COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5039

Konkoly Observatory
Budapest
7 March 2001

HU ISSN 0374 – 0676

TWO NEW SHORT PERIOD VARIABLES: HD 88278 AND HD 128862

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Variability in both HD 88278 (HIP 49416) and HD 128862 (HIP72055) was first discovered by the *Hipparcos* mission, with both stars classified as "Unsolved" variables (ESA 1997). Periodogram analysis of the *Hipparcos* epoch photometry suggests single frequencies of 15.7 d^{-1} (amplitude 21 mmag, HD 88278) and 22.7 d^{-1} (amplitude 16 mmag, HD 128862) in the two sets of observations (Fig. 1). This prompted us to obtain short observing runs on these stars, in order to confirm the periodic variations.

All observations were made using the photoelectric Modular Photometer attached to the 0.5-m telescope of the South African Astronomical Observatory. Measurements consisted of a continuous stream of 10 second integrations through a B filter, with occasional interruptions in order to monitor the sky background. One short observation run (2.3 hours) on HD 88278, and two short runs on HD 128862 (durations of 2.7 and 3.5 hours), were obtained. Standard reduction procedures for such observations were followed. The resulting light curves, consisting of one minute averages of the reduced data, are shown in Figures 2 and 3.

A sinusoid with the frequency determined from the *Hipparcos* data was fitted to the HD 88278 data by least squares, and is plotted with the observations in Fig. 2. Given that no corrections to the data were made for atmospheric transparency variations, the fit is quite good. We conclude that the star is indeed variable with the *Hipparcos* frequency of 15.72375 d^{-1}. (The least squares uncertainty is 4 in the last quoted digit: the high accuracy is due to the long time baseline of the *Hipparcos* observations). The amplitude in the B-band is about 42 mmags.

It is clear from Fig. 3 that a single stable periodicity cannot adequately describe the observations of HD 128862 — for example, the amplitude during the first run is considerably lower. A near-perfect fit to the observations is possible with a four-frequency solution, but given the paucity of data, much credence could not be put in it, particularly as the amplitude of the star may simply be variable. Least squares fitting of a single sinusoid gives a best frequency of 10.4 d^{-1} (or nearby 1 d^{-1} aliases). There is no exceptional feature in the amplitude spectrum in Fig. 1 which corresponds to this rather obvious frequency in our data. However, examination of the window function of the *Hipparcos* data shows that strong aliases may be expected at separations of $\sim$ 11.3 d^{-1} from the true frequencies in the data, so that the most prominent feature in Fig. 1 (bottom panel)

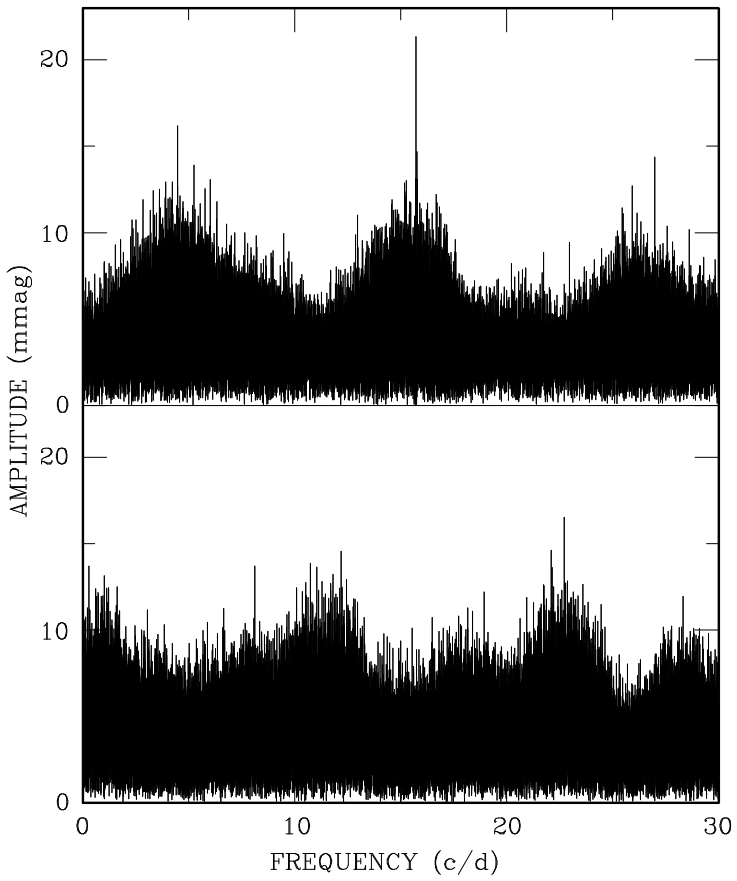

Figure 1. Amplitude spectra calculated for the *Hipparcos* epoch photometry of HD 88278 (top panel) and HD 128862 (bottom panel). Prewhitening by subtracting appropriate sinusoids from the datasets leaves residuals without any pronounced features in their amplitude spectra

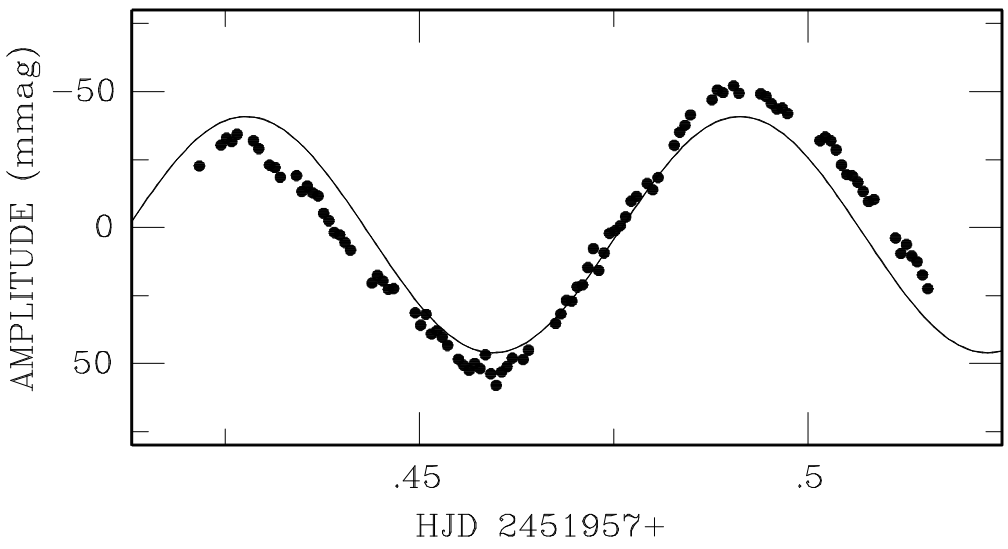

Figure 2. The B-band observations of HD 88278, and a fitted sinusoid with a frequency of 15.7 d^{-1}

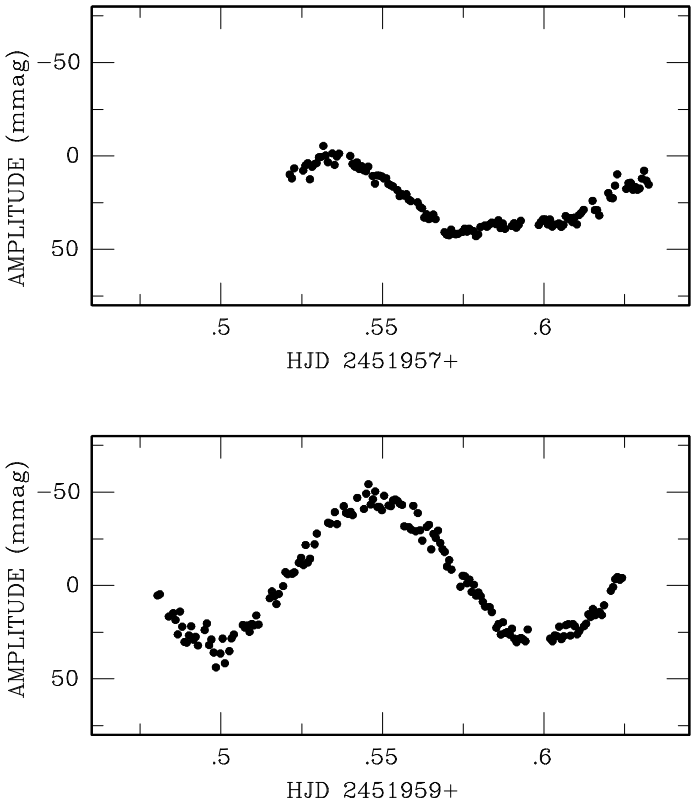

Figure 3. The B-band observations of HD 128862

may be an alias of a true frequency of 11.4 d^{-1}. The latter frequency is reconcilable with the results of our observations.

The *Hipparcos* parallaxes of the stars, together with their V magnitudes, give absolute visual magnitudes M_V of 1.52 ± 0.17 and 0.19 ± 0.75 for HD 88278 and HD 128862. These luminosities appear to be respectively too low and too high for the MK classifications of A4 III/IV (HD 88278) and F0 III/IV (HD 128862) (see Houk & Cowley 1975). Agreement is better with the photometric absolute visual magnitudes of 0.62 and 1.19 derived from Crawford's (1979) calibration of the Strömgren photometric indices (Hauck & Mermilliod 1998). Other information derived from the Strömgren photometry is similar $E(b-y)$ reddenings of 0.07 and 0.06, and δc_1 indices of 0.23 and 0.19, for HD 88278 and HD 128862 respectively. Finally, the Hβ and c_0 indices can be compared with the model results of Moon & Dworetsky (1985) to find $T_{\rm eff} = 8000$ K, $\log g = 3.6$ (HD 88278) and $T_{\rm eff} = 7400$ K, $\log g = 4.0$ (HD 128862).

The spectral types, periods and amplitudes of both stars are consonant with their being δ Scuti pulsators. We therefore proceed to calculate the implied pulsation constants

$$\log Q = -6.456 - \log f + 0.5 \log g + 0.1 M_{\rm bol} + \log T_{\rm eff},$$

f being the frequency in d^{-1}. For HD 88278 we use the *Hipparcos* frequency, while for HD 128862, $f \sim 11.4$ d^{-1} is assumed. Resulting pulsation constants are then 0.016, 0.013 (HD 88278) and 0.023, 0.030 (HD 128862), where the first value given for each star is based on the *Hipparcos* absolute magnitude, and the second on the photometrically derived M_V. These values are normal for δ Scuti stars.

The authors thank Dr Gerald Handler for supplying an unpublished list of candidate δ Scuti stars. This research made use of the SIMBAD database, operated at Strasbourg, France.

References:

Crawford, D. L., 1979, *AJ*, **84**, 1858
ESA, 1997, The Hipparcos and Tycho catalogues, ESA SP-1200
Hauck, B., Mermilliod, M., 1998, *A&AS*, **129**, 431
Houk, N., Cowley, A.P., 1975, Michigan Spectral Catalogue Volume 1, University of Michigan, Ann Arbor
Moon, T.T., Dworetsky, M.M., 1985, *MNRAS*, **217**, 305