## LIGHT MAXIMA OF THE DELTA SCUTI STAR HD 94033

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#### **RESUMEN**

Observaciones recientes de los tiempos de máximo brillo mediante fotometría fotoeléctrica de la estrella tipo Delta Scuti HD 94033 permiten la determinación de una efemérides para esta estrella de  $T_{max} = 2442516.15903 + 0.05951012E$  en concordancia con la derivada anteriormente.

#### **ABSTRACT**

Photoelectric photometry of the Delta Scuti star HD 94033 has been carried out. New observations of the maximum light of this star allow a determination of an ephemeris  $T_{max} = 2442516.15903 + 0.05951012$  E in agreement with the previously derived one.

Key words: VARIABLE STARS - DELTA SCUTI STARS - PULSATION - SX Phe STARS

# I. INTRODUCTION

The Delta Scuti Star HD 94033 was first discovered in 1975 by Przybylski and Bessell (1979, hereinafter PB) in a photometric survey of early type stars with high proper motion; from their observations they concluded that this star shows a period of 85 min 45 s and a visual amplitude of 0.8 mag, from 9.47 to 10.26 mag. In their extensive study on this star, PB found it deficient in metals by a factor of 30 relative to the Sun, and moving around the center of the Galaxy in a highly eccentric and retrograde orbit. According to PB, HD 94033 is the first known short period cepheid which clearly belongs to Population II.

Breger (1977) and Frolov (1974), previous to the report by PB, had already called attention to some Delta Scuti stars that are clearly different and belong to the halo population with high space velocities and low metal abundances, but at that time, the only direct evidence of this rested on the trigonometric parallax and space velocity of SX Phe. With the discovery of NJL 220 (Niss 1981) and NJL 79 (Jorgensen 1982) in the globular cluster  $\omega$  Cen the membership of this class increased since both have nearly the same physical parameters as SX Phe itself. The complete list of the stars now considered as members of the SX Phe class has been given by Breger and Stockenhuber (1983) and Frolov and Irkaev (1984).

According to Breger (1983), the SX Phe-type varia-

bles are not yet explained by stellar evolution theory: they are too hot for the globular cluster main sequence, their radial pulsation periods are too short and their luminosities are several magnitudes too faint for the horizontal branch. Theoretical models developed by different authors lead to different interpretations on their nature. Andreasen (1983) found for the metal poor variables (HD 94033, among them) that their masses (0.9-1.3)M<sub>o</sub> are consistent with the Pop II Main Sequence hypothesis, but their ages are much less than expected for such objects. Dziembowski and Kozlowski (1974) have developed low mass models that consider degenerate helium cores and represent pre-white-dwarf evolution still governed by hydrogen burning in the shell. Their results, of masses around 0.2 M<sub>o</sub> and a low metal content, predicted a period variation that has been confirmed for CY Aqr by Rolland et al. (1984) in a time span of more than fifty three years but, since most of the SX Phe stars have been discovered recently, within the last ten years, a comprehhensive study of their period variation cannot be carried out except for a few of which sufficient amount of observations covering a large basis of time is available. These two facts together encouraged the authors to engage in a study of the monitorying of the time of maximum light of this type of star, since this study will eventually throw light on the characteristics of these stars. In the present paper the determined times of maximum light of HD 94033 are presented.

#### II. OBSERVATIONS

The observations were carried out mainly in the 1-m telescope of the Observatorio de Tonantzintla, México, with a two-channel high speed photometer (a description of it can be found in Nather and Warner 1971) with an integration every ten seconds. The accuracy with which the maxima were determined is better than 1-min (0.0007 d). A few determinations of the maximum light were carried out at the 0.84-m telescope at the San Pedro Mártir Observatory, México, with one of the original cooled Johnson's photometers in the b filter of the Strömgren System. An integration of the star was obtained every ten seconds and, since only the times of maximum light were desired, the variable alone was monitored with a few observations of a reference star. In consequence, the accuracy of the determined maxima is of 1-min.

#### III. DISCUSSION

From their 25 times of maximum light that covered a time span of fourteen months, PB were able to determine the following

$$T = 2442516.15836 + 0.0595104212 E.$$

A new determination of the ephemeris was carried out considering this time, not only PB's determined maxima, but also considering the maxima reported in Table 1 covering, consequently, a time span of nine years. The new determined ephemeris is in excellent agreement with the previously derived parameters by PB and it is the following:

$$T_{\text{max}} = 2442516.15903 + (0.05951012 \pm 4 \times 10^{-8}) \times E$$

The uncertainties were derived considering an accuracy in the determination of each maximum of  $\pm 2$  min and also taking into account the time span of nine years or 55328 cycles.

Figure 1 presents the residuals of the observed minus calculated time of maximum light versus epoch obtained with the parameters determined in this paper. Unfortunately, no observations known to us, have been carried out on this star since its discovery by PB, and as a result, nothing definitive can be said with respect to the period variation on this star. We plan to continue the observations of these stars and encourage other astronomers to do so, since this is the only way to determine the constancy or variation of their pulsational periods that will, ultimately, lead to a comprehensive knowledge of the nature of these stars.

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TABLE 1
TIMES OF MAXIMUM LIGHT OF HD 94033

(HJD 2440000.+) Epoch (d) (min)  1		Time of		O – C	
2 2517,9440 30 -0.0004 -0.5524 3 2518.0034 31 -0.0004 -0.5814 4 2518.1223 33 -0.0005 -0.7546 5 2541.9256 433 -0.0005 -0.7087 7 2542.0448 435 -0.0012 -1.7024 8 2542.1045 434 -0.0005 -0.7087 8 2542.1045 434 -0.0001 -1.4290 9 2542.8787 449 -0.0003 -0.4952 10 2542.9782 450 -0.0004 -0.5242 11 2542.97973 451 -0.0008 -1.1580 12 2543.88903 466 -0.0004 -0.5541 13 2544.0094 448 -0.0004 -0.5541 14 2545.9138 500 -0.0003 -0.4897 15 2545.9729 501 -0.0007 -1.0226 16 2542.9730 787 -0.0005 -0.6545 17 2755.2111 4017 -0.0001 -0.1902 18 2845.9729 501 -0.0007 -1.0226 18 2845.9729 5551 0.0010 1.5014 21 2890.0628 6283 0.0017 2.4566 22 2890.9553 6298 0.0015 2.1804 24 2929.9739 6954 0.0015 2.1804 24 2929.9739 6954 0.0015 2.1679 25 2548.8081 54321 -0.0002 -0.2859 25 7548.8081 54321 -0.0002 -0.2859 25 7548.9861 54321 -0.0002 -0.9917 29 5748.9278 54339 0.0005 -0.7361 35 5749.8199 54339 -0.0000 -0.0583 34 5749.8795 54339 0.0005 -0.7361 35 5749.8199 54339 -0.0000 -0.0833 35 5749.8199 54339 -0.0000 -0.0833 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8199 54339 -0.0000 -0.0883 35 5749.8795 54399 -0.0000 -0.0884 35 5749.8158 54674 0.0004 0.6135 36 5751.7243 54300 -0.0004 0.6353 37 5749.8750 54675 0.0002 -0.1934 36 5769.8158 54674 0.0004 0.6135 37 5769.8750 54675 0.0002 -0.1934 37 5769.8750 54675 0.0000 -0.0884 38 5769.8158 54674 0.0004 0.6135 5783.8812 54907 54889 0.0001 0.0883 5749.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54674 0.0004 0.6135 5789.8158 54690 0.0004 0.5229 5783.6812 5490 0.0006 0.8246 5783.6812 5490 0.000		Maximum (HJD 2440000.+)	Epoch	(d)	(min)
3 2518,0034 31 -0.0004 -0.5814 4 2518,1023 33 -0.0005 -0.7546 5 2541.9266 433 -0.0005 -0.7546 5 2541.9859 434 -0.0005 -0.7087 7 2542.0448 435 -0.0012 -1.7024 8 2542.1045 436 -0.0010 -1.4290 9 2542.8787 449 -0.0003 -0.4952 10 2542.9783 451 -0.0004 -0.5242 11 2542.9793 451 -0.0004 -0.5242 11 2542.9793 451 -0.0004 -0.5242 11 2542.9793 451 -0.0004 -0.5846 13 2544.0094 468 -0.0004 -0.5846 13 2545.9138 500 -0.0003 -0.4851 12 2545.9138 500 -0.0007 -1.0226 16 2545.9729 501 -0.0007 -1.0226 16 2545.9729 501 -0.0007 -1.0226 16 2562.9730 787 -0.0005 -0.6545 17 2755.2111 4017 -0.0001 -0.1902 18 2846.9767 5559 0.0009 1.3145 20 2847.0959 5561 0.0010 1.5014 20 2847.0959 5561 0.0010 1.5014 22 2890.0628 6283 0.0017 2.4566 22 2890.9553 6298 0.0015 2.1804 22 2890.9553 6298 0.0015 2.1804 22 2890.9553 6298 0.0015 2.1804 22 2890.9553 6298 0.0017 2.4566 22 29.9939 6954 0.0015 2.1604 22 2870.9583 6298 0.0015 2.1604 22 22 27 27 27 27 27 27 27 27 27 27 27			Q		-0.7633
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12		2542.9973			-1.1580
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15         2545,9729         501         -0.0007         -1.0226           16         2562,9730         787         -0.0005         -0.6902           17         2755,2111         4017         -0.0001         -0.1902           18         2846,9767         5559         0.0009         1.3145           19         2847,0759         5561         0.0010         1.5014           20         2847,1550         5562         0.0007         1.0116           21         2890,0628         6283         0.0017         2.4566           22         2890,9553         6298         0.0015         2.1804           23         2891,9644         6315         0.0010         1.4143           24         2929,9739         6954         0.0015         2.1679           25         2958,9161         7440         0.0017         2.51679           26         5748,7479         54320         -0.0008         -1.1786           27         5748,8671         54321         -0.0007         -0.2859           28         5748,87278         54323         0.0005         0.7361           30         5749,7564         54324         -0.0007         -1.0353 <td></td> <td></td> <td></td> <td></td> <td></td>					
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17         2755.2111         4017         -0.0001         -0.1902           18         2846.9767         5559         0.0009         1.3145           19         2847.0959         5561         0.0010         1.5014           20         2847.1550         5562         0.0007         1.0116           21         2890.9553         6298         0.0017         2.4566           22         2890.9553         6298         0.0010         1.4143           24         2929.9939         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.7479         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0002         -0.2859           28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54332         0.0005         0.7361           30         5749.7608         54337         0.0004         0.5465           31         5749.7608         54337         0.0001         0.0853           34         5749.8199         54338         -0.0001         0.0853 <td></td> <td></td> <td></td> <td></td> <td></td>					
19         2847.0559         5561         0.0010         1.5014           20         2847.1550         5562         0.0007         1.0116           21         2890.0628         6283         0.0017         2.4566           22         2890.9553         6298         0.0015         2.1804           23         2891.964         6315         0.0010         1.4143           24         2929.9739         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.8081         54321         -0.0002         -0.2917           27         5748.8081         54321         -0.0007         -0.9917           28         5748.8671         54322         -0.0007         -0.7361           30         5748.9861         54323         0.0005         0.7361           31         5749.7608         54337         0.0004         0.5455           32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.0003         -0.3566 <td></td> <td></td> <td></td> <td></td> <td></td>					
20         2847.1550         5562         0.0007         1.0116           21         2890.0628         6283         0.0017         2.4566           22         2890.9553         6298         0.0015         2.1804           23         2891.9664         6315         0.0010         1.4143           24         2929.9939         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.7479         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0007         -0.2859           28         5748.8661         54322         -0.0007         -0.9917           29         5748.9861         54322         -0.0007         -1.0353           30         5748.9861         54324         -0.0007         -1.0353           31         5749.8199         54338         -0.0004         0.5465           32         5749.8199         54338         -0.0004         0.5843           33         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.0003         -0.3					1.3145
21         2890.0628         6283         0.0017         2.4566           22         2890.9553         6298         0.0015         2.1804           23         2891.9664         6315         0.0010         1.4143           24         2929.9939         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.7479         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0007         -0.2859           28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5749.81927         543324         -0.0007         -1.0353           31         5749.8199         54338         -0.0000         -0.5843           32         5749.8199         54338         -0.0000         -0.5843           33         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.003         -0.3612           35         5750.9503         54357         -0.0003					
22         2890.9553         6298         0.0015         1.1804           23         2891.9664         6315         0.0010         1.4143           24         2929.9939         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.8081         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0007         -0.9917           28         5748.8278         54323         0.0005         0.7361           30         5748.9278         54323         0.0005         0.7361           30         5748.9819         54337         0.0004         0.5465           32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         0.8853           34         5749.9387         54340         -0.0003         -0.4506           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.080           37         5769.8750         54673         0.0004         0.6135					
23         2891.9664         6315         0.0010         1.4143           24         2929.9939         6954         0.0015         2.1679           25         2958.9161         7440         0.0017         2.5159           26         5748.7479         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0002         -0.2859           28         5748.9278         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5748.9861         54324         -0.0007         -1.0353           31         5749.8199         54338         -0.0000         -0.584           32         5749.8199         54338         -0.0000         -0.584           33         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.0803           37         5769.87564         54673         0.0004 <td< td=""><td></td><td></td><td></td><td></td><td></td></td<>					
25         2958.9161         7440         0.0017         2.5159           26         5748.7479         54320         -0.0008         -1.1786           27         5748.8671         54322         -0.0007         -0.9917           28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5748.9861         54324         -0.0007         -1.0353           31         5749.7608         54337         0.0004         0.5465           32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         0.0853           34         5749.8795         54339         0.0001         0.0853           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.0880           37         5769.7564         54673         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0003 <td< td=""><td></td><td></td><td></td><td>0.0010</td><td></td></td<>				0.0010	
26         5748.7479         54320         -0.0008         -1.1786           27         5748.8081         54321         -0.0002         -0.2859           28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5748.9861         54324         -0.0007         -1.0353           31         5749.7608         54337         0.0004         0.5465           32         5749.8199         54338         -0.0000         -0.0853           34         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.0883           37         5769.7564         54673         0.0006         0.8340           38         5769.8158         54674         0.0004         0.6135           39         5769.8550         54675         0.0002         0.2189           40         5770.6479         54688         -0.0004         -0.8246           41         5770.7674         54699         -0.0003					
27         5748.8081         54321         -0.0002         -0.2859           28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5748.9861         54324         -0.0007         -1.0353           31         5749.8199         54338         -0.0000         -0.584           32         5749.8199         54339         0.0001         0.0853           34         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54337         -0.0003         -0.4506           36         5751.7243         54370         0.0004         0.808           37         5769.7564         54673         0.0004         0.8340           38         5769.8750         54673         0.0004         0.6135           39         5769.8750         54673         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.647         54688         -0.0006         -					
28         5748.8671         54322         -0.0007         -0.9917           29         5748.9278         54323         0.0005         0.7361           30         5748.9861         54324         -0.0007         -1.0353           31         5749.7608         54337         0.0004         0.5465           32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         -0.3612           35         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.0830           37         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0004         0.6135           41         5770.7077         54689         -0.0001         -0.1336           43         5776.7185         54790         -0.0001         -0.1336           45         5777.7303         54807         0.0001					
29         5748,9278         54323         0.0005         0.7361           30         5748,9861         54324         -0.0007         -1.0353           31         5749,7608         54337         0.0004         0.5465           32         5749,8199         54338         -0.0000         -0.0584           33         5749,8795         54339         0.0001         0.0853           34         5749,9887         54340         -0.0003         -0.4506           36         5751,7243         54370         0.0000         0.0880           37         5769,7564         54673         0.0006         0.8340           38         5769,8750         54675         0.0002         0.2189           40         5770,6479         54688         -0.0004         -0.8246           41         5770,7077         54689         -0.0003         -0.4971           42         5770,7674         54690         -0.0001         -0.1336           43         5776,7185         54790         -0.0000         -0.0049           44         5777,7303         54807         0.0001         0.1773           46         5782,6699         54890         0.0004         <					
31         5749.7608         54337         0.0004         0.5465           32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         -0.3612           34         5749.9387         54340         -0.0003         -0.4506           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.080           37         5769.7564         54673         0.0004         0.6135           39         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0004         -0.4371           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.6699         54891         0.003		5748.9278	54323		0.7361
32         5749.8199         54338         -0.0000         -0.0584           33         5749.8795         54339         0.0001         0.0853           34         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.0880           37         5769.7564         54673         0.0004         0.6135           38         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0003         -0.4071           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0000         -0.069           44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0004 <t< td=""><td></td><td></td><td></td><td></td><td></td></t<>					
33         5749,8795         54339         0.0001         0.0853           34         5749,9387         54340         -0.0003         -0.3612           35         5750,9503         54357         -0.0003         -0.4506           36         5751,7243         54370         0.0000         0.0880           37         5769,7564         54473         0.0006         0.8340           38         5769,8158         54674         0.0002         0.2189           40         5770,6479         54688         -0.0006         -0.8246           41         5770,7077         54689         -0.0003         -0.4071           42         5770,7674         54690         -0.0001         -0.1336           43         5776,7185         54790         -0.0008         -1.1041           45         5777,6699         54806         -0.0008         -1.1041           45         5772,7303         54807         0.0001         0.1773           46         5782,6699         54890         0.0004         0.5229           47         5782,8485         54893         0.0004         0.6378           49         5782,8485         54893         0.0004         <					
34         5749.9387         54340         -0.0003         -0.3612           35         5750.9503         54357         -0.0003         -0.4506           36         5751.7243         54370         0.0000         0.080           37         5769.7564         54673         0.0004         0.6135           38         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0006         -0.8246           41         5770.7077         54689         -0.0003         -0.4071           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0000         -0.0069           44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.84895         54893         0.0004         <					
36         5751.7243         54370         0.0000         0.0080           37         5769.7564         544673         0.0006         0.8340           38         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0006         -0.8246           41         5770.7674         54689         -0.0003         -0.4071           42         5770.7674         54690         -0.0000         -0.0069           44         5777.76699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.8485         54893         0.0004         0.6378           50         5783.6812         54907         0.0000         0.0448           51         5783.8000         54908         0.0003         0					
37         5769,7564         54673         0.0006         0.8340           38         5769,8158         54674         0.0004         0.6135           39         5769,8750         54675         0.0002         0.2189           40         5770,6479         54688         -0.0006         -0.8246           41         5770,7077         54689         -0.0003         -0.4071           42         5770,7674         54690         -0.0000         -0.0069           43         5776,7185         54790         -0.0008         -1.1041           45         5777,6699         54806         -0.0008         -1.1041           45         5777,7303         54807         0.0001         0.1773           46         5782,6699         54890         0.0001         0.1773           46         5782,7294         54891         0.0003         0.4940           48         5782,7294         54892         0.0004         0.6378           49         5782,8485         54893         0.0004         0.6088           50         5783,6812         54907         0.0000         0.448           51         5783,8000         54908         0.0003         0.					
38         5769.8158         54674         0.0004         0.6135           39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0003         -0.4071           41         5770.7077         54689         -0.0001         -0.4071           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5783.6812         54907         0.0004         0.6388           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0004         0					
39         5769.8750         54675         0.0002         0.2189           40         5770.6479         54688         -0.0006         -0.8246           41         5770.7077         54689         -0.0001         -0.4071           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0000         -0.0069           44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0004         0.5229           47         5782.7294         54891         0.0004         0.4378           49         5782.8845         54893         0.0004         0.6378           49         5782.8845         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.6812         54907         0.0000         0.3414           52         5783.88000         54909         -0.0002 <td< td=""><td></td><td></td><td></td><td></td><td></td></td<>					
41         5770.7077         54689         -0.0003         -0.4071           42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0000         -0.0036           44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5783.6812         54907         0.0000         0.0488           50         5783.6812         54907         0.0000         0.0488           51         5783.6812         54907         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0					
42         5770.7674         54690         -0.0001         -0.1336           43         5776.7185         54790         -0.0000         -0.0069           44         5777.6699         54806         -0.0001         -0.1773           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.8845         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6600         55058         -0.0012         -1					
43         5776.7185         54790         -0.0000         -0.0069           44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.8485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0004         0.8171           54         5784.7527         54925         0.0004         0.8169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.003         0.44					
44         5777.6699         54806         -0.0008         -1.1041           45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.88485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.8000         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55159         0.0008         1.09					
45         5777.7303         54807         0.0001         0.1773           46         5782.6699         54890         0.0004         0.5229           47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.8485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957<					
47         5782.7294         54891         0.0003         0.4940           48         5782.7890         54892         0.0004         0.6378           49         5782.8485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6761         55327         0.0007         0.9946<		5777.7303		0.0001	0.1773
48         5782.7890         54892         0.0004         0.378           49         5782.8485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5808.6761         55327         0.0007         0.9948           61         5808.6761         55327         0.0007         0.9946		5782.6699			
49         5782.8485         54893         0.0004         0.6088           50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5796.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6761         55327         0.0007         0.9946					
50         5783.6812         54907         0.0000         0.0448           51         5783.7410         54908         0.0003         0.3614           52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6168         55326         0.0008         1.1820           62         5808.6761         55327         0.0007         0.9946					
52         5783.8000         54909         -0.0002         -0.2320           53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5806.6422         55192         0.0006         0.9028           61         5808.6168         55326         0.0008         1.1820           62         5808.6761         55327         0.0007         0.9946					
53         5784.6935         54924         0.0006         0.8771           54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6761         55327         0.0007         0.9946			54908		0.3614
54         5784.7527         54925         0.0004         0.5169           55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6168         55326         0.0008         1.1820           62         5808.6761         55327         0.0007         0.9946					
55         5784.8125         54926         0.0006         0.8191           56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6168         55326         0.0008         1.1820           62         5808.6761         55327         0.0007         0.9946					
56         5792.6660         55058         -0.0012         -1.7525           57         5793.6792         55075         0.0003         0.4478           58         5795.6431         55108         0.0004         0.5429           59         5798.6785         55159         0.0008         1.0957           60         5800.6422         55192         0.0006         0.9028           61         5808.6168         55326         0.0008         1.1820           62         5808.6761         55327         0.0007         0.9946					
57     5793.6792     55075     0.0003     0.4478       58     5795.6431     55108     0.0004     0.5429       59     5798.6785     55159     0.0008     1.0957       60     5800.6422     55192     0.0006     0.9028       61     5808.6168     55326     0.0008     1.1820       62     5808.6761     55327     0.0007     0.9946	56	5792.6660		-0.0012	-1.7525
59     5798.6785     55159     0.0008     1.0957       60     5800.6422     55192     0.0006     0.9028       61     5808.6168     55326     0.0008     1.1820       62     5808.6761     55327     0.0007     0.9946	57				0.4478
60       5800.6422       55192       0.0006       0.9028         61       5808.6168       55326       0.0008       1.1820         62       5808.6761       55327       0.0007       0.9946					
61 5808.6168 55326 0.0008 1.1820 62 5808.6761 55327 0.0007 0.9946					
62 5808.6761 55327 0.0007 0.9946					
63 5808.7358 55328 0.0009 1.2968		5808.6761	55327		0.9946
	63	5808.7358	55328	0.0009	1.2968

## REFERENCES

Andreasen, G.K. 1983, Astr. and Ap., 121, 250.
Breger, M. 1977, Proceedings and Stellar Pulsation Conference, eds. A.N. Cox and R.G. Dupree (Los Alamos, N.M.), publication 6544-C.

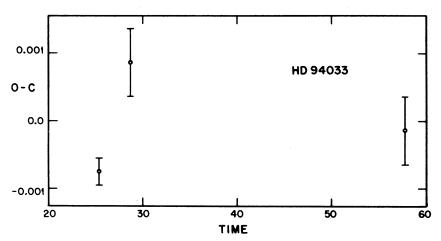


Fig. 1. O-C residuals vs. time diagram for HD 94033. Each point represents a seasonal mean of all the maxima in a time interval of one year. The O-C axis is in day fraction, whereas to convert the time scale into heliocentric julian days one must consider the following: time shown = (HJD-2440000/100).

Breger, M. and Stockenhuber, H. 1983, Rapid Variability of Early Type Stars, Workshop held at Hvar, Yugoslavia.
Dziembowski, W. and Kozlowski, M. 1974, Acta Astr., 24, 245.
Frolov, M.S. 1974, Sci. Inform. Astron. Council USSR Acad. Sci. No. 33, 29

No. 33, 29. Frolov, M.S. and Irkaev, B.N. 1984, Commission No. 27 of the IAU No. 2462. Jorgensen, H.E. 1982, Astr. and Ap., 108, 99.
Nather, R.E. and Warner, B. 1971, M.N.R.A.S., 152, 209.
Niss, B. 1981, Astr. and Ap., 98, 415.
Przybylski, A. and Bessel, M.S. 1979, M.N.R.A.S., 189, 377.
Rolland, A., Peña, J.H., López de Coca, P., Peniche, R., and González, S.F. 1984, Astr. and Ap., in press.

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