NEWLY DISCOVERED VARIABLE STARS
IN THE GLOBULAR CLUSTER NGC 6864 (M75)

SCOTT, N. J.[1]; CORWIN, T. M.[1,4]; CATELAN, M.[2]; SMITH, H. A.[3]

[1] Department of Physics, University of North Carolina at Charlotte, Charlotte, NC 28223, USA;
e-mail: njscott@email.uncc.edu, mcorwin@uncc.edu

[2] Pontificia Universidad Católica de Chile, Departamento de Astronomía y Astrofísica, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile; email: mcatelan@astro.puc.cl

[3] Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824, USA;
email: smith@pa.msu.edu

[4] Visiting Astronomer, Cerro Tololo Inter-American Observatory, National Optical Astronomy Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

The distant globular cluster NGC 6864 (M75) belongs to a group of relatively rare clusters that display multimodal horizontal-branch (HB) morphology (Catelan et al. 1998, 2002). Using Alard's (2000) image-subtraction method, we recently discovered a number of new variables in this cluster, pointing to an unusual Oosterhoff-intermediate classification (Corwin et al. 2003). The present study also uses image subtraction with the data reported on in our previous analysis. This time, however, the image subtraction threshold was substantially reduced. This produced thousands of false identifications, but, in addition to the previously known variables, we found four new variables, all very close to the cluster core.

The CCD images used in this study were obtained with the 0.9 m telescope at the Cerro Tololo Inter-American Observatory. The field was observed over a seven-night interval in 1999 July. Observing conditions were not good for three of the seven nights, and data from these nights were not included in our analysis. The data reported here were obtained on the nights of 1999 July 15/16 (night 1), 19/20, 20/21, and 21/22 (nights 5, 6, and 7). The 2048 × 2048 Tek 2K-3 CCD was used. Images were obtained through both V and B filters. Typical exposure times were 360 s for the B frames and 240 s for the V frames. The pixel scale was $0''.395$, giving a field of view $13'.5 \times 13'.5$.

The location and tentative periods of the variables are given in Table 1. The x and y coordinates are in arcseconds with respect to the cluster center, given in the Clement et al. (2001) online catalog as RA $20^h03^m.2$ and Dec $-22°04'$ (J1950). Because the data are limited and relatively noisy, the periods are given to only three significant figures. Light curves (in flux units) based on the periods of Table 1 are shown in Figure 1.

Of the four nights reported here, the data for night one were the least reliable and are not plotted for NV1, NV2, and NV3 (B light curve). NV1 was not found in the data from nights one or six. Three of the stars reported here have periods less than 0.3 d. While the most natural interpretation is that they are simply first-overtone pulsators (Kovács 1998;

Catelan 2004), there also exists the possibility that they are RR Lyrae stars pulsating in the second overtone (Alcock et al. 1996; Clement & Rowe 2000). The low amplitudes of second-overtone and short-period first-overtone pulsators might account for these stars being found only at the lower image-subtraction threshold, although their location very close to the cluster core may have been an important factor as well. NV2 seems to have two distinct B light curves. The reason for this is not clear. It is likely that it is a blended image, but this should not affect the differential flux as determined by ISIS. NV3 has a somewhat unusual curve, showing a large dip in brightness on nights 1 and 6. The light curve is roughly consistent with an eclipsing binary of the β Lyrae type, although our tentative short period could favor a W UMa classification instead. However, a period of approximately 1.93 days will also phase the data well, producing a light curve with large gaps.

Table 1. Locations and tentative periods for new variables.

Variable	$x('')$	$y('')$	Period (d)	Type
NV1	6.4	-2.1	0.278	RRe or RRc
NV2	4.0	2.3	0.276	RRe or RRc
NV3	0.0	1.0	0.634	EB?
NV4	-1.5	1.2	0.269	RRe or RRc

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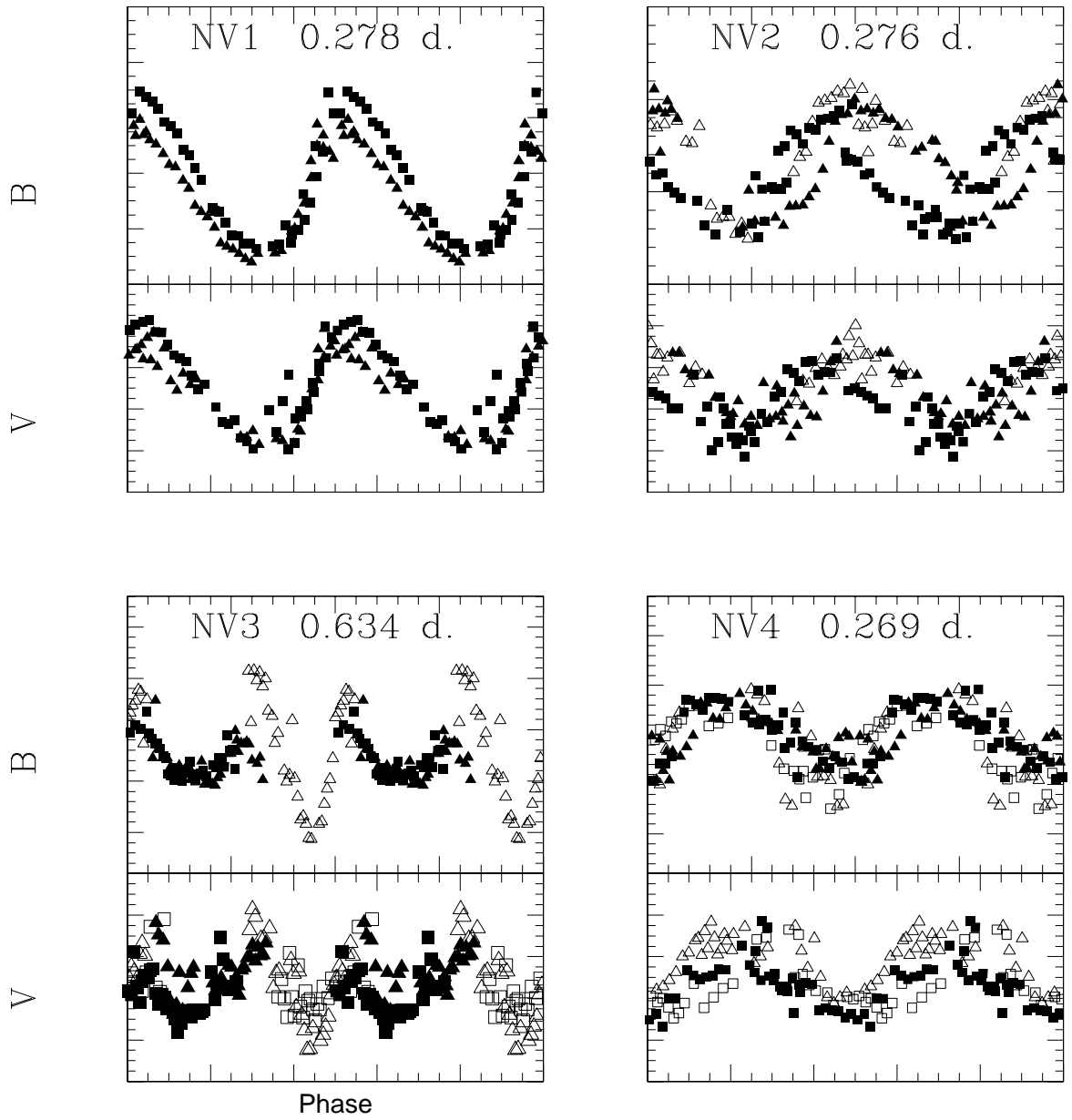
Figure 1. *B* and *V*-band differential light curves (in flux units) for the four new variables in M75. The open squares represent data from night 1, the filled squares from night 5, the open triangles from night 6, and the filled triangles from night 7.