Confirmation of the β Cephei pulsations in Hogg22-67

G. Kopacki

Hogg22-67 was observed as an additional target in observing project at SAAO

It was discovered variable from the ASAS data (Pojmański 2002)

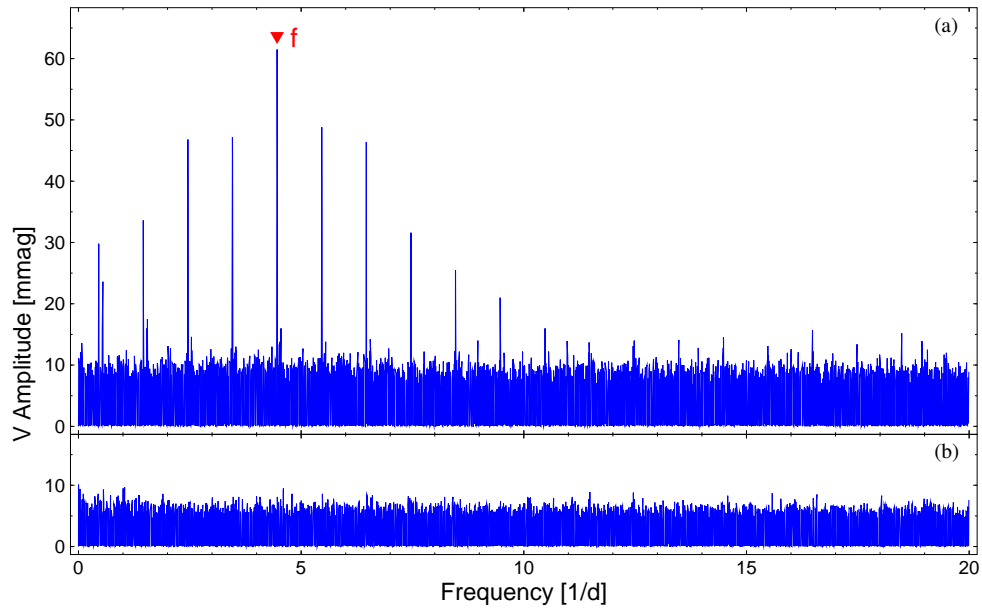It belongs to the young open cluster Hogg22 (age about 6 Myr)

Fig. Amplitude spectra of Hogg22-67: (a) for original V-filter obse-
rvations from ASAS database, (b) after prewhitening with frequency
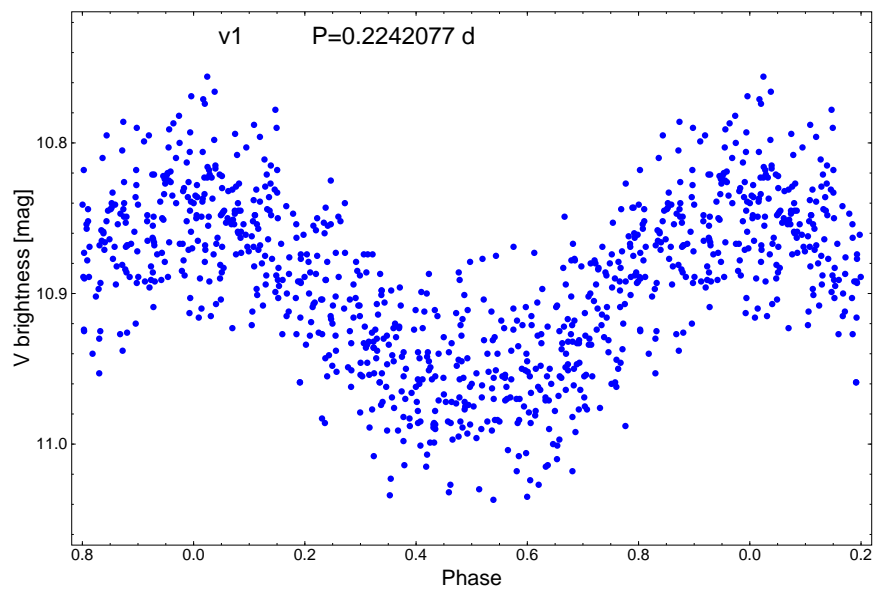$f = 4.460150 \ \mathrm{d}^{-1}$. The ordinate scale is the same in all panels.

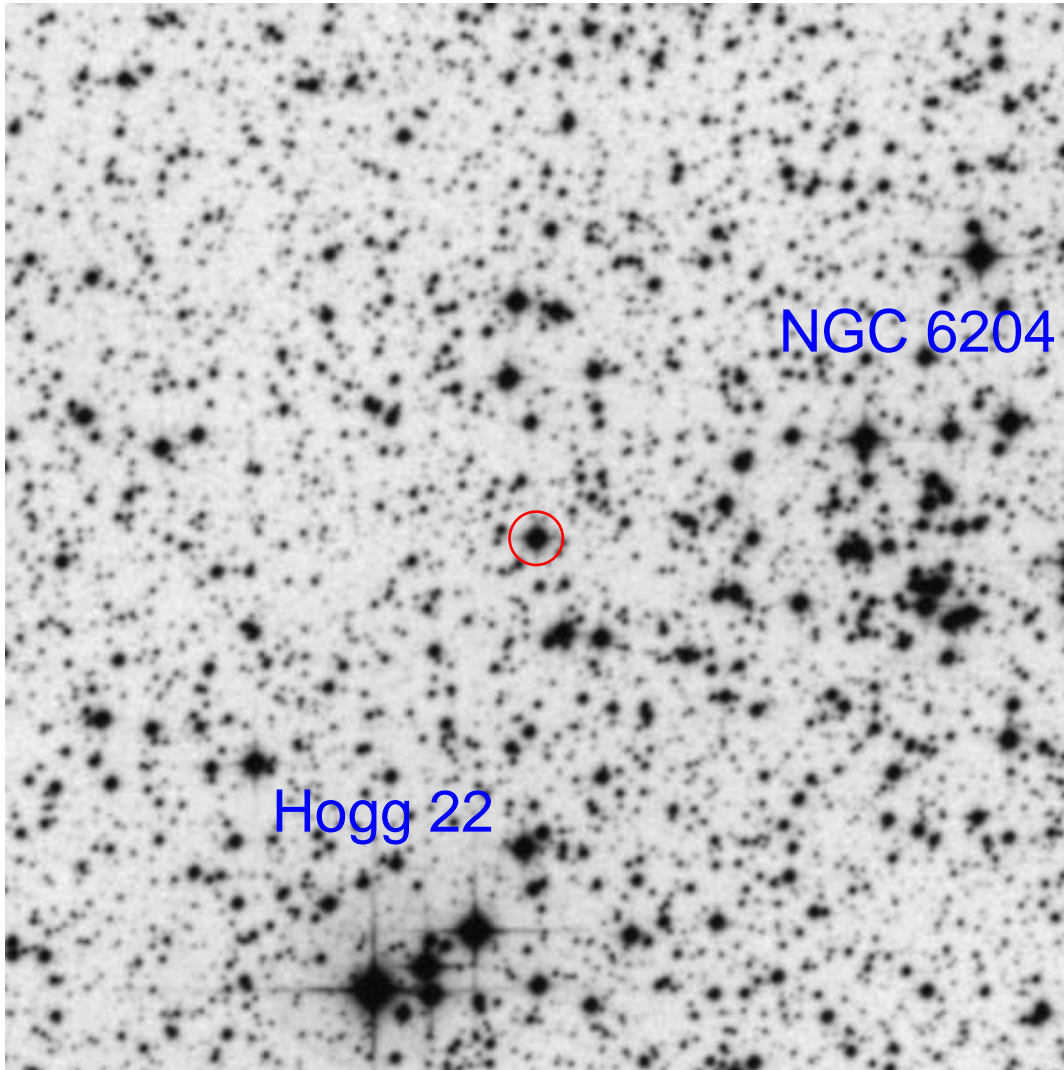Fig. *V*-filter light curve of Hogg22-67 based on ASAS data.

Fig. The overlook view of an area around Hogg22-67 covering 10×10 arcmin^2. Hogg22-67 is indicated with red circle. Two open clusters in this region, NGC 6204 and Hogg 22, are labeled with their designations. North is up, east to the left.

Telescope and detector:

    SAAO 75cm telescope

    UTC CCD covering 3.4×2.2 arcmin^2

Observations:

    two nights, 11 May (6 h) and 12 May (8.5 h) 2009

    $UBVI$ photometry

$$N_U = 140, \; T_{\text{exp},U} = 120 \text{ s}$$
$$N_B = 142, \; T_{\text{exp},B} = 90 \text{ s}$$
$$N_V = 449, \; T_{\text{exp},V} = 30 \text{ s}$$
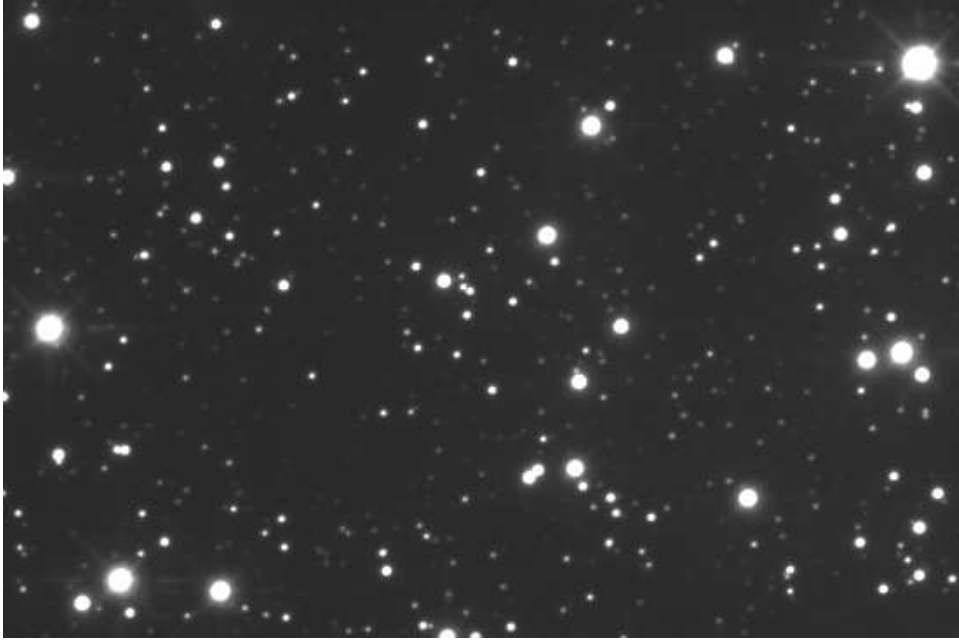$$N_I = 213, \; T_{\text{exp},I} = 20 \text{ s}$$

Fig. *I*-filter reference frame of the observed field covering about 3.4×2.2 arcmin^2. Hogg22-67 is the brightest star at the left border of the picture. North is up, east to the left.

Methods:

    DAOPHOT

        aperture and profile fitting photometry

        colour – magnitude diagram

    detection of periodic signal through Fourier analysis

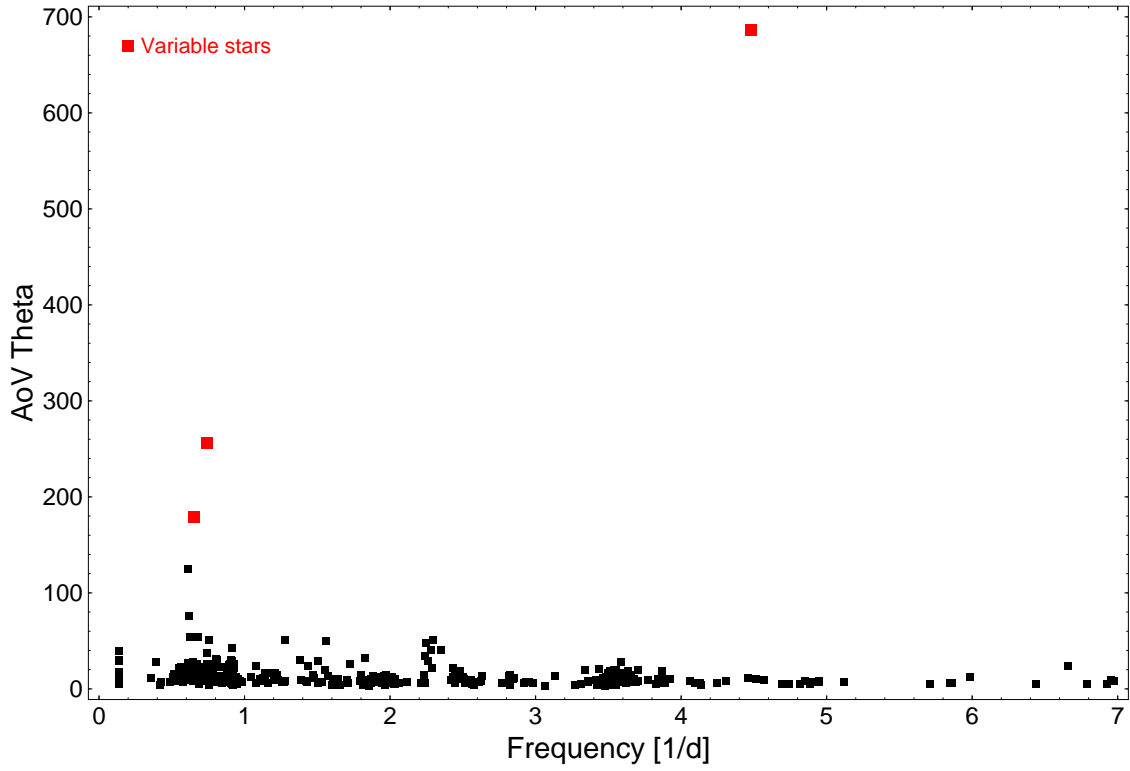   S/N vs. f

    search for eclipses

Fig. The θ parameter of the highest peak in the AoV spectrum plotted against its frequency. Each point corresponds to one star detected in the reference frame. Variable stars are indicated with red squares. Hogg22-67 shows the largest θ parameter among observed stars (red symbol at $f = 4.46 \ \mathrm{d}^{-1}$).
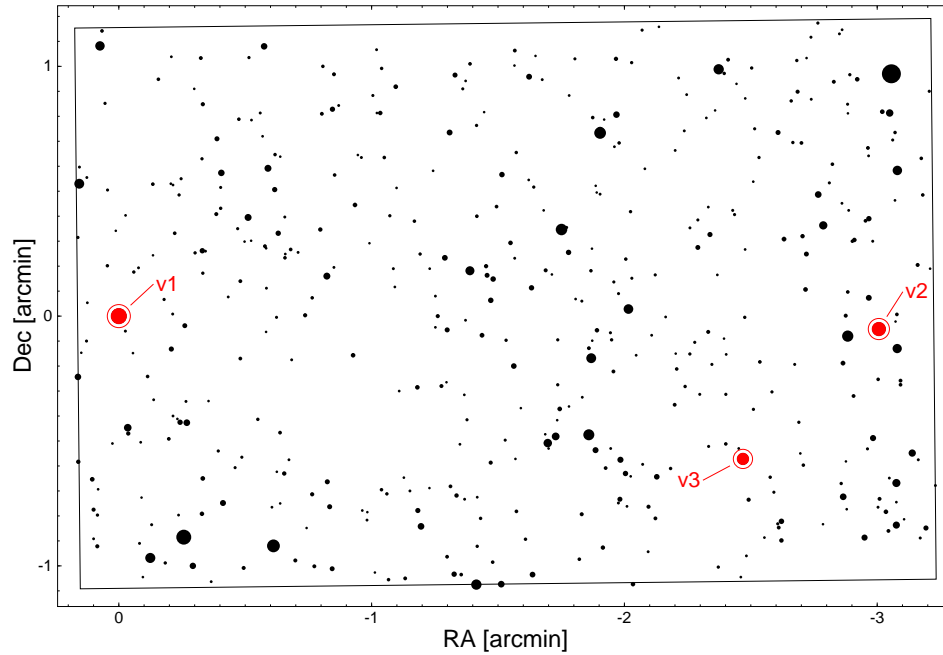
Fig. The schematic view of the observed field around Hogg22-67. Variable stars are indicated with red encircled dots. They are also labeled with designations adopted in this work. Hogg22-67 is named with v1. North is up, east to the left.
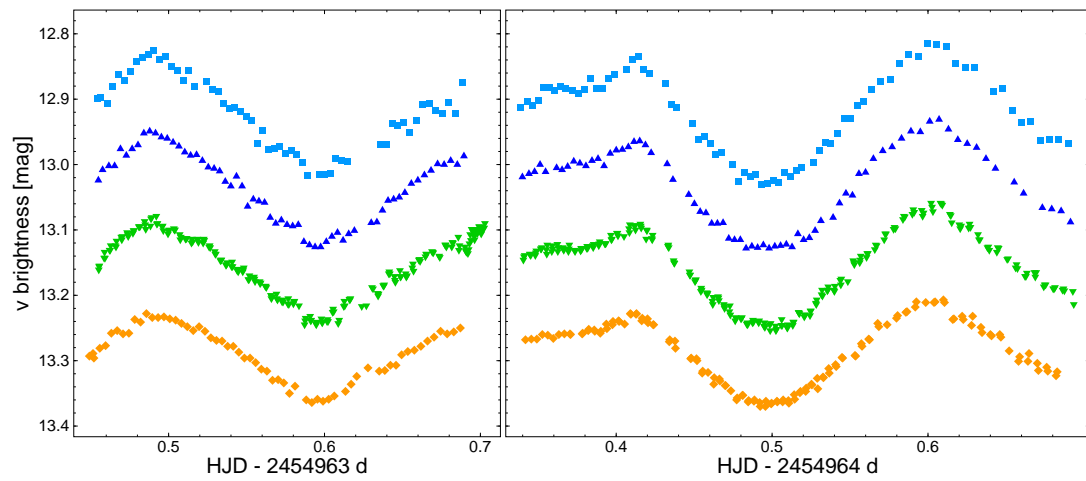
Fig. *U*- (light blue squares) *B*- (blue triangles tiped up) *V*- (green triangles tiped down) and *I*-filter (yellow diamonds) light curves of Hogg22-67 based on SAAO data. Pulsation of the β Cephei type is clearly seen.

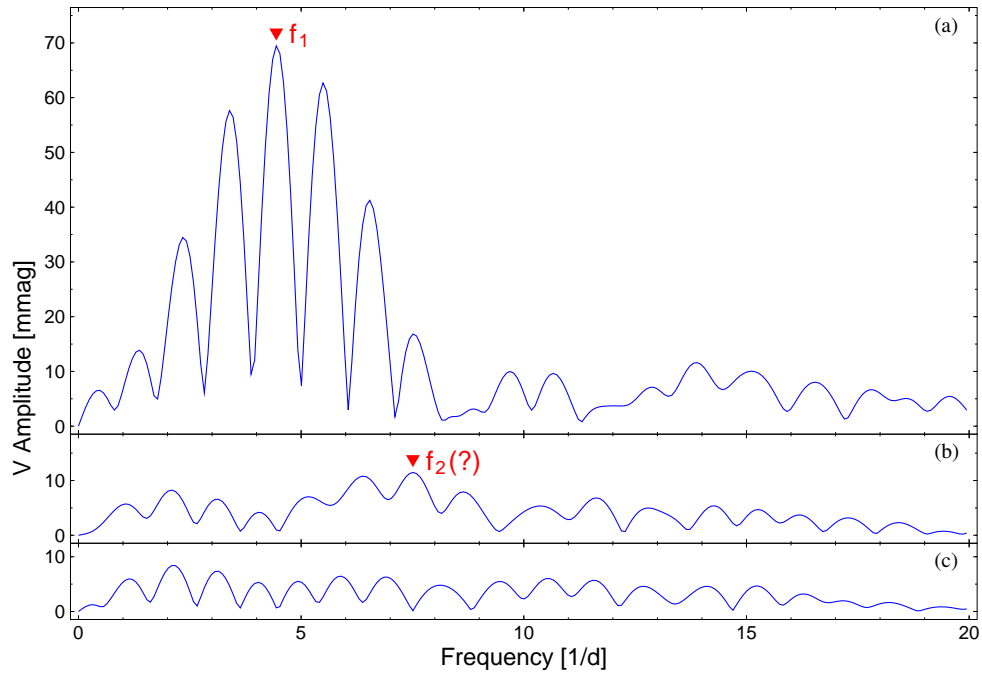Fig. Amplitude spectra of Hogg22-67: (a) for original V-filter observations from SAAO, (b) after prewhitening with frequency $f_1 = 4.478$ d^{-1}. (b) after prewhitening with frequencies f_1 and $f_2 = 7.50$ d^{-1}. The ordinate scale is the same in all panels.
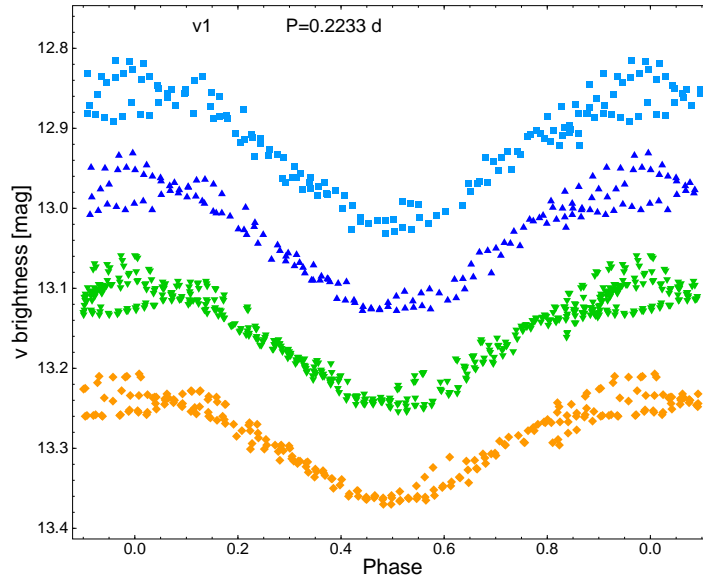
Fig. *U*- (light blue squares) *B*- (blue triangles tiped up) *V*- (green triangles tiped down) and *I*-filter (yellow diamonds) light curves of Hogg22-67 based on SAAO data.

Amplitudes:

$$A_U = 0.081 \text{ mag}$$
$$A_B = 0.075 \text{ mag}$$
$$A_V = 0.068 \text{ mag}$$
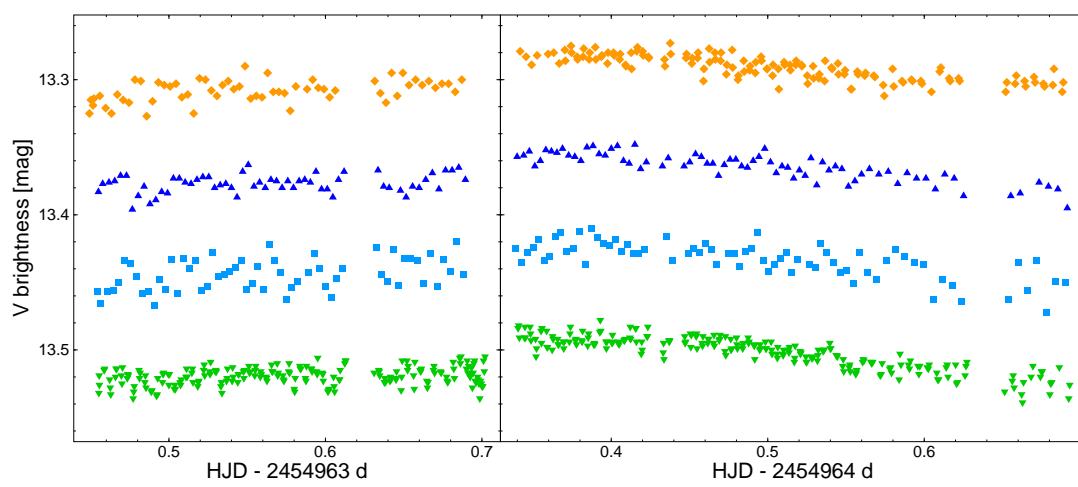$$A_I = 0.060 \text{ mag}$$

Fig. *U*- (light blue squares) *B*- (blue triangles tiped up) *V*- (green triangles tiped down) and *I*-filter (yellow diamonds) light curves of v2 based on SAAO data.

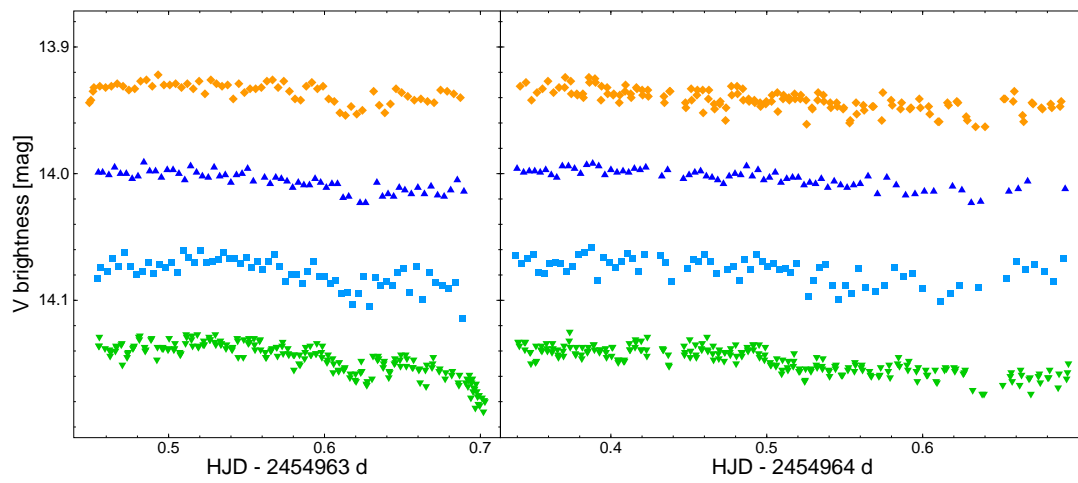Fig. *U*- (light blue squares) *B*- (blue triangles tiped up) *V*- (green triangles tiped down) and *I*-filter (yellow diamonds) light curves of v3 based on SAAO data.
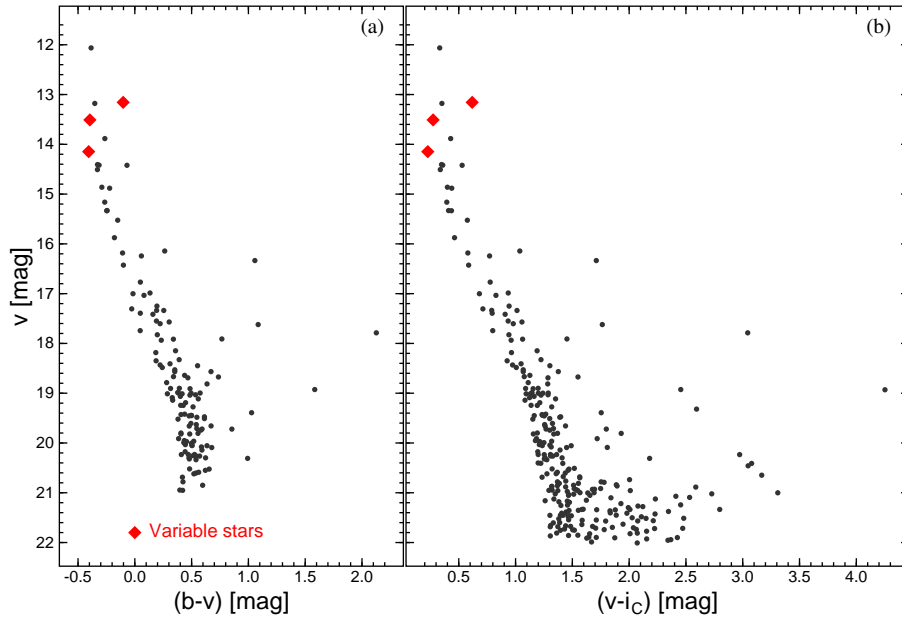
Fig. The instrumental $V - (B - V)$ (left panel) and $V - (V - I)$ (right panel) colour – magnitude diagrams for the observed field. Variable stars are indicated with red diamonds. Hogg22-67 is the brightest variable star.

Results:

    confirmation of the β Cephei nature of Hogg22-67

    indication for other periods in Hogg22-67

    discovery of 2 new variable stars of unknown type