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THE LIGHT CURVES OF SX Phe STARS IN NGC 6752

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Recently, attention has been paid to short period ($P < 0.07$ d) pulsating stars located in globular clusters. Poretti (1999) re-analyzed the data collected by the OGLE team on 34 new SX Phe stars in ω Centauri: Fourier decomposition extended the $\varphi_{21} - P$ relationship toward shorter periods. The existing progression (Antonello et al. 1986; Poretti et al. 1990) is continued in a natural way, even if some peculiarities were found: a group of deviant points around 0.038 d, a change in the slope around 0.050 d and a single, unusual light curve (OGLEGC 26, $P = 0.038$ d).

Thompson et al. (1999) reported on CCD photometry of 11 new variable stars in the field of another globular cluster, NGC 6752. Among them, there are three new SX Phe stars. Their light curves look very different from each other and the classification of their properties (pulsation mode, membership in the cluster, ...) are considered to be problematic. It is interesting to examine the properties of their light curve to verify the results obtained in ω Cen.

First, we confirmed the previously found periods using an independent frequency analysis; we note that the spectral window is good since aliases at ± 1 c d^{-1} are below the 60 % of the central peak. Then, we applied the Fourier decomposition. Three V–light curves deserve attention:

Star 13 ($P = 0.046877$ d) — The full amplitude is only 0.08 mag, but the light curve is very well defined. A 2$^{\rm nd}$–order fit leaves a residual of only 0.010 mag and an accurate φ_{21} value can be derived (3.43 ± 0.17 rad), in excellent agreement with the expected value. Contrary to the doubts expressed by Thompson et al. (1999), there is no problem in considering this star as one which pulsates in its fundamental mode.

Star 7 ($P = 0.059076$ d) — Its φ_{21} value is well defined (3.76 ± 0.10 rad) and very close to the expected one. The large amplitude allows a 3$^{\rm rd}$–order fit. The φ_{31} value (1.36 ± 0.52 rad) is in excellent agreement with the φ_{31} values reported by Poretti (1999; Table 1), which in turn are very coherent with those of large-amplitude galactic variables.

Star 12 ($P = 0.040895$ d) — It is the most interesting star since its period falls in the region where Poretti (1999) found some deviant φ_{21} values. Unfortunately, the light curve has a full-amplitude of only 0.05 mag and the derived Fourier parameters are a little uncertain. However, the φ_{21} value is actually higher than expected (4.0 ± 0.4).

Fig. 1 shows the φ_{21} values of the pulsating stars found in the Galaxy (open squares with 0.06 d$< P <$0.08 d correspond to CY Aqr, ZZ Mic and V831 Tau), in ω Cen (filled dots) and in NGC 6752 (crosses). The points related to OGLEGC 26 and OGLEGC 62

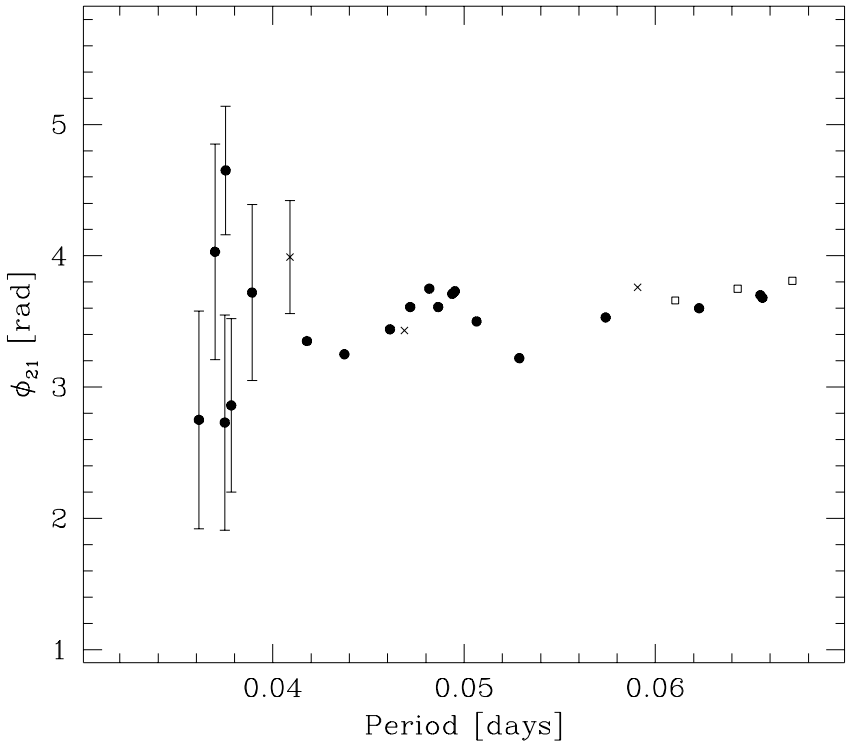

Figure 1. The $\varphi_{21} - P$ plot for pulsating variables observed in the Galaxy (squares), in ω Cen (filled dots) and in NGC 6752 (crosses). Error bars are reported for the small amplitude stars suggesting two separated groups at $P < 0.042$ d.

are omitted (see Poretti 1999 for discussion). From Fig. 1 it is quite evident that we find pulsating stars with only $P < 0.06$ d in globular clusters. As an additional example, the shortest period observed in the OGLE database is 0.056 d (V116 in the BW8 field; Udalski et al. 1995).

It should be noted that the dispersion of the φ_{21} values for stars with $P < 0.042$ d is much larger than for stars with $P > 0.042$ d. Of course, this can result from the larger errors related to the small amplitudes (less than 0.08 mag) of the shortest period variables; error bars are shown in Fig. 1 for this purpose. However, the working hypothesis of two different pulsation modes (fundamental or first overtone radial modes, non-radial modes) should be fruitfully investigated on the basis of new, more accurate data.

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