

ПЕРЕМЕННЫЕ ЗВЕЗДЫ

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Визуальные наблюдения звезд типа RR Лиры

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Приведены результаты визуальных наблюдений 12 звезд типа RR Lyr. Получены средние кривые блеска.

Visual Observations of RR Lyr Type Stars

by E. P. Strelkova

Results of visual observations of 12 RR Lyr type stars are given. Mean light curves are obtained.

В статье приведены визуальные наблюдения 12 звезд типа RR Lyr, выполненные в 1958 г. на 8" рефракторе Одесской астрономической обсерватории, установленном в с. Маяки.

Карты окрестностей звезд взяты из "Атласа звезд сравнения", составленного на Одесской астрономической обсерватории (рис. 1).

В табл. 1 даны элементы, по которым вычислялись фазы и число наблюдений (n).

Таблица 1.

Звезда	n	Эпоха	Период (p)	p^{-1}	Ссылка
VX Boo	64	2436407.406	0 ^d .59127	1.691275	[1]
YZ Boo	33	36050.3400	.104090008	9.607071	[2]
W CVn	106	21077.985	.551758	1.8123888	ОКПЗ, 1958
Z CVn	89	23860.355	.6539052	1.5292737	"
RR CVn	57	20245.382	.5586076	1.7901654	"
RU CVn	76	20227.340	.5732492	1.7444420	"
RZ CVn	65	24621.488	.567403	1.7624158	"
SS CVn	84	24611.523	.4785195	2.0897790	"
ST CVn	53	24622.860*	.32906263	3.0389352	"
SW CVn	63	25646.558	.4416419	2.2642779	
TW Lyn	41	28627.310	.4818529	2.07532216	[3]
AE Peg	88	26239.532	.49673126	2.0131612	ОКПЗ, 1958

*) Указан момент прохождения через среднюю величину на восходящей ветви.

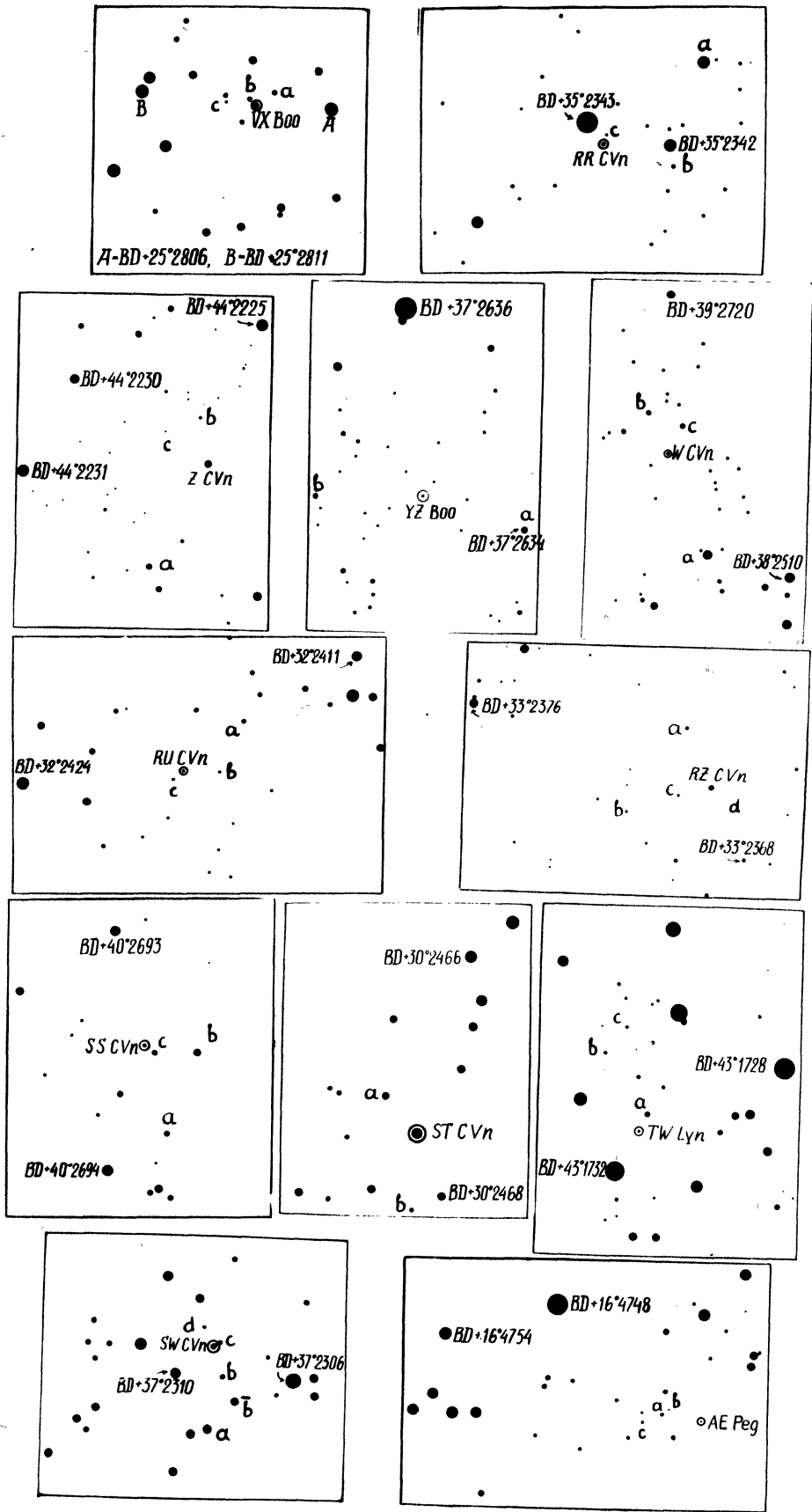


Рис. 1

Нормальные максимумы 10 звезд (кроме ST и SW CVn), полученные по этим наблюдениям, опубликованы в [4].

В табл. 2 приведены величины звезд сравнения в градусах.

Таблица 2.

Звезда	a	b	c	d
VX Boo	0 st 0	12 st 3	19 st 6	—
YZ "	0. 0	13. 0	—	—
W CVn	0. 0	14. 4	23. 6	—
Z "	0. 0	13. 0	19. 1	—
RR "	0. 0	16. 4	25. 0	—
RU "	0. 0	12. 7	22. 7	—
RZ "	0. 0	12. 6	22. 6	35 st 5
SS "	0. 0	19. 8	28. 9	—
ST "	0. 0	14. 6	—	—
SW " { I*)	0. 0	12. 1	14. 5	17. 7
{ II	0. 0	12. 3(Б)	20. 3	23. 5
TW Lyn	0. 0	10. 2	18. 2	—
AE Peg	0. 0	18. 8	28. 0	—

В табл. 3 приведены визуальные наблюдения звезд.

Таблица 3.

VX Boo		VX Boo		VX Boo		YZ Boo	
J.D.☉	St	J.D.☉	St	J.D.☉	St	J.D.☉	St
2436...		2436...		2436...		2436...	
396.3356	16.7	404.3678	18.6:	422.3194	16.5	450.3474	6.9
.3520	15.9	.3954	15.0	454.2898	17.3:	453.3036	5.6
.3662	16.9	.4049	12.3	455.2588	12.3	.3118	0.0:
.3846	17.5	.4142	12.3	.2660	8.5	.3323	6.9
.4020	16.7	.4310	9.2	.2698	8.2	.3508	6.5
.4176	16.7	.4442	8.5	.2779	9.5	.3608	4.7
.4406	17.3:	.4583	7.6	.2858	10.2	.3740	-2.0
397.3540	8.6	405.3433	17.2	.2956	11.3	.3823	-2.0
.3658	6.7	.3559	17.5	.3049	10.4	.3917	0.0
.3821	12.3:	.3781	16.7	.3160	10.2	454.2917	6.9
.3943	10.1	.3902	16.9	.3234	9.2	.3115	-3.0:
.4102	9.8	.4138	17.5:	456.2664	18.4	.3532	5.0
.4227	12.3:	.4395	19.6:	.3050	19.6:	.3758	6.9
.4324	12.3:	406.3290	16.4			.3823	4.3
.4533	12.3:	.3623	15.0	YZ Boo		455.2719	-3.0
.4696	13.3:	.3926	16.3			.2806	-1.0
398.3404	18.6	407.3820	7.6			.2882	-2.0
.3560	19.1:	.3894	7.9	442.2933	7.8	.3261	6.5
.3657	18.4:	.3974	7.4	.2992	7.8	.3802	0.0
.3997	18.4:	.4182	7.6	.3048	7.8	456.3072	0.0
.4115	18.4:	.4401	12.3	.3090	7.4	.3308	7.8
.4567	18.3:	408.3914	18.6:	.3176	7.4	.3586	7.8
401.3548	19.6:	.4063	19.6:	.3447	0.0	.3687	9.0
.3655	18.1	420.3051	18.1:	.3517	4.0	463.2830	-3.0
.3838	18.1	.3273	18.6:	450.3360	7.4	.3340	9.1
404.3490	17.5						

*) При наблюдении звезды SW CVn я сначала пользовалась звездами сравнения: "a", "b", "c", "d"—шкала I (см. рис.). Но так как звезды "b" и "c" мало отличались по блеску (2st 4), то я ввела вместо звезды "b" звезду "Б". Звезды сравнения стали: "a", "Б", "c", "d"—шкала II. Наблюдения обрабатывались и со шкалой I и со шкалой II (см. табл. 3).

Таблица 3 (продолжение).

W CV _n		W CV _n		Z CV _n		Z CV _n	
J.D.⊙	St	J.D.⊙	St	J.D.⊙	St	J.D.⊙	St
2436...		2436...		2436...		2436...	
391.4355	13.5:	406.4379	5.8	373.4438	16.7	453.2497	16.0
.4504	9.2	.4536	6.8	.4647	16.0:	454.3115	16.5
392.3767	11.8	.4633	8.1	391.3260	8.1	RR CV _n	
.3989	14.4	.4730	8.5	.3534	10.0		
.4332	17.0	.4817	8.5	.4058	10.0		
.4461	18.5	.4911	9.6	392.3384	11.8	2436...	
.4680	19.5	.4969	10.1	.3849	15.0		
393.3302	14.4	407.3718	19.4	.4137	16.0		
.3885	19.5	.4236	10.6	393.3085	9.8	373.3542	22.0
.4250	19.5	.4364	8.6	.3359	9.1	.3667	22.0
.4552	19.8	.4458	8.5	.4057	9.0	.3861	22.0
395.3380	5.4:	.4614	6.8	.4335	10.8	.4201	21.5
.3598	0.0:	.4805	5.1	395.3104	11.8	.4486	22.0
.3813	2.9:	.4889	6.3	.3511	13.6	391.3444	19.4
.4019	5.5	408.3656	9.3	.3680	13.0	.3632	14.4
.4675	8.6	.3822	16.4:	.3983	13.0	392.3525	21.0:
396.4518	5.2	.4094	14.4	396.3236	16.0	.3930	24.0:
.4948	7.2	.4560	18.6	.3521	15.0	393.3179	23.0:
397.3326	14.4	420.3479	8.9	.3691	15.3	.3464	20.7
.3722	16.7	.3725	9.3	.3840	15.6	.4131	23.0
.3996	18.5	.3975	9.6	.4059	16.0	395.3250	13.4
.4417	18.5	.4194	12.5	.4458	15.6	.3483	10.9
398.3207	17.5	.4323	14.4:	397.3124	12.0	.3590	11.3
.3492	14.9:	422.3991	7.6	.3554	11.0	.3691	13.3
.3805	16.4	.4227	6.8	.3825	10.8	.3816	12.5
.4176	13.4:	.4331	7.6	.4106	10.0	.3910	12.5
.4402	13.4:	.4467	9.0:	.4575	13.0	.4168	14.4
.4524	11.5	453.2617	8.5	398.3131	16.5	.4344	17.4
.4600	10.8	.2746	5.8	.3346	16.4	396.3386	21.3
.4683	12.4:	.2898	7.6	.3600	15.3	.3430	22.7
.4784	12.4:	.3036	7.7	.3943	16.0	.3522	21.3
.4920	14.4:	.3232	8.1	.4308	13.0	.3670	19.3
401.3340	17.5	.3332	8.1	.4471	10.8	.3858	14.0
.3712	12.4	.3617	8.6	.4555	8.7	.4011	10.9
.3848	9.2	.3714	9.6	.4631	7.8	.4115	10.2
.3934	7.8	454.3297	10.8	.4718	6.9	397.3142	21.8
.4056	5.2	.3502	10.2	.4846	6.5	.3565	22.1
.4160	6.2	.3662	7.2	401.3250	13.0	.3857	21.8
.4236	6.3	.3738	8.0	.3566	15.0	.4128	22.8
.4354	3.8	.3832	7.6	.3900	15.4	398.3296	21.8
.4514	5.8	Z CV _n		402.3693	11.0	.3571	21.6
.4646	5.9			.4117	6.0	.3880	21.2
.4775	6.7			.4339	6.5	.4270	23.1
.4918	7.7			404.3110	16.0	401.3440	23.9:
402.3774	12.4	2436...		.3616	8.0	.3858	23.0:
.4163	15.5:	371.3669	13.0	.3773	8.0	404.3384	13.4
.4406	19.5	.3780	10.4	.3998	8.4	.3564	16.4
.4625	16.7	.3856	12.3	.4130	9.3	.3800	18.9
404.3228	11.5	.4370	13.6	.4307	8.4	.4074	20.1
.3512	9.2	.4578	15.0	.4446	8.9	405.3137	17.8
.3742	12.1	.4759	15.6	.4738	9.0	.3266	13.7
.3970	14.0:	.4926	13.0	405.3196	16.0	.3373	10.2
.4220	14.4	372.3223	8.7	.3432	16.0	.3484	10.4
.4394	13.4:	.3466	7.8	.3728	15.0	.3648	11.2
.4658	13.4:	.3612	8.0	.4071	15.0	.3817	11.5
405.3310	5.2	.4022	9.0	.4224	16.0	.4039	12.8
.3402	5.5	.4209	10.0	406.3095	9.8	.4202	13.4
.3520	7.2	.4445	9.3	.3401	8.1	406.3111	21.6
.3655	8.4	.4682	10.2	.3619	7.3	.3407	21.8
.3814	8.9	.4813	10.8	.3945	9.5	.3633	21.7
.4037	8.9	.4918	11.5	.4227	10.0	407.3537	21.4
.4262	12.4:	373.3161	13.0	.4421	10.4	.4017	22.4
406.3265	18.5	.3334	16.0	407.3505	15.6	408.3422	20.2
.3761	7.7	.3570	15.4	.4195	13.0	420.3217	24.0:
.3945	7.6	.3751	16.5	408.3382	11.6	422.3127	21.3
.4213	5.1	.4091	15.4	.3920	13.0		

Таблица 3 (продолжение).

RU CV _n		RU CV _n		RZ CV _n		SS CV _n	
J.D.⊙	St	J.D.⊙	St	J.D.⊙	St	J.D.⊙	St
2436...		2436...		2436...		2436...	
391.3909	11.7:	420.3432	15.7	406.3746	30.7	401.3955	18.3
392.3658	-2.0	.3746	14.7	.4302	31.8	.4123	22.8
.4019	4.2	422.3609	10.7	407.3774	30.0	.4393	24.8
.4238	5.6	453.2628	9.1	.4260	31.5	402.3746	25.2
.4387	6.4	.2749	8.2	408.3527	18.4	404.3163	24.3
.4609	8.1	.2825	11.5	.3635	19.1	.3697	27.9
393.3324	10.2	.2929	9.2	.3759	18.3	.4253	27.9
.3554	9.7	.3249	10.6	.3863	18.7	.4621	27.9
.3592	8.9	454.3305	6.8	.4110	22.6	405.3234	23.2
.4040	13.7	.3471	6.8	.4315	26.4	.3328	24.8
.4283	16.7			.4453	27.8	.3706	27.9
.4568	11.4			420.3458	25.8	.4280	28.9
395.3343	8.4	RZ CV _n		453.2807	29.6	406.3188	25.6
.3572	5.8			.3162	30.3	.3706	27.2
.3781	6.8	2436...				.3926	25.6
.4017	7.8	391.4018	29.1	SS CV _n		.4334	26.2
.4542	8.7	392.3713	29.6			407.3684	27.2
.4760	9.9	.4051	17.6	2436...		.4293	28.9
396.3423	6.6	.4263	8.4	391.4160	25.9	408.3687	27.9
.4095	5.8	.4436	17.6	392.3811	23.7	.4198	19.8
.4537	7.1	.4655	18.8	.4082	26.2	.4268	17.8
.4727	7.8	393.3974	30.3	.4305	26.9	.4351	16.8
397.3349	12.1 f	.4314	32.0	.4499	25.5	.4417	15.3
.3745	11.5	.4606	32.5	.4700	28.9:	.4479	13.8
.4030	14.7	395.3362	29.8	393.3235	25.3	.4529	14.6
.4460	13.8	.3584	30.0	.3916	28.9	420.3690	17.8
398.3230	10.6	.3796	30.7	.4193	28.4:	.3919	14.0
.3504	10.2	.4122	30.7	.4485	28.9	.4159	21.9:
.3834	12.7	.4543	30.9	395.3289	28.9	422.3155	14.8
.4195	14.9	.4779	31.5	.3546	26.3	.3520	13.2
.4445	14.4	396.3434	30.5	.3758	25.9	.3672	13.8
401.3373	12.7	.4104	18.8	.4011	25.0	.3818	15.3
.3751	14.9	.4184	18.4	.4643	29.9	.3970	15.8
.4099	15.7	.4528	18.4	396.3708	28.9	453.2705	26.9
.4551	15.2	.4747	20.2	.4115	26.9	.2913	29.9
402.3790	13.7	397.3389	30.8	.4553	25.8	.3150	27.9
404.3257	13.7	.3778	30.5	.4904	20.4:	454.3278	28.0
.3917	5.8	.4056	31.5	397.3246	31.0:		
.3979	4.8	.4493	31.5	.3677	31.0:	ST CV _n	
.4173	3.1	398.3305	30.5	.3961	28.9	2436...	
.4333	7.0	.3527	31.2	.4357	22.4	391.3949	7.3
.4499	6.8	.3850	31.5	.4642	20.4	.4415	8.1
.4681	7.2	.4200	30.5	.4739	13.8	392.3679	8.1
405.3352	12.7	.4454	31.8	.4802	11.6	.4040	6.5
.3620	12.7	401.3414	32.0	.4878	12.2	.4255	7.9
.3807	13.7	.3730	31.5	.4947	11.3	.4398	5.8
.3967	14.5	.4084	30.9	398.3167	26.9	.4651	4.5:
.4321	14.1	.4564	29.6	.3461	25.9	393.3337	9.0
406.3234	10.8	402.3796	30.9	.3760	25.1	.4004	6.1
.3728	11.3	404.3280	9.2	.3931	21.8	.4296	4.5
.4273	12.7	.3370	10.3	.4031	17.2	395.3350	7.9
.4562	14.7	.3523	10.3	.4125	16.1	.3579	8.3
407.3741	7.8	.3770	16.2	.4221	14.3	.3792	8.2
.3851	7.1	.3995	18.7	.4329	13.2	.4114	7.7
.3938	7.4	.4179	19.9	.4420	12.9	.4531	6.9
.4140	7.6	.4717	22.0	.4503	11.3	.4770	8.2
.4341	9.6	405.3375	30.9	.4586	12.2	396.3429	6.9
.4501	9.7	.3625	31.2	.4656	12.9	.4089	6.9
408.3482	11.7	.4000	30.9	.4753	14.6	.4544	6.4
.3732	8.1	.4340	29.6	.4867	13.9	.4735	7.3
.3850	5.4	.4437	15.4	.4971	15.8	397.3377	6.4
.3968	0.0	.4500	10.3	401.3283	13.5	.3766	5.8
.4146	4.2	.4566	8.1	.3553	13.9	.4037	6.4
.4330	1.8:	.4632	-7.9	.3679	15.6	.4474	7.8
.4448	3.6	.4743	10.1	.3783	15.8		
.4546	7.2	406.3254	30.9				

Таблица 3 (продолжение).

ST CVn		SW CVn		TW Lyn		AE Peg	
J.D.⊙	St	J.D.⊙	St	J.D.⊙	St	J.D.⊙	St
2436...		2436...		2436...		2436...	
398.3293	6.8	395.3502	16.1	454.5748	0.5	455.4851	17.7
.3515	6.0	.3724	15.8	.5824	2.0	.4930	19.8
.3838	6.0	.3943	16.4	.5876	3.1	.5017	24.7
.4216	6.5	.4186	14.5	455.5239	2.0	.5205	24.7
.4470	6.9	.4367	9.7	.5450	4.2	.5413	28.0
401.3405	6.4	.4478	7.4	.5565	4.7	.5559	26.2
.3773	6.9	396.3260	7.6	.5655	4.7	456.2626	24.3
402.3810	6.0	.3541	8.4	.5753	5.9	.3031	25.7
404.3361	6.9	.3662	8.1	.5849	17.3	.3212	23.4
.3923	8.6	.3892	10.1	456.4656	0.0	.3309	23.1
.4215	8.6	.4044	11.1	.4732	1.8	.3413	8.9
.4406	7.7	397.3199	12.6	.4805	3.4	.3438	9.8
.4493	8.6	.3605	13.5	.4930	3.7	.3462	10.3
.4707	9.7	.3887	15.3	.5032	5.6	.3517	10.2
405.3360	8.1	.4169	15.6	.5264	6.5	.3576	7.2
.3592	7.7	398.3338	14.5	.5462	10.2	.3621	8.6
.3974	8.5	.3567	15.6	462.4910	19.2	.3705	9.8
.4360	7.7	.3877	16.6	.4972	18.2	.3806	10.6
406.3245	7.3	.4241	16.9	.5087	20.2	.3888	9.4
.3742	8.4	401.3471	14.5	.5226	19.2:	.3934	9.0
.4266	7.7	404.3427	— 17.3	.5306	18.2	.4014	9.8
.4574	7.8	.3577	11.5 17.3	.5382	19.2	.4066	10.2
407.3769	8.0	.3887	14.5 20.3	.5562	16.2	.4191	11.1
.4251	8.8	.4056	14.5 20.3	.5677	19.2	.4274	11.0
.4494	7.8	405.3170	14.5 20.3	.5865	19.2	.4340	11.7
408.3490	8.0	.3472	15.6 21.4			.4452	11.1
.4184	8.4	.3847	15.6 21.4			.4545	12.3
420.3443	7.7	.4284	16.6 22.4			.4625	14.3
.3752	7.7	406.3153	15.6 21.4			.5194	22.3
		.3430	15.1 20.9			.5812	29.0
		.3656	15.6 21.4				
		407.3617	— 11.7	2436...		462.3621	7.2
		.3818	— 8.8	454.4135	11.3	.3691	7.5
		.3895	— 8.9	.4230	10.0	.3740	10.0
2436...		.4089	— 15.3	.4330	11.1	.3812	12.1
371.4218	15.6	420.3069	12.5 18.3	.4458	11.5	.3868	13.4
.4663	16.5	.3205	15.5 21.3	.4573	12.5	.4010	12.9
.4857	15.5	422.3114	16.5 22.3	.4674	12.5	.4090	11.8
372.3349	15.1			.4767	13.6	.4177	14.5
.3502	16.1			.4871	13.9	.4222	14.1
.3710	15.6			.4955	14.4	.4288	13.4
.4071	16.3			.5042	14.4	.4334	15.7
.4280	15.6			.5337	21.9	.4666	18.8
.4488	13.7			.5688	28.0	.4844	18.8
.4696	11.3	2436...		455.2566	23.9	.4910	21.9
.4856	9.1	453.4993	22.2	.3160	28.0	.5230	22.5
.4960	9.3	.5115	22.2	.3430	18.8	463.2830	13.2
373.3224	15.6	.5233	21.2	.3466	11.3	.2996	8.7
.3363	14.6	.5316	17.1	.3517	10.0	.3031	7.2
.3634	11.5	.5361	8.2	.3594	8.5	.3142	10.0
.3828	10.6	.5383	5.8	.3677	8.5	.3233	0.0:
.4148	10.8	.5417	6.1	.3740	7.2	.3334	0.0
.4412	13.1	.5448	6.8	.3809	9.0	.3469	9.4
391.3381	15.6	.5483	5.7	.3916	8.6	.3559	10.6
.3634	14.5	.5518	5.1	.3986	11.0	.3694	11.1
392.3502	9.7	.5569	3.7	.4087	10.5	.3778	11.8
.3891	8.4	454.5070	6.8	.4156	11.3	.3920	14.5
393.3119	11.1	.5140	5.7	.4236	12.8	.4160	16.3
.3400	14.5	.5348	4.6	.4395	13.4	.4378	18.8
395.3246	16.6	.5498	3.1	.4552	12.5	.4635	22.5
		.5640	1.8	.4730	12.8		

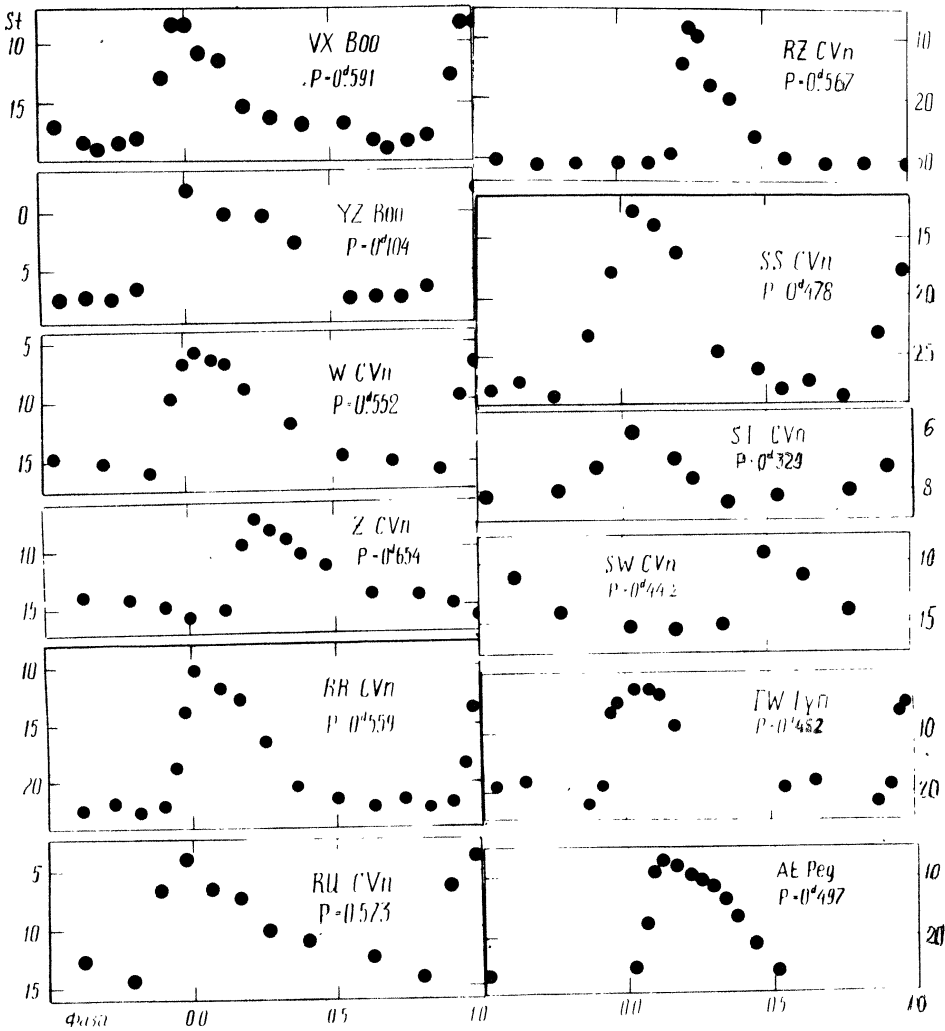


Рис. 2

В табл. 4 приведены данные о средних кривых. На рис. 2 — графики средних кривых.

Таблица 4.

BX Boo			Z CVn			RZ CVn			SW CVn		
Фаза	St	n	Фаза	St	n	Фаза	St	n	Фаза	St	n
0.007	8.7	9	0.001	15.8	9	0.016	31.3	9	0.028	15.6	7
.054	11.0	4	.125	15.2	4	.122	31.4	5	.188	15.8	13
.127	11.7	4	.186	9.6	5	.199	29.8	4	.355	15.4	9
.208	15.3	4	.230	7.5	7	.240	14.4	3	.490	9.3	12
.298	16.6	5	.282	8.4	8	.260	8.4	3	.627	11.3	6
.405	17.1	4	.335	9.2	7	.289	9.8	4	.787	14.3	11
.551	17.1	4	.389	10.4	8	.336	18.0	6			
.655	18.5	5	.473	11.5	10	.403	20.4	8	TW Lyn		
.700	19.2	4	.631	14.0	9	.489	26.8	8			
.776	18.6	4	.794	14.2	12	.590	30.3	5			
.840	18.2	6	.915	14.9	10	.731	31.2	6			
.926	13.0	4				.862	31.0	4	0.032	2.6	5
.962	8.7	7	RR CVn						.082	2.7	5
YZ Boo			0.012	10.6	5	SS CVn			.119	3.5	4
			.099	12.0	5				.170	8.9	5
			.170	13.0	5				.554	19.2	4
			.254	16.7	4				.659	18.4	5
0.008	-1.8	4	.362	20.5	3	0.047	12.8	10	.876	22.2	2
.139	0.2	4	.500	21.7	5	.113	14.0	8	.922	19.2	2
.263	0.4	4	.626	22.4	4	.190	16.4	4	.950	6.7	5
.377	2.7	4	.734	21.8	7	.330	24.6	7	.973	5.0	4
.569	7.4	4	.820	22.7	8	.470	26.2	7	AE Peg		
.656	7.2	5	.902	22.1	5	.552	27.8	6			
.746	7.4	4	.943	18.8	3	.647	27.2	10			
.832	6.5	4	.973	14.0	3	.769	28.4	10			
W CVn						.886	23.2	10	0.024	25.7	3
			RU CVn			.968	18.0	12	.065	18.4	3
						ST CVn			.090	9.5	7
									.122	7.5	8
0.030	5.8	10	0.060	6.7	7				.170	8.5	9
.089	6.5	10	.160	7.6	11	0.032	6.0	9	.215	10.0	11
.134	6.8	10	.258	10.2	9	.171	6.9	8	.253	12.0	10
.200	8.9	10	.396	11.2	8	.235	7.6	5	.298	12.7	9
.358	11.9	10	.621	12.7	14	.356	8.4	6	.336	14.3	8
.537	14.7	15	.788	14.3	12	.528	8.2	9	.372	17.0	5
.708	15.2	15	.885	6.7	3	.775	8.0	5	.433	22.0	8
.876	16.0	10	.972	4.1	12	.903	7.2	11	.518	26.7	5
.944	9.7	6									
.991	6.8	10									

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