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DISCOVERY OF RAPID OSCILLATIONS IN THE Ap STAR HD 84041

The rapidly oscillating Ap (roAp) stars are magnetic Ap SrCrEu stars which exhibit low-amplitude ($A \leq 8$ mmag semi-amplitude) rapid broadband light oscillations with periods in the range $P = 4$-16 min. These light oscillations are interpreted as low degree ($\ell \leq 3$), high overtone ($n >> \ell$) p-mode pulsations. The most comprehensive recent review of these variables is that of Kurtz (1990). Shortly after Kurtz's review was written, we commenced a systematic survey of the roAp phenomenon in the Southern sky. The Cape Rapidly Oscillating Ap Star Survey has already led to the discovery of six new roAp stars (Martinez *et al.* 1991, Martinez & Kurtz 1991). We present here the seventh roAp star to be discovered in our survey, HD 84041.

On the night JD2448335 we acquired 1.02 hr of high-speed photometry of HD 84041 which suggested the presence of rapid oscillations with a frequency of 1.1 mHz and an amplitude of about 1.2 mmag. To confirm our detection of rapid oscillations, we observed this star again on the nights JD2448354, 8355, 8358, 8359, 8362 and 8377. The observations were acquired with various 0.5-m, 0.75-m and 1.0-m telescope/photometer combinations at the Sutherland site of the South African Astronomical Observatory. All observations consisted of continuous 10-s integrations through a Johnson B filter. Our usual observing and reduction procedures are described in detail by Martinez *et al.* (1991). The data were all Fourier analyzed in individual nights, in groups of closely spaced nights, and as a whole. There are reasonably convincing indications of amplitude modulation among the nightly data sets, and even on a time-scale shorter than a night, but space does not permit us to present these frequency analyses here. These analyses suggest that the oscillations in HD 84041 are multi-periodic.

In Fig. 1 we present light curve acquired on night JD2448377. The amplitude spectrum of this light curve is shown in Fig. 2, in which the peak of interest is the one labeled ν_1 at 1.14 mHz. The solid line in Fig. 1 is a fit of a sinusoid of frequency $\nu_1 = 1.14$ mHz to the data. The peaks to the left of ν_1 in Fig. 2 are caused by sky transparency variations during the observations. These sky transparency variations have been removed in Fig. 1 to facilitate the reader's perception of the oscillations. There are several non-cosmetic reasons why these peaks must be removed in the frequency analyses, but we

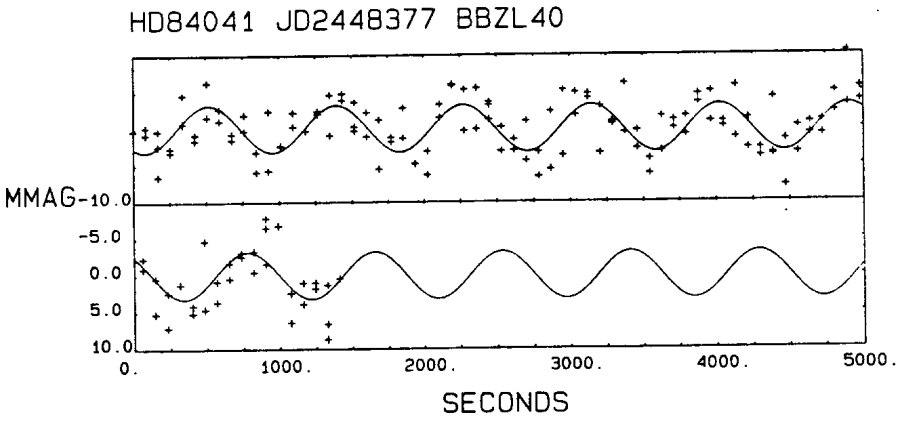

Figure 1

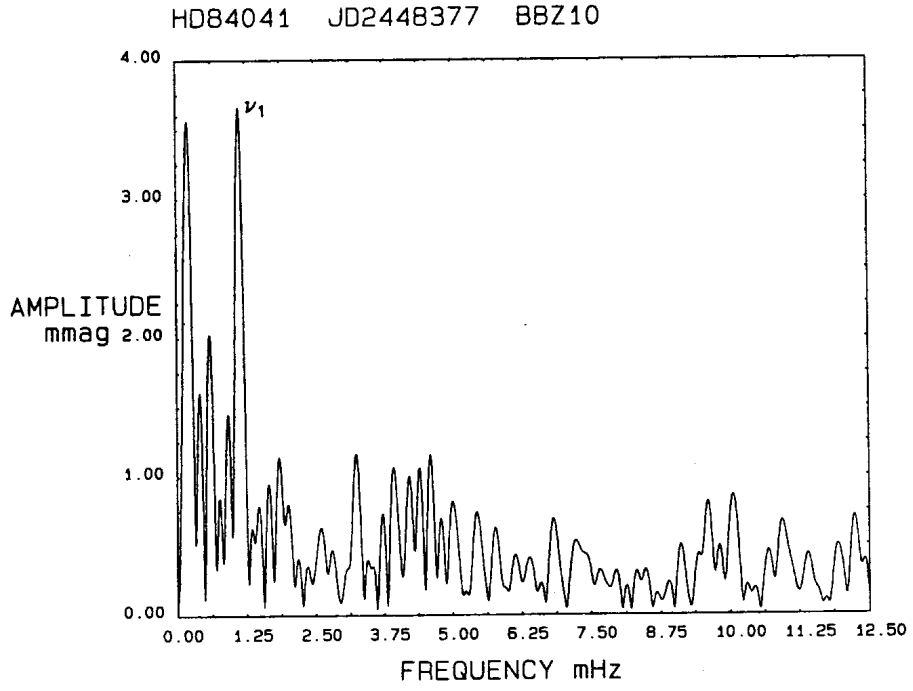

Figure 2

have left them in Fig. 2 so that the reader may judge the data. The noise at frequencies $\nu_1 \geq 0.8$ mHz, the scintillation noise, is quite high in Fig. 1 because these observations were acquired using an 0.5-m telescope. Ironically, these are some of the best signal-to-noise data we have! As Fig. 2 shows, at $\nu_1 = 1.1$ mHz, the oscillations are not clearly in the frequency regime dominated by scintillation noise and this complicates the study of the rapid oscillations in this star. A more detailed analysis of the rapid oscillations of HD 84041 will be presented in a future publication.

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