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ON THE SX Phe-TYPE STARS

About ten years ago one of the authors (Frolov, 1974) turned his attention to the physical peculiarities of Delta Scuti stars having short periods ( $<0.1^d$ ) and large amplitudes ( $>0.3^m$ ). It was noticed that besides their specific position on the period-amplitude diagram, they are totally lacking in open clusters unlike usual Delta Scuti variables, and they often show metal deficiency. Moreover, it was realized that several Population II objects may also exist among Delta Scuti stars of long-periodic group, e.g. XX Cyg having high space velocity.

After lengthy discussion in the astronomical literature (on Delta Scuti stars being Population I objects excluding only SX Phe itself) it would seem that it is now agreed that there are several low mass low metallicity objects among these stars. The majority of these stars indeed have  $P < 0.1^d$  and large pulsational amplitudes. All the doubts have disappeared with the discovery of two such variables NJL 220 (Niss, 1981) and NJL 79 (Jørgensen, 1982) in the globular cluster  $\omega$  Cen; both have nearly the same physical parameters as SX Phe ( $P = 0.055^d$ ) itself: their amplitudes are about  $0.5^m$ , periods are  $0.046^d$  and  $0.063^d$ , and absolute magnitudes are +2.9 and +3.0. Even if these two stars are not physical members of  $\omega$  Cen, they have z-coordinates large enough (about 1 kpc) to be the objects of the galactic halo.

In the paper on Delta Scuti stars in open clusters (Frolov and Irkaev, 1982) we have mentioned XX Cyg and RS Gru as being typical for globular clusters with different metal abundances on the basis of their low metal abundances or high space motion. XX Cyg and BDS 1269A = VW Ari with periods  $0.135^d$  and  $0.149^d$ , respectively were mentioned by Breger (1979) as probable objects of Population II. In reality, such objects among long-periodic Delta Scuti stars can be more numerous due to faintness of many "Dwarf Cepheids" and to usual lack of such information such as  $v_r$  and metal abundance. The only source of information is the star's z-coordinate. In this way we can distinguish 4 more new Population II objects among long-periodic Delta Scuti stars having z-coordinates exceeding 1 kpc: UW CVn ( $0.146^d$ ), MQ Pav ( $0.168^d$ ), LZ Her ( $0.199^d$ ) and V 934 Oph ( $0.206^d$ ). Taking into account their periods, we adopted absolute magnitudes equal to +2 or to +1; interstellar absorption was calculated ac-

Table I

Star	Period	Amplitude (V)	Criterion of Pop. II
SX Phe	0.055	0. <sup>m</sup> 5 var(0.37-0.73)	1, 2
CY Aqr	0.061	0.73	1
DY Peg	0.073	0.61	1, 2
KZ Hya = HD 94033	0.0595	0.80	1, 2
BL Cam = GD 428	0.039	0.30	1, 2
NJL 220	0.046	≥0.5 B	3, ω Cen
NJL 79	0.063	0.48 B	3, ω Cen
SU Crt = HD 100363	0.055	0.03	1, 2
XX Cyg	0.135	0.90	1, 2
VW Ari = BDS 1269A	0.149	0.12	2
BS Tuc = HD 6870	0.065	0.015	2
RS Gru	0.147	0.56	1
UW CVn	0.146	0.5 pg	3
V 934 Oph	0.206	0.4 pg	3
LZ Her	0.199	0.5 pg	3
MQ Pav	0.168	0.5 pg	3

ording to Sharov (1963).

We are already aware of seven Population II objects among long-periodic Delta Scuti stars and nine among short-periodic ones including two stars in ω Cen. Possibly the name "SX Phe-type stars" is not the most appropriate because about half of these variables have much longer periods than the prototype. Possibly the situation with SX Phe stars is the same as for W Vir stars. In both cases the Population II objects have been separated from the majority of Population I stars and in both cases the period distribution is bimodal.

In Table I we include all the Population II SX Phe-type objects known up to date. In addition to the name of the star, its period, and light amplitude, we show in the last column the criterion of Population II: 1 - high space motion; 2 - low metallicity; 3 - z-coordinate exceeds 1 kpc; "ω Cen" indicates that the star (NJL 79 and NJL 220) is in the globular cluster.

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