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δSct like variability in the Am star 18 Vul

In this short communication the discovery of luminosity variations in the A3mIII star 18 Vulpeculae (HR7711) is reported, on the basis of rapid photometric observations performed looking for periodicities ranging from a few minutes to several hours. 18Vul is an already known magnetic variable star (Bertolini, Foschini and Piccioni, 1974) with a rotation period $\sim 9.^d31$. The Strömgren photometry (Hauck and Mermilliod, 1980) provides values of b-y=0.047 and C_1=1.149 which place it near the blue border of the δSct instability strip. It is member, and a possible blue straggler (BS) star, of the stellar cluster NGC6882.

18Vul was observed by Breger (1969) in a large search for δSct variables amongst stars within the instability strip. He observed it twice (for $0.^h4$ and $3.^h5$ long respectively) and concluded that the star was stable in the range of interest at a level of $\sim$2 mmag. Manteiga and Martínez Roger (1988) observed it in a campaign to determine the IR colours of a large group of BS stars, finding a strange photometric behaviour; so it was decided to observe 18Vul again carefully also in the visible range.

In Table 1, we present the journal of the observations made in 3 consecutive nights in October 1988. Observations were performed through a B filter, using the IAC-UBV photometer (Belmonte, 1986), working in photon counting mode, attached to the Cassegrein focus of the 1.5m Carlos Sánchez Telescope (TCS) of the Observatorio del Teide (Tenerife, Spain). In the three nights, small light variations were evident in the light curves. The data were reduced via the standard fit to airmass, obtaining the residual data series, the standard deviation of the fit (σ) and the extinction coefficient (K_B) amongst other parameters. Both σ and K_B are listed in Table 1, showing the high photometric quality of the runs and hence of the data (notice that in σ any actual signal will be included).

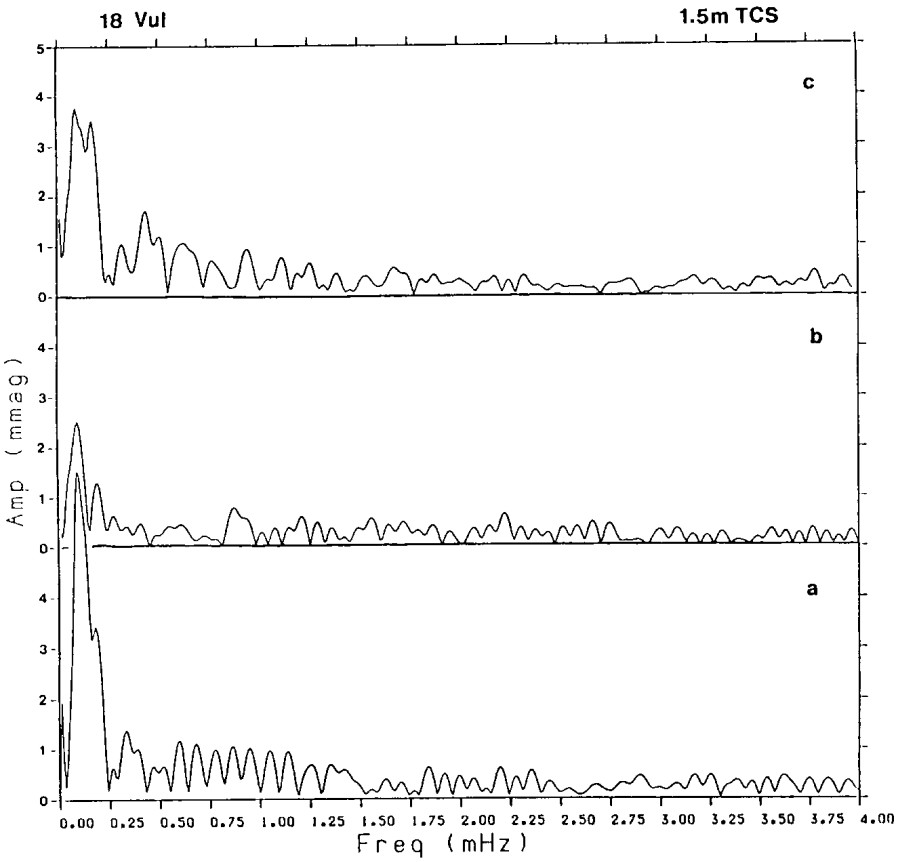

Figure 1: Amplitude spectra of the residual data series obtained on the star 18 Vul. Notice the double peak at frequencies between 0 and 0.25 mHz associated to an unresolved double mode pulsation of the star. **a**: For the night of October the 18^{th}, **b**: Id. 19^{th}, **c**: Id. 20^{th}.

Table 1: *Journal of the observations.*

Date	t (hours)	σ (mmag)	K_B (mag/am)
18/10/88	4.2	5.8	0.23
19/10/88	4.5	2.9	0.25
20/10/88	4.5	4.8	0.23

Nightly data series were analyzed via an Iterative Sine Wave Fitting (ISWF) procedure for unevenly spaced data (Ponman, 1981; Belmonte, 1986) to obtain, for each night, the amplitude spectrum. Figure 1 shows the results of the analysis. In all the plots two significant peaks are present at the low frequency range. The corresponding frequency, amplitude and phase are listed in Table 2.

Table 2: *Frequency, amplitude and phase of the two main peaks present in the amplitude periodogram of Figure 1. Origin for the phase 0^h UT October 18.*

Date	ν_1 (μHz)	A_1 (mmag)	ϕ_1 (rad)	ν_2 (μHz)	A_2 (mmag)	ϕ_2 (rad)
18	90	6.3	0.3	180	3.4	2.8
19	90	2.4	0.1	200	1.3	1.9
20	90	3.8	0.3	180	3.5	2.4

In order to obtain more information, to decrease the noise and to increase the resolution, a single time series was produced using the 3 nightly series. This series was again analyzed via ISWF. The analysis, after *prewhitening* of the highest amplitude peak at the lowest frequency (95.3 μHz), yielded the following results:

P (hours)	ν (μHz)	A (mmag)	ϕ (rad)
2.9	95.3	3.83	1.1
1.4	201.3	1.50	0.3

From this analysis (see Figure 2), it was also obvious that 18Vul was stable in the range from 1 hour to a few minutes, at least, at a level of 0.5 mmag.

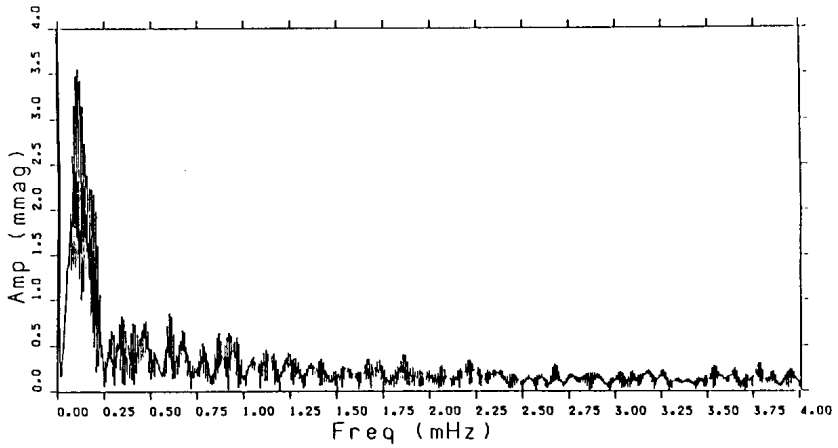

Figure 2: Amplitude spectrum of the whole residual series of the Am star 18Vul (18-19-20/10/88).

The main conclusion is that 18Vul is fluctuating (pulsating?) with, at least, a main period (95.3 μHz) and possibly its first harmonic (201.3 μHz). The very low amplitude of the variations could explain the non variability found by Breger in his short series of observations. From the analysis of the complete series, there are traces that more than two frequencies are in action at once in this star which, together with the seemingly amplitude modulation, has made us to include 18Vul in a future rapid differential photometric and spectroscopic campaign, to be soon performed.

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