457	3.142 006	–	–
	0.458	3.677 004	–	–	0.459	3.203 005	0.460	3.154 006	–	–
	0.462	3.682 003	–	–	0.462	3.198 004	0.464	3.146 004	–	–
	0.472	3.647 005	–	–	0.473	3.170 004	0.474	3.121 005	–	–
	0.476	3.643 005	–	–	0.477	3.154 005	0.478	3.099 005	–	–
	0.479	3.604 004	–	–	0.48	3.141 006	0.481	3.083 007	–	–
	0.482	3.609 003	–	–	0.483	3.126 005	0.484	3.074 007	–	–
	0.486	3.593 003	–	–	0.486	3.116 006	0.488	3.064 008	–	–
	0.496	3.547 002	–	–	0.496	3.070 006	0.497	3.007 007	–	–
	0.499	3.530 002	–	–	0.500	3.057 004	0.501	3.006 007	–	–
	0.502	3.536 004	–	–	0.503	3.056 006	0.504	3.003 007	–	–
	0.505	3.526 004	–	–	0.506	3.045 006	0.507	2.992 011	–	–
	0.509	3.529 003	–	–	0.509	3.037 005	0.511	2.991 006	–	–
	0.518	3.515 004	–	–	0.519	3.024 006	0.520	2.971 010	–	–
	0.521	3.515 005	–	–	0.522	3.027 005	0.523	2.962 007	–	–
	0.525	3.499 003	–	–	0.526	3.014 005	0.527	2.967 008	–	–
	0.528	3.493 004	–	–	0.529	3.010 004	0.530	2.951 006	–	–
	0.531	3.496 002	–	–	0.532	3.010 004	0.533	2.963 006	–	–
	0.541	3.514 005	–	–	0.542	3.019 005	0.543	2.973 006	–	–
	0.544	3.505 006	–	–	0.545	3.026 004	0.546	2.973 004	–	–
	0.548	3.505 004	–	–	0.549	3.031 005	0.550	2.975 004	–	–
	0.551	3.515 004	–	–	0.552	3.034 007	0.553	2.986 006	–	–
	0.554	3.525 005	–	–	0.555	3.040 007	0.556	2.991 005	–	–
	0.564	3.535 006	–	–	0.565	3.054 004	0.566	3.004 011	–	–
	0.567	3.545 006	–	–	0.568	3.063 004	0.569	3.015 011	–	–
	0.571	3.553 006	–	–	0.572	3.095 003	0.573	3.033 012	–	–
	0.574	3.563 008	–	–	0.575	3.102 005	0.576	3.045 010	–	–
	0.577	3.577 005	–	–	0.578	3.109 002	0.579	3.073 014	–	–
	0.588	3.635 007	–	–	0.589	3.169 004	0.590	3.129 012	–	–
	0.591	3.646 005	–	–	0.592	3.183 003	0.593	3.136 013	–	–
	0.594	3.652 005	–	–	0.595	3.182 002	0.596	3.138 013	–	–
2452009	0.336	3.497 005	–	–	0.336	3.013 011	0.338	2.992 011	–	–
	0.339	3.492 004	–	–	0.336	3.013 011	0.341	2.979 007	–	–
	0.342	3.487 005	–	–	0.340	3.004 007	0.344	2.986 008	–	–
	0.346	3.481 003	–	–	0.343	3.002 007	0.348	2.984 009	–	–
	0.364	3.531 003	–	–	0.347	3.006 008	0.366	3.258 008	–	–
	0.371	3.567 004	–	–	0.365	3.056 004	0.373	3.043 004	–	–
	0.374	4.076 139	–	–	0.372	3.095 009	0.377	3.079 012	–	–

Table 3. (Contd.)

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
	0.378	3.582 009	–	–	0.376	3.314 020	0.380	3.098 003	–	–
	0.384	3.628 012	–	–	0.379	3.121 003	0.386	3.126 010	–	–
	–	–	–	–	0.385	3.151 006	–	–	–	–
2452310	0.604	3.516 005	–	–	0.606	3.056 007	0.607	3.010 006	–	–
	0.609	3.515 007	–	–	0.610	3.039 004	0.611	3.005 006	–	–
	0.613	3.499 005	–	–	0.614	3.033 008	0.615	2.986 005	–	–
	0.616	3.489 004	–	–	0.617	3.034 004	0.618	2.983 005	–	–
	0.620	3.497 007	–	–	0.621	3.033 006	0.622	2.984 004	–	–
	0.623	3.491 006	–	–	0.624	3.024 005	0.626	2.978 005	–	–
2453487	0.398	3.545 005	0.428	3.113 003	0.398	3.063 003	0.400	3.030 011	0.432	3.071 020
	0.401	3.522 004	0.436	3.116 006	0.402	3.044 002	0.404	3.018 010	–	–
	0.405	3.520 004	–	–	0.406	3.040 003	0.407	2.999 013	–	–
	0.409	3.516 004	–	–	0.410	3.044 003	0.411	3.002 006	–	–
	0.439	3.509 007	–	–	0.437	3.016 006	0.438	2.959 008	–	–
	0.440	3.498 004	–	–	0.441	3.010 004	0.442	2.971 011	–	–
	0.458	3.531 006	–	–	0.459	3.048 003	0.460	3.022 010	–	–
	0.461	3.538 004	–	–	0.462	3.058 005	0.463	3.035 006	–	–
	0.465	3.547 003	–	–	0.466	3.064 003	0.467	3.036 007	–	–
	0.468	3.567 002	–	–	0.469	3.084 002	0.470	3.080 013	–	–
2453569	0.273	3.504 008	–	–	0.274	3.067 010	0.276	3.071 013	–	–
	0.278	3.542 008	–	–	0.280	3.095 009	0.282	3.059 013	–	–
	0.285	3.582 011	–	–	0.286	3.130 006	0.288	3.108 018	–	–
	0.304	3.649 011	–	–	0.305	3.172 007	0.307	3.183 009	–	–
	0.309	3.656 011	–	–	0.310	3.208 010	0.313	3.159 013	–	–
	0.315	3.658 010	–	–	0.315	3.186 006	0.318	3.172 015	–	–
2453571	–	–	0.292	3.176 009	–	–	–	–	0.287	3.160 046
2453572	–	–	0.289	3.157 008	–	–	–	–	0.295	3.086 025
	–	–	0.302	3.159 013	–	–	–	–	–	–
					V444 Cyg*					
2446694	0.311	3.76 02	0.315	4.35 02	0.319	4.42 02	0.325	4.34 03	0.333	3.60 11
2446695	0.310	4.02 02	0.315	4.63 02	0.319	4.67 01	0.321	4.58 03	0.306	3.65 13
2446715	0.342	3.71 01	0.345	4.30 01	0.347	4.38 02	0.352	4.24 04	0.358	3.42 13
2446982	0.505	3.71 02	0.508	4.29 02	–	–	–	–	–	–
2446987	0.359	3.71 02	0.353	4.27 01	0.385	4.29 02	0.380	4.12 06	–	–
2446988	0.403	3.69 03	0.409	4.31 02	0.413	4.35 02	0.394	4.11 06	–	–
2446989	0.359	3.72 02	0.363	4.31 02	0.353	4.30 02	0.386	4.13 04	–	–
	0.514	3.72 02	0.519	4.26 02	0.523	4.33 02	0.505	4.30 05	–	–
2447013	0.389	3.91 03	0.394	4.49 02	0.399	4.54 02	0.381	4.36 04	–	–
	0.434	3.87 01	0.416	4.46 01	0.421	4.54 01	0.428	4.29 03	–	–
	0.457	3.86 01	0.463	4.41 02	0.469	4.49 01	0.451	4.36 03	–	–
	0.501	3.79 01	0.483	4.40 01	0.488	4.47 01	0.494	4.33 04	–	–
	0.523	3.78 01	0.528	4.37 01	0.533	4.43 01	0.517	4.25 05	–	–
	0.558	3.76 02	0.563	4.35 02	0.567	4.42 02	0.550	4.27 03	–	–
2447015	0.309	3.88 01	0.314	4.46 01	0.319	4.56 01	0.301	4.41 05	–	–
	0.407	3.98 02	0.412	4.55 02	0.417	4.61 01	0.399	4.55 08	–	–
	0.489	3.97 02	0.494	4.50 03	0.500	4.59 01	0.483	4.36 03	–	–
2447016	0.303	3.77 02	0.309	4.33 01	0.314	4.38 02	0.296	4.25 03	0.34	3.35 12
	0.528	3.72 01	0.532	4.32 02	0.537	4.36 01	0.522	4.21 03	0.564	3.60:
2447017	0.410	3.85 02	0.405	4.42 02	0.432	4.55 02	0.424	4.42 05	0.457	3.49 14
2447019	0.514	3.89 01	0.524	4.47 01	0.487	4.52 02	0.502	4.44 05	0.544	4.12:
2447039	0.369	3.74 01	0.381	4.30 01	0.392	4.37 01	0.404	4.21 03	0.427	3.43 11
2447041	0.478	3.77 01	0.487	4.30 02	0.453	4.36 02	0.466	4.24 04	0.505	3.42 09
2447042	0.392	3.72 02	0.403	4.32 01	0.414	4.37 01	0.425	4.20 02	0.445	3.46 12
2447043	0.247	3.72 01	0.256	4.28 01	0.267	4.33 01	0.284	4.16 03	0.306	3.32 10

Table 3. (Contd.)

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
2447044	0.509	3.68 02	–	–	0.499	4.38 02	0.487	4.22 03	0.465	3.50 14
2447045	0.428	3.76 02	–	–	0.439	4.39 02	0.416	4.15 03	0.383	3.72 10
2447048	0.383	3.71 02	–	–	0.392	4.34 01	0.332	4.13 05	0.358	3.59 10
2447049	0.383	3.79 01	–	–	0.380	4.46 02	0.327	4.30 03	0.355	3.67 12
2447052	0.469	3.71 01	–	–	0.478	4.33 01	0.444	4.26 04	–	–
	–	–	–	–	–	–	0.457	4.18 05	–	–
2447053	0.299	3.90 01	–	–	0.308	4.51 02	0.275	4.42:	–	–
	0.330	3.96 02	–	–	0.339	4.55 01	0.286	4.27 04	–	–
	0.362	3.95 02	–	–	0.371	4.56 02	0.319	4.26 06	–	–
	–	–	–	–	0.447	4.53 02	0.350	4.48 04	–	–
	–	–	–	–	–	–	0.384	4.32 05	–	–
	–	–	–	–	–	–	0.416	4.27 05	–	–
	–	–	–	–	–	–	0.432	4.37 05	–	–
2447054	0.237	3.73 01	–	–	0.247	4.34 01	0.221	4.22 04	–	–
2447640	0.579	3.74 01	–	–	0.574	4.37 01	0.541	4.16 03	–	–
	–	–	–	–	–	–	0.552	4.25 03	–	–
	–	–	–	–	–	–	0.562	4.27 03	–	–
2447704	0.447	3.76 01	–	–	0.442	4.42 01	0.460	4.24 04	–	–
2447725	0.410	3.76 04	–	–	0.401	4.40 03	–	–	–	–
2447726	0.481	3.66 01	–	–	0.471	4.28 01	–	–	–	–
	0.516	3.68 01	–	–	0.529	4.28 01	–	–	–	–
	0.377	3.65 01	–	–	0.387	4.26 01	–	–	–	–
	0.398	3.66 01	–	–	0.410	4.26 01	–	–	–	–
	0.424	3.66 01	–	–	0.434	4.27 01	–	–	–	–
	0.446	3.66 01	–	–	0.457	4.27 01	–	–	–	–
2447728	0.335	3.72 01	–	–	0.352	4.38 01	0.373	4.21 02	–	–
	0.344	3.73 01	–	–	0.36	4.37 02	0.440	4.19 03	–	–
	0.385	4.22 02	–	–	0.406	4.35 01	0.485	4.22 02	–	–
	0.397	3.71 01	–	–	0.458	4.35 01	0.531	4.21 02	–	–
	0.450	3.71 01	–	–	0.503	4.34 01	–	–	–	–
	0.494	3.71 01	–	–	0.549	4.34 01	–	–	–	–
	0.541	3.71 01	–	–	–	–	–	–	–	–
2447729	0.268	3.73 01	–	–	0.278	4.41 03	0.289	4.33 03	–	–
	0.303	3.80 01	–	–	0.311	4.45 02	0.321	4.29 03	–	–
	0.361	3.86 01	–	–	0.369	4.49 01	0.380	4.35 02	–	–
	0.394	3.88 01	–	–	0.406	4.50 01	0.415	4.36 03	–	–
	0.425	3.89 01	–	–	0.436	4.54 01	0.446	4.37 04	–	–
	0.457	3.90 01	–	–	0.465	4.54 01	0.475	4.42 03	–	–
	0.487	3.89 01	–	–	0.494	4.55 01	0.505	4.39 03	–	–
	0.514	3.89 01	–	–	0.521	4.53 01	0.530	4.36 04	–	–
	0.540	3.86 01	–	–	0.547	4.51 01	0.556	4.32 05	–	–
	0.565	3.82 01	–	–	0.572	4.46 01	–	–	–	–
	0.580	3.81 01	–	–	–	–	–	–	–	–
2447730	0.309	3.75 04	–	–	0.335	4.31 04	0.371	4.22 03	–	–
	0.326	3.75 05	–	–	0.361	4.32 01	0.381	4.20 03	–	–
	0.352	3.72 01	–	–	0.408	4.32 02	0.391	4.26 03	–	–
	0.400	3.71 01	–	–	0.423	4.32 01	0.437	4.12 03	–	–
	0.416	3.70 01	–	–	0.486	4.33 02	0.446	4.13 03	–	–
	0.477	3.71 01	–	–	0.514	4.33 01	0.457	4.19 03	–	–
	0.506	3.72 01	–	–	0.538	4.35 01	0.466	4.14 03	–	–
	0.532	3.71 01	–	–	–	–	0.523	4.21 02	–	–
	–	–	–	–	–	–	0.549	4.21 03	–	–
2447731	0.273	3.74 02	–	–	0.281	4.38 01	0.294	4.26 03	–	–
	0.305	3.74 01	–	–	0.314	4.36 01	0.324	4.25 03	–	–

Table 3. (Contd.)

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
	0.333	3.75 01	–	–	0.345	4.37 01	0.355	4.23 04	–	–
	0.366	3.76 01	–	–	0.374	4.40 01	0.383	4.26 02	–	–
	0.392	3.80 01	–	–	0.399	4.43 01	0.408	4.31 02	–	–
	0.416	3.84 01	–	–	0.423	4.45 01	0.432	4.32 03	–	–
	0.473	3.91 01	–	–	0.480	4.55 01	0.491	4.44 03	–	–
	0.499	3.94 01	–	–	0.506	4.54 01	0.514	4.36 05	–	–
	0.523	3.95 01	–	–	0.530	4.56 01	0.537	4.46 04	–	–
	0.545	3.95 01	–	–	0.551	4.56 01	0.558	4.38 03	–	–
	0.567	3.95 01	–	–	0.573	4.56 01	–	–	–	–
	0.580	3.96 01	–	–	0.587	4.58 01	–	–	–	–
2447774	0.433	3.75 01	–	–	0.445	4.38 01	0.454	4.25 03	–	–
2447776	0.278	3.62 02	–	–	0.290	4.24 02	0.300	4.10 04	–	–
2447779	0.281	3.76 01	–	–	0.290	4.38 02	0.299	4.29 04	–	–
2447784	0.269	3.94 01	–	–	0.281	4.60 01	0.291	4.48 03	–	–
	0.312	3.90 01	–	–	0.320	4.56 01	0.328	4.41 03	–	–
	0.339	3.86 01	–	–	0.346	4.52 01	0.355	4.35 02	–	–
	0.364	3.83 01	–	–	0.371	4.50 01	0.380	4.36 03	–	–
	0.390	3.81 01	–	–	0.400	4.47 01	0.409	4.40 02	–	–
	0.419	3.81 01	–	–	0.427	4.44 03	0.435	4.32 03	–	–
	0.447	3.80 01	–	–	0.455	4.47 02	0.464	4.33 05	–	–
	0.475	3.79 01	–	–	0.482	4.42 02	–	–	–	–
2447815	0.248	3.76 01	–	–	0.255	4.39 01	–	–	–	–
2447826	0.255	3.85 01	–	–	0.263	4.53 01	–	–	–	–
	0.277	3.90 01	–	–	0.285	4.54 01	–	–	–	–
	0.292	3.89 01	–	–	0.301	4.55 01	–	–	–	–
	0.309	3.91 01	–	–	0.316	4.56 01	–	–	–	–
	0.324	3.92 01	–	–	0.332	4.56 01	–	–	–	–
	0.339	3.91 01	–	–	0.346	4.56 01	–	–	–	–
	0.353	3.91 01	–	–	0.361	4.56 01	–	–	–	–
2447852	0.153	3.71 01	–	–	0.162	4.34 01	–	–	–	–
	0.178	3.71 01	–	–	0.185	4.35 01	–	–	–	–
	0.201	3.71 01	–	–	0.210	4.34 01	–	–	–	–
	0.228	3.72 01	–	–	0.237	4.32 01	–	–	–	–
	0.256	3.73 01	–	–	0.264	4.35 01	–	–	–	–
2448133	0.491	3.67 02	–	–	0.468	4.30 02	–	–	–	–
	0.498	3.67 01	–	–	0.475	4.26 02	–	–	–	–
2448134	0.433	3.71 01	–	–	0.424	4.32 02	–	–	–	–
	0.457	3.71 01	–	–	0.448	4.31 01	–	–	–	–
	0.475	3.70 01	–	–	0.465	4.33 01	–	–	–	–
2448136	0.339	3.74 02	–	–	0.356	4.34 01	–	–	–	–
	0.363	3.73 01	–	–	0.371	4.34 01	–	–	–	–
2449886	0.510	3.72 01	–	–	0.508	4.43 02	–	–	–	–
	0.519	3.75 02	–	–	0.517	4.42 02	–	–	–	–
2449905	0.404	3.81 01	–	–	0.394	4.51 01	–	–	–	–
	0.422	3.78 02	–	–	0.413	4.47 01	–	–	–	–
	0.438	3.80 02	–	–	0.430	4.46 01	–	–	–	–
	0.455	3.78 02	–	–	0.446	4.44 01	–	–	–	–
	0.471	3.79 01	–	–	0.462	4.43 01	–	–	–	–
	0.487	3.76 01	–	–	0.480	4.45 01	–	–	–	–
	0.515	3.78 01	–	–	0.495	4.42 01	–	–	–	–
	–	–	–	–	0.523	4.42 01	–	–	–	–
2450210	0.517	3.82 00	–	–	0.528	4.51 01	–	–	–	–
	0.538	3.84 01	–	–	0.547	4.52 01	–	–	–	–
	0.557	3.87 01	–	–	0.567	4.54 01	–	–	–	–

Table 3. (Contd.)

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
	0.575	3.90 02	–	–	0.583	4.56 01	–	–	–	–
	0.592	3.89 02	–	–	0.602	4.57 01	–	–	–	–
2450212	0.481	3.76 01	–	–	0.490	4.44 02	–	–	–	–
	0.501	3.79 00	–	–	0.510	4.45 00	–	–	–	–
	0.519	3.80 01	–	–	0.528	4.46 01	–	–	–	–
	0.539	3.81 01	–	–	0.549	4.47 01	–	–	–	–
	0.557	3.83 01	–	–	0.567	4.48 01	–	–	–	–
	0.576	3.85 01	–	–	0.584	4.51 01	–	–	–	–
	0.593	3.86 01	–	–	–	–	–	–	–	–
2450246	0.406	3.98 01	–	–	0.415	4.62 01	–	–	–	–
	0.424	3.97 01	–	–	0.433	4.64 01	–	–	–	–
	0.442	3.94 02	–	–	0.451	4.64 01	–	–	–	–
	0.460	3.98 02	–	–	0.470	4.64 02	–	–	–	–
	0.479	3.97 02	–	–	0.489	4.61 01	–	–	–	–
	0.500	3.96 01	–	–	0.510	4.58 01	–	–	–	–
	0.520	3.94 01	–	–	0.531	4.60 01	–	–	–	–
	0.540	3.92 01	–	–	0.549	4.57 01	–	–	–	–
	0.557	3.90 01	–	–	0.565	4.56 01	–	–	–	–
2450254	0.417	3.73 01	–	–	0.426	4.38 02	–	–	–	–
	0.437	3.75 01	–	–	0.447	4.36 02	–	–	–	–
	0.463	3.79 03	–	–	0.482	4.43 02	–	–	–	–
	0.493	3.76 04	–	–	–	–	–	–	–	–
2450267	0.336	3.87 01	–	–	0.352	4.54 01	–	–	–	–
	0.362	3.84 01	–	–	0.371	4.51 00	–	–	–	–
	0.381	3.92 01	–	–	0.390	4.54 01	–	–	–	–
	0.399	3.91 01	–	–	0.409	4.56 02	–	–	–	–
	0.418	3.93 01	–	–	0.428	4.58 02	–	–	–	–
	0.438	3.92 02	–	–	0.448	4.59 02	–	–	–	–
	0.458	3.96 01	–	–	0.467	4.61 02	–	–	–	–
	0.477	3.97 01	–	–	0.487	4.61 01	–	–	–	–
	0.497	3.97 01	–	–	0.506	4.61 02	–	–	–	–
	0.515	3.96 02	–	–	0.524	4.58 02	–	–	–	–
	0.533	3.95 01	–	–	0.542	4.59 01	–	–	–	–
	0.551	3.93 02	–	–	0.560	4.59 01	–	–	–	–
2450648	0.492	3.74 00	–	–	0.489	4.42 01	–	–	–	–
	0.503	3.72 00	–	–	0.500	4.42 01	–	–	–	–
	0.514	3.73 00	–	–	0.511	4.44 01	–	–	–	–
	0.524	3.75 01	–	–	0.521	4.44 01	–	–	–	–
	0.535	3.76 01	–	–	0.531	4.46 00	–	–	–	–
	0.546	3.77 01	–	–	0.542	4.45 01	–	–	–	–
					V1357 Cyg					
2449490	0.480	7.08 01	–	–	0.500	6.63 01	–	–	–	–
	0.490	7.08 01	–	–	–	–	–	–	–	–
2449491	0.505	7.07 01	–	–	0.523	6.64 01	–	–	–	–
	0.514	7.08 01	–	–	–	–	–	–	–	–
2449525	0.483	7.09 02	–	–	0.508	6.68 02	–	–	–	–
	0.481	7.08 02	–	–	–	–	–	–	–	–
2449528	0.424	7.02 01	–	–	0.451	6.61 01	–	–	–	–
	0.432	7.01 01	–	–	–	–	–	–	–	–
2449530	0.396	7.05 00	–	–	0.419	6.61 01	–	–	–	–
	0.428	7.06 01	–	–	–	–	–	–	–	–
2449596	0.362	7.11 01	–	–	0.383	6.64 00	–	–	–	–
	0.356	7.08 01	–	–	–	–	–	–	–	–
	0.375	7.06 02	–	–	–	–	–	–	–	–

Table 3. (Contd.)

JD	Δ JD	*J*	ΔJD	*H*	ΔJD	*K*	ΔJD	*L*	ΔJD	*M*
2449615	0.331	7.04 01	–	–	0.349	6.63 01	–	–	–	–
	0.340	7.03 01	–	–	–	–	–	–	–	–
2449641	0.267	7.08 02	–	–	0.301	6.68 01	–	–	–	–
	0.275	7.13 02	–	–	–	–	–	–	–	–
	0.283	7.08 01	–	–	–	–	–	–	–	–
	0.291	7.08 01	–	–	–	–	–	–	–	–
2449654	0.210	7.04 01	–	–	0.228	6.60 01	–	–	–	–
	0.219	7.04 01	–	–	–	–	–	–	–	–
2449885	0.518	7.09 00	–	–	0.515	6.67 01	–	–	–	–
	0.526	7.08 01	–	–	0.524	6.67 01	–	–	–	–
2449905	0.542	7.03 01	–	–	0.533	6.61 01	–	–	–	–
2449969	0.282	7.07 02	–	–	–	–	–	–	–	–
	0.290	7.06 01	–	–	–	–	–	–	–	–
	0.299	7.06 00	–	–	–	–	–	–	–	–
2451063	0.335	6.97 01	–	–	0.332	6.55 01	–	–	–	–
	0.343	6.99 01	–	–	0.345	6.55 01	–	–	–	–
2451065	0.332	7.00 01	–	–	0.335	6.57 01	–	–	–	–
	0.346	7.00 01	–	–	0.343	6.56 01	–	–	–	–
2451066	0.343	7.01 02	–	–	0.340	6.57 01	–	–	–	–
	0.350	7.01 02	–	–	0.354	6.57 01	–	–	–	–
2451067	0.251	7.00 02	–	–	0.254	6.58 01	–	–	–	–
	0.267	7.00 01	–	–	0.263	6.60 01	–	–	–	–
	0.274	7.01 01	–	–	0.277	6.60 01	–	–	–	–
2451068	0.349	6.98 02	–	–	0.352	6.55 02	–	–	–	–
	0.364	6.98 01	–	–	0.360	6.55 02	–	–	–	–
2451069	0.361	7.01 02	–	–	0.364	6.58 01	–	–	–	–
	0.384	7.00 02	–	–	0.372	6.57 01	–	–	–	–
	–	–	–	–	0.387	6.58 01	–	–	–	–
2451072	0.308	7.00 01	–	–	0.312	6.59 01	–	–	–	–
	0.323	7.02 01	–	–	0.320	6.60 01	–	–	–	–
2451383	0.390	6.99 01	–	–	0.393	6.58 01	–	–	–	–
	0.405	7.00 01	–	–	0.401	6.58 01	–	–	–	–
	0.412	6.99 01	–	–	0.415	6.58 01	–	–	–	–
2451384	0.458	6.98 01	–	–	0.462	6.58 01	–	–	–	–
	0.473	6.99 01	–	–	0.470	6.59 01	–	–	–	–
2451385	0.416	7.02 01	–	–	0.419	6.59 03	–	–	–	–
	0.429	7.02 02	–	–	0.426	6.61 01	–	–	–	–
2451387	0.442	6.94 01	–	–	0.438	6.52 01	–	–	–	–
	0.449	6.94 01	–	–	0.452	6.54 01	–	–	–	–
2451393	0.369	6.96 01	–	–	0.354	6.56 01	–	–	–	–
	–	–	–	–	0.365	6.56 01	–	–	–	–
2451420	0.374	6.99 00	–	–	0.371	6.58 02	–	–	–	–
	0.380	7.01 00	–	–	0.383	6.59 01	–	–	–	–
2451421	0.369	6.98 01	–	–	0.365	6.56 01	–	–	–	–
	0.376	6.96 01	–	–	0.380	6.56 01	–	–	–	–
2451451	0.296	6.98 01	–	–	0.300	6.58 01	–	–	–	–
	0.312	6.97 01	–	–	0.308	6.57 01	–	–	–	–
2451452	0.282	6.93 01	–	–	0.286	6.52 00	–	–	–	–
	0.298	6.93 01	–	–	0.293	6.52 01	–	–	–	–
2451453	0.290	7.00 01	–	–	0.286	6.58 01	–	–	–	–
2451454	0.320	7.00 01	–	–	0.317	6.58 01	–	–	–	–
2451455	0.324	6.99 01	–	–	0.328	6.59 01	–	–	–	–
2451456	0.253	6.97 02	–	–	0.257	6.58 01	–	–	–	–
2451738	0.433	7.05 01	–	–	0.438	6.64 01	–	–	–	–

Table 3. (Contd.)

JD	Δ JD	J	ΔJD	H	ΔJD	K	ΔJD	L	ΔJD	M
	0.455	7.05 01	–	–	0.449	6.64 01	–	–	–	–
2451741	0.429	7.07 01	–	–	0.433	6.65 01	–	–	–	–
2451742	0.416	7.04 01	–	–	0.419	6.64 01	–	–	–	–
2451744	0.388	7.06 01	–	–	0.392	6.66 01	–	–	–	–
2451774	0.330	7.01 00	–	–	0.333	6.62 01	–	–	–	–
	0.347	7.00 00	–	–	0.343	6.60 01	–	–	–	–
2451775	0.356	7.02 00	–	–	0.352	6.61 01	–	–	–	–
2451776	0.388	7.02 01	–	–	0.383	6.59 00	–	–	–	–
	0.396	7.01 01	–	–	0.399	6.60 00	–	–	–	–
2451777	0.374	7.02 01	–	–	0.378	6.62 00	–	–	–	–
	0.391	7.05 01	–	–	0.386	6.62 01	–	–	–	–
2451778	0.308	7.07 00	–	–	0.311	6.66 00	–	–	–	–
2451779	0.397	7.02 01	–	–	0.392	6.59 01	–	–	–	–
2451780	0.363	7.05 01	–	–	0.359	6.62 01	–	–	–	–
	0.370	7.04 01	–	–	0.374	6.62 01	–	–	–	–
2451782	0.353	6.97 01	–	–	0.358	6.59 02	–	–	–	–
	0.372	7.00 01	–	–	0.368	6.60 01	–	–	–	–
2451802	0.294	6.99 01	–	–	0.289	6.55 01	–	–	–	–
	0.303	6.98 01	–	–	0.306	6.56 00	–	–	–	–
2451824	0.285	7.01 01	–	–	0.281	6.59 00	–	–	–	–
2451832	0.200	7.04 00	–	–	0.204	6.64 01	–	–	–	–
2451834	0.296	7.04 01	–	–	0.299	6.63 01	–	–	–	–
2451850	0.257	7.02 01	–	–	0.260	6.61 01	–	–	–	–
2451864	0.177	7.04 00	–	–	0.180	6.63 01	–	–	–	–
2451865	0.268	7.08 01	–	–	0.271	6.67 01	–	–	–	–
2451866	0.207	7.02 00	–	–	0.209	6.61 01	–	–	–	–
2451867	0.153	7.04 01	–	–	0.150	6.65 00	–	–	–	–
2451887	0.138	7.02 01	–	–	0.141	6.62 01	–	–	–	–
2452125	0.446	7.03 01	–	–	0.449	6.66 01	–	–	–	–
2452127	0.407	7.01 01	–	–	0.410	6.63 01	–	–	–	–
	0.424	7.03 02	–	–	0.427	6.62 01	–	–	–	–
2452153	0.359	7.06 01	–	–	0.361	6.66 01	–	–	–	–
	0.371	7.04 01	–	–	0.373	6.66 01	–	–	–	–
2452154	0.388	6.99 01	–	–	0.391	6.61 01	–	–	–	–
	0.401	7.02 01	–	–	0.403	6.58 01	–	–	–	–
2452158	0.337	7.04 01	–	–	0.335	6.66 01	–	–	–	–
2452163	0.364	7.03 01	–	–	0.366	6.63 01	–	–	–	–
2452188	0.250	6.99 01	–	–	0.252	6.59 01	–	–	–	–
2452209	0.194	7.06 00	–	–	0.199	6.64 00	–	–	–	–
	0.213	7.04 00	–	–	0.215	6.63 00	–	–	–	–
2452450	0.450	7.04 01	0.453	6.77 01	0.454	6.61 01	0.458	6.42 04	–	–
2452454	0.452	6.98 01	0.454	6.72 01	0.456	6.56 01	0.491	6.34 03	–	–
2452455	0.433	7.03 01	0.435	6.75 01	0.437	6.62 02	0.441	6.35 04	0.427	5.92 13
2452456	0.445	7.04 02	0.450	6.75 01	–	–	–	–	–	–
2452458	0.390	7.04 01	0.358	6.77 01	0.360	6.64 02	0.367	6.39 05	–	–
	0.517	7.06 01	0.518	6.80 01	0.508	6.66 01	0.512	6.42 05	–	–
2452514	0.370	7.03 01	–	–	0.372	6.62 01	–	–	–	–
	0.382	7.03 01	–	–	0.384	6.63 01	–	–	–	–
2452867	0.279	7.08 01	–	–	0.282	6.65 01	–	–	–	–
	0.294	7.07 01	–	–	0.297	6.65 00	–	–	–	–
2453962	0.379	7.04 01	0.384	6.77 01	0.367	6.65 01	0.373	6.39 04	–	–
2454023	0.325	7.02 01	0.330	6.75 02	0.308	6.60 01	0.313	6.38 02	–	–
2454337	0.370	7.06 01	–	–	0.373	6.66 00	–	–	–	–
2454692	0.387	7.08 01	0.404	6.78 01	0.391	6.66 01	0.397	6.43 04	–	–

* Magnitude difference between V444 Cyg and the standard star BD + 38°4003.

$[P(\lambda)]^{\Delta(\sec z)}$. The transparency $P(\lambda)$ is then determined from the relation $\log P(\lambda) = -0.4[\Delta m(\lambda)/\Delta(\sec z)]$.

An analysis of the IR transparency at observatories with good seeing conditions where IR observations are systematically carried out shows that this relation is valid for the *JHKLM* photometric bans, at least for air masses within one to three. To estimate the IR transparency at the location of the Crimean Laboratory on each observing night, we selected all possible pairs of standards whose air masses were no lower than 0.3 and calculated the atmospheric transparency in each filter. We analyzed several thousand transparency measurements in each filter over 900 observing nights. Table 7 presents the mean values of $P(\lambda)$ and the associated standard deviations, sd.

Since the standards for each object were chosen to be as close as possible in terms of angular distance on the sky and the observations were planned so that the differences in the air masses were less than 0.1, it was not necessary to correct for the atmospheric transparency in most cases.

2.4. Method for the Observations and Preliminary Reduction of the Data

The observations were carried out only on clear, photometric nights. The main criterion for good photometric conditions was high stability over fairly long time intervals of the counts measured for observations of both standards and program stars. The observations were usually obtained using a "standard–object–standard" scheme. On nights with high stability of the atmospheric transparency, the standard for each object was measured only once. The same standard was always used for a given object. The magnitude of the object was calculated using measurements of a standard with known magnitude.

We wrote a special program to control both the telescope (pointing, guiding, focusing etc.) and the photometer, which was fully automated. The program is input a catalog containing the coordinates of the objects and standards, magnitudes of the standards, and the observing parameters in each filter—the amplification of the signal after it is received, the integration time for a single record, the number of records, and other parameters. The coordinates are used to point the telescope. The photometer is automatically set up with the required filter, amplification coefficient, and integration time. All the parameters can be operatively changed during the observations if necessary. Upon completion of a cycle of observations, the magnitudes of the object are calculated taking into account the mean extinction, and the magnitudes for all dates are then stored in a special file, which can be written in a text format for the subsequent reduction.

Table 4. Characteristics of the IR filters

Filter	λ, μm	$\Delta\lambda$, μm	Transparency
J	1.25	0.23	0.66
H	1.63	0.40	0.67
K	2.19	0.46	0.76
L	3.47	0.60	0.60
M	4.7	0.78	0.70

Windows for the control program for the telescope and photometer, the control of the receiver array, and an image of the diaphragm are shown on the monitor screen. Guiding of the object's image and all other manipulations can be carried out using the keyboard.

3. TYPES OF OBSERVED VARIABLE OBJECTS

The catalog contains photometry for 254 galactic and extragalactic objects displaying various types of variability. The main types are the following.

I. Close binary systems, including the following [binary systems located in a stage of their evolution featuring mass transfer between the components, so that there is circumstellar material in and around the system, including dust envelopes (clouds)].

A. W Ser stars and Algol systems. W Ser stars are close binaries located in a rapid phase of mass transfer and represent a natural extention of the Algol phenomenon, but with longer orbital periods. Algol systems are close (semi-contact) binaries in the first mass-transfer phase, with the less massive component being a late-type star. Before our IR observations, these systems were completely unstudied in this range.

B. Z And stars are symbiotic stars forming a varied group of close binaries consisting of a hot star and a late-type star whose total brightness undergoes irregular variations with amplitudes to 4^m. These close binaries were observed only episodically in the IR before our studies [12–17]. Swings and Allen [13] divided all known symbiotic systems into two groups according to their IR spectral energy distributions (SEDs)—S-type systems, without dust envelopes, and D-type systems, with dust envelopes.

II. Long-period binaries with late-type components, in which mass loss is expected even if the components are not especially close. These systems were also essentially unobserved in the IR before our observations.

III. Single stars, such as semi-regular variables, RCB stars, pulsating RV Tau stars, Mira variables,

Table 5. Threshold parameters of the InSb photometer

Filter	f_{th}^{*}, 10^{-15} W/Hz$^{0.5}$	f_{th}^{**}, 10^{-15} W/Hz$^{0.5}$	F_{lim}, 10^{-18} W/cm^2 μm	m_{lim}
J	10	13	30	13.4
H	7.8	9.7	15	13.0
K	5.8	7.2	8	12.6
L	3.7	6.8	6.1	10.8
M	2.7	19	21	8.1

Note: f_{th}^{*} is the theoretical sensitivity threshold of the receiver, f_{th}^{**} the sensitivity threshold determined from observations, F_{lim} the limiting flux, and m_{lim} the limiting magnitude for a signal-to-noise ratio of three and an integration time of 60 min.

etc. (the unique object FG Sge is the core of a planetary nebula that underwent catastrophic changes in 1992).

IV. Extragalactic objects (the Seyfert galaxies NGC 4151 and NGC 1068). The IR observations have an episodic character before 1985.

V. Planetary nebulae.

VI. Post-AGB candidates for protoplanetary nebulae.

VII. Rapid, irregular variables of early spectral types displaying high photometric activity and Algol-like minima with durations from several days to a week, which had been poorly studied in the IR. A typical example is UX Ori. The brightness minima are caused by circumstellar dust–gas clouds in the vicinity of a young star, which intersect the line of sight from time to time [24].

VIII. Novae.

4. GENERAL PICTURE OF THE ANALYSIS PROCESS

In general, an observed source can be a complex system—for example, it could be a close binary immersed in a gas–dust envelope or an extragalactic source such as a Seyfert galaxy in which cool sources of radiation appear during times of nuclear activity. The central heating source can be either a single variable (pulsating) star, a binary system (including close binary systems), or a galactic nucleus.

The observed flux from such a system in one of our photometric filters can be written

$$F_{obs}(\lambda) = [F_1^*(\lambda) + F_2^*(\lambda)] + F_g(\lambda) + F_d(\lambda) = F_{model}(\lambda),$$

where $F_1^*(\lambda)$, $F_2^*(\lambda)$, $F_g(\lambda)$, and $F_d(\lambda)$ are the observed fluxes from the stellar, gas, and dust components of the system.

As one component of a complex source, a dust envelope is manifest not only in the IR, but also via absorption at shorter wavelengths, so that we must attend to the following before studying and modeling its parameters:

—separating the observed total flux into components based on our observations at different wavelengths (obtaining the SEDs of each of the sources);

—investigating the non-stationarity of each of these on various time scales;

—investigating their inter-connections;

—relating all the components of the source with a reasonable model and estimating the parameters of each component and of the system as a whole.

Thus, searches for and studies of dust envelopes are not possible without a detailed investigtion of the parameters of the stellar components. Ideally, we should compare the left-hand side of the relation above containing the components that are derived from the observations with flux values based on an adopted model. This model should include the parameters of both the stellar components and of the gas and dust envelopes that interact with them, if these are present in the studied system.

As a rule, the SEDs of each source and their contributions to the total radiation are unknown. Moreover, each of the sources is non-stationary to some degree. Nevertheless, there exist approaches to distinguishing individual components in the total flux, which were applied to our IR photometric data. Typical procedures of this sort include the following.

1. Comparing the observed SED of an object with the radiation of normal stars in various spectral ranges, allowing for the fact that, as a rule, the stellar components in the studied close binaries have different spectral types and luminosities, with their spectral maxima occuring at different wavelengths ($\lambda_{max} \sim 3000/T^*$). Moreover, if a dust envelope is present, both stellar components will probably be immersed in it, since the size of such dust envelopes is usually much larger than the size of the binary system.

2. Observations of the object over a long time aimed at detecting non-stationary phenomena that

Table 6. List of standards and their $JHKLM$ magnitudes

BS	J	H	K	L	M	BS	J	H	K	L	M
21	1.65	1.51	1.48	1.45	1.50	5429	1.46	0.82	0.66	0.54	0.74
165	1.24	0.63	0.48	0.30	0.54	5505	0.65	0.13	0.00	−0.05	0.08
219	2.36	2.05	1.97	1.93	2.01	5601	2.61	2.24	2.15	2.06	2.20
294	2.60	2.12	2.00	1.93	2.07	5602	1.93	1.46	1.34	1.28	1.41
334	1.58	0.98	0.83	0.77	0.89	5744	1.38	0.82	0.68	0.54	0.74
382	3.47	3.17	3.10	2.91	3.11	5932	1.82	0.96	0.77	0.54	0.86
458	3.17	2.91	2.85	2.79	2.88	5933	2.94	2.72	2.66	2.62	2.69
464	1.53	0.95	0.79	0.72	0.88	5947	2.09	1.60	1.30	1.12	1.35
539	1.92	1.37	1.23	1.17	1.31	6075	1.60	1.11	0.99	0.96	1.05
542	3.67	3.76	3.78	3.77	3.76	6104	2.77	2.31	2.19	2.12	2.26
622	2.78	2.68	2.66	2.65	2.67	6132	1.17	0.71	0.59	0.44	0.63
668	1.68	1.22	1.10	0.97	1.15	6148	1.21	0.72	0.60	0.50	0.68
804	3.30	3.25	3.23	3.22	3.24	6212	1.70	1.38	1.30	1.14	1.31
834	1.05	0.29	0.09	−0.09	0.18	6220	1.98	1.48	1.35	1.25	1.41
843	1.76	0.98	0.78	0.67	0.89	6337	1.59	0.73	0.52	0.44	0.66
915	1.53	1.09	0.98	0.93	1.04	6498	1.88	1.19	1.02	0.91	1.11
1017	0.87	0.62	0.56	0.48	0.58	6603	0.92	0.37	0.23	0.13	0.30
1035	3.23	3.05	3.00	2.85	2.99	6623	2.18	1.85	1.77	1.72	1.82
1101	3.28	–	2.94	–	–	6698	1.68	1.22	1.10	0.97	1.15
1165	2.95	2.96	2.96	2.90	2.94	6703	2.19	1.73	1.62	1.56	1.69
1203	2.65	2.67	2.67	2.66	2.67	6869	1.65	1.17	1.05	0.99	1.12
1242	3.93	3.79	3.76	3.68	3.78	6895	1.92	1.31	1.16	1.02	1.22
1256	2.63	2.10	1.97	1.91	2.05	7063	2.42	1.88	1.74	1.67	1.82
1409	1.94	1.45	1.33	1.27	1.40	7176	2.33	1.82	1.69	1.55	1.74
1411	2.29	1.84	1.73	1.67	1.79	7178	3.23	3.24	3.24	3.17	3.22
1454	2.09	1.48	1.33	1.17	1.39	7193	2.23	1.65	1.51	1.44	1.59
1603	2.61	2.20	2.10	2.04	2.16	7235	2.93	2.92	2.92	2.92	2.92
1666	2.51	2.41	2.38	2.37	2.40	7328	2.25	1.74	1.67	1.58	1.78
1729	3.64	3.36	3.29	3.24	3.33	7377	2.75	2.61	2.57	2.55	2.59
1784	2.52	2.02	1.90	1.84	1.97	7417	1.01	0.33	0.16	−0.01	0.23
1791	1.97	2.03	2.05	2.07	2.04	7429	2.50	1.91	1.76	1.63	1.83
1899	3.31	3.46	3.50	3.53	3.48	7488	2.74	2.20	2.13	2.00	2.22
1907	2.35	1.82	1.69	1.63	1.77	7525	0.30	−0.41	−0.59	−0.80	−0.52
2004	2.48	2.58	2.60	2.60	2.58	7557	0.39	0.29	0.26	0.21	0.26
2012	2.18	1.64	1.51	1.44	1.59	7582	2.25	1.79	1.68	1.54	1.72
2134	2.71	2.25	2.13	2.08	2.20	7602	2.26	1.82	1.71	1.60	1.76
2421	1.90	1.90	1.90	1.90	1.90	7615	2.28	1.76	1.67	1.54	1.65
2478	2.57	1.99	1.84	1.77	1.92	7635	0.79	0.03	−0.16	−0.36	−0.08
2777	2.86	2.67	2.62	2.59	2.65	7685	2.36	1.73	1.57	1.41	1.73
2854	1.80	1.07	0.89	0.79	0.99	7796	1.16	0.75	0.72	0.67	0.65
2985	2.02	1.57	1.46	1.40	1.52	7924	1.00	0.91	0.89	0.78	0.87
3249	1.09	0.35	0.16	0.01	0.25	7939	3.02	2.43	2.28	2.11	2.33
3474	2.46	2.00	1.88	1.82	1.95	7949	0.77	0.24	0.11	0.05	0.19
3705	0.39	−0.41	−0.61	−0.74	−0.43	7957	1.90	1.40	1.28	1.19	1.31
3748	−0.33	−1.02	−1.19	−1.37	–	8079	1.00	0.18	−0.05	−0.28	−0.06
3775	2.28	2.07	2.02	1.98	2.05	8115	1.65	1.20	1.09	0.98	1.14
3905	1.93	1.36	1.22	1.15	1.30	8252	2.55	2.09	1.97	1.88	2.06
3980	1.91	1.21	1.04	0.89	1.23	8255	3.09	2.57	2.44	2.37	2.51
3982	1.55	1.61	1.62	1.60	1.60	8334	3.14	2.91	2.85	2.70	2.85
4031	2.81	2.66	2.62	2.59	2.63	8413	2.41	1.75	1.58	1.48	1.67
4100	2.71	2.27	2.16	2.10	2.22	8430	3.00	2.72	2.65	2.63	2.69
4335	1.16	0.58	0.43	0.32	0.50	8465	0.97	0.28	0.11	0.00	0.20
4434	0.87	0.07	−0.14	−0.31	0.01	8499	2.58	2.12	2.01	1.95	2.05
4845	4.91	4.63	4.56	4.16	4.49	8538	2.69	2.19	2.07	2.00	2.14
4910	−0.17	−1.03	−1.25	−1.43	−1.01	8632	2.36	1.68	1.51	1.44	1.61
4915	3.04	3.15	3.18	3.17	3.16	8684	2.01	1.55	1.43	1.38	1.50
4932	1.36	0.91	0.80	0.75	0.87	8694	1.82	1.32	1.19	1.13	1.26
5107	3.20	3.13	3.11	3.11	3.12	8832	3.87	3.39	3.27	3.20	3.34
5191	2.27	2.37	2.40	2.34	–	8860	1.46	0.62	0.37	0.25	0.67

Note: We have no measurements for the standard BD+38°4003.

Table 7. Mean IR transparency of the Earth's atmosphere at the Crimean Laboratory of the SAI in 1976–2008

Filter	$P(\lambda)$	sd
J	0.79	0.03
H	0.82	0.02
K	0.81	0.03
L	0.76	0.04
M	0.67	0.05

depend on the physical parameters of each component and their interactions.

5. MAIN RESULTS

As was noted above, the results of our analysis based on long-term IR photometry have been published in more than 200 scientific papers, of which the relatively most important publications are listed in Table 8. The left column in Table 8 indicates the objects of study and the right column the corresponding publications.

The figure shows K (2.2 μm) light curves for several objects representing various types of variables (Table 1). Among the most important results we have obtained based on our long-term IR photometry, we especially note the following.

We have carried out searches for and studies of dust envelopes in binary systems based on these observations. We have detected relatively hot dust envelopes in a whole series of objects for the first time, including the RCB star UV Cas, the W Ser star RX Cas, several classical symbiotic stars, the unique object FG Sge before its IR flare in Autumn 1992, and others.

We have attempted to construct a model of the FG Sge dust envelope, which formed around the star as a result of several successive cycles of dust condensation beginning in Autumn 1992. A spherically symmetrical, extended dust envelope consisting of a mixture of spherical particles of amorphous carbon and silicon carbide with the size distribution proposed by Mathis et al. [11] was fit to the mean observed SEDs of FG Sge at its maximum and minimum brightness after 1998 for the luminosities and effective temperatures of the central star $T_{eff} = 5900$ K, $L = 3300\ L_\odot$ and $T_{eff} = 5800$ K, $L = 6300\ L_\odot$. In each case, the characteristics of the stellar wind and mass-loss rate were also estimated. It is possible to obtain more or less satisfactory representations of the observed SED for the maximum-brightness state using both models, with appreciably different sets of parameters and different distances. Fitting of the observational data for the minimum-brightness state using a spherically symmetrical dust-envelope model encounters considerable difficulties. With the first luminosity–temperature pair, the distance must be increased from 2.1 to 3.5 kpc if the luminosity of the star remains the same. The former value does not lie far outside the range of distance estimates obtained for FG Sge in other studies, 2.5 to 4.1 kpc, while the latter value lies within this range. Nevertheless, this seeming difference in the distance to the object could be a consequence of inadequacy of the model and the disruption of some assumptions used in its calculation. With the second luminosity–temperature pair, it is not possible to obtain a satisfactory agreement with the observations for the minimum-brightness state at all, if the values of the luminosity and distance remain constant. This is a consequence of the unusual behavior of the object, expressed as a simultaneous decrease in the observed fluxes in all filters. It is possible that the inadequacy of the model is due to the severe disruption of the spherically symmetry of the envelope associated with the appearance of a small, dense cloud in the line of sight. The characteristics of the stellar wind, accordingly, also change.

We have established the following for the classical symbiotic star Z And in its quiescent (before 2000) and active (2000–2002) phases:

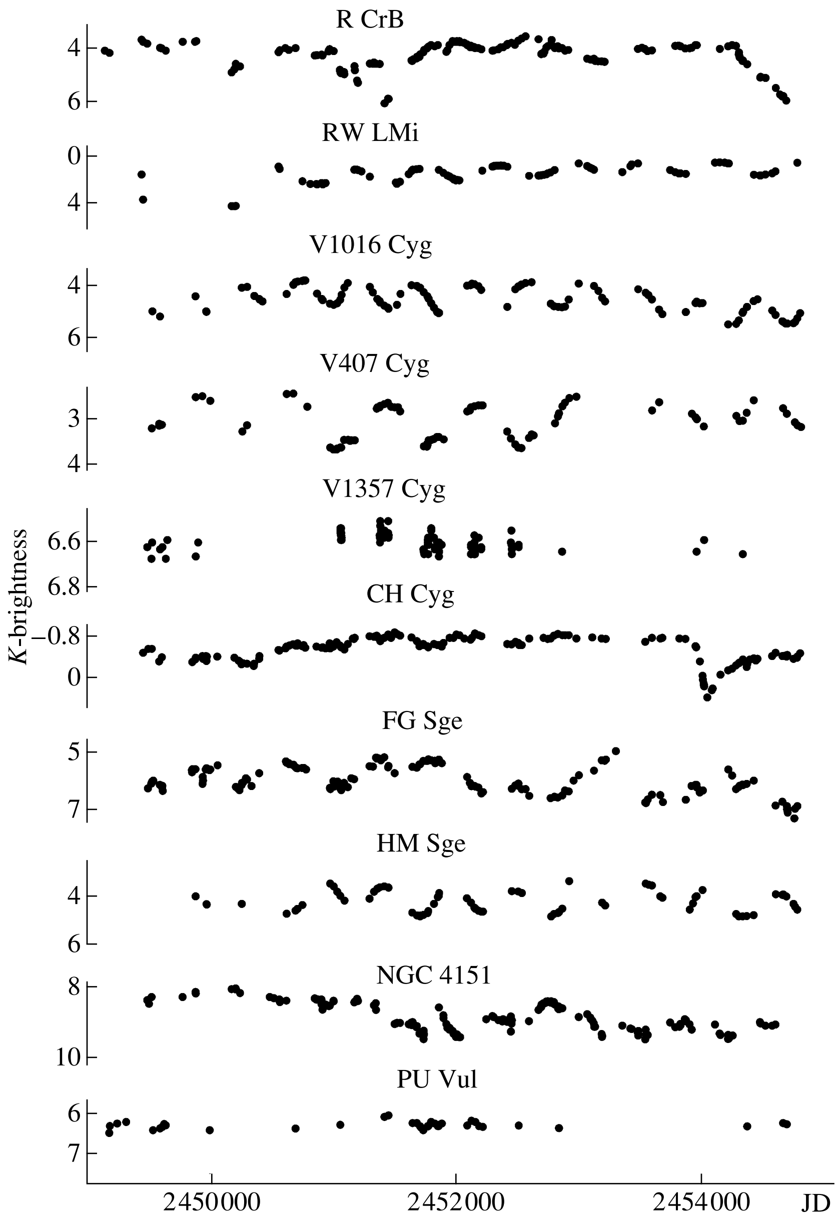
—the hot, compact component expanded during the flare, and the emission measure of the surrounding nebula grew;

—the effective temperature of the cool component (an M4.5 giant) of the Z And system is 3400 ± 270 K, its observed integrated flux 2.25×10^{-8} erg cm^{-2} s^{-1}, and its radius $85 \pm 14\ R_\odot$;

—in the quiescent state of Z And, the electron temperature and emission measure of the nebula are 2×10^4 K and 4.7×10^{59} cm^{-3};

—during the 2000–2002 flare, the emission measure of the nebula grew by about a factor of 4.4, reaching 20.9×10^{59} cm^{-3}, while the electron temperature of the nebula essentially remained constant.

Several episodes of dust-grain condensation have been traced in the envelopes of symbiotic systems (CH Cyg, V1016 Cyg, HM Sge, and others), and the role of the hot component in the formation of the dust envelopes studied. Information about the possible types of dust grains present in the envelopes has been obtained for some objects. Variations of the IR brightness have established that the cool components in the V1016 Cyg, HM Sge, and possibly CH Cyg symbiotic systems is a Mira. The binary of V1016 Cyg and HM Sge has been firmly established. The main results for CH Cyg are the following.



K light curves for ten variables based on observations for 1984–2008.

1. The "local" dust envelope that formed in the system in 1986, with its density in the line of sight reaching its maximum in 1996, had essentially dissipated by the middle of 2001, with the radiation of the red star in the system returning to its pre-1985 level. Estimates of the parameters of the components in the system were obtained during various episodes of its optical and IR activity.

2. Variability of the JHK brightness of CH Cyg with a 4000-day period was detected. This variability fits well in a picture with an eclipsing pair consisting of two cool giants (M7 and M6) whose effective temperatures differ by approximately 100 K; the ratio of their luminosities is $L(\mathrm{M7})/L(\mathrm{M6}) \sim 6.8$, and the ratio of their radii $R(\mathrm{M7})/R(\mathrm{M6}) \sim 3.6$. The orbital ephemerides can be written $\mathrm{JD(Min\ I)} = 2444180 + 4000E$.

3. In August–November 2006, an extremely rapid fall in the IR brightness of CH Cyg was observed. An absolute minimum in the IR brightness (at 1.25–5 μm) was reached after 100–150 days. For example, the brightness at 1.25 μm fell by nearly 2^m in November 2006. Analysis of IR observations of CH Cyg in 2003–2006 together with V photometry available on the internet site http://www.garypoyner.pwp.blueyonder.co.uk/chcyg.html led to the following interpretation of our observations:

Table 8. Main publications of the authors on the results of our IR photometry

Objects	Publications
VX Cas, UX Ori, BN Ori, WW Vul	E. A. Kolotilov, G. V. Zaitseva, and V. I. Shenavrin, Astrofizika **13**, 449 (1977)
SU Tau	V. T. Doroshenko, Yu. S. Efimov, E. Rozenbush, et al., Astrofizika **14**, 5 (1978)
R CrB	V. I. Shenavrin, O. G. Taranova, V. I. Moroz, and A. V. Grigoriev, Astron. Zh. **56**, 1007 (1979) [Sov. Astron. **23**, 567 (1979)]
XX Cam, UV Cas, SU Tau	V. I. Shenavrin, Astron. Zh. **56**, 1228 (1979) [Sov. Astron. **23**, 696 (1979)]
HE 2-442	V. F. Esipov, O. G. Taranova, and B. F. Yudin, Pis'ma Astron. Zh. **6**, 418 (1980) [Sov. Astron. Lett. **6**, 231 (1980)]
XX Cam, UV Cas, SU Tau, SV Sge	V. I. Shenavrin, Perem. Zvezdy **21**, 315 (1980)
HM Sge, V1016 Cyg	O. G. Taranova and B. F. Yudin, Pis'ma Astron. Zh. **6**, 495 (1980) [Sov. Astron. Lett. **6**, 273 (1980)]
Z And	O. G. Taranova and B. F. Yudin, Astron. Zh. **58**, 1249 (1981) [Sov. Astron. **25**, 710 (1981)]
CI Cyg	O. G. Taranova and B. F. Yudin, Astron. Zh. **58**, 1051 (1981) [Sov. Astron. **25**, 598 (1981)]
V1357 Cyg	O. G. Taranova and V. I. Shenavrin, Astron. Tsirk., No. 1205, 5 (1982)
CH Cyg	O. G. Taranova, B. F. Yudin, and V. I. Shenavrin, Astron. Tsirk., No. 1219, 8 (1982)
PU Vul	T. S. Belyakina, R. E. Gershberg, Yu. S. Efimov, et al., Astron. Zh. **59**, 302 (1982) [Sov. Astron. **26**, 184 (1982)]
AX Per, AG Dra, BF Cyg, V 443 Her, YY Her	O. G. Taranova and B. F. Yudin, Astron. Zh. **59**, 92 (1982) [Sov. Astron. **26**, 57 (1982)]
PU Vul	T. S. Belyakina, Yu. S. Efimov, E. P. Pavlenko, and V. I. Shenavrin, Astron. Zh. **59**, 1 (1982) [Sov. Astron. **26**, 1 (1982)]
HM Sge	O. G. Taranova and B. F. Yudin, Pis'ma Astron. Zh. **8**, 90 (1982) [Sov. Astron. Lett. **8**, 46 (1982)]
CH Cyg	O. G. Taranova and B. F. Yudin, Pis'ma Astron. Zh. **8**, 722 (1982) [Sov. Astron. Lett. **8**, 389 (1982)]
He 2-442	V. P. Arkhipova, V. F. Esipov, and B. F. Yudin, Astron. Tsirk., No. 1249, 8 (1983)
CH Cyg	O. G. Taranova and V. I. Shenavrin, Perem. Zvezdy **21**, 817 (1983)
TX CVn	O. G. Taranova and B. F. Yudin, Pis'ma Astron. Zh. **9**, 36 (1983) [Sov. Astron. Lett. **9**, 19 (1983)]
RX Cas	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **9**, 291 (1983) [Sov. Astron. Lett. **9**, 154 (1983)]
Z And, AG Dra, CI Cyg, V443 Her, BF Cyg	O. G. Taranova and B. F. Yudin, Pis'ma Astron. Zh. **9**, 618 (1983) [Sov. Astron. Lett. **9**, 322 (1983)]
V1016, HM Sge	O. G. Taranova and B. F. Yudin, Astron. Astrophys. **117**, 209 (1983)
He 2-442A, He 2-442B	O. G. Taranova and B. F. Yudin, Astron. Tsirk., No. 1322, 8 (1984)
CH Cyg, TX CVn	O. G. Taranova and B. F. Yudin, Astron. Zh. **61**, 510 (1984) [Sov. Astron. **28**, 299 (1984)]
PU Vul	T. S. Belyakina, N. I. Bondar', R. E. Gershberg, et al., Izv. Krymsk. Astrofiz. Observ. **72**, 3 (1985)
PU Vul	V. P. Arkhipova, V. F. Esipov, and B. F. Yudin, Pis'ma Astron. Zh. **11**, 511 (1985) [Sov. Astron. Lett. **11**, 213 (1985)]
CH Cyg	O. G. Taranova and B. F. Yudin, Astron. Tsirk., No. 1370, 7 (1985)
RY Tau	G. V. Zaitseva, E. A. Kolotilov, P. P. Petrov, et al., Pis'ma Astron. Zh. **11**, 271 (1985) [Sov. Astron. Lett. **11**, 109 (1985)]
RX Cas	A. E. Nadjip, O. G. Taranova, and V. I. Shenavrin, Astron. Tsirk., No. 1370, 4 (1985)
V725 Tau	A. E. Nadjip and B. F. Yudin, Astron. Tsirk., No. 1369, 7 (1985)
CH Cyg	O. G. Taranova and B. F. Yudin, Astron. Tsirk., No. 1438, 8 (1986)

Table 8. (Contd.)

Objects	Publications
CI Cyg, BF Cyg, Z And, AX Per, V443 Her	O. G. Taranova and B. F. Yudin, Astron. Tsirk., No. 1454, 7 (1986)
WY Gem, ZZ CMi	O. G. Taranova, Astron. Tsirk., No. 1467, 7 (1986)
Periods in the IR emission of 10 symbiotic stars	O. G. Taranova, Astron. Tsirk., No. 1473, 7 (1986)
V1329 Cyg	O. G. Taranova and B. F. Yudin, Astron. Zh. **63**, 151 (1986) [Sov. Astron. **30**, 93 (1986)]
V1016 Cyg	O. G. Taranova and B. F. Yudin, Astron. Zh. **63**, 317 (1986) [Sov. Astron. **30**, 193 (1986)]
FG Sge	O. G. Taranova, Astrofizika **25**, 453 (1986)
Z And, CI Cyg, BF Cyg, AG Dra, AX Per, V443 Her, YY Her	B. F. Yudin, Astrophys. Space Sci. **135**, 143 (1987)
UV Aur, RW LMi	O. G. Taranova, Astrofizika **27**, 29 (1987)
V443 Her	O. G. Taranova and B. F. Yudin, Astron. Tsirk., No. 1489, 7 (1987)
CI Cyg	O. G. Taranova, Pis'ma Astron. Zh. **13**, 423 (1987) [Sov. Astron. Lett. **13**, 173 (1987)]
RX Cas	O. G. Taranova, Pis'ma Astron. Zh. **13**, 502 (1987) [Sov. Astron. Lett. **13**, 206 (1987)]
CI Cyg, AG Dra, BF Cyg, Z And, AX Per, YY Her, V443 Her, AG Peg	O. G. Taranova and B. F. Yudin, Astron. Zh. **64**, 867 (1987) [Sov. Astron. **31**, 452 (1987)]
FG Sge	O. G. Taranova, Pis'ma Astron. Zh. **13**, 891 (1987) [Sov. Astron. Lett. **13**, 374 (1987)]
AG Peg	B. F. Yudin, in *The Symbiotic Phenomenon,* Ed. by J. Mikolajewska, M. Friedjung, S. J. Kenyon, and R. Viotti (Kluwer, Dordrecht, 1988), p. 261
V407 Cyg, V1413 Aql	V. F. Esipov, O. G. Taranova, and B. F. Yudin, Astrofizika **29**, 285 (1988)
Cool components of symbiotic stars	O. G. Taranova and B. F. Yudin, in *The Symbiotic Phenomenon,* Ed. by J. Mikolajewska, M. Friedjung, S. J. Kenyon, and R. Viotti (Kluwer, Dordrecht, 1988), p. 37
CH Cyg	O. G. Taranova and B. F. Yudin, Astrophys. Space Sci. **146**, 33 (1988)
22 secondary standards	O. G. Taranova, Byull. Abastumansk. Astrofiz. Observ. **67**, 19 (1989)
CH Cyg	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **15**, 1020 (1989) [Sov. Astron. Lett. **15**, 444 (1989)]
Atmospheric Opacity in the Crimea	O. G. Taranova, Byull. Abastumansk. Astrofiz. Observ. **67**, 73 (1989)
PU Vul	T. S. Belyakina, N. I. Bondar, D. Chochol, et al., Astron. Astrophys. **223**, 119 (1989)
V1057 Cyg	E. A. Kolotilov, Pis'ma Astron. Zh. **16**, 24 (1990) [Sov. Astron. Lett. **16**, 12 (1990)]
CH Cyg	O. G. Taranova, Pis'ma Astron. Zh. **16**, 1011 (1990) [Sov. Astron. Lett. **16**, 434 (1990)]
HM Sge	O. G. Taranova and B. F. Yudin, in *Physics of Classical Novae*, Lecture Notes Phys. **369**, 435 (1990)
FG Sge	V. P. Arkhipova and O. G. Taranova, Pis'ma Astron. Zh. **16**, 808 (1990) [Sov. Astron. Lett. **16**, 347 (1990)]
BQ Ori, R UMi, SV UMa, UU Her	O. G. Taranova and E. I. Torgovkina, Astron. Tsirk., No. 1548, 13 (1991)
CH Cyg	O. G. Taranova, Pis'ma Astron. Zh. **17**, 253 (1991) [Sov. Astron. Lett. **17**, 107 (1991)]
CH Cyg	O. G. Taranova and B. F. Yudin, Astron. Zh. **69**, 262 (1992) [Sov. Astron. **36**, 132 (1992)]
CH Cyg	O. G. Taranova and B. F. Yudin, Astron. Astrophys. **257**, 615 (1992)
T CrB	B. Yudin and U. Munari, Astron. Astrophys. **270**, 165 (1993)
V1974 Cyg	E. A. Kolotilov, A. E. Nadjip, V. I. Shenavrin, and B. F. Yudin, Astron. Zh. **71**, 618 (1994) [Astron. Rep. **38**, 548 (1994)]

Table 8. (Contd.)

Objects	Publications
V433 Her	E. A. Kolotilov and B. F. Yudin, Pis'ma Astron. Zh. **20**, 411 (1994) [Astron. Lett. **20**, 347 (1994)]
V444 Cyg	A. M. Cherepashchuk, I. I. Antokhin, E. B. Dzhapiashvili, et al., Astron. Zh. **71**, 623 (1994) [Astron. Rep. **38**, 552 (1994)]
V1419 Aql	U. Munari, B. F. Yudin, E. A. Kolotilov, et al., Astron. Astrophys. **284**, L9 (1994)
HM Sge	B. Yudin, U. Munari, O. Taranova, and I. Dalmeri, Astron. Astrophys. Suppl. Ser. **105**, 169 (1994)
CH Cyg	O. G. Taranova, B. F. Yudin, and E. A. Kolotilov, Pis'ma Astron. Zh. **21**, 529 (1995) [Astron. Lett. **21**, 470 (1995)]
V441 Her	A. M. Tatarnikov and B. F. Yudin, Astron. Zh. **72**, 57 (1995) [Astron. Rep. **39**, 50 (1995)]
V1419 Aql	B. Yudin and U. Munari, in *Cataclysmic Variables*, Ed. by A. Bianchini, M. della Valle, and M. Orio, Astrophys. Space Sci. Library **205**, 295 (1995)
V1419 Aql	E. A. Kolotilov, V. I. Shenavrin, and B. F. Yudin, Astron. Zh. **73**, 94 (1996) [Astron. Rep. **40**, 81 (1996)]
V1425 Aql	E. A. Kolotilov, A. M. Tatarnikov, V. I. Shenavrin, and B. F. Yudin, Pis'ma Astron. Zh. **22**, 813 (1996) [Astron. Lett. **22**, 729 (1996)]
V627 Cas	E. A. Kolotilov, U. Munari, B. F. Yudin, and A. M. Tatarnikov, Astron. Zh. **73**, 894 (1996) [Astron. Rep. **40**, 812 (1996)]
V1357 Cyg	A. E. Nadjip, T. S. Khruzina, A. M. Cherepashchuk, and V. I. Shenavrin, Astron. Zh. **73**, 377 (1996) [Astron. Rep. **40**, 338 (1996)]
V723 Cas	U. Munari, V. P. Goranskij, A. A. Popova, et al., Astron. Astrophys. **315**, 166 (1996)
NGC 4151	A. E. Nadjip, O. G. Taranova, and V. I. Shenavrin, Astron. Tsirk., No. 1557, 1 (1996)
V1419 Aql	A. V. Sementkovskii and B. F. Yudin, Pis'ma Astron. Zh. **22**, 193 (1996) [Astron. Lett. **22**, 170 (1996)]
V443 Her	U. Munari, E. A. Kolotilov, A. A. Popova, and B. F. Yudin, Astron. Zh. **74**, 898 (1997) [Astron. Rep. **41**, 802 (1997)]
V627 Cas	E. A. Kolotilov, A. A. Popova, A. M. Tatarnikov, and B. F. Yudin, Astron. Astrophys. Trans. **14**, 195 (1997)
KX And, V367 Cyg	O. G. Taranova, Pis'ma Astron. Zh. **23**, 810 (1997) [Astron. Lett. **23**, 704 (1997)]
RX Cas, TX UMa	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **23**, 803 (1997) [Astron. Lett. **23**, 698 (1997)]
NGC 4151	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **23**, 815 (1997) [Astron. Lett. **23**, 709 (1997)]
T CrB	T. Shahbaz, M. Somers, B. Yudin, and T. Naylor, Mon. Not. R. Astron. Soc. **288**, 1027 (1997)
V4334 Sgr	V. P. Arkhipova, V. F. Esipov, R. I. Noskova, et al., Pis'ma Astron. Zh. **24**, 297 (1998) [Astron. Lett. **24**, 248 (1998)]
V407 Cyg	E. A. Kolotilov, U. Munari, A. A. Popova, et al., Pis'ma Astron. Zh. **24**, 526 (1998) [Astron. Lett. **24**, 451 (1998)]
NGC 4151	V. M. Lyuty, O. G. Taranova, and V. I. Shenavrin, Pis'ma Astron. Zh. **24**, 243 (1998) [Astron. Lett. **24**, 199 (1998)]
FG Sge	A. M. Tatarnikov and B. F. Yudin, Pis'ma Astron. Zh. **24**, 359 (1998) [Astron. Lett. **24**, 303 (1998)]
FG Sge	A. M. Tatarnikov, V. I. Shenavrin, and B. F. Yudin, Astron. Zh. **75**, 428 (1998) [Astron. Rep. **42**, 377 (1998)]
V443 Her	E. A. Kolotilov, U. Munari, A. A. Popova, and B. F. Yudin, Pis'ma Astron. Zh. **24**, 39 (1998) [Astron. Lett. **24**, 34 (1998)]
NGC 4151	V. L. Oknyanskij, V. M. Lyuty, O. G. Taranova, and V. I. Shenavrin, Pis'ma Astron. Zh. **25**, 563 (1999) [Astron. Lett. **25**, 483 (1999)]
NGC 4151	O. G. Taranova and V. I. Shenavrin, Astron. Zh. **76**, 729 (1999) [Astron. Rep. **43**, 637 (1999)]
UV Aur, NQ Gem, RW LMi	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **25**, 860 (1999) [Astron. Lett. **25**, 750 (1999)]
V407 Cyg	B. F. Yudin, Astron. Zh. **76**, 198 (1999) [Astron. Rep. **43**, 167 (1999)]

Table 8. (Contd.)

Objects	Publications
RW LMi	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **76**, 780 (1999) [Astron. Rep. **43**, 684 (1999)]
FG Sge, V4334 Sgr	B. F. Yudin and A. M. Tatarnikov, in *Asymptotic Giant Branch Stars,* Ed. by T. Le Bertre, A. Lebre, and C. Waelkens (Kluwer, Dordrecht, 1999), p. 487
CH Cyg	O. G. Taranova and V. I. Shenavrin, Astron. Zh. **77**, 525 (2000) [Astron. Rep. **44**, 460 (2000)]
V1016 Cyg, HM Sge	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **26**, 695 (2000) [Astron. Lett. **26**, 600 (2000)]
V1413 Aql	V. F. Esipov, E. A. Kolotilov, J. Mikolajewska, et al., Pis'ma Astron. Zh. **26**, 200 (2000) [Astron. Lett. **26**, 162 (2000)]
35 variable stars	O. G. Taranova, Pis'ma Astron. Zh. **26**, 472 (2000) [Astron. Lett. **26**, 404 (2000)]
PU Vul	T. S. Belyakina, V. I. Burnashev, R. E. Gershberg, et al., Izv. Krymsk. Astrofiz. Observ. **96**, 22 (2000)
XTE J1118+480	O. G. Taranova and V. I. Shenavrin, IAU Circ., No. 7407, 2 (2000)
V4334 Sgr	A. M. Tatarnikov, V. I. Shenavrin, B. F. Yudin, et al., Pis'ma Astron. Zh. **26**, 587 (2000) [Astron. Lett. **26**, 506 (2000)]
R Cas	A. E. Nadjip, A. M. Tatarnikov, V. I. Shenavrin, et al., Pis'ma Astron. Zh. **27**, 376 (2001) [Astron. Lett. **27**, 324 (2001)]
VV Cep, ZZ CMi, WY Gem, e Aur, zh Aur	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **27**, 393 (2001) [Astron. Lett. **27**, 338 (2001)]
HM Sge	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **78**, 52 (2001) [Astron. Rep. **45**, 44 (2001)]
R CrB	K. Ohnaka, Y. Balega, T. Blucker, et al., Astron. Astrophys. **380**, 212 (2001)
V1016 Cyg	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **78**, 535 (2001) [Astron. Rep. **45**, 461 (2001)]
CH Cyg	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **78**, 915 (2001) [Astron. Rep. **45**, 797 (2001)]
V4334 Sgr	A. M. Tatarnikov, V. I. Shenavrin, P. A. Vaitlok, et al., Pis'ma Astron. Zh. **27**, 625 (2001) [Astron. Lett. **27**, 534 (2001)]
XTE J1118+480	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **27**, 31 (2001) [Astron. Lett. **27**, 25 (2001)]
V4334 Sgr	V. I. Shenavrin and B. F. Yudin, Astron. Zh. **78**, 729 (2001) [Astron. Rep. **45**, 631 (2001)]
R CrB	B. F. Yudin, J. D. Fernie, N. R. Ikhsanov, et al., Astron. Astrophys. **394**, 617 (2002)
RR Tau	V. P. Grinin, D. N. Shakhovskoi, V. I. Shenavrin, et al., Astron. Zh. **79**, 715 (2002) [Astron. Rep. **46**, 646 (2002)]
YY Her	E. A. Kolotilov, A. A. Tatarnikova, S. Yu. Shugarov, and B. F. Yudin, Pis'ma Astron. Zh. **28**, 688 (2002) [Astron. Lett. **28**, 620 (2002)]
FG Sge	O. G. Taranova and V. I. Shenavrin, Astron. Zh. **79**, 1118 (2002) [Astron. Rep. **46**, 1010 (2002)]
T Cep	G. Weigelt, U. Beckmann, T. Bloecker, et al., Astron. Gesellsch. Abstr. Ser. **19**, 94 (2002)
R CrB	V. I. Shenavrin, J. D. Fernie, G. Weigelt, et al., Astron. Zh. **79**, 894 (2002) [Astron. Rep. **46**, 805 (2002)]
DY Per	A. Alksnis, V. M. Larionov, L. V. Larionova, and V. I. Shenavrin, Baltic Astron. **11**, 487 (2002)
X Oph, R Aql, RU Her, R Ser, V CrB	K.-H. Hofmann, U. Beckmann, T. Blucker, et al., New Astron. **7**, 9 (2002)
NGC 4151	O. G. Taranova and V. I. Shenavrin, Astron. Astrophys. Trans. **22**, 691 (2003)
V407 Cyg	E. A. Kolotilov, V. I. Shenavrin, S. Yu. Shugarov, and B. F. Yudin, Astron. Zh. **80**, 845 (2003) [Astron. Rep. **47**, 777 (2003)]
YY Her, V1413 Aql	A. A. Tatarnikova and B. F. Yudin, in *Symbiotic Stars Probing Stellar Evolution*, Ed. by R. L. M. Corradi, R. Mikolajewska, and T. J. Mahoney, ASP Conf. Ser. **303**, 236 (2003)

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Objects	Publications
Z And	N. A. Tomov, O. G. Taranova, and M. T. Tomova, Astron. Astrophys. **401**, 669 (2003)
T Cep	G. Weigelt, U. Beckmann, T. Blucker, et al., Astron. Nachr. **324** (Suppl. 2), 71 (2003)
FG Sge	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **80**, 583 (2003) [Astron. Rep. **47**, 535 (2003)]
R CrB	K. Ohnaka, U. Beckmann, J.-P. Berger, et al., Astron. Astrophys. **408**, 553 (2003)
29 cool stars	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **30**, 605 (2004) [Astron. Lett. **30**, 549 (2004)]
Z And	O. G. Taranova, N. A. Tomov, M. T. Tomova, and V. I. Shenavrin, Astron. Zh. **81**, 816 (2004) [Astron. Rep. **48**, 742 (2004)]
Z And	N. A. Tomov, M. T. Tomova, and O. G. Taranova, Astron. Astrophys. **428**, 985 (2004)
CH Cyg	O. G. Taranova and V. I. Shenavrin, Astron. Zh. **81**, 895 (2004) [Astron. Rep. **48**, 813 (2004)]
KX And, RX Cas, β Lyr, V367 Cyg, V360 Lac,	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **31**, 669 (2005) [Astron. Lett. **31**, 598 (2005)]
BF Cyg	B. F. Yudin, V. I. Shenavrin, E. A. Kolotilov, et al., Astron. Zh. **82**, 262 (2005) [Astron. Rep. **49**, 232 (2005)]
Z And	N. A. Tomov, M. T. Tomova, and O. G. Taranova, Aerospace Res. Bulg. **20**, 252 (2005)
Z And	N. A. Tomov, M. T. Tomova, and O. G. Taranova, in *The Astrophysics of Cataclysmic Variables and Related Objects*, Ed. by J.-M. Hameury and J.-P. Lasota, ASP Conf. Ser. **330**, 465 (2005)
RW LMi	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **82**, 256 (2005) [Astron. Rep. **49**, 226 (2005)]
BF Cyg	B. F. Yudin, E. A. Kolotilov, V. I. Shenavrin, et al., Astron. Astrophys. Trans. **24**, 447 (2005)
OH 104.9+2.4	D. Riechers, Y. Balega, T. Driebe, et al., Astron. Astrophys. **436**, 925 (2005)
22 hot stars	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **32**, 866 (2006) [Astron. Lett. **32**, 780 (2006)]
NGC 1068	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **32**, 489 (2006) [Astron. Lett. **32**, 439 (2006)]
NGC 1068	O. G. Taranova and V. I. Shenavrin, Astron. Astrophys. Trans. **25**, 233 (2006)
LP And	A. B. Men'shchikov, Y. Y. Balega, M. Berger, et al., Astron. Astrophys. **448**, 271 (2006)
CH Cyg	O. Taranova and V. Shenavrin, Perem. Zvezdy **6** (Suppl. 28) (2006)
6 hot stars	J. Puls, N. Markova, S. Scuderi, et al., Astron. Astrophys. **454**, 625 (2006)
V2108 Oph	M. B. Bogdanov, O. G. Taranova, and V. I. Shenavrin, Astron. Zh. **83**, 437 (2006) [Astron. Rep. **50**, 387 (2006)]
CH Cyg	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **33**, 598 (2007) [Astron. Lett. **33**, 531 (2007)]
8 planetary nebulae	O. G. Taranova and V. I. Shenavrin, Pis'ma Astron. Zh. **33**, 657 (2007) [Astron. Lett. **33**, 584 (2007)]
NGC 4151	V. L. Oknyanskij, V. M. Lyuty, O. G. Taranova, and V. I. Shenavrin, in *AGN Variability from X-Rays to Radio Waves*, Ed. by C. M. Gaskell, I. M. McHardy, B. M. Peterson, and S. G. Sergeev, ASP Conf. Ser. **360**, 75 (2007)
V407 Cyg	S. Yu. Shugarov, A. A. Tatarnikova, E. A. Kolotilov, et al., Baltic Astron. **16**, 23 (2007)
V1357 Cyg	O. G. Taranova, V. I. Shenavrin, and A. E. Nadjip, Perem. Zvezdy **28** (7) (2008)
BU Tau	O. G. Taranova, V. I. Shenavrin, and A. E. Nadjip, Perem. Zvezdy **8** (Suppl. 6) (2008)
CH Cyg	M. B. Bogdanov and O. G. Taranova, Astron. Zh. **85**, 454 (2008) [Astron. Rep. **52**, 403 (2008)]

—A fairly dense dusty formation (cloud or envelope) appeared in the line of sight in August–November 2006.

—The dependence of the attenuation of the brightness $\log[\Delta m(\lambda)]$ on $\log\lambda$ has a break at 1.8–2 μm, and has the form $\Delta m(\lambda) \propto \lambda^{-2}$ at $\lambda > 1.65$ μm. The attenuation exhibits only a weak wavelength dependence at $\lambda < 1.65$ μm. The observed wavelength dependence of the attenuation is characteristic of dust particles such as graphite, with the size of the grains primarily lying in the range 0.14–0.16 μm.

—A new dust envelope formed in November–December 2006 was optically thick, with its optical depth at 2.2 μm being $\tau(2.2) \approx 0.97$.

—The mass of the dust envelope was $M_{\rm d}(2006) \approx 8 \times 10^{-6}$ $M_\odot$, and the rate at which matter was supplied to the envelope was $\sim 2 \times 10^{-5}$ $M_\odot$/yr.

4. The *JHKLM* photometry supplemented by far-IR measurements obtained with the ISO orbiting observatory were used to calculate a spherically symmetrical dust-envelope model for the star in its maximum- and minimum-brightness states. The optical depths and expansion rates of the envelopes, as well as the mass-loss rate and an upper limit for the mass of the central source were estimated. Comparison with models calculated earlier indicates an accelerated growth in the optically thick dust envelope and the mass-loss rate with time.

We have studied the origin of the variability of a whole series of objects, including the stellar components of close binaries, several dozen Mira stars, and semi-regular variables. In particular, the ellipsoidality of the components in the RX Cas system (a prototype W Ser star) has been firmly established, as well as the ellipsoidality of the cool component in the symbiotic system CI Cyg. We have obtained long-term photometric IR observations of the symbiotic star BF Cyg. The cool component can be distinguished in the brightness variations as a component with a period equal to half the orbital period. This is associated with the ellipsoidal shape of the red giant, which computations have shown fills its Roche lobe. Taking into account the contribution of the hot source, which varies with the orbital period, appreciably influences estimates of the parameters of the ellipsoidal variability of the red giant's brightness.

The IR variability of the symbiotic star V407 Cyg was studied over 14 years. The cool component is a Mira with a period of 745 days. The mean brightness level rose during the observations, comprising 0.4^m in the K band. The pulsations and trend are associated with luminosity and temperature variations of the Mira, as well as optical-depth variations of the dust envelope. We have estimated the sizes of the dust grains and mass-loss rate of the Mira.

An eclipsing light curve for the V444 Cyg system (WN5 + O6) was obtained in the IR for the first time. We determined the wavelength dependence of the parameters of the WN5 atmosphere. The strong increase in the size of the glowing extended atmosphere of this star with wavelength was confirmed, providing evidence that the WN5 stellar wind has a clumpy structure.

The IR light curves of several novae have been studied. The condensation of dust envelopes in the transition periods of the Cygnus 1992 (V1974 Cyg), Aquila 1993 (V1419 Aql), and Aquila 1995 (V1425 Aql) was demonstrated. The luminosity, mass, and temperature of the dust envelops, as well as the rate of formation and size of their dust grains, were estimated.

The IR light curve of R CrB was obtained over a long time interval. A detailed analysis of the temporal and color characteristics of the radiation for both the star itself and its extended dust envelope was carried out. The bolometric flux of hot dust clouds was estimated to comprise only a few percent of the bolometric flux of the dust envelope. The stellar wind of R CrB is not spherically symmetrical. The dust envelope consists of small (0.01 μm) grains, and the cloud screening the star from the observer of larger (0.1 μm) particles.

We conducted IR observations of the nova-like variable V4334 Sgr over four years. Over this time, the star passed through four stages in its motion along its post-AGB track. The color characteristics of the radiation of the star and its dust envelope in each stage have been analyzed. The bolometric flux, optical depth, and structure of the dust cloud have been estimated, as well as the mass of its dust layer.

IR observations of the UX Ori star RR Tau were carried out during a uniquely long Algol-like minimum. The J and H fluxes were measured simultaneous with optical flux variations; the K and L fluxes rose during and for some time after the end of the optical minimum. Our analysis showed that the source of the K and L radiation was a dust cloud, with the growth of the flux in these bands being due to a growth in the number of radiating particles in the cloud. The mass of the radiating dust and of the entire dust cloud were obtained.

We have obtained and analyzed long-term IR light curves for 29 cool stars (9 carbon Miras, 18 carbon semi-regular variables, and 2 oxygen Miras. Our main results are as follows.

1. A periodic component was detected in the J brightness variations of the oxygen Mira V2108 Oph, with an amplitude of about 1.7^m. This star is immersed in a fairly dense dust envelope, with $A_V \sim 4^m$ ($\tau(1.25\ \mu\text{m}) \sim 0.9$). The color temperature of the star is $\sim$1100 K at the brightness minimum and $\sim$1200 K

at the maximum. The period of the brightness variations of the Mira was refined (570 ± 3 d), and reliable light curves and color indices were obtained. The color temperatures of the two black bodies providing the observed fluxes at the brightness minimum and maximum were estimated. IRAS data were used to calculate a dust-envelope model in which the dust is comprised of silicate particles, which describes the SED of the object well. The high temperature of the dust at the inner envelope boundary, close to the condensation temperature for silicates, testifies that the formation of the dust is ongoing. The derived mass-loss rate exceeds earlier approximate estimates, and moves V2108 Oph to the group of object with high mass-loss rates.

2. Observations of the carbon semi-regular variable RW LMi in 1999–2003 showed periodic variations of the IR brightness and color against the background of a slow increase in the J brightness. The color indices simultaneously decreased; i.e., the object became hotter. Three components can be distinguished in the brightness and color variations of RW LMi:

a) Variations of the IR brightness and color with the period 600–630 d (the observations after 1996 are in good agreement with a period of 605 d). The J brightness of the star became hotter at the maximum.

b) Long-period, possibly periodic, variations of the IR brightness and color. The period of these variations may be $\sim$5200 days ($\sim$14.2 yr), and the amplitude of the J variations is $\sim 1^m$.

c) A linear trend corresponding to a gradual increase in the J brightness from 1986 until Summer 2003. The mean J, H, K, and L brightnesses changed by approximately -0.45^m, -0.75^m, -0.60^m and -0.04^m over 17 years. A drop in brightness was observed at 5 μm, with the corresponding linear trend comprising 0.1^m over 17 years. The maximum brightness increase was observed at 1.65 μm. The increase in the $JHKL$ brightness, decrease in the M brightness, and decrease in the $K-L$ color index from 1986 through 2003 suggest a possible decrease in the optical depth of the dust envelope (and its scattering).

An axially symmetrical model for the dust envelope of the carbon star RW LMi with a density distribution characteristic for the "superwind" stage was calculated for the first time. This envelope model is able to reproduce the observed fluxes in the entire observable spectral range, and yields a good agreement with the observational data. The estimated mass-loss rate by the star is $\dot{M} = 1.2 \times 10^{-5} M_{\odot}$/yr. The near-IR brightness distribution calculated for this model is in satisfactory agreement with observations with high angular resolution.

3. We estimated the mean dust-envelope optical depths at 1.25 μm, angular diameters, and temperatures for each of 29 objects.

We studied 22 hot stars (mainly supergiants). The three stars V482 Cas, QZ Sge, and HD 338926 were found to be candidate variables in the IR. The interstellar absorption has been estimated for each object, as well as their angular diameters. The luminosities and volume emission measures of the circumstellar gas envelopes were estimated for stars with IR excesses.

IR photometry for nine hot supergiants was used in an international program of studies of bright Galactic OV stars aimed at placing constraints on the radial stratification of small-scale density inhomogeneities in the winds of hot stars based on analysis of Hα, IR, and radio observations.

Long-term JK photometry of the X-ray binary Cyg X-1 (V1357 Cyg) shows that the amplitudes of the J and K variations during 1995–2007 did not exceed 0.2^m. The maximum JK brightness was observed roughly in 2000. Periodic variations with the characteristic time scale $\sim$11.5 yr were detected in the JK brightness of Cyg X-1 in 1984–2007, possibly due to periodic ($P \sim 11.5$ yr) variations in the temperature, radius, and luminosity of the optical component of the binary. The orbital JK light curve is asymmetrical at the quadratures. The second minimum is bluer than the main minimum, suggesting that the star may become hotter in the second minimum. The ratio of the radii of the supergiant at the quadratures and at the minima is $\sim$1.02, if the temperature of the optical component remains constant during the orbital motion.

Analysis of JK photometry of Cyg X-1 in the main minimum of the orbital motion (when the X-ray source is behind the optical component) yields the estimated interstellar extinction $E(B-V) = 1.025^m \pm 0.006^m$, distance to the star $d = 2.44 \pm 0.04$ kpc, and luminosity and radius of the O9.7 supergiant $2.8 \times 10^5\ L_{\odot}$ and 21 $R_{\odot}$. The dependence of the JK brightnesses on the phase of the orbital motion obtained for 1995–2007 and 1984–1994 are similar and consistent with a model for the ellipsoidal variability of the hot supergiant during its orbital motion. The parameters of the binary derived from IR observations in 1984–1994 can also fit the observations for 1994–2007. A period of 294 days may be present in the J and K brightness variations. The amplitude of K variations with the period 294 d is no more than 0.03^m–0.05^m. The minimum of the 294-day variations in the J and K brightness is shifted by approximately 90 days relative to the ephemerides of Camp et al. [25].

Detailed IR photometry of BU Tau was carried out during a dimming of its IR brightness in 1999–2007. The decrease in the brightness of the star between December 1999 and November 2007 was $\sim 0.20^m - 0.25^m$ in J, H, K, and L.

Five RV Tau stars (R Sge, RV Tau, AC Her, V Vul, and R Sct) and the yellow supergiant and protoplanetary-nebula candidate V1027 Cyg were studied. Over 14 years of observations, the amplitudes of the IR variations of R Sge and RV Tau were $0.5^m - 0.7^m$; the IR variations of V1027 Cyg did not exceed 0.2^m over 18 years. The color excesses at 1.25–5 μm (compared to normal supergiants) were higher for R Sge and RV Tau than for V1027 Cyg. The studied supergiants displayed a decrease in the color temperature with increasing wavelength, as is characteristic for stars surrounded by dust envelopes.

The variations in the J brightness and $J-H$ color index of the supergiant R Sge occurring about a smoothly varying mean. The mean J brightness fell by approximately 0.15^m from 1995 through 2008. The star became brighter in the near IR (1.25–1.65 μm) in 2008 than in 1995. The largest increase in the color temperature was observed in 2001. The variations in the mean brightnesses and colors at 1.25–1.65 μm (where the supergiant radiates) observed from 1995 through 2008 can be explained as variations of the temperature and radius of the supergiant itself, with the temperature of the star increasing as its radius decreases. The observed mean temperature and radius variations probably occurring in the presence of a constant luminosity of the star. In addition to the variations in the mean IR brightness and colors, pulsations of the brightness and color with characteristic times (for RVB stars) from hundreds to thousands of days and an amplitude of $0.5^m - 0.7^m$ (for J) were observed. Variations of the IR brightness of the supergiant R Sge with the period 70.77 d agree with the ephemerides presented by Kholopov et al. [20]. The periodic variations of J and $J-H$ of R Sge can be explained by temperature pulsations with $\Delta T \leq$ 200 K and radial pulsations with $\Delta R/R \leq 0.2$. The variations of J and $J-H$ for R Sge with the variability phase ($P = 77$ d) show a delay of the J variations relative to the $J-H$ variations, as is characteristic for the optical variations of RV Tau stars [26]; this phase shift is about 0.1–0.15.

The mean J brightness of the supergiant RV Tau decreased and its mean $J-H$ color index increased from 1995 through 2008. The increase in the color temperature and J brightness can mostly be explained by variations of the temperature of the star. A periodic component with $P = 78.73$ d can also be distinguished in the IR brightness and color variations of RV Tau [20], although the epoch of minimum for the IR light curves, JD(Min, J) ≈ 2417496.05, may differ from that in the optical. The delay noted for R Sge is not visible in the IR brightness and color variations of RV Tau.

Variations of the mean J brightness and $J-H$ color index for V1027 Cyg over 18 yrs did not exceed several hundreds of a magnitude. Long-period pulsations with amplitudes of $0.2^m - 0.25^m$ (in J) are observed about the mean IR brightness and color values. The pulsations in $J-H$ are within $0.27^m - 0.35^m$, which corresponds to color-temperature variations of 500–600 K. The observed color-temperature variations should lead to variations of the J brightness over a larger range than is observed, suggesting that the J variations may include components due to both temperature and radial pulsations. A search for periodic IR variations in the radiation of the supergiant V1027 Cyg indicated the period $P = 237 \pm 2$ d to be most probable. A broad maximum at 650–720 d and the equally probable period $\sim$143 d are also visible in the periodogram. The temperature pulsations in the atmosphere of V1027 Cyg with the period 237 d ($\Delta T \sim 600$ K) are accompanied by variations of the radius within 10–20%: the temperature increases as the radius decreases.

The dust envelope of R Sge probably has two layers, with the temperatures of the grains in these layers being $\sim$1000 K and $\sim$700 K; the corresponding optical depths at 1.25 μm are $\sim$0.02 and $\sim$0.24. The temperatures of the grains in the circumstellar dust envelopes of the supergiants RV Tau and V1027 Cyg are $\sim$600 K and $\sim$700 K, respectively; their optical depths at 1.25 μm are $\sim$0.24 and $\sim$0.008, respectively.

A model with a spherically symmetrical dust envelope was calculated for V1027 Cyg. The good agreement between the calculated and observed fluxes indicates the adequacy of a spherically symmetrical dust-envelope model for this star. Additional evidence that the envelope is symmetrical is provided by polarimetric observations. The most recent published data do not confirm earlier reports of substantial polarization of V1027 Cyg. The degrees of linear polarization in B, R, and I (in %) were found to be 1.13 ± 0.59, 0.82 ± 0.11, and 1.06 ± 0.16, respectively. The calculated gas velocity at the outer boundary of the envelope was $V_e = 18.2$ km/s, close to the observed expansion velocities of planetary nebulae. Together with a fairly high envelope density, this leads to a high mass-loss rate for the star, $\dot{M} = 1.3 \times 10^{-5}\ M_{\odot}$/yr. The derived diameter of the dust-envelope boundary and the distance to the star yield the characteristic angular size of the envelope $0.12''$, consistent with images of V1027 Cyg obtained at 9.8 μm on the HST, which indicate a lack of structure at an angular resolution of about $1''$.

The Seyfert galaxy NGC 4151 was observed in 1985–2002. The infrared brightness of the galaxy grew from 1985 through 1996 (by $\sim 0.9^m$ at 1.25 μm, $\sim 1^m$ at 1.65 μm, $\sim 1.1^m$ at 2.2 μm, and $\sim 1.3^m$ at 3.5 μm), while the galaxy simultaneously reddened. The "cool" source of NGC 4151 was still in its active state in 1998, although its luminosity had decreased by approximately 15–20%. If the "cool" component of the variable source of the galaxy is a dust envelope, heated by a "hot" central source, the envelope should be optically thin to the radiation of this source—its mean optical depth lies in the range 0.05–0.15. In the period of activity of the galactic nucleus in 1995–1998, material was heated at a distance of several parsec from the nucleus, and emission of dust particles at a temperature of 600–800 K was observed in the near IR, with the mass of emitting dust being 5–20 $M_\odot$. If the gas-to-dust ratio in the vicinity of the nucleus is $\sim$500, the mass of matter at a distance of several parsec from the nucleus of NGC 4151 reaches $\sim 10^4 M_\odot$. Observations of the galaxy in 1994–2003 show a tendency for it to become blue at 1.25–1.65 μm, while it simultaneously reddens at 2.2–3.5 μm. Beginning in Autumn 2000, the galaxy began to emerge from a minimum, which continued from March 2000 through April 2001 in the IR; in this same interval, a flare of the nucleus was observed and was followed in detail in the IR.

The variability of the Seyfert galaxy NGC 1068 in the IR was confirmed. The amplitudes of the brightness variations in J (1.25 μm) and K (2.2 μm) reach 0.15^m and 0.3^m, respectively, and exceed the observational errors by more than a factor of five. The nucleus of NGC 1068 is variable, and can be in various stages of activity. The brightness decreased from 1998 through 2004 in all filters except J, where a tendency for the brightness to increase was observed in this period. The variable source in NGC 1068 has a complex structure. At least two sources emit at 1.25–5 μm: a "hot" source, whose emission is manifest at 1.25–1.65 μm, and a "cool" source that radiates at 2.2–5 μm. The color temperature of the "hot" source increased from $\sim$2300 K (at the beginning of our observations) to $\sim$2700 K (at the end of our observations). On the contrary, the temperature of the "cool"source decreased by several tens of Kelvin (in the range 800–900 K). It was established that the IR brightness and color variations observed in 1998–2004 were associated with scattering by a dust envelope, which formed around the galactic nucleus about 30 yrs ago and reached its maximum density in 1994–1995. Analysis of the SED showed that the observed emission at 1.25–5 μm can be represented as the sum of contributions from two blackbody sources. In the first interval (JD 2451400), the temperatures of the "hot" and "cool" sources were $\sim$3100 and $\sim$760 K, while these were $\sim$3200 and $\sim$720 K in the second interval (JD 2453230). The "hot" source is relatively compact, and it is more than an order of magnitude smaller than the "cool" source: the mean sizes of the "hot" source and "cool" source are $\sim 2.35 \times 10^{16}$ cm and $\sim 7.8 \times 10^{17}$ cm. The total mean luminosity of the two sources was the same at the beginning and end of our observing interval. The optical depth of the envelope averaged over the spectrum of the "hot" source is $\tau \sim 1.5$. The state of the dust envelope had nearly returned to its 1974 level in 2004; i.e., the cycle for the formation and dissipation of the dust envelope comprises about 11 000 d ($\sim$30 yr).

Our long-term photometry of eight planetary nebulae in the near IR (1.25–5 μm) reliably established the IR brightness and color variability of these nebulae on time scales from several tens of days to six to eight years. The maximum IR brightness variations were observed for IC 2149, IC 4997, and possibly NGC 7662, whose J brightnesses varied within 0.2^m–0.25^m. The J variations for the remaining five planetary nebulae did not exceed 0.15^m. The J brightnesses for four objects (NGC 1514, NGC 7636, NGC 2392, and NGC 7662) fell, on average, over the interval of our observations (1999–2006), while the J brightness of NGC 7027 increased, on average, from 2001 through 2006; three of the planetary nebulae (NGC 6826, IC 2149, and IC 4997) displayed variations in their mean brightnesses.

Appreciable variations in the $J-K$ color index were observed for all of the studied planetary nebulae. Trends corresponding to a decrease in the J brightness by $\sim 0.02^m$ were observed for NGC 1514 and NGC 7635, with this decrease occuring over approximately 1770 days for the former and 2520 days for the latter. J variations with an amplitude of $\sim 0.2^m$ were observed for IC 2149 and IC 4997, on a time scale of 260–280 days. Relatively rapid J variations were observed for NGC 7027, with an amplitude of $\sim 0.1^m$ and a time scale of several tens of days. The mean increase in the J brightness of NGC 7027 over our observation interval ($\sim$1750 days) was $\sim 0.05^m$. On average, the J brightness of NGC 7662 fell by 0.15^m–0.17^m and the $J-K$ color index increased by approximately 0.1^m over our observation interval, corresponding to a decrease in the color temperature by approximately 1000 K (in the range 4000–6000 K). J variations were observed for this nebula, with an amplitude of $\sim 0.2^m$ and a time scale of less than a year. The J brightness of NGC 2392 fell by $\sim 0.1^m$ over approximately 2000 days. Variations in the J brightness of NGC 2392 with an amplitude of $\sim 0.1^m$ were observed on a time scale of about 400 days. J brightness variations in NGC 6826 with an amplitude of $\sim 0.15^m$–0.20^m were observed on a time scale of one to three years. Based on their emission at 1.25–2.2 μm, the two planetary nebulae NGC 1514 and NGC 7635 are type S, while the five nebulae IC 2149, NGC 2392, IC 4997, NGC 6826, and NGC 7027 are type N. The emission in regions of NGC 1514 and NGC 7635 within a 12″ diaphragm was classified as that of a V3–V7 main-sequence star (NGC 1514) and a ∼O9.5 star on the upper part of the main sequence (NGC 7635). Excess emission (compared to that of the hot source) was observed at $\lambda > 2.5$ μm for the nebulae IC 4997 and NGC 7027. The color temperature of IC 4997 at 2.2–3.5 μm was ∼1200 K, while that of NGC 7027 at 2.2–5 μm was ∼900–1200 K.

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