COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 3553

Konkoly Observatory
Budapest
10 January 1991

HU ISSN 0374 - 0676

DISCOVERY OF RAPID OSCILLATIONS IN HD 19918

The southern (δ=-82°) Ap SrEuCr (Houk & Cowley 1975) star HD19918 was monitored photometrically for 2.2 hr on the night of 6/7 October 1990 (JD2448171) as part of the Cape Rapidly Oscillating Ap star survey. The scope and goals of the survey as well as the first results are described in a separate publication by Martinez, Kurtz & Kauffmann (1991). HD19918 is the sixth rapidly oscillating Ap (roAp) star to emerge from the survey since its beginning in May 1990.

The photometry was obtained using the University of Cape Town photometer attached to the 0.75-m telescope of the South African Astronomical Observatory (SAAO) in Sutherland. The observations comprise continuous 10-s integrations through a Johnson *B* filter and a 30 arcsec diaphragm with occasional interruptions for sky measurements. Because we were searching for oscillations on time-scales of 5-15 min we did not observe comparison stars and no attempt was made to transform our observations to the standard system.

The reduction procedure was as follows: The data were corrected for coincidence-counting losses, sky background and extinction, in that order. Because no comparison stars were observed the data contain variations on time-scales of 0.5 hr which were introduced by sky transparency variations. On good nights these sky transparency variations will be of sufficiently low amplitude and be gradual enough not to interfere with our search for rapid oscillations. Their effect is simply to introduce a few high amplitude (1-4 mmag) peaks at low frequencies ($\nu \leq 0.6$ mHz) in the Fourier transform of the observations (See Fig. 1). The Fourier transforms presented in this Bulletin were computed using Deeming's (1975) Discrete Fourier Transform algorithm with the modification suggested by Kurtz (1985).

In Figure 1(a) we present the amplitude spectrum of the observations of HD 19918 on JD2448171 out to 12.5 mHz. Normally we would remove the low frequency sky transparency peaks, but we deliberately show them in Fig. 1 so that the reader may judge the data. The peak marked ν_1 suggests the presence of rapid oscillations at 1.5 mHz with an amplitude of 0.9 mmag. We thus observed this star again on the nights JD2448172 and JD2448217 to confirm the presence of rapid oscillations at ν_1 = 1.5 mHz. The JD2448172 data do not show a peak at 1.5 mHz but these data were

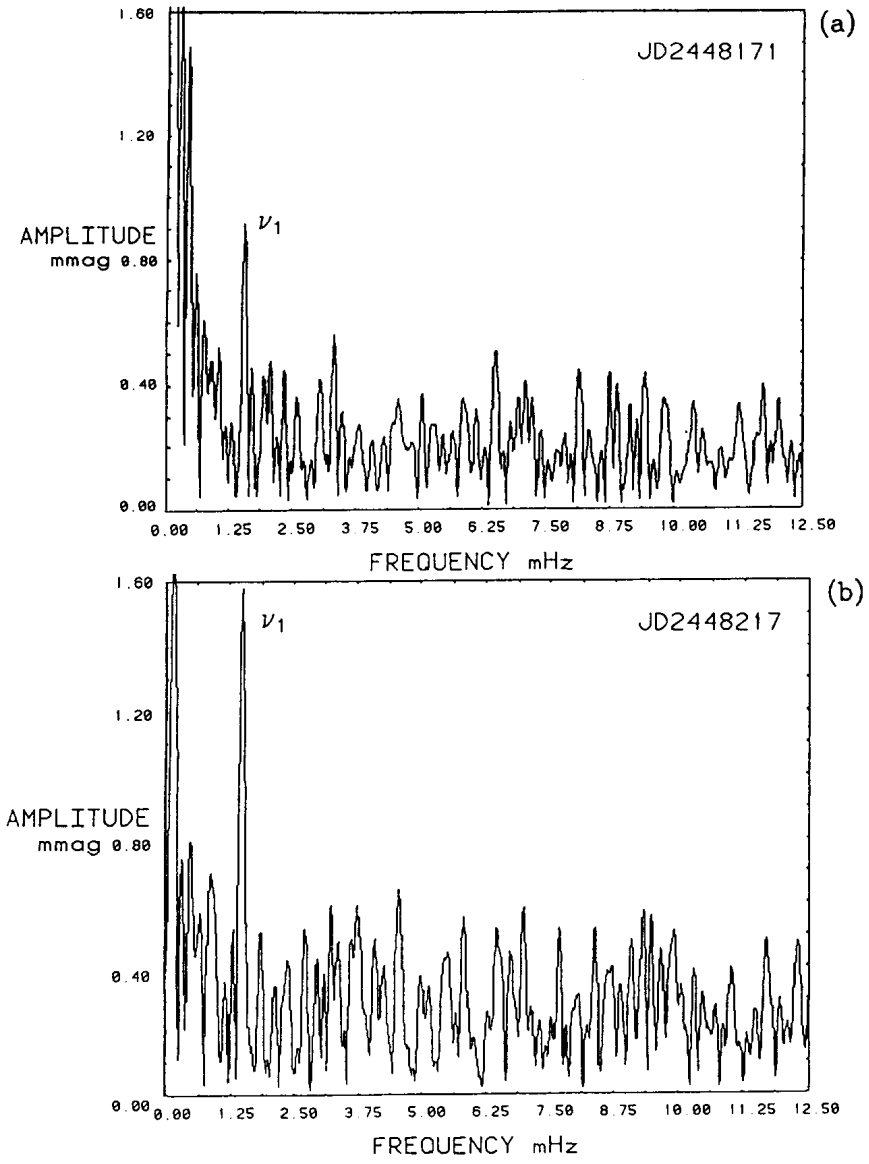
(a)
JD2448171
ν_1
AMPLITUDE
mmag
1.60
1.20
0.80
0.40
0.00
0.00 1.25 2.50 3.75 5.00 6.25 7.50 8.75 10.00 11.25 12.50
FREQUENCY mHz
(b)
JD2448217
ν_1
AMPLITUDE
mmag
1.60
1.20
0.80
0.40
0.00
0.00 1.25 2.50 3.75 5.00 6.25 7.50 8.75 10.00 11.25 12.50
FREQUENCY mHz

Figure 1

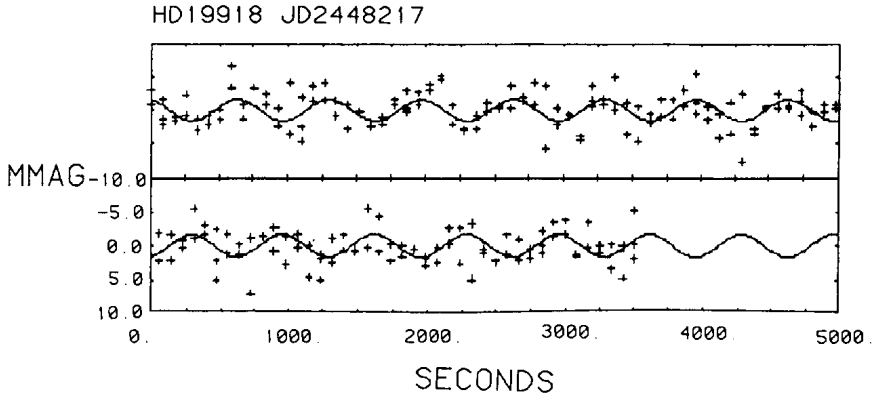

Figure 2

twice as noisy as the data acquired on night JD2448171. We will not discuss the JD2448172 observations further. In Figure 1(b) we present the observations acquired on night JD2448217. The 1.50 mHz peak appears with a very good signal-to-noise in these data. Note the difference in the amplitude of ν_1 in the two panels of Fig. 1. Such amplitude modulation is commonly observed in the roAp stars. It arises in the following ways: (1) through the beating of two, or more, unresolved oscillation frequencies, (2) though the oscillations being observed with changing aspect as the star rotates or (3) through intrinsic variations in the amplitude of the oscillation frequency. Only a detailed study of the oscillations will reveal relative importance of these factors in HD19918.

In Fig. 2 we present a light curve of the observations acquired on night JD2448217. In order to reduce the point to point scatter we have binned the data to 40-s integrations by taking non-overlapping 4-point averages of the data. We have also removed some low frequency sky transparency variations to facilitate the reader's perception of the oscillations. The solid line is a least squares fit to the data of a sinusoid with frequency $\nu_1 = 1.50$ mHz and an optimized amplitude of 1.61 mmag. The fit is reasonably good.

As of this writing we have high-speed observations of HD 19918 on 8 other nights, most of which show the 1.50 mHz peak at a good signal-to-noise. One must bear in mind that nights of excellent photometric quality are needed to study the rapid oscillations in HD 19918 because the lowest airmass attained by this $\delta = -82^{\circ}$ star at Sutherland is 1.54. Further observations and a detailed frequency analysis of the oscillations of HD 19918 will be presented in a future publication.

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