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NEW ECLIPSING BINARY HII706 IN THE PLEIADES CLUSTER

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We present observational results of a newly discovered eclipsing binary star HII 706 (RA₂₀₀₀ = 3^h45^m35^s.7, DEC₂₀₀₀ = 24°30'3"; V = 11^m85, B–V = 0^m61) in the central region of the Pleiades cluster. The light variations of HII 706 were detected accidentally during a multi-site observation campaign (Rodríguez 1998) for four γ Dor type variable star candidates in the Pleiades cluster.

Time-series CCD photometry was performed over four nights from December 5 to 11, 1998. The observations were done with a SITE 2048 CCD camera attached to the 1.8m telescope at Bohyunsan Optical Astronomy Observatory (BOAO). The field of view of the CCD image is 11'6 × 11'6 at the f/8 Cassegrain focus of the telescope.

Using the IRAF/CCDRED package, we processed CCD images to correct overscan regions, trim unreliable subsections, subtract bias frames and correct flat field images. Instrumental magnitudes for HII 706 and comparison stars were obtained via the aperture photometry routine in IRAF/DAOPHOT package (Massey & Davis 1992). Because seeing was variable and typically about 2.0 arcsec during the observing runs, the aperture size was chosen to be 18 pixels (6.12 arcsec) in diameter. We applied classical two-star differential photometry to get differential magnitudes. Brightness of two comparison stars (V = 11^m26, B–V = 0^m81 for C1 \equiv HII 746; V = 13^m84, B–V = 0^m89 for C2 \equiv HII 650, from our observation) near HII 706 was monitored to check light variations of HII 706 (see Figure 1).

We could not find any previous reports about light variations of HII 706 (Kholopov *et al.* 1985–1988, Durlevich *et al.* 1996). However, we detected obvious brightness change of the star from our data. Light curves of HII 706 are shown in Figure 2 and its differential magnitudes, $\Delta V = V_{\text{HII706}} - V_{\text{HII746}}$, are listed in Table 1. Total V amplitude is about 0^m45 (11^m85–12^m30) and the period is estimated to be about 0.574 day (epoch at primary minimum is JD 2451157.06). Because the light curves of phase from 0.0 to 0.5 and phase from 0.5 to 1.0 look nearly the same, the star could be classified as a pulsating variable star with a period of 0.287 day (a half of the above value). However, considering the short period, large amplitude and peculiar light curves (broad maximum and sharp minimum), we can rule out the possibility that it belongs to pulsating stars such as δ Sct stars, γ Dor stars and RR Lyrae stars, *etc.* The light curves are similar to that of an W UMa type eclipsing binary star (Hoffmeister *et al.* 1985).

In Figure 3, we show the position of HII 706 in color–magnitude diagram of the Pleiades cluster. Magnitudes and colors in the BDA data base (Mermilliod 1992) were used. From this, we can deduce that HII 706 may be a non-member star; it is about 1^m5 fainter than the main sequence stars in the cluster with the same color.

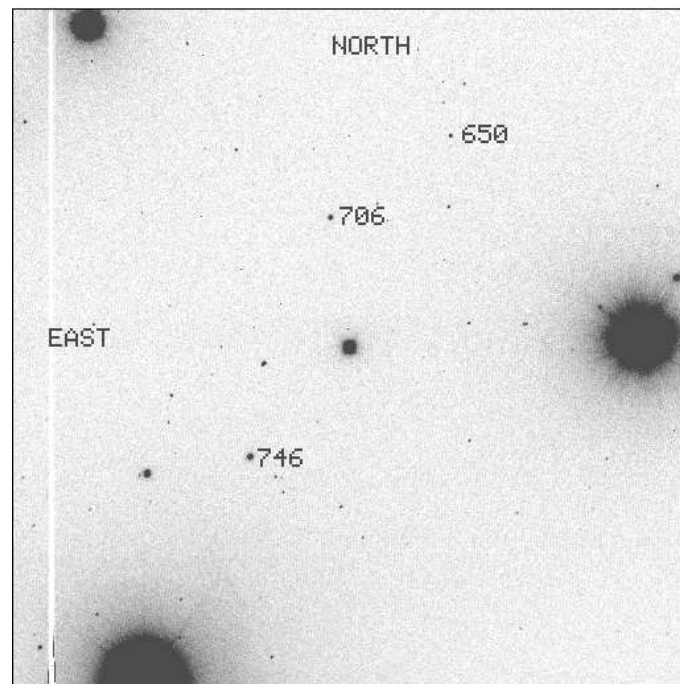


Figure 1. Observed CCD frame ($11/6 \times 11/6$) of HII 706 in the central region of the Pleiades cluster. Two comparison stars (HII 746, HII 650) are denoted by their Hertzsprung (1947) number

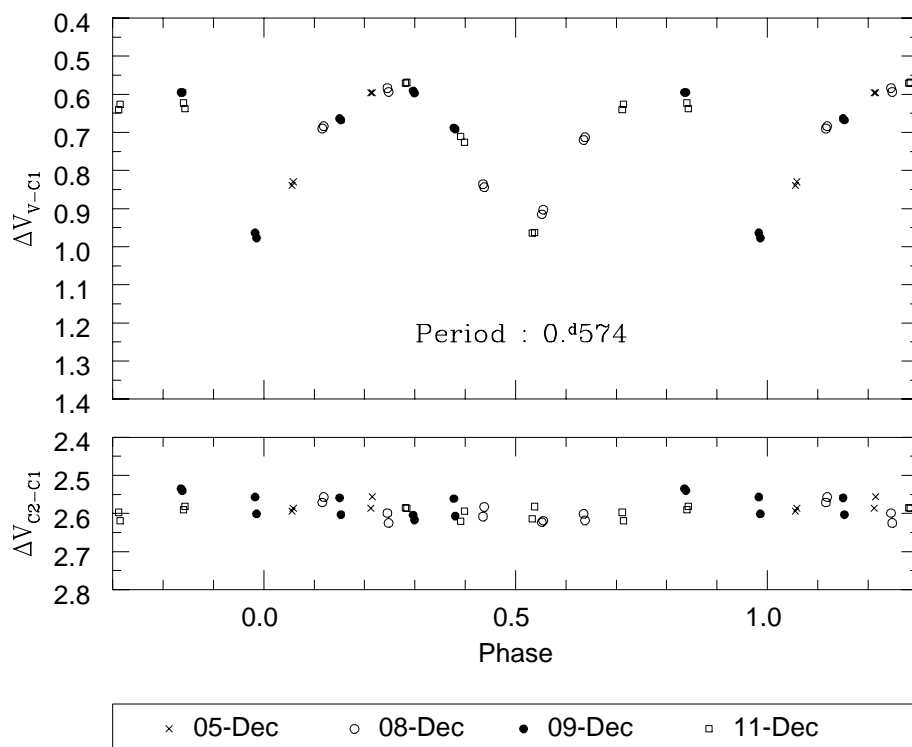


Figure 2. Light variations of HII 706. Magnitude differences between the two comparison stars are also plotted in the lower panel. Data points obtained over four nights are differently marked for each observation night

Table 1: Differential magnitudes of HII 706 ($\Delta V = V_{\text{HII706}} - V_{\text{HII746}}$)

HJD 2451000 +	ΔV	HJD 2451000 +	ΔV	HJD 2451000 +	ΔV	HJD 2451000 +	ΔV
153.07418	0.839	156.16336	0.844	157.14637	0.664	159.01099	0.726
153.07561	0.830	156.22908	0.915	157.14786	0.668	159.08791	0.964
153.16392	0.596	156.23059	0.903	157.23028	0.591	159.09087	0.963
153.16559	0.596	156.27667	0.720	157.23173	0.597	159.19068	0.640
155.97877	0.690	156.27814	0.713	157.27667	0.688	159.19222	0.626
155.98024	0.684	156.96551	0.595	157.27818	0.692	159.26448	0.623
156.05291	0.584	156.96715	0.595	158.94350	0.571	159.26600	0.638
156.05430	0.594	157.05015	0.964	158.94504	0.569		
156.16183	0.836	157.05184	0.977	159.00652	0.711		

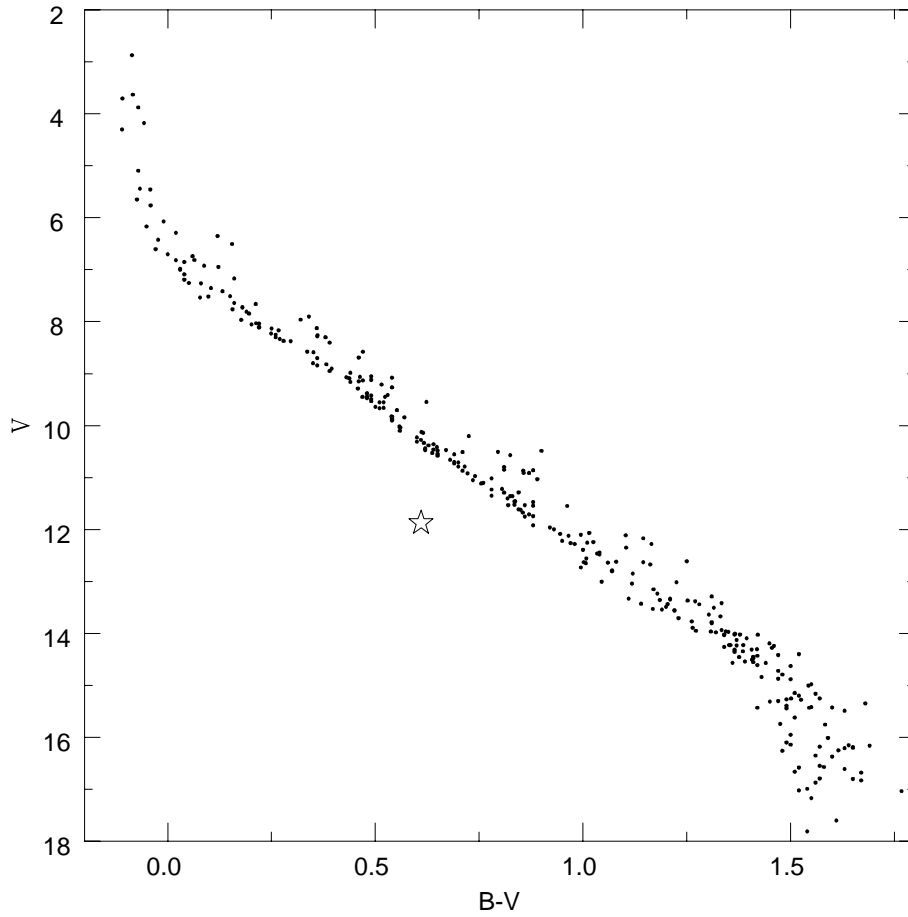


Figure 3. Position of HII 706 in the color-magnitude diagram of the Pleiades cluster. We use magnitudes and colors in the BDA data base (Mermilliod 1992). HII 706 (star symbol) is about 1^m5 fainter than main sequence stars in the cluster with the same color

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