SOME RESULTS OF HUNGARIAN VARIABLE STAR OBSERVERS

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Abstract

This paper presents some new results of the Pleione Változócsillag-észlelo Hálózat = Pleione Variable Star Observing Network (PVH).

1. Dwarf novae

In recent years, dwarf novae have become favorite objects of Hungarian observers. In Figure 1 we present recent light curves for five well-observed dwarf novae: Z Cam, AH Her, EM Cyg, SS Cyg, RU Peg. Times of observed maxima will be published later.

2. Light curves of AX Per and R CrB in 1988-89

AX Per is a Z Andromedae variable with a photographic magnitude range of 9.4-13.4. Its recent outburst was predicted for 1981, but the brightening occurred much later, in early 1988. Since then, the star has been at maximum (around magnitude 9) except for an interval when an eclipse minimum was observed at magnitude 12.5. The middle of the eclipse is estimated at JD 2447550. The light curve is based on 300 estimates by members of the PVH.

A recent active phase of R CrB was observed in 1988-89. A sudden, unpredicted minimum started on JD 2447361. The brightness fell to magnitude 11, followed by a slow brightening with several waves. A second, but brief, minimum was also observed from JD 2447740, but it reached only magnitude 8.5. The light curve is based on 1,500 estimates by members of the PVH.

3. Improved Light Curves of μ Cephei

μ Cephei is one of the brightest semi-regular stars, but visual observation of this star is not an easy task. The light curve of μ Cep is very noisy because of its small amplitude and deep red color. I. Kovacs, a member of the PVH, has applied the so-called ALCEP method developed by the Groupe Européen d'Observations Stellaires (GEOS) to investigate visual data of μ Cep for 1984-87, with impressive results.

4. Pulsating Variables

We have analyzed several semi-regular and Mira variables observed between 1970 and 1990 (Table 1). The search for periods was based on the Discrete Fourier Transformation (DFT) method for unequally spaced data. Usually these variables oscillate in one or two modes, and the periods can probably be linked with pulsation modes, using the theoretical period ratios for radial modes.

The error of visual observations is rather large, and in some cases it is difficult to decide whether the pulsational behavior is multi-periodic and regular or irregular and random. Chaotic behavior is a possibility.

Especially interesting is the study of the O-C diagrams. For example, period of AC Herculis varies sinusoidally with a large amplitude, while for the semi-regular variable UX Dra the period increases but jumps back from time to time.

Table 1 contains important physical properties of some pulsating red variables that we obtained from the analysis of PVH observations. N denotes the number of 10-day averages used, T is the data length. After the periods, P, and Fourier amplitudes, A, we noted the number of our journal, *Meteor*, where the analysis were published. Figure 2 shows period vs. Fourier amplitude for the stars in Table 1.

Table 1. Data for Stars Studied with Discrete Fourier Transform

Desig. / *HD*	*Star* / *Type*	*Max-Min (visual)*	*Spectrum*	*N* / *T(d)*	*P(d)*	*A(m)*	Meteor number
072046	Y Lyn	6.4 - 8.3	M5 Ib-II	244	1215	0.38	1985/2
58521	SRc			3130	205	0.21	
					133	0.19	
103769	R UMa	6.7 - 13.4	M3-9 III	393	300.3	2.57	1987/4
92763	M			5110			
115158	Z UMa	6.5 - 9.1	M5e III	559	5680	0.19	1986/11
103681	SRb			6620	194.9	0.60	
					101.1	0.22	
					99.0	0.25	
					97.1	0.22	
131546	V CVn	6.5 - 8.6	M4-6e III	349	191.4	0.56	1986/7-8
115898	SRa			4260			
142539	V Boo	7.0 - 12.0	M6e	335	259.8	0.60	1986/7-8
127335	SRa			4490	135.2	0.28	
163360	TX Dra	6.8 - 8.4	M4-5e III	392	1540	0.11	1987/3
150077	SRb			4630	720	0.15	
					77.4	0.16	
					76.0	0.15	
164657	AH Dra	7.1 - 8.6	M7	318	6660	0.16	1987/3
152152	SRb			4510	194.2	0.20	
					185.1	0.16	
					104.2	0.11	
183308	X Oph	6.9 - 9.3	M5-9e	244	329.1	0.60	1987/2
123744	M			3420			
192576	UX Dra	5.9 - 7.1	N0-N7	388	177	0.2	1990/7-8
183556	SRa		(C7,3)	4840			
192745	AF Cyg	6.0 - 8.1	M5-7 III	535	2083	0.15	1986/9

Table 1 (continued)

Desig. HD	Star Type	*Max-Min (visual)*	*Spectrum*	*N* / *T(d)*	*P(d)*	*A(m)*	Meteor *number*
184008	SRb			6740	168.9	0.16	
					162.1	0.20	
					91.7	0.10	
193449	R Cyg	6.2 - 14.5	S4-6e	272	6580	0.94	1987/2
185456	M			4730	432.9	2.44	
					214.6	1.03	
200938	RS Cyg	6.5 - 9.4	N0pe	200	413.6	0.65	1989/1
192443	SRa		(C8,2e)	2790	211.5	0.30	
203317	EU Del	5.8 - 6.9	M6 III	442	62.1	0.06	1988/2
196610	SRb			6420	58.7	0.06	
204017	U Del	5.6 - 7.5	M5 II-III	443	1150	0.21	1988/2
197812	SRb			6780	182	0.08	
210868	T Cep	5.2 - 11.0	M5-8e	424	394.2	1.68	1986/2
202012	M			5540			
213244	W Cyg	5.6 - 7.1	M4-5eg	374	6060	0.20	1985/6
205730	SRb			4070	1000	0.14	
					227	0.18	
					127	0.15	
235350	R Cas	5.0 - 12.9	M6-10e	269	431.8	2.37	1986/12
224490	M			4540			
235659	WZ Cas	6.9 - 8.5	N1(C9)	385	2940	0.11	1986/7-8
224855	SRb			4630	384	0.12	
					183	0.10	

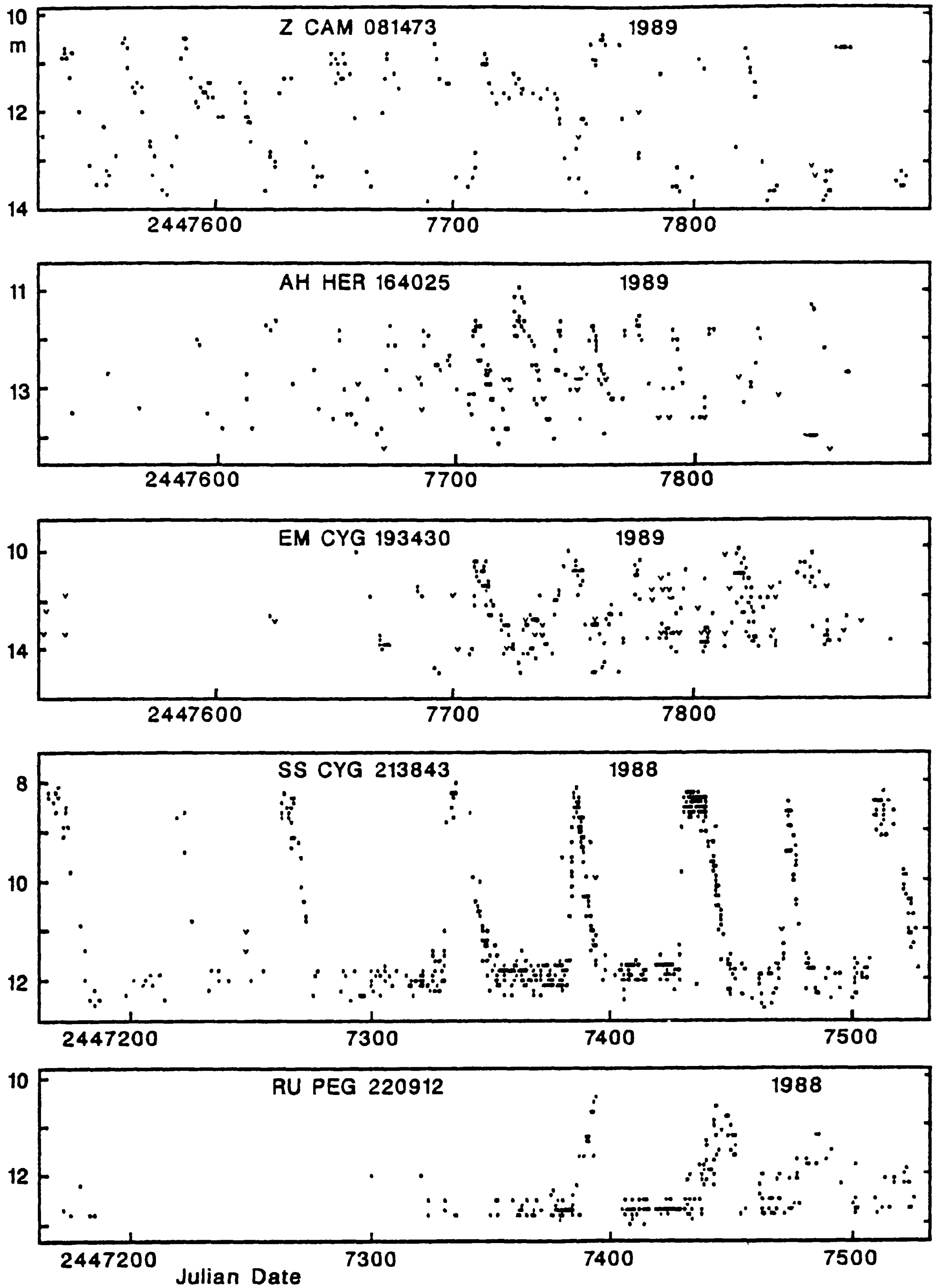

Figure 1. Computer-plotted light curves of some well-observed dwarf novae. Note the anomalous maxima of RU Pegasi.

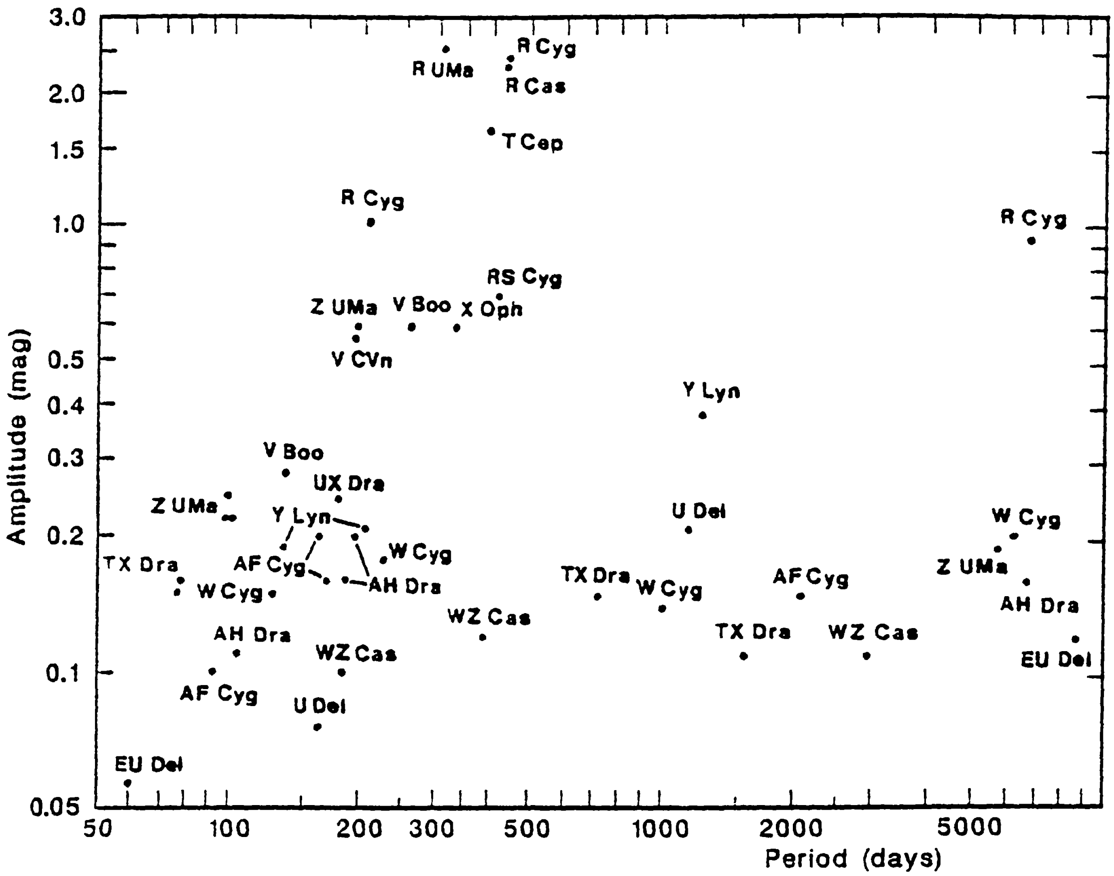

Figure 2. Period *versus* Fourier-amplitude diagram for the stars which are listed in Table 1.