Optical Monitoring of BL Lac Object S5 0716+714 with High Temporal Resolution

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ABSTRACT

Optical monitoring of S5 0716+714 was performed with a 60/90 Schmidt telescope in 2003 November and December and 2004 January for studying the variability of the object on short timescales. Due to the high brightness of the source we could carry out quasi-simultaneous measurements in three bands with a temporal resolution of about 20 minutes by using one single telescope. Intraday and intranight variations were observed with an overall change of ∼0.9 mag during the whole campaign. Two outbursts were recorded on JD 2 453 005 and JD 2 453 009. Minimum timescales of a few hours were derived from the light curves of individual nights but were different from night to night. A bluer-when-brighter chromatism was present when the object was in fast flare, but was absent when it was in a relatively quiescent state. Our results are basically consistent with the shock-in-jet model and demonstrate that the geometrical effects can sometimes play an important role in the variability of blazars.

Subject headings: galaxies: active — galaxies: photometry — BL Lacertae objects: individual (S5 0716+714)

1. INTRODUCTION

Blazars are a subset of active galactic nuclei (AGNs). These radio-loud flat-spectrum objects exhibit the most rapid variations and the largest amplitude variations among all AGNs. The variations are thought to originate from a relativistic jet, which is believed to be oriented at a small angle to our light of sight and which is probably powered and accelerated by a rotating and accreting supermassive black hole. There are basically two types of blazars, the BL Lac objects and the flat-spectrum radio quasars (FSRQ), the former have a featureless optical continuum while the latter show many strong and broad emission lines.

Variability studies of blazars have been essential in understanding the physics of their central regions, which in general cannot be resolved even with existing or planned optical/infrared interferometers. The timescales, the spectral changes, and the correlations and delays between variations in different continuum components provide crucial information on the nature and location of these components and on their interdependencies. These parameters can be well studied with multi-frequency observational campaigns, such as those coordinated for Mrk 421 (e.g., Buckley et al. 1996), 3C 279 (e.g., Wehrle et al. 1998), S5 0716+714 (e.g., Raiteri et al. 2003; Wagner et al. 1996), and PKS 2155-304 (e.g., Urry et al. 1997).

The BL Lac object S5 0716+714 is well known for its intraday variability (IDV) in the radio and optical bands and has been the target of many monitoring programs, as mentioned above. Nesci, Massaro, & Montagni (2002) found a typical variation rate of 0.02 mag per hour and a maximum rising rate of 0.16 mag per hour for this object. Heidt & Wagner (1996) reported a period of 4 day in the optical band while Qian, Tao, & Fan (2002) derived a 10 day period from their 5.3 yr optical monitoring. The latter authors also discovered a variation range of about 3 mag in the V band and 2.5 mag in both R and I bands during their whole monitoring program. The optical and radio behavior of the object was recently presented by Raiteri et al. (2003) based on 8 years of optical and more than 20 years of radio observations. Four major optical outbursts were observed at the beginning of 1995, in late 1997, at the end of 2000, and in fall 2001. An exceptional brightening of 2.3 mag in 9 days was detected in the R band just before a BeppoSAX pointing on Oct 30th, 2000. The radio flux variations at different frequencies are similar, but the amplitude decreases with increasing wavelength. Its multiwavelength variability was described in detail in Wagner et al. (1996).

The broad band spectral properties of S5 0716+714 suggest that it is intermediate between low-frequency peaked BL Lac (LBL) and high-frequency peaked BL Lac (HBL) (Ulrich, Maraschi, & Urry 1997). The high-energy part of its spectral energy distribution is expected to peak in the MeV energy domain. A 450 ks *INTEGRAL* observation of S5 0716+714 proposed by the Landessternwarte Heidelberg group (PI: S. Wagner) was performed in the period 2003 November 10–18. A number of ground-based radio and optical telescopes have monitored this source during this period, including our 60/90 Schmidt telescope.

Our monitoring program have covered the period from 2003 November 8 to 18. and from 2003 December 30 to 2004 January 5 with a temporal resolution of about 20 minutes. Unlike most previous investigations, which focused on the long-term variability of this object, we concentrated on its microvariability in short timescales based on our high temporal resolution. The short timescales and spectral behaviors were studied. Here we present the observational results and analysis.

This paper is organized as follows: The observation and reduction procedures on the monitoring data are described in Sect. 2. Sect. 3 presented the results, including the light curves, the analysis on timescales and spectral changes, and some discussion on the sine-like light curves we observed. A summary is given in Sect. 4.

2. OBSERVATION AND DATA REDUCTION

Our optical monitoring program was performed on a 60/90 Schmidt telescope, which is located at the Xinglong Station of the National Astronomical Observatories of China (NAOC). A Ford Aerospace $2\,048 \times 2\,048$ CCD camera is mounted at its main focus. The CCD has a pixel size of 15 microns and its field of view is $58' \times 58'$, resulting in a resolution of $1.7\,''$/pixel. The telescope is equipped with a 15-color intermediate-band photometric system, covering a wavelength range from 3 000 to 10 000 Å. The telescope and the photometric system are mainly used to carry out the Beijing-Arizona-Taiwan-Connecticut (BATC) survey and has shown their efficiency in detecting fast variabilities in blazars (e.g., Peng, Wu, & Zhou 2003).

The observations on the telescope are now highly automated. The telescope and filters can be controlled by a single computer command with a parameter file that specifies the telescope pointing, the filter change, the exposure time, etc. Once the observation starts, The remaining work left for the observers are to check the quality of the observed CCD images and to pay some attention to the weather condition. In fact, after the night assistant prepared the hardwares, the monitoring of S5 0716+714 was controlled remotely by a computer at the headquarters of NAOC in Beijing, which is about 140 km away from the telescope.

Our monitoring of S5 0716+714 was divided into two periods, one was from 2003 November 8 to 18 (6 nights, in fact, due to weather condition), the other was from 2003 December 30 to 2004 January 5 (7 successive nights). The first period (hereafter Period 1) covered the duration of the *INTEGRAL* observation and the second period (hereafter Period 2) was an extension of Period 1. A filter cycle of e, f, and k (their central wavelengths are 4873, 5248, and 7528 Å, respectively) was used in Period 1 and a typical exposure time of 200–300 s was able to produce an image with a good signal-to-noise ratio. Only the central 512×512 pixels were read out as the CCD images and the readout time was about 5.6 s. Plus the time on filter change, we achieved a temporal resolution of about 20 min in each band. This enabled us to realize quasi-simultaneous measurements in three BATC bands with a high temporal resolution by using only one telescope. The size of the 512×512 image is $14\overset{'}{.}5 \times 14\overset{'}{.}5$ and is enough to cover the BL Lac and eight previously published comparison stars (Villata et al. 1998).

During Period 2, we changed the k filter to the more sensitive i filter (its central wavelength is 6711 Å), with which a shorter exposure time can produce images with the same quality as in the k band. The other observational procedures and constraints were the same as in Period 1. The observational log and parameters are presented in Tables 2–7 with columns being observation date and time (UT), exposure time, Julian Date, BATC magnitude and error. The finding chart of S5 0716+714 and the comparison stars is illustrated in

Fig. 1.

In order to obtain in real time the light curves of the BL Lac object we developed an automatic procedure. The procedure includes the following steps. The CCD images were first flat-fielded, then Bertin's Source EXtractor (SEX, Bertin & Arnouts 1996) was run on the CCD frames and the instrumental magnitudes and errors of S5 0716+714 and the 8 comparison stars were extracted. The average FWHM of the stellar images is about $4.0''$. A photometric aperture of 5 pixel ($8.5''$) diameter was adopted during the extraction. The BATC e, f, i, and k magnitudes of the 8 comparison stars were obtained by observing them and a BATC standard star HD 19445 in a same night and are listed in Table 1. Then, by comparing the instrumental magnitudes of the 8 comparison stars with their BATC magnitudes, the instrumental magnitudes of S5 0716+714 were calibrated into the BATC e, f, i, and k magnitudes and the light curves in 4 BATC bands were obtained.

3. RESULTS

3.1. Light Curves

The light curves are displayed in Figs. 2 and 3 for Periods 1 and 2, respectively. The large panels show light curves of the BL Lac and the small ones present those of the differential magnitudes (average set to 0) between the 5th comparison star and the average of all 8. In order to show the variation clearly, we only plot the duration when the BL Lac was observed and exclude the daytime periods when no observations could be made by us.

All light curves show intranight fluctuations superposed on longer timescale variations. In Period 1 (see Fig. 2), the variation is characterized by fast oscillations with small amplitudes. In the first night or on JD 2 452 952, the BL Lac was in a relatively 'high' state. Then its brightness dropped in the following days and reached a minimum on JD 2 452 956. In the following two days, the BL Lac got brighter, reaching another 'high' state around the beginning of JD 2 452 959. The total magnitude change was about 0.4 mag in Period 1 and the magnitude changes in individual nights were mostly about 0.1 mag except that on JD 2 452 956. The object appeared in a relatively quiescent state.

The observational accuracy in Period 2 is higher than in Period 1 due to the better weather conditions in Period 2. The light curves are characterized by continuous (except on JD 2 453 006) increase in brightness. Two outbursts were observed on JD 2 453 005 and JD 2 453 009 with rapid brightening of more than 0.3 mag within 0.4 days. The most sharp increase in brightness occurred on JD 2 453 005. The i magnitude changed from 13.896 on JD 2453005.328 to 13.716 on JD 2453005.400 (see Table 7), resulting in a rising rate of 0.1

mag per hour. The total magnitude change is about 0.8 mag in Period 2, which is a factor of two larger than that in Period 1, and the object appeared in an active or flaring state.

The most unusual variation in Period 2 was observed on JD 2 453 006: all three light curves look very close to sine curves (see Fig. 3) with an amplitude of about 0.1 mag and a period of about 0.21 day (5 hr). This kind of variation is of particular interest and will be discussed in Sect. 3.4.

In order to establish whether there is a time lag between the variations in different wavebands, we have calculated the z-transformed discrete correlation function (ZDCF, Alexander 1997) for Periods 1 and 2 and for several individual nights. No significant time lag has been identified except that a couple of nights show time lags from a few to less than 20 minutes between different wavebands. A time lag between variations in different wavebands will lead to an oscillating color index with respect to brightness, rather than a bluer-when-brighter trend reported in Sect. 3.3.

In both periods, the light curves in different bands are consistent with one another. The rms's of the differential magnitudes between the 5th comparison star and the average of all 8 are 0.011, 0.010, 0.012, 0.009, 0.008, and 0.010 mag in the six small panels in Figs. 2 and 3. These results demonstrate the accuracy of our magnitude measurements.

3.2. Timescales of Variability

Structure function (Simonetti, Cordes, & Heeschen 1985) can be used to search for the typical timescales and periodicities of the variability. A characteristic timescale in a light curve, defined as the time interval between a maximum and an adjacent minimum or vice versa, is indicated by a maximum of the structure function, whereas a periodicity in the light curve causes a minimum of the structure function (Heidt & Wagner 1996).

For S5 0716+714, structure function analysis was performed on the light curves of each individual night. Short timescales of a few hours were derived but the results are different from night to night. For example, the structure function analysis (see the left panel in Fig. 4) identified a timescale of 0.11 day (2.5 hr) and a period of 0.21 day (5 hr) for JD 2 453 006, which are consistent with the period clearly visible on the sine-like light curves in that night. Another example is that the same analysis on light curves of JD 2 453 007 revealed timescales of 0.07 and 0.17 day (1.7 and 4.1 hr) and periods of 0.11 and 0.23 day (2.6 and 5.5 hr) (see the right panel in Fig. 4). All timescales and periods are labeled by dashed lines in Fig. 4. There are also a common timescale of about 20 min appeared in all structure functions. But this timescale is identical to the temporal resolution of our monitoring and can not be associated with the intrinsic variability.

IDV has been frequently reported at radio and optical wavelengths in BL Lac S5 0716+714, our observations at optical bands re-confirmed such IDV phenomena in this source. Comparing to the much longer optical timescales of 4–10 day derived by other authors (e.g., Heidt & Wagner 1996; Qian, Tao, & Fan 2002), our dense monitoring enabled us to derive much shorter timescales for this object, which may constrain the physical processes that result in the fast microvariability of S5 0716+714 (see discussion in Sect. 4).

3.3. Spectral Behavior

The optical spectral change with brightness has been investigated for S5 0716+714 (e.g., Ghisellini et al. 1997; Raiteri et al. 2003; Villata et al. 2000, 2004) and for other BL Lac objects (e.g., Carini et al. 1992; Romero, Cellone, & Combi 2000; Speziali & Natali 1998; Villata et al. 2002). Most authors have reported a bluer-when-brighter chromatism when the objects are in fast flares and an "achromatic" trend for their long-term variability. However, Raiteri et al. (2003) also noted for S5 0716+714 that, on short timescales, "different behaviours have been found: sometimes a bluer-when-brighter trend is recognizable, while in some other cases the opposite is true; there are also cases where magnitude variations do not imply spectral changes". They suggested to perform a very dense monitoring with high precision data to distinguish trends in the short-term spectral behaviour of this source.

Our monitoring of S5 0716+714 with high temporal resolution enables us to study its spectral behavior with a high confidence level. Following most authors mentioned above, we use color index to denote the spectral shape. The color index and brightness are taken as $e-k$ and $\frac{e+k}{2}$ for Period 1 and $e-i$ and $\frac{e+i}{2}$ for Period 2. The changes of the color index to the brightness in two periods are shown in Fig. 5. The solid lines are best fits to the points and have taken the errors in both coordinates into consideration (Press et al. 1992).

In Period 1 or when the object was in a relatively quiescent state, The distribution in color-brightness diagram is quite dispersed and there was not an overall color change. However, in Period 2 or when the object was in a flaring state, a clear bluer-when-brighter chromatism was found. The linear fit has a slope of 0.077. The Pearson correlation coefficient is 0.636 and the significance level is 5.014×10^{-18}, suggesting a strong correlation between color index and brightness. This is in agreement with the results obtained by most authors mentioned above. Ghisellini et al. (1997) have deduced from their monitoring that two processes may be operating in this source: the first one would cause the achromatic long-term flux variations, while the second would be responsible for the short-term fast variations.

Our results are somewhat different but still consistent with theirs: during the quiescent or low state, the variation may be dominated by the long-term component and shows no clear spectral change; while in the active or flaring state, the variation is dominated by the short-term component and has a bluer-when-brighter chromatism.

That the spectra of S5 0716+714 change with its brightness have been observed in other wavelengths. For instances, Raiteri et al. (2003) reported a flatter-when-brighter trend in radio waveband and Cappi et al. (1994) discovered a steeper-when-fainter phenomenon in soft X-ray. In fact, the spectrum changing with the flux in multi-wavelengths is a common feature in blazars (e.g., Aller et al. 1985; Urry, Mushotzky, & Holt 1986; Sembay et al. 1993; Kniffen et al. 1993; Mukherjee et al. 1996). This universal spectral behaviour is nontrivial. It suggests a close relationship among the mechanisms that are responsible for the emission and variation in different wavebands. The analysis of spectral changes of blazars can put some strong constraints on the physical processes that are responsible for their variations (see discussion in Sect. 3.4).

3.4. The Sine Light Curves

The perfect sine light curves observed on JD 2 453 006 is of particular interest because very few of this kind of light curve has been reported before. They mimic a periodic variation but there is only one complete period (it's a great pity that our weather got bad just at the end of this period). Webb (1990) has detected a sinusoidal component in the variations of 3C 120, but the period was much longer ($\sim$ 13 yr). For S5 0716+714, quasi-periodic oscillations have been detected by Quirrenbach et al. (1991). Their light curves, however, are very different: they are sawtooth-like with sharp turnoffs while our light curves are sine-like with smooth turns. Then we come to the question: what mechanism can produce such sine light curves?

Some mechanisms have been proposed to explain the IDV phenomena of blazars. They can be largely classified into two types, the extrinsic and the intrinsic, as reviewed by Wagner & Witzel (1995). The extrinsic mechanisms include the inter-stellar scintillation (ISS) and gravitational microlensing. The ISS is highly frequency-dependent and only operates at low radio frequencies. The IDV in the mm regime and the fast variability in the optical regime, as observed by us, cannot be caused by the ISS mechanism. Meanwhile, the microlensing is an achromatic process and will result in symmetric light curves. However, color or spectral changes have been frequently observed from radio to X-ray wavebands for the variability of S5 0716+714, as mentioned in last section. We have also detected a clear bluer-when-brighter chromatism. In addition, the light curves at all wavelengths, including our optical ones, are generally asymmetric. Therefore, the fast variation of S5 0716+714 is unlikely due to microlensing. In fact, the close correlation between the optical and radio bands observed in S5 0716+714 (e.g., Quirrenbach et al. 1991; Wagner et al. 1996) provides a strong evidence against the extrinsic origin of its variability.

The intrinsic interpretations include mainly the accretion disk instabilities and shock-in-jet model. The accretion disk model is able to explain some of the phenomena seen in the optical to X-ray range but cannot explain radio IDV (e.g., Wagner & Witzel 1995). The most frequently cited model is the shock-in-jet model which has been widely used to explain the variability of blazars and quasars (e.g., Guetta et al. 2004; Jia et al. 1998; Qian et al. 1991; Romero, Cellone, & Combi 2000; Wagner & Witzel 1995, and references therein). The main idea of the model is that shocks propagate down the relativistic jet whose plasma is hydromagnetically turbulent. At sites where the shocks encounter particles or magnetic field overdensities, the optical synchrotron emission is enhanced. The amplitude and timescale of the resulting variation depend on the power spectrum of the turbulence and the shock thickness. This kind of shock-in-jet model will naturally lead to the prediction of a bluer-when-brighter phenomenon (Marscher 1998), as observed in our case.

The shock-in-jet model still suffers from a number of problems in explaining IDV, such as the close correlation between the radio and optical variations. Therefore, the geometrical effects are sometimes invoked to account for some observational facts that can not be interpreted satisfactorily by the shock-in-jet model. Geometrical modulation in the context of shock-in-jet models are detailed by Camenzind & Krockenberger (1992). They argued that knots of enhanced particle density are injected at a finite jet radius. In knots moving relativistically on helical trajectories, the direction of forward beaming varies with time. For an observer close to the jet axis, the sweeping of the beam will introduce flares due to the light house effect. This will lead to quasi-periodic variations of a few oscillations and the variations are basically achromatic.

It is tempting to examine the color change on only JD 2 453 006 since perfect sine-like light curves were observed in that night. Fig. 6 illustrates the color index vs brightness relation. The linear fit gives a slope of 0.256 which is very different from the overall slope of Period 2. The correlation coefficient is 0.361 and the significance level is 0.170, which means a poor fit or no clear correlation between the color index and brightness. That is to say, the brightness changed nearly achromatically on JD 2 453 006. The only two known processes that can cause achromatic variability are the microlensing and light house effect. Although the microlensing has been ruled out as the dominant mechanism of the variability of S5 0716+714, it may still have some contribution. The symmetry in the sine light curves may indicate a microlensing event, but the concave shape of the second halves of the light curves can not be explained in terms of microlensing. In addition, this very short timescale would require a transverse speed of $v_{trans} \sim c$ when microlensing. Therefore, the most probable mechanism responsible for the sine light curves is the light house effect. It may produce a periodic variation according to Camenzind & Krockenberger (1992) and the variation is achromatic. In other words, the variation observed on JD 2 453 006 is likely due to geometrical effects.

It is unclear whether all fast IDV, especially the quasi-periodic ones, such as those observed by Quirrenbach et al. (1991), can also be explained in terms of geometrical effects within the context of shock-in-jet model. If the answer is yes, the actual timescales of the intrinsic flux changes will be longer by a few factors and the deduced extremely high brightness temperature will be reduced by one or more orders of magnitude. This will help to resolve the large difference between the high brightness temperature ($\sim 10^{17}$ K) and the Compton limit ($< 10^{12}$ K), though not fully resolved.

4. SUMMARY

During the periods of 2003 November 8–18 and from 2003 December 30 to 2004 January 5, we have carried out optical monitoring of the BL Lac object S5 0716+714 with a high temporal resolution. Intraday and intranight variations were observed with an overall magnitude change of about 0.9 mag during the whole campaign. Two outbursts were recorded on JD 2 453 005 and JD 2 453 009. Short timescales of a few hours were derived from the light curves of each individual night but are different from night to night. A bluer-when-brighter chromatism was present when the object was in an active or flaring state but was absent when it was in a relatively low or quiescent state.

Our observations have suggested that the fast microvariability in S5 0716+714 is basically consistent with the shock-in-jet model. The analysis has also indicated that the geometrical effects can sometimes play an important role in the variability of blazars. Up to now, all theoretical models that have been proposed to explain the variability of blazars have their own individual difficulties (see, e.g., Wagner & Witzel 1995, for a discussion). In order to better understand the variability of blazars and to strictly constrain the theoretical models, simultaneous multifrequency campaigns with high temporal resolutions should be the direction of future efforts.

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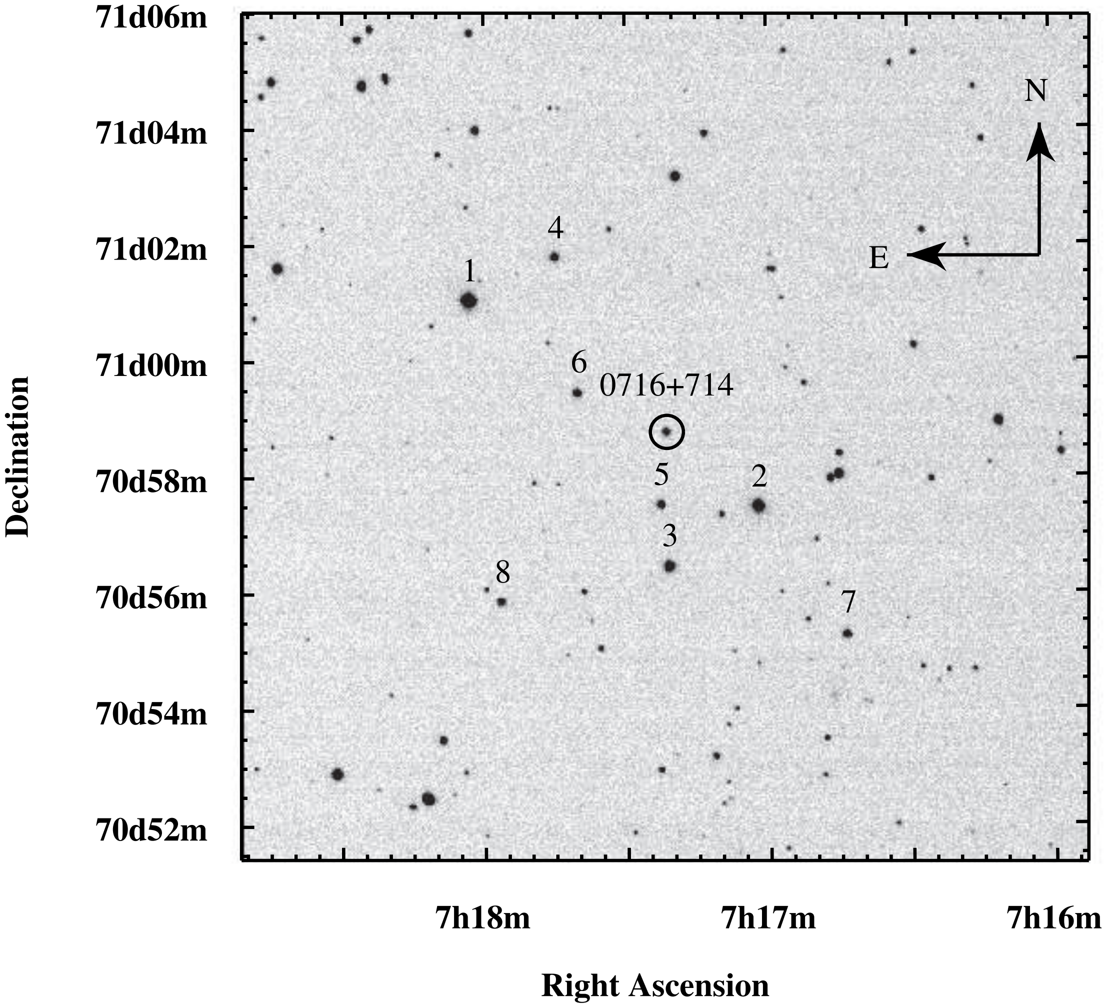


Fig. 1.— Finding chart of S5 0716+714 and the 8 comparison stars taken with the 60/90 Schmidt telescope and filter i on JD 2 453 008. The size is $14'.5 \times 14'.5$ (or 512×512 in pixels). The 8 comparison stars are the same as in Villata et al. (1998).

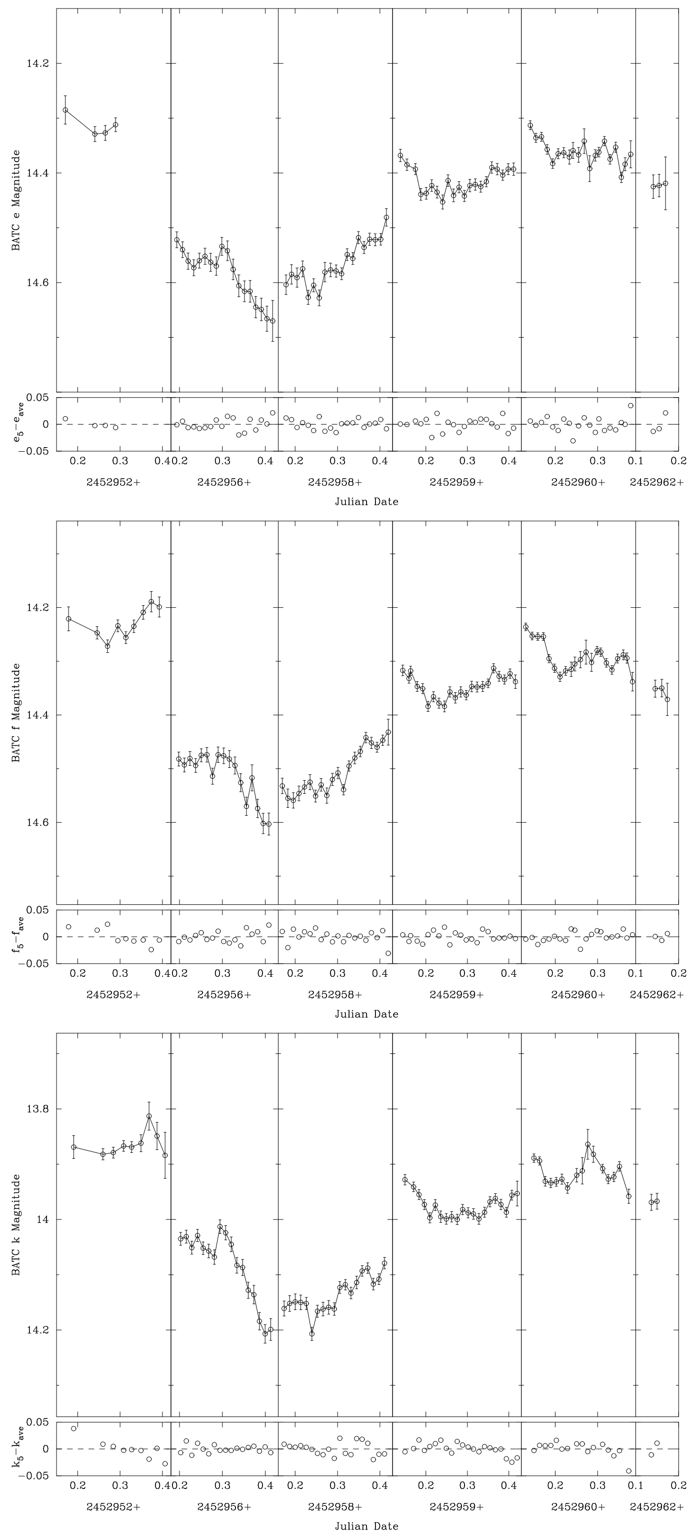
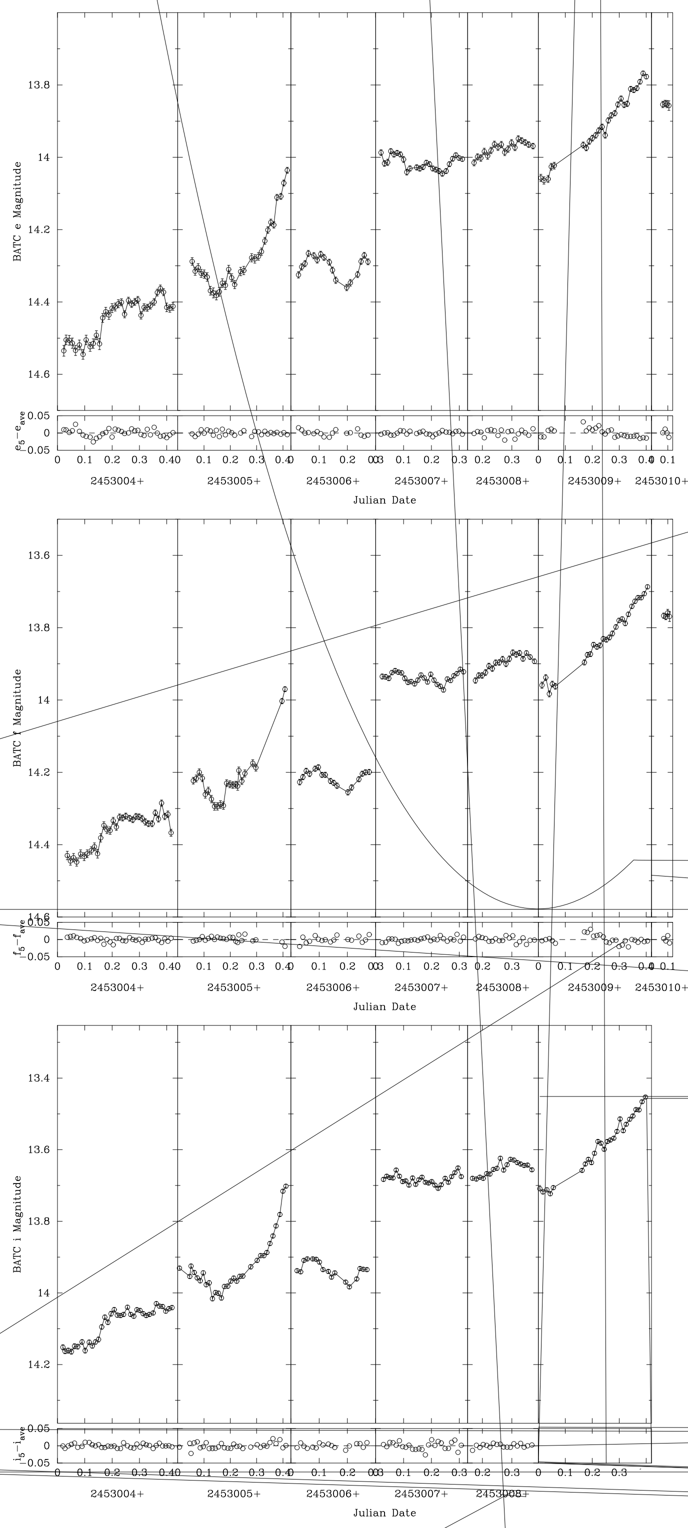


Fig. 2.— Light curves of S5 0716+714 in the BATC e, f, and k bands in Periods 1. Large panels are those of the BL Lac object and small ones are of the differential magnitudes between the 5th comparison star and the average of all 8.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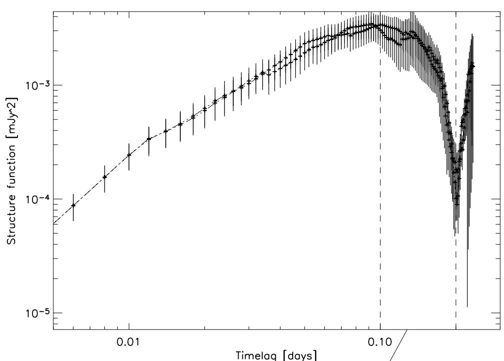
$f_5 - f_{ave}$
BATC i Magnitude
$i_5 - i_{ave}$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10⁻⁴
10⁻⁵
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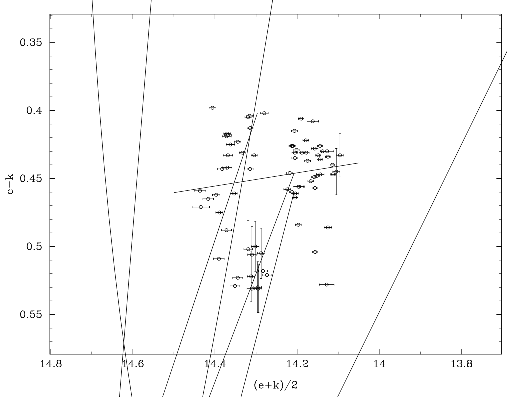
0.10
Timelag [days]


0.01
0.10



0.35
0.4
0.45
0.5
0.55
e−k
14.8
14.6
14.4
14.2
14
13.8
(e+k)/2

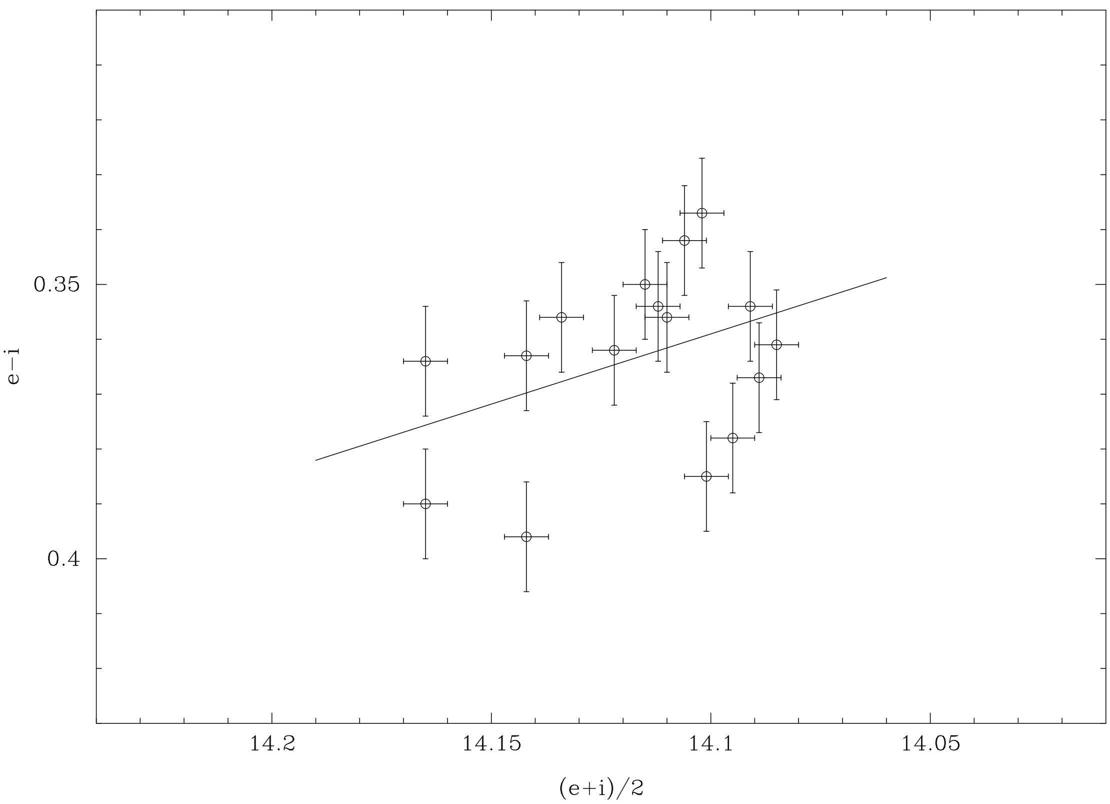


Fig. 6.— Color index vs brightness on JD 2 453 006. The solid line only indicates a very weak correlation between the color index and brightness.

Table 1. BATC Magnitudes of 8 Comparison Stars.

Star	*e*	*f*	*i*	*k*
1	11.207	11.174	11.075	11.007
2	11.656	11.615	11.508	11.490
3	12.663	12.564	12.428	12.361
4	13.366	13.296	13.245	13.211
5	13.760	13.661	13.511	13.449
6	13.839	13.747	13.590	13.564
7	14.049	13.962	13.628	13.645
8	14.335	14.284	14.113	14.106

Table 2. Observational log and results in the BATC e band in Period 1.

Obs. Date[a] (yyyy mm dd)	Obs. Time[a] (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2003 11 08	16:04:57	100	2452952.171	14.285	0.026
2003 11 08	17:43:46	300	2452952.241	14.329	0.014
2003 11 08	18:19:14	300	2452952.265	14.327	0.014
2003 11 08	18:54:11	300	2452952.289	14.312	0.013
2003 11 12	16:36:29	300	2452956.194	14.522	0.014
2003 11 12	16:55:35	300	2452956.207	14.540	0.014
2003 11 12	17:14:19	300	2452956.220	14.561	0.015
2003 11 12	17:33:15	300	2452956.233	14.573	0.015
2003 11 12	17:52:09	300	2452956.246	14.560	0.014
2003 11 12	18:10:59	300	2452956.259	14.552	0.015
2003 11 12	18:29:50	300	2452956.273	14.563	0.016
2003 11 12	18:48:47	300	2452956.286	14.570	0.017
2003 11 12	19:07:32	300	2452956.299	14.534	0.016
2003 11 12	19:26:31	300	2452956.312	14.542	0.018
2003 11 12	19:45:18	300	2452956.325	14.576	0.019
2003 11 12	20:04:36	300	2452956.338	14.606	0.020
2003 11 12	20:23:30	300	2452956.351	14.616	0.019
2003 11 12	20:42:24	300	2452956.364	14.616	0.020
2003 11 12	21:01:19	300	2452956.378	14.645	0.019
2003 11 12	21:20:02	300	2452956.391	14.649	0.021
2003 11 12	21:38:58	300	2452956.404	14.666	0.023
2003 11 12	21:58:10	300	2452956.417	14.670	0.037
2003 11 14	16:14:20	300	2452958.178	14.604	0.018
2003 11 14	16:33:04	300	2452958.191	14.585	0.018
2003 11 14	16:51:59	300	2452958.205	14.591	0.018
2003 11 14	17:10:48	300	2452958.218	14.575	0.014
2003 11 14	17:29:48	300	2452958.231	14.627	0.013
2003 11 14	17:48:29	300	2452958.244	14.605	0.012
2003 11 14	18:07:29	300	2452958.257	14.628	0.014
2003 11 14	18:26:39	300	2452958.270	14.581	0.018
2003 11 14	18:45:54	300	2452958.284	14.577	0.012
2003 11 14	19:04:43	300	2452958.297	14.579	0.011
2003 11 14	19:23:29	300	2452958.310	14.584	0.011
2003 11 14	19:42:20	300	2452958.323	14.549	0.011
2003 11 14	20:01:27	300	2452958.336	14.556	0.011
2003 11 14	20:20:35	300	2452958.349	14.518	0.011
2003 11 14	20:39:35	300	2452958.363	14.536	0.011
2003 11 14	20:58:20	300	2452958.376	14.521	0.011
2003 11 14	21:17:37	300	2452958.389	14.522	0.011
2003 11 14	21:36:34	300	2452958.402	14.521	0.011
2003 11 14	21:55:39	300	2452958.415	14.481	0.016
2003 11 15	15:17:15	300	2452959.139	14.368	0.011
2003 11 15	15:39:57	300	2452959.154	14.385	0.010
2003 11 15	16:09:28	300	2452959.175	14.393	0.010
2003 11 15	16:28:10	300	2452959.188	14.439	0.011

Table 2—Continued

Obs. Date[a] (yyyy mm dd)	Obs. Time[a] (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2003 11 15	16:46:52	300	2452959.201	14.437	0.011
2003 11 15	17:05:52	300	2452959.214	14.423	0.011
2003 11 15	17:24:35	300	2452959.227	14.435	0.011
2003 11 15	17:43:40	300	2452959.240	14.453	0.013
2003 11 15	18:02:34	300	2452959.254	14.414	0.011
2003 11 15	18:21:30	300	2452959.267	14.441	0.012
2003 11 15	18:40:35	300	2452959.280	14.426	0.010
2003 11 15	18:59:20	300	2452959.293	14.442	0.010
2003 11 15	19:18:12	300	2452959.306	14.423	0.011
2003 11 15	19:36:58	300	2452959.319	14.421	0.010
2003 11 15	19:56:04	300	2452959.332	14.425	0.010
2003 11 15	20:15:17	300	2452959.346	14.416	0.009
2003 11 15	20:34:12	300	2452959.359	14.390	0.010
2003 11 15	20:53:04	300	2452959.372	14.393	0.010
2003 11 15	21:12:13	300	2452959.385	14.404	0.009
2003 11 15	21:31:09	300	2452959.398	14.393	0.010
2003 11 15	21:50:01	300	2452959.412	14.393	0.011
2003 11 16	15:20:41	300	2452960.141	14.313	0.008
2003 11 16	15:39:53	300	2452960.154	14.336	0.008
2003 11 16	15:58:38	300	2452960.168	14.334	0.008
2003 11 16	16:18:00	300	2452960.181	14.357	0.009
2003 11 16	16:36:50	300	2452960.194	14.383	0.009
2003 11 16	16:55:34	300	2452960.207	14.365	0.009
2003 11 16	17:14:35	300	2452960.220	14.363	0.009
2003 11 16	17:33:32	300	2452960.233	14.371	0.013
2003 11 16	17:46:00	300	2452960.242	14.359	0.015
2003 11 16	18:04:47	300	2452960.255	14.367	0.014
2003 11 16	18:23:48	300	2452960.268	14.342	0.022
2003 11 16	18:42:33	300	2452960.281	14.392	0.024
2003 11 16	19:01:31	300	2452960.294	14.368	0.010
2003 11 16	19:14:01	300	2452960.303	14.362	0.009
2003 11 16	19:32:45	300	2452960.316	14.342	0.009
2003 11 16	19:51:44	300	2452960.329	14.375	0.009
2003 11 16	20:11:02	300	2452960.343	14.353	0.009
2003 11 16	20:30:16	300	2452960.356	14.408	0.009
2003 11 16	20:43:00	300	2452960.365	14.384	0.012
2003 11 16	21:02:02	300	2452960.378	14.366	0.025
2003 11 18	15:20:20	300	2452962.141	14.425	0.022
2003 11 18	15:39:24	360	2452962.154	14.423	0.021
2003 11 18	16:01:25	300	2452962.169	14.419	0.048

[a]The obs. date and time are of universal time. They are the same for Tables 3-7.

Table 3. Observational log and results in the BATC f band in Period 1.

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2003 11 08	16:16:03	100	2452952.178	14.221	0.022
2003 11 08	17:51:25	300	2452952.246	14.247	0.012
2003 11 08	18:26:52	300	2452952.270	14.272	0.012
2003 11 08	19:01:50	300	2452952.295	14.234	0.011
2003 11 08	19:29:07	300	2452952.314	14.256	0.011
2003 11 08	19:56:22	300	2452952.333	14.235	0.012
2003 11 08	20:28:06	300	2452952.355	14.209	0.013
2003 11 08	20:55:32	300	2452952.374	14.189	0.019
2003 11 08	21:22:45	300	2452952.393	14.199	0.019
2003 11 12	16:43:00	300	2452956.198	14.482	0.013
2003 11 12	17:01:49	300	2452956.211	14.493	0.013
2003 11 12	17:20:32	300	2452956.224	14.481	0.013
2003 11 12	17:39:39	300	2452956.238	14.494	0.013
2003 11 12	17:58:25	300	2452956.251	14.475	0.012
2003 11 12	18:17:22	300	2452956.264	14.474	0.014
2003 11 12	18:36:17	300	2452956.277	14.514	0.015
2003 11 12	18:55:01	300	2452956.290	14.474	0.014
2003 11 12	19:13:47	300	2452956.303	14.476	0.015
2003 11 12	19:32:46	300	2452956.316	14.482	0.016
2003 11 12	19:51:35	300	2452956.329	14.494	0.016
2003 11 12	20:10:47	300	2452956.343	14.526	0.017
2003 11 12	20:29:56	300	2452956.356	14.570	0.017
2003 11 12	20:48:50	300	2452956.369	14.517	0.024
2003 11 12	21:07:33	300	2452956.382	14.574	0.017
2003 11 12	21:26:17	300	2452956.395	14.602	0.019
2003 11 12	21:45:15	300	2452956.408	14.603	0.021
2003 11 14	16:01:49	300	2452958.170	14.532	0.014
2003 11 14	16:20:33	300	2452958.183	14.555	0.017
2003 11 14	16:39:19	300	2452958.196	14.559	0.014
2003 11 14	16:58:17	300	2452958.209	14.546	0.014
2003 11 14	17:17:03	300	2452958.222	14.534	0.012
2003 11 14	17:36:01	300	2452958.235	14.525	0.014
2003 11 14	17:54:44	300	2452958.248	14.551	0.011
2003 11 14	18:13:44	300	2452958.261	14.530	0.012
2003 11 14	18:33:09	300	2452958.275	14.550	0.014
2003 11 14	18:52:11	300	2452958.288	14.520	0.011
2003 11 14	19:10:58	300	2452958.301	14.508	0.010
2003 11 14	19:29:53	300	2452958.314	14.539	0.010
2003 11 14	19:48:41	300	2452958.327	14.495	0.010
2003 11 14	20:08:04	300	2452958.341	14.480	0.011
2003 11 14	20:26:49	300	2452958.354	14.468	0.010
2003 11 14	20:45:50	300	2452958.367	14.442	0.010
2003 11 14	21:04:46	300	2452958.380	14.452	0.010
2003 11 14	21:23:51	300	2452958.393	14.460	0.009
2003 11 14	21:43:00	300	2452958.407	14.447	0.009

Table 3—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2003 11 14	22:01:56	300	2452958.420	14.432	0.024
2003 11 15	15:25:35	300	2452959.145	14.317	0.010
2003 11 15	15:47:07	300	2452959.160	14.332	0.009
2003 11 15	15:52:51	300	2452959.163	14.318	0.009
2003 11 15	16:15:41	300	2452959.179	14.347	0.009
2003 11 15	16:34:23	300	2452959.192	14.351	0.009
2003 11 15	16:53:09	300	2452959.205	14.384	0.009
2003 11 15	17:12:05	300	2452959.219	14.366	0.009
2003 11 15	17:31:00	300	2452959.232	14.378	0.009
2003 11 15	17:50:05	300	2452959.245	14.384	0.010
2003 11 15	18:08:50	300	2452959.258	14.357	0.009
2003 11 15	18:27:45	300	2452959.271	14.368	0.010
2003 11 15	18:46:49	300	2452959.284	14.357	0.009
2003 11 15	19:05:34	300	2452959.297	14.363	0.009
2003 11 15	19:24:27	300	2452959.310	14.347	0.010
2003 11 15	19:43:10	300	2452959.323	14.348	0.009
2003 11 15	20:02:26	300	2452959.337	14.347	0.009
2003 11 15	20:21:31	300	2452959.350	14.341	0.008
2003 11 15	20:40:28	300	2452959.363	14.313	0.009
2003 11 15	20:59:30	300	2452959.376	14.328	0.009
2003 11 15	21:18:26	300	2452959.389	14.334	0.009
2003 11 15	21:37:23	300	2452959.403	14.323	0.009
2003 11 15	21:56:14	300	2452959.416	14.338	0.013
2003 11 16	15:05:24	300	2452960.131	14.236	0.007
2003 11 16	15:26:57	300	2452960.146	14.253	0.007
2003 11 16	15:46:08	300	2452960.159	14.254	0.007
2003 11 16	16:05:08	300	2452960.172	14.254	0.007
2003 11 16	16:24:16	300	2452960.185	14.295	0.008
2003 11 16	16:43:05	300	2452960.198	14.313	0.008
2003 11 16	17:01:50	300	2452960.211	14.329	0.009
2003 11 16	17:20:50	300	2452960.225	14.318	0.008
2003 11 16	17:39:47	300	2452960.238	14.315	0.013
2003 11 16	17:52:19	300	2452960.246	14.305	0.013
2003 11 16	18:11:03	300	2452960.259	14.297	0.015
2003 11 16	18:30:03	300	2452960.273	14.283	0.022
2003 11 16	18:48:49	300	2452960.286	14.302	0.017
2003 11 16	19:07:47	300	2452960.299	14.280	0.008
2003 11 16	19:20:16	300	2452960.308	14.283	0.008
2003 11 16	19:39:15	300	2452960.321	14.303	0.008
2003 11 16	19:58:14	300	2452960.334	14.316	0.008
2003 11 16	20:17:19	300	2452960.347	14.295	0.008
2003 11 16	20:36:44	300	2452960.361	14.288	0.009
2003 11 16	20:49:16	300	2452960.369	14.294	0.010
2003 11 16	21:08:17	300	2452960.382	14.338	0.017
2003 11 18	15:26:36	300	2452962.145	14.351	0.016

Table 3—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2003 11 18	15:48:54	300	2452962.161	14.350	0.016
2003 11 18	16:07:39	300	2452962.174	14.371	0.030

Table 4. Observational log and results in the BATC k band in Period 1.

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	k (mag)	$k_{\rm err}$ (mag)
2003 11 08	16:33:17	100	2452952.190	13.869	0.021
2003 11 08	18:11:18	300	2452952.260	13.882	0.010
2003 11 08	18:46:28	300	2452952.284	13.879	0.010
2003 11 08	19:21:27	300	2452952.308	13.867	0.010
2003 11 08	19:48:44	300	2452952.327	13.869	0.010
2003 11 08	20:20:24	300	2452952.349	13.862	0.015
2003 11 08	20:47:55	300	2452952.368	13.813	0.025
2003 11 08	21:15:07	300	2452952.387	13.849	0.025
2003 11 08	21:42:28	300	2452952.406	13.884	0.042
2003 11 12	16:49:24	300	2452956.203	14.035	0.012
2003 11 12	17:08:07	300	2452956.216	14.031	0.012
2003 11 12	17:26:45	300	2452956.229	14.051	0.012
2003 11 12	17:45:55	300	2452956.242	14.029	0.011
2003 11 12	18:04:41	300	2452956.255	14.052	0.011
2003 11 12	18:23:35	300	2452956.268	14.057	0.012
2003 11 12	18:42:29	300	2452956.281	14.068	0.013
2003 11 12	19:01:19	300	2452956.294	14.013	0.012
2003 11 12	19:20:14	300	2452956.308	14.024	0.013
2003 11 12	19:39:04	300	2452956.320	14.045	0.013
2003 11 12	19:57:58	300	2452956.334	14.083	0.014
2003 11 12	20:17:15	300	2452956.347	14.087	0.015
2003 11 12	20:36:10	300	2452956.360	14.128	0.015
2003 11 12	20:55:05	300	2452956.373	14.136	0.017
2003 11 12	21:13:46	300	2452956.386	14.184	0.016
2003 11 12	21:32:44	300	2452956.400	14.207	0.017
2003 11 12	21:51:40	300	2452956.413	14.199	0.020
2003 11 14	16:08:07	300	2452958.174	14.161	0.014
2003 11 14	16:26:47	300	2452958.187	14.152	0.014
2003 11 14	16:45:46	300	2452958.200	14.149	0.014
2003 11 14	17:04:32	300	2452958.213	14.150	0.013
2003 11 14	17:23:34	300	2452958.226	14.152	0.011
2003 11 14	17:42:14	300	2452958.239	14.207	0.012
2003 11 14	18:01:14	300	2452958.253	14.166	0.011
2003 11 14	18:20:12	300	2452958.266	14.162	0.012
2003 11 14	18:39:25	300	2452958.279	14.159	0.012
2003 11 14	18:58:25	300	2452958.292	14.162	0.011
2003 11 14	19:17:15	300	2452958.305	14.123	0.011
2003 11 14	19:36:05	300	2452958.319	14.118	0.009
2003 11 14	19:55:12	300	2452958.332	14.133	0.010
2003 11 14	20:14:18	300	2452958.345	14.114	0.011
2003 11 14	20:33:08	300	2452958.358	14.093	0.010
2003 11 14	20:52:04	300	2452958.371	14.088	0.010
2003 11 14	21:11:11	300	2452958.384	14.117	0.010
2003 11 14	21:30:06	300	2452958.398	14.108	0.010
2003 11 14	21:49:14	300	2452958.411	14.079	0.010

Table 4—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	k (mag)	$k_{\rm err}$ (mag)
2003 11 15	15:33:15	300	2452959.150	13.928	0.009
2003 11 15	16:03:03	300	2452959.170	13.941	0.009
2003 11 15	16:21:53	300	2452959.184	13.955	0.009
2003 11 15	16:40:40	300	2452959.197	13.973	0.009
2003 11 15	16:59:23	300	2452959.210	13.997	0.009
2003 11 15	17:18:20	300	2452959.223	13.974	0.010
2003 11 15	17:37:22	300	2452959.236	13.995	0.010
2003 11 15	17:56:21	300	2452959.249	13.999	0.010
2003 11 15	18:15:03	300	2452959.262	13.995	0.009
2003 11 15	18:34:12	300	2452959.275	14.000	0.009
2003 11 15	18:53:04	300	2452959.289	13.982	0.009
2003 11 15	19:12:02	300	2452959.302	13.988	0.009
2003 11 15	19:30:42	300	2452959.315	13.990	0.010
2003 11 15	19:49:37	300	2452959.328	13.999	0.010
2003 11 15	20:08:58	300	2452959.341	13.987	0.009
2003 11 15	20:27:59	300	2452959.354	13.968	0.009
2003 11 15	20:46:42	300	2452959.368	13.962	0.009
2003 11 15	21:05:59	300	2452959.381	13.973	0.009
2003 11 15	21:24:51	300	2452959.394	13.987	0.009
2003 11 15	21:43:46	300	2452959.407	13.956	0.009
2003 11 15	22:02:28	300	2452959.420	13.953	0.022
2003 11 16	15:33:25	300	2452960.150	13.889	0.008
2003 11 16	15:52:23	300	2452960.163	13.894	0.007
2003 11 16	16:11:34	300	2452960.176	13.931	0.009
2003 11 16	16:30:32	300	2452960.190	13.934	0.008
2003 11 16	16:49:18	300	2452960.203	13.932	0.008
2003 11 16	17:08:05	300	2452960.216	13.927	0.009
2003 11 16	17:27:04	300	2452960.229	13.943	0.010
2003 11 16	17:58:33	300	2452960.251	13.920	0.012
2003 11 16	18:17:33	300	2452960.264	13.912	0.024
2003 11 16	18:36:18	300	2452960.277	13.864	0.027
2003 11 16	18:55:07	300	2452960.290	13.882	0.015
2003 11 16	19:26:31	300	2452960.312	13.908	0.008
2003 11 16	19:45:30	300	2452960.325	13.927	0.008
2003 11 16	20:04:36	300	2452960.338	13.923	0.008
2003 11 16	20:23:46	300	2452960.352	13.904	0.009
2003 11 16	20:55:33	300	2452960.374	13.958	0.013
2003 11 18	15:13:55	300	2452962.136	13.969	0.014
2003 11 18	15:32:58	300	2452962.150	13.967	0.014

Table 5. Observational log and results in the BATC e band in Period 2.

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2003 12 30	12:31:07	300	2453004.023	14.535	0.015
2003 12 30	12:42:56	300	2453004.032	14.505	0.014
2003 12 30	12:59:40	300	2453004.043	14.506	0.013
2003 12 30	13:16:10	300	2453004.055	14.514	0.014
2003 12 30	13:32:42	300	2453004.066	14.534	0.014
2003 12 30	13:53:08	300	2453004.080	14.519	0.014
2003 12 30	14:12:09	300	2453004.094	14.545	0.013
2003 12 30	14:28:39	300	2453004.105	14.505	0.013
2003 12 30	14:49:45	300	2453004.120	14.524	0.012
2003 12 30	15:06:09	300	2453004.131	14.515	0.013
2003 12 30	15:22:46	300	2453004.142	14.492	0.013
2003 12 30	15:39:17	300	2453004.154	14.516	0.016
2003 12 30	15:56:00	300	2453004.166	14.444	0.012
2003 12 30	16:12:17	300	2453004.177	14.427	0.012
2003 12 30	16:28:42	300	2453004.188	14.436	0.012
2003 12 30	16:45:08	300	2453004.200	14.417	0.012
2003 12 30	17:01:36	300	2453004.211	14.414	0.011
2003 12 30	17:18:16	300	2453004.223	14.405	0.011
2003 12 30	17:34:50	300	2453004.234	14.401	0.010
2003 12 30	17:51:22	300	2453004.246	14.434	0.010
2003 12 30	18:11:39	300	2453004.260	14.396	0.009
2003 12 30	18:28:22	300	2453004.271	14.406	0.009
2003 12 30	18:44:52	300	2453004.283	14.400	0.010
2003 12 30	19:01:11	300	2453004.294	14.394	0.009
2003 12 30	19:17:39	300	2453004.306	14.437	0.010
2003 12 30	19:34:08	300	2453004.317	14.415	0.010
2003 12 30	19:50:37	300	2453004.329	14.416	0.010
2003 12 30	20:07:34	300	2453004.340	14.410	0.010
2003 12 30	20:26:57	300	2453004.354	14.400	0.009
2003 12 30	20:43:33	300	2453004.365	14.374	0.009
2003 12 30	20:59:53	300	2453004.377	14.363	0.010
2003 12 30	21:16:36	300	2453004.388	14.373	0.010
2003 12 30	21:33:15	300	2453004.400	14.415	0.012
2003 12 30	21:49:50	300	2453004.411	14.418	0.010
2003 12 30	22:06:23	300	2453004.423	14.412	0.011
2003 12 31	13:16:36	300	2453005.055	14.288	0.011
2003 12 31	13:33:01	300	2453005.066	14.315	0.011
2003 12 31	13:49:36	300	2453005.078	14.305	0.011
2003 12 31	14:05:59	300	2453005.089	14.321	0.011
2003 12 31	14:22:26	300	2453005.101	14.323	0.012
2003 12 31	14:38:55	300	2453005.112	14.331	0.012
2003 12 31	14:56:20	300	2453005.124	14.369	0.012
2003 12 31	15:12:50	300	2453005.136	14.375	0.014
2003 12 31	15:29:04	300	2453005.147	14.382	0.012
2003 12 31	15:45:18	300	2453005.158	14.372	0.012

Table 5—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2003 12 31	16:01:42	300	2453005.170	14.348	0.012
2003 12 31	16:18:27	300	2453005.181	14.354	0.012
2003 12 31	16:36:37	300	2453005.194	14.310	0.011
2003 12 31	16:53:03	300	2453005.205	14.333	0.011
2003 12 31	17:09:18	300	2453005.216	14.352	0.011
2003 12 31	17:42:14	300	2453005.239	14.316	0.012
2003 12 31	17:59:11	300	2453005.251	14.313	0.012
2003 12 31	18:42:17	300	2453005.281	14.278	0.011
2003 12 31	18:59:28	300	2453005.293	14.281	0.012
2003 12 31	19:19:37	300	2453005.307	14.274	0.011
2003 12 31	19:36:02	300	2453005.318	14.261	0.010
2003 12 31	19:54:17	300	2453005.331	14.231	0.009
2003 12 31	20:10:59	300	2453005.343	14.201	0.009
2003 12 31	20:27:25	300	2453005.354	14.180	0.009
2003 12 31	20:43:51	300	2453005.366	14.187	0.009
2003 12 31	21:00:31	300	2453005.377	14.111	0.009
2003 12 31	21:22:06	300	2453005.392	14.108	0.008
2003 12 31	21:38:20	300	2453005.403	14.071	0.008
2003 12 31	21:57:07	300	2453005.416	14.036	0.008
2004 01 01	12:36:21	300	2453006.027	14.325	0.009
2004 01 01	12:52:49	300	2453006.038	14.303	0.009
2004 01 01	13:09:33	300	2453006.050	14.294	0.009
2004 01 01	13:26:34	300	2453006.062	14.266	0.009
2004 01 01	13:54:33	300	2453006.081	14.272	0.009
2004 01 01	14:11:39	300	2453006.093	14.284	0.009
2004 01 01	14:29:25	300	2453006.105	14.268	0.008
2004 01 01	14:46:18	300	2453006.117	14.277	0.008
2004 01 01	15:13:28	300	2453006.136	14.290	0.008
2004 01 01	15:29:49	300	2453006.147	14.312	0.009
2004 01 01	15:46:07	300	2453006.159	14.340	0.009
2004 01 01	16:41:51	300	2453006.198	14.360	0.009
2004 01 01	17:00:23	300	2453006.210	14.347	0.009
2004 01 01	17:37:42	300	2453006.236	14.324	0.009
2004 01 01	17:54:43	300	2453006.248	14.288	0.008
2004 01 01	18:11:14	300	2453006.259	14.271	0.008
2004 01 01	18:30:07	300	2453006.273	14.289	0.008
2004 01 02	12:25:02	300	2453007.019	13.987	0.008
2004 01 02	12:42:41	300	2453007.031	14.017	0.008
2004 01 02	12:59:16	300	2453007.043	14.014	0.009
2004 01 02	13:15:31	300	2453007.054	13.983	0.007
2004 01 02	13:31:59	300	2453007.066	13.992	0.007
2004 01 02	13:48:17	300	2453007.077	13.988	0.007
2004 01 02	14:04:59	300	2453007.089	13.992	0.007
2004 01 02	14:21:37	300	2453007.100	14.006	0.008
2004 01 02	14:37:55	300	2453007.111	14.041	0.008

Table 5—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2004 01 02	14:54:20	300	2453007.123	14.031	0.007
2004 01 02	15:29:14	300	2453007.147	14.028	0.007
2004 01 02	15:45:25	300	2453007.158	14.031	0.007
2004 01 02	16:01:40	300	2453007.170	14.027	0.007
2004 01 02	16:19:13	300	2453007.182	14.015	0.007
2004 01 02	16:35:30	300	2453007.193	14.019	0.007
2004 01 02	16:52:17	300	2453007.205	14.031	0.007
2004 01 02	17:08:34	300	2453007.216	14.034	0.007
2004 01 02	17:25:09	300	2453007.228	14.038	0.007
2004 01 02	17:41:39	300	2453007.239	14.045	0.007
2004 01 02	18:01:28	300	2453007.253	14.038	0.007
2004 01 02	18:18:19	300	2453007.264	14.019	0.007
2004 01 02	18:35:03	300	2453007.276	14.004	0.007
2004 01 02	18:51:36	300	2453007.288	13.994	0.007
2004 01 02	19:08:12	300	2453007.299	14.002	0.007
2004 01 02	19:25:11	300	2453007.311	14.005	0.007
2004 01 03	16:05:05	300	2453008.172	14.015	0.009
2004 01 03	16:21:41	300	2453008.184	13.999	0.009
2004 01 03	16:38:03	300	2453008.195	14.002	0.009
2004 01 03	16:54:46	300	2453008.206	13.984	0.009
2004 01 03	17:11:18	300	2453008.218	13.996	0.009
2004 01 03	17:27:37	300	2453008.229	13.981	0.009
2004 01 03	17:44:25	300	2453008.241	13.964	0.009
2004 01 03	18:01:43	300	2453008.253	13.972	0.009
2004 01 03	18:18:13	300	2453008.264	13.965	0.009
2004 01 03	18:34:42	300	2453008.276	13.986	0.009
2004 01 03	18:51:14	300	2453008.287	13.977	0.009
2004 01 03	19:07:52	300	2453008.299	13.960	0.009
2004 01 03	19:24:43	300	2453008.311	13.973	0.009
2004 01 03	19:41:02	300	2453008.322	13.949	0.009
2004 01 03	19:57:38	300	2453008.333	13.954	0.008
2004 01 03	20:14:43	300	2453008.345	13.959	0.008
2004 01 03	20:31:59	300	2453008.357	13.965	0.008
2004 01 03	20:53:05	300	2453008.372	13.969	0.008
2004 01 04	12:10:37	300	2453009.009	14.057	0.010
2004 01 04	12:27:18	300	2453009.021	14.064	0.010
2004 01 04	12:49:37	300	2453009.036	14.060	0.010
2004 01 04	13:06:02	300	2453009.048	14.026	0.009
2004 01 04	13:22:18	300	2453009.059	14.023	0.009
2004 01 04	15:57:09	300	2453009.166	13.966	0.008
2004 01 04	16:13:39	300	2453009.178	13.974	0.008
2004 01 04	16:29:57	300	2453009.189	13.956	0.008
2004 01 04	16:46:23	300	2453009.201	13.947	0.008
2004 01 04	17:04:24	300	2453009.213	13.939	0.008
2004 01 04	17:20:49	300	2453009.225	13.926	0.008

Table 5—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	e (mag)	$e_{\rm err}$ (mag)
2004 01 04	17:38:12	300	2453009.237	13.916	0.008
2004 01 04	17:54:44	300	2453009.248	13.939	0.008
2004 01 04	18:11:11	300	2453009.259	13.898	0.008
2004 01 04	18:27:30	300	2453009.271	13.884	0.008
2004 01 04	18:46:06	300	2453009.284	13.878	0.008
2004 01 04	19:02:31	300	2453009.295	13.854	0.007
2004 01 04	19:19:24	300	2453009.307	13.838	0.007
2004 01 04	19:35:49	300	2453009.318	13.855	0.008
2004 01 04	19:52:27	300	2453009.330	13.852	0.008
2004 01 04	20:10:56	300	2453009.343	13.811	0.007
2004 01 04	20:27:21	300	2453009.354	13.814	0.007
2004 01 04	20:43:50	300	2453009.366	13.809	0.007
2004 01 04	21:00:48	300	2453009.377	13.791	0.007
2004 01 04	21:17:11	300	2453009.389	13.768	0.007
2004 01 04	21:34:46	300	2453009.401	13.777	0.006
2004 01 05	13:36:53	300	2453010.069	13.854	0.009
2004 01 05	13:57:26	300	2453010.083	13.851	0.009
2004 01 05	14:14:16	300	2453010.095	13.853	0.010
2004 01 05	14:30:43	300	2453010.106	13.857	0.013

Table 6. Observational log and results in the BATC f band in Period 2.

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2003 12 30	12:49:12	300	2453004.036	14.430	0.012
2003 12 30	13:05:58	300	2453004.047	14.445	0.012
2003 12 30	13:22:14	300	2453004.059	14.436	0.012
2003 12 30	13:38:47	300	2453004.070	14.448	0.011
2003 12 30	13:59:29	300	2453004.085	14.426	0.012
2003 12 30	14:18:16	300	2453004.098	14.433	0.011
2003 12 30	14:34:44	300	2453004.109	14.425	0.011
2003 12 30	14:56:00	300	2453004.124	14.416	0.010
2003 12 30	15:12:26	300	2453004.135	14.406	0.011
2003 12 30	15:28:52	300	2453004.147	14.425	0.012
2003 12 30	15:45:31	300	2453004.158	14.381	0.012
2003 12 30	16:02:08	300	2453004.170	14.347	0.010
2003 12 30	16:18:23	300	2453004.181	14.359	0.010
2003 12 30	16:34:50	300	2453004.193	14.361	0.010
2003 12 30	16:51:27	300	2453004.204	14.334	0.010
2003 12 30	17:07:55	300	2453004.216	14.351	0.009
2003 12 30	17:24:32	300	2453004.227	14.324	0.009
2003 12 30	17:40:55	300	2453004.238	14.326	0.008
2003 12 30	17:57:27	300	2453004.250	14.321	0.008
2003 12 30	18:17:44	300	2453004.264	14.327	0.008
2003 12 30	18:34:29	300	2453004.276	14.331	0.008
2003 12 30	18:50:58	300	2453004.287	14.322	0.008
2003 12 30	19:07:16	300	2453004.298	14.323	0.008
2003 12 30	19:23:43	300	2453004.310	14.328	0.009
2003 12 30	19:40:27	300	2453004.322	14.337	0.009
2003 12 30	19:56:56	300	2453004.333	14.342	0.008
2003 12 30	20:16:31	300	2453004.347	14.342	0.008
2003 12 30	20:33:06	300	2453004.358	14.312	0.008
2003 12 30	20:49:41	300	2453004.370	14.329	0.008
2003 12 30	21:06:01	300	2453004.381	14.285	0.009
2003 12 30	21:22:48	300	2453004.393	14.322	0.009
2003 12 30	21:39:34	300	2453004.404	14.316	0.009
2003 12 30	21:56:09	300	2453004.416	14.367	0.010
2003 12 31	13:22:43	300	2453005.059	14.223	0.009
2003 12 31	13:39:20	300	2453005.071	14.217	0.010
2003 12 31	13:55:44	300	2453005.082	14.200	0.009
2003 12 31	14:12:16	300	2453005.094	14.216	0.010
2003 12 31	14:28:30	300	2453005.105	14.261	0.010
2003 12 31	14:45:01	300	2453005.116	14.251	0.010
2003 12 31	15:02:28	300	2453005.128	14.274	0.010
2003 12 31	15:18:54	300	2453005.140	14.294	0.011
2003 12 31	15:35:08	300	2453005.151	14.294	0.010
2003 12 31	15:51:32	300	2453005.162	14.289	0.010
2003 12 31	16:07:58	300	2453005.174	14.292	0.010
2003 12 31	16:25:23	300	2453005.186	14.230	0.009

Table 6—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2003 12 31	16:42:52	300	2453005.198	14.233	0.010
2003 12 31	16:59:07	300	2453005.209	14.235	0.009
2003 12 31	17:15:36	300	2453005.221	14.234	0.009
2003 12 31	17:25:44	300	2453005.228	14.238	0.011
2003 12 31	17:31:52	300	2453005.232	14.195	0.010
2003 12 31	17:48:30	300	2453005.244	14.224	0.010
2003 12 31	18:05:15	300	2453005.255	14.203	0.010
2003 12 31	18:48:24	300	2453005.285	14.175	0.010
2003 12 31	19:05:39	300	2453005.297	14.187	0.010
2003 12 31	21:28:10	300	2453005.396	14.003	0.007
2003 12 31	21:44:24	300	2453005.408	13.970	0.007
2004 01 01	12:42:27	300	2453006.031	14.227	0.008
2004 01 01	12:58:54	300	2453006.043	14.213	0.008
2004 01 01	13:15:40	300	2453006.054	14.196	0.007
2004 01 01	13:32:55	300	2453006.066	14.204	0.008
2004 01 01	14:01:09	300	2453006.086	14.190	0.008
2004 01 01	14:17:49	300	2453006.097	14.186	0.007
2004 01 01	14:35:52	300	2453006.110	14.207	0.007
2004 01 01	14:52:48	300	2453006.122	14.207	0.007
2004 01 01	15:19:36	300	2453006.140	14.224	0.007
2004 01 01	15:35:55	300	2453006.152	14.229	0.007
2004 01 01	15:52:26	300	2453006.163	14.237	0.008
2004 01 01	16:47:57	300	2453006.202	14.255	0.008
2004 01 01	17:06:29	300	2453006.215	14.242	0.008
2004 01 01	17:44:02	300	2453006.241	14.219	0.007
2004 01 01	18:00:49	300	2453006.252	14.204	0.007
2004 01 01	18:17:21	300	2453006.264	14.200	0.007
2004 01 01	18:36:26	300	2453006.277	14.199	0.007
2004 01 02	12:31:10	300	2453007.023	13.935	0.007
2004 01 02	12:48:55	300	2453007.036	13.936	0.007
2004 01 02	13:05:22	300	2453007.047	13.940	0.007
2004 01 02	13:21:39	300	2453007.058	13.924	0.006
2004 01 02	13:38:04	300	2453007.070	13.919	0.007
2004 01 02	13:54:20	300	2453007.081	13.923	0.006
2004 01 02	14:11:15	300	2453007.093	13.925	0.006
2004 01 02	14:27:45	300	2453007.104	13.940	0.007
2004 01 02	14:44:13	300	2453007.116	13.951	0.007
2004 01 02	15:00:27	300	2453007.127	13.949	0.006
2004 01 02	15:18:49	300	2453007.140	13.955	0.006
2004 01 02	15:35:18	300	2453007.151	13.945	0.006
2004 01 02	15:51:33	300	2453007.162	13.931	0.006
2004 01 02	16:08:00	300	2453007.174	13.939	0.006
2004 01 02	16:25:17	300	2453007.186	13.950	0.006
2004 01 02	16:41:46	300	2453007.197	13.929	0.006
2004 01 02	16:58:24	300	2453007.209	13.945	0.006

Table 6—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2004 01 02	17:14:50	300	2453007.220	13.957	0.006
2004 01 02	17:31:14	300	2453007.232	13.962	0.006
2004 01 02	17:47:45	300	2453007.243	13.972	0.006
2004 01 02	18:07:42	300	2453007.257	13.942	0.006
2004 01 02	18:24:35	300	2453007.269	13.946	0.006
2004 01 02	18:41:11	300	2453007.280	13.933	0.006
2004 01 02	18:57:42	300	2453007.292	13.927	0.006
2004 01 02	19:14:30	300	2453007.303	13.915	0.006
2004 01 02	19:31:17	300	2453007.315	13.922	0.006
2004 01 03	16:11:29	300	2453008.176	13.946	0.008
2004 01 03	16:27:49	300	2453008.188	13.932	0.008
2004 01 03	16:44:21	300	2453008.199	13.932	0.008
2004 01 03	17:00:52	300	2453008.211	13.924	0.008
2004 01 03	17:17:24	300	2453008.222	13.906	0.008
2004 01 03	17:34:01	300	2453008.234	13.913	0.008
2004 01 03	17:50:30	300	2453008.245	13.897	0.008
2004 01 03	18:08:03	300	2453008.257	13.896	0.008
2004 01 03	18:24:19	300	2453008.269	13.887	0.008
2004 01 03	18:41:00	300	2453008.280	13.900	0.008
2004 01 03	18:57:22	300	2453008.292	13.886	0.008
2004 01 03	19:14:11	300	2453008.303	13.869	0.008
2004 01 03	19:30:51	300	2453008.315	13.874	0.007
2004 01 03	19:47:07	300	2453008.326	13.870	0.007
2004 01 03	20:04:00	300	2453008.338	13.886	0.007
2004 01 03	20:20:56	300	2453008.350	13.870	0.007
2004 01 03	20:38:29	300	2453008.362	13.881	0.007
2004 01 03	20:59:48	300	2453008.377	13.893	0.007
2004 01 04	12:16:42	300	2453009.013	13.959	0.009
2004 01 04	12:37:10	300	2453009.027	13.938	0.008
2004 01 04	12:55:51	300	2453009.041	13.983	0.009
2004 01 04	13:12:06	300	2453009.052	13.956	0.008
2004 01 04	13:28:24	300	2453009.063	13.962	0.008
2004 01 04	16:03:27	300	2453009.171	13.896	0.007
2004 01 04	16:19:44	300	2453009.182	13.875	0.007
2004 01 04	16:36:15	300	2453009.194	13.873	0.007
2004 01 04	16:52:29	300	2453009.205	13.847	0.007
2004 01 04	17:10:28	300	2453009.217	13.853	0.007
2004 01 04	17:26:55	300	2453009.229	13.849	0.007
2004 01 04	17:44:20	300	2453009.241	13.831	0.007
2004 01 04	18:01:00	300	2453009.252	13.833	0.007
2004 01 04	18:17:17	300	2453009.264	13.827	0.007
2004 01 04	18:33:34	300	2453009.275	13.816	0.007
2004 01 04	18:52:13	300	2453009.288	13.798	0.007
2004 01 04	19:08:50	300	2453009.299	13.780	0.007
2004 01 04	19:25:27	300	2453009.311	13.776	0.007

Table 6—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	f (mag)	$f_{\rm err}$ (mag)
2004 01 04	19:41:55	300	2453009.322	13.788	0.007
2004 01 04	19:58:30	300	2453009.334	13.763	0.006
2004 01 04	20:16:54	300	2453009.347	13.741	0.006
2004 01 04	20:33:25	300	2453009.358	13.727	0.006
2004 01 04	20:50:09	300	2453009.370	13.717	0.006
2004 01 04	21:06:58	300	2453009.382	13.717	0.006
2004 01 04	21:23:19	300	2453009.393	13.706	0.006
2004 01 04	21:40:50	300	2453009.405	13.687	0.005
2004 01 05	13:44:57	300	2453010.075	13.767	0.008
2004 01 05	14:03:35	300	2453010.088	13.770	0.008
2004 01 05	14:20:23	300	2453010.099	13.759	0.010
2004 01 05	14:37:06	300	2453010.111	13.769	0.014

Table 7. Observational log and results in the BATC i band in Period 2.

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	i (mag)	$i_{\rm err}$ (mag)
2003 12 30	12:26:59	180	2453004.020	14.152	0.007
2003 12 30	12:38:17	180	2453004.028	14.163	0.007
2003 12 30	12:55:21	180	2453004.040	14.161	0.007
2003 12 30	13:12:06	180	2453004.051	14.164	0.007
2003 12 30	13:28:21	180	2453004.062	14.149	0.007
2003 12 30	13:45:10	180	2453004.074	14.150	0.007
2003 12 30	14:08:04	180	2453004.090	14.137	0.007
2003 12 30	14:24:34	180	2453004.101	14.161	0.007
2003 12 30	14:45:40	180	2453004.116	14.138	0.007
2003 12 30	15:02:05	180	2453004.127	14.148	0.007
2003 12 30	15:18:39	180	2453004.139	14.137	0.007
2003 12 30	15:34:56	180	2453004.150	14.130	0.007
2003 12 30	15:51:39	180	2453004.162	14.095	0.007
2003 12 30	16:08:12	180	2453004.173	14.068	0.007
2003 12 30	16:24:28	180	2453004.185	14.082	0.007
2003 12 30	16:40:56	180	2453004.196	14.058	0.007
2003 12 30	16:57:31	180	2453004.208	14.047	0.007
2003 12 30	17:14:12	180	2453004.219	14.062	0.006
2003 12 30	17:30:46	180	2453004.231	14.063	0.006
2003 12 30	17:47:04	180	2453004.242	14.060	0.006
2003 12 30	18:07:31	180	2453004.256	14.040	0.005
2003 12 30	18:24:04	180	2453004.268	14.060	0.005
2003 12 30	18:40:46	180	2453004.279	14.065	0.006
2003 12 30	18:57:07	180	2453004.291	14.047	0.006
2003 12 30	19:13:34	180	2453004.302	14.049	0.006
2003 12 30	19:30:03	180	2453004.314	14.058	0.006
2003 12 30	19:46:32	180	2453004.325	14.063	0.006
2003 12 30	20:03:16	180	2453004.337	14.060	0.005
2003 12 30	20:22:50	180	2453004.350	14.056	0.005
2003 12 30	20:39:26	180	2453004.362	14.030	0.005
2003 12 30	20:55:46	180	2453004.373	14.037	0.006
2003 12 30	21:12:17	180	2453004.385	14.038	0.006
2003 12 30	21:29:10	180	2453004.396	14.051	0.006
2003 12 30	21:45:42	180	2453004.408	14.044	0.006
2003 12 30	22:02:15	180	2453004.419	14.041	0.006
2003 12 31	12:08:13	180	2453005.007	13.931	0.006
2003 12 31	13:04:33	180	2453005.046	13.954	0.006
2003 12 31	13:11:32	180	2453005.051	13.925	0.006
2003 12 31	13:29:01	180	2453005.063	13.943	0.006
2003 12 31	13:45:27	180	2453005.074	13.958	0.006
2003 12 31	14:01:52	180	2453005.086	13.966	0.006
2003 12 31	14:18:20	180	2453005.097	13.944	0.006
2003 12 31	14:34:37	180	2453005.108	13.977	0.006
2003 12 31	14:51:05	180	2453005.120	13.972	0.006
2003 12 31	15:08:44	180	2453005.132	14.016	0.006

Table 7—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	i (mag)	$i_{\rm err}$ (mag)
2003 12 31	15:25:00	180	2453005.143	13.999	0.006
2003 12 31	15:41:15	180	2453005.155	14.001	0.006
2003 12 31	15:57:38	180	2453005.166	14.014	0.006
2003 12 31	16:14:13	180	2453005.178	13.982	0.006
2003 12 31	16:32:29	180	2453005.190	13.981	0.006
2003 12 31	16:48:59	180	2453005.202	13.967	0.006
2003 12 31	17:05:15	180	2453005.213	13.959	0.006
2003 12 31	17:21:39	180	2453005.224	13.967	0.006
2003 12 31	17:37:56	180	2453005.236	13.954	0.007
2003 12 31	17:55:05	180	2453005.248	13.953	0.006
2003 12 31	18:38:10	180	2453005.278	13.927	0.006
2003 12 31	19:13:31	180	2453005.302	13.909	0.006
2003 12 31	19:32:00	180	2453005.315	13.896	0.006
2003 12 31	19:50:10	180	2453005.327	13.896	0.006
2003 12 31	20:06:35	180	2453005.339	13.887	0.005
2003 12 31	20:23:09	180	2453005.350	13.862	0.006
2003 12 31	20:39:34	180	2453005.362	13.841	0.005
2003 12 31	20:56:27	180	2453005.374	13.813	0.005
2003 12 31	21:17:46	180	2453005.388	13.781	0.005
2003 12 31	21:34:15	180	2453005.400	13.716	0.005
2003 12 31	21:50:40	180	2453005.411	13.702	0.005
2004 01 01	12:29:54	180	2453006.022	13.938	0.005
2004 01 01	12:48:43	180	2453006.035	13.941	0.005
2004 01 01	13:05:12	180	2453006.046	13.909	0.005
2004 01 01	13:22:28	180	2453006.058	13.905	0.005
2004 01 01	13:50:10	180	2453006.078	13.905	0.005
2004 01 01	14:07:23	180	2453006.090	13.906	0.005
2004 01 01	14:23:55	180	2453006.101	13.914	0.005
2004 01 01	14:42:11	180	2453006.114	13.935	0.005
2004 01 01	15:09:09	180	2453006.132	13.940	0.005
2004 01 01	15:25:42	180	2453006.144	13.956	0.005
2004 01 01	15:42:00	180	2453006.155	13.944	0.005
2004 01 01	16:37:43	180	2453006.194	13.970	0.005
2004 01 01	16:56:15	180	2453006.207	13.983	0.005
2004 01 01	17:33:35	180	2453006.233	13.961	0.005
2004 01 01	17:50:22	180	2453006.244	13.932	0.005
2004 01 01	18:06:56	180	2453006.256	13.934	0.005
2004 01 01	18:26:01	180	2453006.269	13.935	0.005
2004 01 02	12:38:34	180	2453007.028	13.683	0.005
2004 01 02	12:55:13	180	2453007.039	13.674	0.004
2004 01 02	13:11:27	180	2453007.051	13.678	0.004
2004 01 02	13:27:53	180	2453007.062	13.679	0.004
2004 01 02	13:44:11	180	2453007.073	13.657	0.004
2004 01 02	14:00:54	180	2453007.085	13.674	0.004
2004 01 02	14:17:33	180	2453007.097	13.689	0.005

Table 7—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	i (mag)	$i_{\rm err}$ (mag)
2004 01 02	14:33:50	180	2453007.108	13.687	0.004
2004 01 02	14:50:17	180	2453007.119	13.699	0.004
2004 01 02	15:08:56	180	2453007.132	13.679	0.004
2004 01 02	15:25:09	180	2453007.144	13.697	0.004
2004 01 02	15:41:22	180	2453007.155	13.684	0.004
2004 01 02	15:57:37	180	2453007.166	13.677	0.004
2004 01 02	16:15:05	180	2453007.178	13.691	0.004
2004 01 02	16:31:26	180	2453007.190	13.693	0.004
2004 01 02	16:48:00	180	2453007.201	13.689	0.004
2004 01 02	17:04:30	180	2453007.213	13.699	0.004
2004 01 02	17:21:04	180	2453007.224	13.708	0.004
2004 01 02	17:37:21	180	2453007.235	13.698	0.004
2004 01 02	17:57:21	180	2453007.249	13.680	0.004
2004 01 02	18:14:02	180	2453007.261	13.691	0.004
2004 01 02	18:30:44	180	2453007.272	13.675	0.004
2004 01 02	18:47:16	180	2453007.284	13.664	0.004
2004 01 02	19:03:47	180	2453007.295	13.651	0.004
2004 01 02	19:20:35	180	2453007.307	13.675	0.004
2004 01 03	15:58:14	180	2453008.167	13.680	0.005
2004 01 03	16:17:35	180	2453008.180	13.682	0.005
2004 01 03	16:33:56	180	2453008.191	13.677	0.005
2004 01 03	16:50:38	180	2453008.203	13.680	0.005
2004 01 03	17:07:10	180	2453008.214	13.667	0.005
2004 01 03	17:23:31	180	2453008.226	13.668	0.005
2004 01 03	17:40:18	180	2453008.237	13.655	0.005
2004 01 03	17:57:35	180	2453008.249	13.652	0.005
2004 01 03	18:14:09	180	2453008.261	13.624	0.005
2004 01 03	18:30:26	180	2453008.272	13.657	0.005
2004 01 03	18:47:04	180	2453008.284	13.642	0.005
2004 01 03	19:03:35	180	2453008.295	13.627	0.005
2004 01 03	19:20:29	180	2453008.307	13.629	0.005
2004 01 03	19:36:57	180	2453008.318	13.636	0.005
2004 01 03	19:53:13	180	2453008.330	13.640	0.005
2004 01 03	20:10:24	180	2453008.342	13.644	0.005
2004 01 03	20:27:21	180	2453008.353	13.643	0.005
2004 01 03	20:48:33	180	2453008.368	13.656	0.004
2004 01 04	12:06:32	180	2453009.006	13.709	0.006
2004 01 04	12:23:00	180	2453009.017	13.718	0.005
2004 01 04	12:43:48	180	2453009.032	13.712	0.005
2004 01 04	13:01:58	180	2453009.044	13.723	0.005
2004 01 04	13:18:13	180	2453009.055	13.706	0.005
2004 01 04	15:52:13	180	2453009.162	13.658	0.005
2004 01 04	16:09:33	180	2453009.174	13.640	0.005
2004 01 04	16:25:51	180	2453009.186	13.627	0.005
2004 01 04	16:42:19	180	2453009.197	13.636	0.005

Table 7—Continued

Obs. Date (yyyy mm dd)	Obs. Time (hh:mm:ss)	Exp. Time (s)	JD	i (mag)	$i_{\rm err}$ (mag)
2004 01 04	16:58:33	180	2453009.208	13.610	0.005
2004 01 04	17:16:36	180	2453009.221	13.577	0.005
2004 01 04	17:33:17	180	2453009.233	13.582	0.005
2004 01 04	17:50:25	180	2453009.244	13.599	0.005
2004 01 04	18:07:07	180	2453009.256	13.577	0.005
2004 01 04	18:23:25	180	2453009.267	13.573	0.005
2004 01 04	18:41:46	180	2453009.280	13.568	0.005
2004 01 04	18:58:27	180	2453009.292	13.549	0.005
2004 01 04	19:15:08	180	2453009.303	13.514	0.004
2004 01 04	19:31:45	180	2453009.315	13.547	0.005
2004 01 04	19:48:09	180	2453009.326	13.529	0.004
2004 01 04	20:06:37	180	2453009.339	13.515	0.005
2004 01 04	20:23:15	180	2453009.350	13.506	0.004
2004 01 04	20:39:46	180	2453009.362	13.488	0.004
2004 01 04	20:56:28	180	2453009.374	13.489	0.004
2004 01 04	21:13:05	180	2453009.385	13.466	0.004
2004 01 04	21:30:37	180	2453009.397	13.453	0.004
2004 01 05	13:22:30	180	2453010.058	13.514	0.005
2004 01 05	13:53:18	180	2453010.080	13.464	0.005
2004 01 05	14:09:54	180	2453010.091	13.463	0.005
2004 01 05	14:26:34	180	2453010.103	13.488	0.007