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Wide-field variability survey of the globular cluster NGC 4833

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Abstract. We present preliminary results of the variability survey in the field of the globular cluster NGC 4833. We observed all 34 variable stars known in the cluster. In addition, we have found two new SX Phoenicis stars, one new RR Lyrae star, twelve new eclipsing systems mostly of the W Ursae Majoris type, nine new variable red giants, and ten new field-stars showing irregular variations. Properties of RR Lyrae stars indicate that NGC 4833 is an Oosterhoff's type II globular cluster.

Keywords. Galaxy: globular clusters: individual: NGC 4833, stars: Population II, stars: variables: RR Lyrae, stars: variables: SX Phoenicis

1. Introduction

Continuing our ongoing project aimed at the search and analysis of pulsating stars in globular clusters (see Kopacki 2013) we present preliminary results for NGC 4833. We used image subtraction method (ISM, Alard & Lupton 1998) which works well in crowded stellar fields like a cluster core and thus enables detection of many variable stars, such as RR Lyrae and SX Phoenicis stars.

NGC 4833 is the southern globular cluster of intermediate metallicity ([Fe/H] = −1.85). The most recent version of the Catalogue of Variable Stars in Globular Clusters (CVSGC, Clement *et al.* 2001) listed 34 objects in the field of this cluster including six SX Phoenicis stars and 20 RR Lyrae stars.

2. Observations and results

We used CCD observations obtained during a one-month observing run in Feb/Apr, 2008 using 40-inch telescope at Siding Spring Observatory, Australia. They consisted of 740 V-filter and 220 $I_{\rm C}$-filter CCD frames.

We confirmed all variable stars found recently in the cluster core by Darragh & Murphy (2012). In addition, we have detected two new SX Phoenicis stars, one new RR Lyrae star, twelve new eclipsing systems mostly of the W Ursae Majoris type, nine new variable red giants at the tip of the red giant branch, and ten field-stars showing irregular variations. Equatorial coordinates of periodic variable stars we observed, together with derived periods, are given in Table 1. New variable stars are indicated with designations starting with letter 'n'.

The mean period of RRab stars in NGC 4833 is equal to $\langle P_{\rm ab}\rangle = 0.701$ d, and the relative percentage of RRc stars amounts to $N_{\rm c}/(N_{\rm ab}+N_{\rm c}) = 48$ %. With these values we find that NGC 4833 belongs to the Oosterhoff's II group of globular clusters.

Table 1. Equatorial coordinates and periods of periodic stars in NGC 4833.

Var	Type	α_{2000} [h m s]	δ_{2000} [° ′ ″]	P [d]
v27	SXPhe	12 59 13.73	−70 52 09.5	0.0509813
v29	SXPhe	12 59 35.31	−70 52 40.9	0.059780
v30	SXPhe	12 59 42.56	−70 53 04.0	0.044256 0.045757
v31	SXPhe	12 59 47.98	−70 52 51.5	0.0533323 0.041726
v32	SXPhe	12 59 55.05	−70 52 24.2	0.0706795 0.072537
v33	SXPhe	12 59 57.64	−70 54 29.5	0.0719219 0.079772
n35	SXPhe	12 58 59.01	−70 52 05.1	0.037510 0.036708
n36	SXPhe	12 59 32.64	−70 53 15.9	0.040149
v01	RRLyr	12 58 36.53	−70 44 48.1	0.750082
v03	RRLyr	12 59 33.73	−70 52 13.2	0.74453
v04	RRLyr	12 59 33.76	−70 51 57.8	0.65577
v05	RRLyr	13 00 01.28	−70 53 17.3	0.629424
v06	RRLyr	12 59 56.18	−70 50 10.2	0.65400
v07	RRLyr	12 59 48.80	−70 52 21.1	0.66888
v12	RRLyr	12 59 37.91	−70 52 14.7	0.58980
v13	RRLyr	13 00 29.86	−70 52 55.9	0.36788
v14	RRLyr	12 59 31.04	−70 53 06.9	0.40842
v15	RRLyr	12 59 20.15	−70 53 25.0	0.66745
v17	RRLyr	12 59 43.98	−70 54 24.9	0.390263
v18	RRLyr	12 59 28.26	−70 54 25.5	0.42559
v19	RRLyr	12 59 06.02	−70 53 29.7	0.370658
v20	RRLyr	12 59 08.21	−70 52 23.5	0.2997 0.3012
v21	RRLyr	12 59 50.94	−70 50 36.5	0.39878
v22	RRLyr	12 59 45.10	−70 53 55.5	0.85095
v23	RRLyr	12 59 44.74	−70 51 27.0	0.406503
v24	RRLyr	12 59 36.68	−70 52 58.7	0.62612
v26	RRLyr	12 59 02.74	−70 52 51.9	0.31788
v28	RRLyr	12 59 21.22	−70 53 26.4	0.87401
n37	RRLyr	12 59 43.16	−70 53 36.5	0.30215
v25	Ecl	12 58 55.37	−70 51 45.9	0.72310
v34	Ecl	13 00 25.17	−70 49 16.4	0.36290
n38	Ecl	13 00 11.88	−70 51 26.4	0.257129
n39	Ecl	13 01 33.10	−70 49 22.6	0.28005
n40	Ecl	13 01 49.41	−70 51 42.1	0.282581
n41	Ecl	13 01 29.29	−70 44 58.0	0.29917
n42	Ecl	12 57 17.71	−70 47 51.0	0.3137
n43	Ecl	13 00 22.56	−70 55 25.8	0.3175
n44	Ecl	12 59 52.75	−70 44 32.7	0.3362
n45	Ecl	13 00 43.49	−70 47 26.9	0.362332
n46	Ecl	13 00 24.25	−70 56 01.4	0.38071
n47	Ecl	12 59 37.69	−70 51 28.4	0.48875
n48	Ecl	13 00 45.49	−70 47 38.2	0.49226
n49	Ecl	13 00 55.03	−70 54 15.9	1.1235
n59	Ukn	13 00 27.52	−70 54 01.6	2.889
n60	Ukn	12 59 14.62	−70 50 37.8	4.390
n61	Ukn	13 00 20.85	−70 49 56.4	6.300

Almost all observed SX Phoenicis stars show multiperiodic light changes (see Table 1) with one star, v31, exhibiting oscillation in two first radial modes. Moreover, we found in the RRc star v20 two closely-spaced frequencies.

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References

Alard, C. & Lupton, R. 1998, *ApJ*, 503, 325
Clement, C., Muzzin, A., Dufton, Q., *et al.* 2001, *AJ*, 122, 2587
Darragh, A. & Murphy, B. 2012, *Journal of the Southeastern Association for Research in Astronomy*, 6, 72.
Kopacki, G. 2013, *AcA*, 63, 91

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