Astrophysical Applications of Stellar Pulsation
ASP Conference Series, Vol. 83, 1995
R. S. Stobie and P. A. Whitelock, eds.

Radial pulsation among δ Sct stars

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Abstract. It has been pointed out by earlier authors that radial pulsation seems to be the only one type present in high amplitude δ Sct stars, at least for monoperiodic stars. In order to confirm or not this point, we have collected all the multicolour data available for these stars in the Strömgren and Johnson photometric systems. Then, the type of pulsation has been analysed on the basis of the phase shifts and amplitude ratios between observed light and colour variations. The results indicate that all the stars analysed are radial pulsators.

It has been pointed by earlier authors that two clearly different groups of pulsators seems to coexist among the δ Sct stars. First, variables with low amplitudes of pulsation (visual amplitudes smaller than roughly $0.^m1$). The majority of these variables show complex pulsation frequency spectra where a number of simultaneously excited nonradial (and radial) modes are present. Second, variables with high amplitudes of pulsation (visual amplitudes greater than roughly $0.^m3$). In most of them only one or two frequencies appear excited, and both single and double mode stars seem to show radial pulsation.

In all these double mode high amplitude stars, radial pulsation has been found from comparison between observed and theoretical period ratios. Moreover, the method based on "amplitude ratios versus phase shifts" between different filters, in *uvby* photometry, was applied by earlier authors to a large sample of monoperiodic high amplitude δ Sct and SX Phe stars leading to radial pulsation for all the variables analysed. A similar method has also been shown in UBV photometry. Thus, radial pulsation seems to be the only one type present in high amplitude δ Sct stars, at least for mono-periodic and double mode pulsators.

In order to confirm or not this point for mono-periodic stars, we have collected all the simultaneous or nearly simultaneous multicolour data available for these stars in the Strömgren and Johnson photometric systems. The data have been considered for Population I and also Population II (SX Phe type) stars. Then, the type of pulsation has been analysed on the basis of these phase shifts and amplitude ratios between observed light and colour variations. Table 1 lists the stars analysed with their periods and full visual amplitudes. In all cases, the results lead to radial pulsation according to the corresponding diagrams of "amplitude ratios versus phase shifts". In addition to mono-periodic variables, some double mode stars (AE UMa, RV Ari, BP Peg, V1719 Cyg and SX Phe) were considered and radial pulsation was also found in good agreement with their period ratios. It is also true for the two first modes of AI Vel. Radial pulsation was also found for the three mono-periodic stars of medium amplitude ($0.^m1 \leq \Delta V < 0.^m3$) considered: V1162 Ori, ρ Pup and V393 Car.

Table 1. Stars analysed.

Star	Period (days)	ΔV (mag)	source	Star	Period (days)	ΔV (mag)	source
Pop. I				Pop. I			
ZZ Mic	0.0672	0.35	23,24,25	V567 Oph	0.1495	0.33	6,7
GP And	0.0787	0.52	1	CW Ser	0.1892	0.43	15,16
V1162 Ori	0.0787	0.20	6	V798 Cyg	0.1948	0.46	4
KU Cen	0.0800	0.47	6	BS Aqr	0.1978	0.44	10,11
AE UMa(F)	0.0860	0.44	1	RY Lep	0.2254	0.35	1
EH Lib	0.0884	0.50	17,18,19,20,21,22	TV Lyn	0.2407	0.44	1
RV Ari(F)	0.0931	0.43	2	DE Lac	0.2537	0.32	12,13
BE Lyn	0.0959	0.39	1	DH Peg	0.2555	0.50	14
YZ Boo	0.1041	0.42	26,27,28,29	UY Cam	0.2670	0.34	1
BP Peg(F)	0.1095	0.41	1	V1719 Cyg(1)	0.2673	0.31	4
AI Vel(F)	0.1116	0.67	3	V1719 Cyg(2)	0.2138		4
AI Vel(1)	0.0862		3	Pop. II			
SZ Lyn	0.1205	0.51	29,34,35,36,37,38	SX Phe(F)	0.0550	0.41	1
AD CMi	0.1230	0.30	1	SX Phe(1)	0.0428		1
ρ Pup	0.1409	0.09	8,9	KZ Hya	0.0595	0.80	1
V393 Car	0.1413	0.19	5	CY Aqr	0.0610	0.71	1
RS Gru	0.1470	0.56	1	DY Peg	0.0729	0.54	1
DY Her	0.1486	0.51	30,31,32,33	XX Cyg	0.1349	0.80	1

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