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**THE GEOS RR Lyr SURVEY**

Fifth list of maxima of RR Lyr stars observed by the automated telescope TAROT

(GEOS Circular RR 28)

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We present here the fifth list of light maxima of RR Lyrae stars from the GEOS RR Lyr Survey, a GEOS program (<http://www.upv.es/geos/>) (Boninsegna et al., 2002) of automated observations of RR Lyr stars started in January 2004. We are using the 25-cm automatic telescope TAROT (<http://tarot.obs-hp.fr>) (Boër et al., 2001, Bringer et al., 1999) located in Calern Observatory (Observatoire de la Côte d’Azur, Nice University, France). Images are obtained by a 2048 × 2048 Marconi 42-40 thin back illuminated CCD. Field of view is 1.86° × 1.86°. Data reduction, from bias subtraction and flatfielding to photometry using SExtractor (Bertin and Arnouts, 1996), is performed automatically. The aim of this legacy project for the study of period variations of RR Lyr stars is to monitor maxima of light of these stars in order to feed the GEOS RR Lyr web database (<http://dbRR.ast.obs-mip.fr>).

The present list contains 290 maxima observed with no filter between January and June 2006 (Table 1). The maxima are determined by fitting a polynomial function on the data points. The uncertainties on individual maxima are estimated from the data sampling of each maximum. The nominal sampling (two consecutive 30s exposures taken every 10 minutes on a time baseline of 2 hours centered around the predicted maximum time) may be altered by local events (weather or telescope operation). This results uncertainties from 0.002 to 0.010 day. For a well observed star, the mean uncertainty on maxima is about 0.003 day (4.3 minutes). The  $O - C$ ’s are computed with the GCVS elements (Kholopov et al., 1985) and are displayed in table 1 in column “ $O - C$ ”. When no elements are available in the GCVS, the reference of the elements is given as a footnote of Table 1. XZ Cyg is also an exception for which we use the elements from Baldwin and Samolyk (2003).

Table 1: maxima of RR Lyrae stars

Variable	Maximum HJD 24. . .	$O - C$ (days)	E	Variable	Maximum HJD 24. . .	$O - C$ (days)	E
CI And	53738.435±0.003	0.002	1401.	Z CVn	53776.590±0.003	0.259	22705.
DR And	53739.370±0.004	-0.016	29335.	Z CVn	53833.472±0.005	0.258	22792.
X Ari	53739.376±0.002	0.307	24811.	Z CVn	53839.368±0.003	0.270	22801.
X Ari	53754.352±0.004	0.307	24834.	Z CVn	53867.483±0.005	0.271	22844.
TZ Aur	53737.647±0.002	0.004	86386.	RU CVn	53759.596±0.002	0.004	33626.
TZ Aur	53785.431±0.002	0.003	86508.	RU CVn	53801.444±0.002	0.005	33699.
BH Aur	53758.455±0.002	-0.002	24133.	RU CVn	53848.452±0.002	0.006	33781.
RS Boo	53795.521±0.002	-0.007	31868.	RU CVn	53860.489±0.002	0.005	33802.
RS Boo	53806.466±0.003	-0.005	31897.	RU CVn	53895.458±0.002	0.006	33863.
RS Boo	53807.601±0.002	-0.002	31900.	RU CVn	53899.471±0.005	0.006	33870.
RS Boo	53809.488±0.002	-0.002	31905.	RZ CVn	53760.672±0.002	-0.180	23646.
RS Boo	53863.447±0.002	-0.002	32048.	RZ CVn	53776.563±0.005	-0.176	23674.
RS Boo	53869.486±0.004	0.000	32064.	RZ CVn	53796.420±0.002	-0.178	23709.
RS Boo	53889.485±0.002	0.000	32117.	RZ CVn	53834.437±0.004	-0.178	23776.
RS Boo	53897.410±0.004	0.001	32138.	RZ CVn	53855.436±0.003	-0.173	23813.
RS Boo	53900.430±0.003	0.002	32146.	RZ CVn	53881.534±0.004	-0.176	23859.
ST Boo	53809.545±0.003	0.071	55646.	SS CVn	53807.665±0.002	0.162	29643.
ST Boo	53832.559±0.003	0.061	55683.	SS CVn	53866.535±0.002	0.174	29766.
ST Boo	53834.431±0.005	0.066	55686.	SS CVn	53867.488±0.002	0.170	29768.
ST Boo	53837.541±0.002	0.064	55691.	UZ CVn	53760.476±0.005	0.241	39171.
ST Boo	53839.409±0.003	0.065	55694.	UZ CVn	53776.520±0.005	0.236	39194.
ST Boo	53857.467±0.005	0.077	55723.	UZ CVn	53831.647±0.003	0.239	39273.
ST Boo	53900.404±0.004	0.076	55792.	UZ CVn	53839.322±0.002	0.238	39284.
TW Boo	53756.643±0.002	-0.048	50473.	UZ CVn	53841.406±0.004	0.229	39287.
TW Boo	53837.550±0.002	-0.046	50625.	UZ CVn	53857.464±0.002	0.238	39310.
TW Boo	53851.388±0.003	-0.047	50651.	UZ CVn	53866.535±0.004	0.237	39323.
TW Boo	53860.436±0.002	-0.048	50668.	UZ CVn	53871.416±0.002	0.234	39330.
TW Boo	53885.451±0.003	-0.050	50715.	AA CMi	53755.553±0.002	0.049	36066.
TW Boo	53893.434±0.003	-0.051	50730.	S Com	53749.597±0.002	-0.095	22324.
UY Boo	53802.659±0.003	-0.025	3835.	S Com	53759.570±0.002	-0.094	22341.
UY Boo	53806.561±0.004	-0.029	3841.	S Com	53776.580±0.005	-0.095	22370.
UY Boo	53832.596±0.004	-0.031	3881.	S Com	53796.528±0.002	-0.091	22404.
UY Boo	53834.546±0.004	-0.033	3884.	S Com	53840.519±0.003	-0.094	22479.
UY Boo	53849.528±0.003	-0.023	3907.	S Com	53850.495±0.003	-0.090	22496.
CM Boo	53850.445±0.003	-0.074	29468.	ST Com	53777.606±0.003	-0.023	17620.
AH Cam	53751.342±0.005	-0.364	40740.	ST Com	53798.561±0.002	-0.030	17655.
RW Cnc	53740.462±0.003	0.203	25921.	ST Com	53831.506±0.004	-0.026	17710.
RW Cnc	53746.472±0.003	0.194	25932.	ST Com	53843.486±0.002	-0.025	17730.
SS Cnc	53755.394±0.002	0.048	83511.	ST Com	53849.478±0.003	-0.022	17740.
TT Cnc	53740.529±0.002	0.103	24485.	ST Com	53855.465±0.003	-0.024	17750.
AN Cnc	53739.487±0.002	0.127	28185.	HY Com	53850.502±0.003	0.042	21832.
AS Cnc	53739.632±0.004	-0.282	23545.	TV CrB	53783.631±0.002	0.020	37914.
AS Cnc	53744.572±0.003	-0.283	23553.	TV CrB	53865.488±0.002	0.031	38054.
AS Cnc	53746.422±0.002	-0.285	23556.	TV CrB	53872.500±0.005	0.027	38066.
EZ Cnc <sup>1</sup>	53738.562±0.002	-0.029	12065.	TV CrB	53882.429±0.002	0.018	38083.
EZ Cnc <sup>1</sup>	53755.480±0.002	-0.030	12096.	TV CrB	53889.448±0.002	0.022	38095.
W CVn	53748.640±0.005	-0.123	58624.	TV CrB	53896.465±0.005	0.023	38107.
W CVn	53806.573±0.004	-0.125	58729.	TV CrB	53903.479±0.002	0.022	38119.
W CVn	53807.674±0.003	-0.127	58731.	UY Cyg	53904.459±0.004	0.055	56127.
W CVn	53831.399±0.003	-0.128	58774.	UY Cyg	53913.427±0.003	0.052	56143.
W CVn	53842.439±0.003	-0.123	58794.	XZ Cyg <sup>2</sup>	53845.482±0.002	-0.004	11305.
W CVn	53863.397±0.002	-0.132	58832.	XZ Cyg <sup>2</sup>	53850.621±0.002	0.003	11316.
W CVn	53869.474±0.004	-0.124	58843.	XZ Cyg <sup>2</sup>	53858.557±0.005	0.007	11333.
W CVn	53874.434±0.005	-0.130	58852.	XZ Cyg <sup>2</sup>	53865.553±0.002	0.004	11348.
W CVn	53880.504±0.004	-0.130	58863.	XZ Cyg <sup>2</sup>	53901.478±0.002	0.001	11425.
W CVn	53890.436±0.004	-0.129	58881.	DM Cyg	53917.428±0.002	0.062	26996.
W CVn	53901.474±0.003	-0.127	58901.	DX Del	53915.483±0.004	0.055	30782.

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24. . .	$O - C$ (days)	E	Variable	Maximum HJD 24. . .	$O - C$ (days)	E
RW Dra	53836.569±0.002	0.153	32645.	RR Gem	53809.371±0.002	-0.343	31342.
RW Dra	53837.467±0.003	0.165	32647.	SZ Gem	53809.340±0.004	-0.047	53110.
RW Dra	53840.549±0.003	0.146	32654.	GI Gem	53756.465±0.002	0.070	54031.
RW Dra	53844.546±0.002	0.157	32663.	GI Gem	53795.461±0.003	0.072	54121.
RW Dra	53848.539±0.002	0.164	32672.	GI Gem	53799.358±0.002	0.069	54130.
RW Dra	53856.534±0.002	0.186	32690.	TW Her	53842.503±0.004	-0.010	80824.
SU Dra	53337.504±0.003	0.037	14287.	TW Her	53864.480±0.002	-0.011	80879.
SU Dra	53743.664±0.004	0.038	14902.	TW Her	53866.478±0.004	-0.011	80884.
SU Dra	53749.615±0.003	0.046	14911.	VX Her	53836.567±0.002	-0.395	70462.
SU Dra	53783.299±0.003	0.048	14962.	VX Her	53851.595±0.003	-0.395	70495.
SU Dra	53806.410±0.003	0.044	14997.	VX Her	53857.514±0.003	-0.395	70508.
SU Dra	53808.394±0.004	0.047	15000.	VX Her	53858.422±0.002	-0.398	70510.
SU Dra	53839.432±0.003	0.045	15047.	VX Her	53872.540±0.003	-0.397	70541.
SU Dra	53864.526±0.005	0.043	15085.	VX Her	53903.504±0.002	0.057	70608.
SW Dra	53798.400±0.005	0.079	48403.	VZ Her	53837.574±0.003	0.061	38718.
SW Dra	53806.354±0.002	0.057	48417.	VZ Her	53871.480±0.002	0.062	38795.
SW Dra	53831.418±0.003	0.056	48461.	VZ Her	53875.442±0.004	0.061	38804.
SW Dra	53839.395±0.005	0.058	48475.	VZ Her	53901.422±0.003	0.061	38863.
SW Dra	53843.375±0.004	0.050	48482.	DL Her	53860.568±0.002	0.033	26456.
SW Dra	53856.484±0.002	0.056	48505.	DL Her	53866.477±0.005	0.026	26466.
SW Dra	53860.470±0.004	0.055	48512.	DL Her	53882.462±0.004	0.037	26493.
XZ Dra	53917.411±0.002	-0.104	25161.	GO Hya	53710.581±0.003	-0.070	44091.
BC Dra	53748.561±0.003	0.077	15939.	GO Hya	53738.581±0.010	-0.073	44135.
BC Dra	53802.531±0.003	0.078	16015.	GO Hya	53759.570±0.003	-0.086	44168.
BC Dra	53807.562±0.002	0.072	16022.	RR Leo	53746.662±0.004	0.070	23102.
BC Dra	53833.476±0.002	0.082	16057.	RR Leo	53760.688±0.002	0.072	23133.
BC Dra	53836.354±0.004	0.081	16062.	RR Leo	53838.502±0.002	0.074	23305.
BC Dra	53856.504±0.010	0.083	16090.	RR Leo	53843.477±0.002	0.073	23316.
BC Dra	53866.567±0.005	0.072	16104.	RX Leo	53839.471±0.002	0.078	26833.
BC Dra	53892.482±0.006	0.082	16140.	RX Leo	53858.433±0.002	0.091	26861.
BC Dra	53897.518±0.005	0.081	16147.	SS Leo	53759.570±0.002	-0.044	19124.
BC Dra	53905.435±0.003	0.083	16158.	SS Leo	53776.484±0.003	-0.041	19151.
BC Dra	53915.498±0.010	0.072	16171.	SS Leo	53801.531±0.003	-0.048	19191.
BD Dra	53737.642±0.005	0.144	20309.	ST Leo	53796.382±0.004	-0.026	54130.
BD Dra	53740.589±0.002	0.146	20314.	ST Leo	53801.646±0.002	-0.020	54141.
BD Dra	53756.532±0.002	0.184	20341.	SZ Leo	53760.592±0.002	-0.136	15528.
BD Dra	53760.635±0.002	0.164	20348.	WW Leo	53737.613±0.003	0.027	31276.
BD Dra	53795.404±0.002	0.179	20407.	WW Leo	53740.625±0.003	0.025	31282.
BD Dra	53838.377±0.004	0.151	20480.	WW Leo	53746.658±0.003	0.030	31292.
BD Dra	53858.415±0.002	0.161	20514.	AE Leo	53748.696±0.005	-0.369	54106.
BD Dra	53865.483±0.002	0.161	20526.	AE Leo	53758.710±0.005	-1.009	54123.
BD Dra	53911.405±0.005	0.137	20604.	AX Leo	53748.678±0.005	-0.039	39217.
BK Dra	53858.403±0.003	-0.146	47857.	AX Leo	53759.581±0.005	-0.038	39232.
BK Dra	53891.555±0.003	-0.151	47913.	V LMi	53787.456±0.002	0.027	62982.
BK Dra	53897.472±0.005	-0.155	47923.	V LMi	53842.396±0.005	0.032	63083.
BK Dra	53900.435±0.002	-0.152	47928.	V LMi	53848.377±0.002	0.030	63094.
BK Dra	53910.501±0.003	-0.152	47945.	X LMi	53740.609±0.002	0.186	21248.
BK Dra	53916.420±0.003	-0.153	47955.	X LMi	53758.401±0.004	0.185	21274.
BT Dra	53783.575±0.003	-0.002	39154.	TT Lyn	53756.467±0.003	-0.032	28630.
BT Dra	53809.467±0.003	-0.011	39198.	TT Lyn	53795.302±0.002	-0.030	28696.
BT Dra	53849.496±0.002	-0.012	39266.	TW Lyn	53737.430±0.002	0.052	18086.
BT Dra	53859.506±0.002	-0.010	39283.	TW Lyn	53744.658±0.003	0.052	18101.
BT Dra	53865.396±0.004	-0.006	39293.	TW Lyn	53754.296±0.002	0.053	18121.
BT Dra	53875.404±0.005	-0.006	39310.	RZ Lyr	53871.434±0.003	-0.003	24818.
BT Dra	53882.466±0.002	-0.008	39322.	RZ Lyr	53893.422±0.003	0.001	24861.
RR Gem	53334.610±0.002	-0.318	30147.	RZ Lyr	53896.493±0.002	0.005	24867.
RR Gem	53754.544±0.002	-0.341	31204.	RZ Lyr	53917.452±0.002	0.003	24908.

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24. . .	$O - C$ (days)	E	Variable	Maximum HJD 24. . .	$O - C$ (days)	E
AW Lyr	53911.483±0.003	0.025	57453.	RV UMa	53801.652±0.002	0.098	18643.
CN Lyr	53869.573±0.005	0.020	22809.	RV UMa	53808.675±0.002	0.101	18658.
CN Lyr	53881.502±0.005	0.019	22838.	RV UMa	53809.612±0.002	0.101	18660.
CN Lyr	53886.442±0.004	0.022	22849.	RV UMa	53831.615±0.005	0.106	18707.
CN Lyr	53911.533±0.002	0.019	22911.	RV UMa	53838.633±0.003	0.103	18722.
CN Lyr	53916.467±0.004	0.016	22923.	RV UMa	53853.611±0.003	0.103	18754.
IO Lyr	53856.524±0.004	-0.026	24670.	RV UMa	53869.522±0.005	0.100	18788.
IO Lyr	53863.450±0.002	-0.026	24682.	RV UMa	53899.472±0.004	0.094	18852.
IO Lyr	53871.530±0.003	-0.026	24696.	RV UMa	53900.411±0.004	0.097	18854.
IO Lyr	53882.494±0.003	-0.027	24715.	TU UMa	53737.601±0.002	-0.025	19557.
IO Lyr	53897.493±0.004	-0.033	24741.	TU UMa	53842.439±0.003	-0.027	19745.
IO Lyr	53904.426±0.002	-0.026	24753.	TU UMa	53857.497±0.003	-0.026	19772.
IO Lyr	53912.498±0.002	-0.033	24767.	AB UMa	53739.604±0.010	0.119	29207.
V455 Oph	53889.482±0.005	-0.226	26561.	AB UMa	53748.599±0.010	0.120	29221.
V455 Oph	53904.456±0.005	0.222	26593.	AB UMa	53838.529±0.005	0.113	29372.
V455 Oph	53909.446±0.002	0.219	26604.	AB UMa	53844.526±0.005	0.115	29382.
AR Per	53738.455±0.010	0.053	62276.	AB UMa	53850.515±0.005	0.108	29392.
AR Per	53750.371±0.002	0.053	62304.	AB UMa	53856.504±0.010	0.101	29402.
VY Ser	53856.437±0.004	0.034	31692.	AB UMa	53859.502±0.008	0.101	29407.
VY Ser	53881.439±0.002	0.043	31726.	AB UMa	53865.508±0.010	0.111	29417.
AN Ser	53844.486±0.003	0.003	74962.	ST Vir	53845.522±0.002	0.037	31909.
AN Ser	53857.533±0.005	-0.002	74987.	ST Vir	53857.429±0.004	0.030	31938.
AN Ser	53892.517±0.004	0.004	75054.	ST Vir	53871.403±0.002	0.036	31971.
AN Ser	53902.430±0.004	-0.003	75073.	UV Vir	53761.581±0.002	0.017	23453.
AT Ser	53845.609±0.004	0.009	16137.	AF Vir	53860.571±0.002	-0.097	27962.
AT Ser	53872.496±0.003	0.020	16173.	AV Vir	53842.510±0.002	0.003	18834.
AT Ser	53881.451±0.002	0.017	16185.	AV Vir	53869.454±0.004	0.014	18875.
AV Ser	53889.526±0.002	0.134	52396.	BB Vir	53843.488±0.002	0.242	30205.
AV Ser	53890.503±0.004	0.135	52398.	BB Vir	53849.610±0.002	0.240	30218.
AV Ser	53872.454±0.002	0.126	52361.	BN Vul	53890.453±0.005	0.062	14071.
RU Sex <sup>3</sup>	53760.485±0.005	0.018	31818.	BN Vul	53912.435±0.002	0.061	14108.
ref.:	1 Boninsegna, 1990						
	2 Baldwin and Samolyk, 2003						
	3 Williams, 1993						

## References:

- Baldwin, M.E., Samolyk, G., 2003, *AAVSO RR Lyrae Monographs* 1, (2)  
 Bertin, E., Arnouts, S., 1996, *A&AS*, **117**, 393  
 Boër, M., Atteia, J. L., Bringer, M., Gendre, B., Klotz, A., Malina, R., de Freitas Pacheco, J. A., Pedersen, H., 2001, *A&A*, **378**, 76  
 Boninsegna, R., 1990, *JAAVSO*, **19**, 126, (1)  
 Boninsegna, R., Vandenbroere, J., Le Borgne, J.F., The Geos Team, 2002, *ASP Conf. Ser.*, **259**, 166, IAU Colloq. 185, "Radial and Nonradial Pulsations as Probes of Stellar Physics"  
 Bringer, M., Boër, M., Peignot, C., Fontan, G., Merce, C., 1999, *A&AS*, **138**, 581  
 Kholopov, P.N., et al., 1985, *General Catalogue of Variable Stars*, Moscow: Nauka Publishing House, 1988, 4th ed., edited by Kholopov, P.N.; and 2006 web edition (<http://www.sai.msu.su/groups/cluster/gcvs/>)  
 Williams, D.B., 1993, *JAAVSO*, **22**, 116