

# The Pulsation Characteristics of HD 93044

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## Abstract

The amplitude and period of the first frequency increased, but the amplitude and period of the second frequency decreased. Two new frequencies (10.5011 and 2.0484 c/d) were found. The frequency (2.0484 c/d) might be an interaction term from which resonances can occur and then lead amplitude and period variations.

## 1. Observations and period analysis

The star was observed from February 7 to March 5, 1992 with the 60-cm telescope at Beijing Astronomical Observatory. The period analysis was completed using a combination of single-frequency Fourier transforms and multifrequency least squares of brightness residuals (Breger 1990, Hao Jin-xin 1991). The 5 frequencies were: 11.9085, 16.801, 10.498, 2.052 and 22.085 cycles per day. The power spectra of the 5 frequency solution were shown in Figure 1. The data were combined together with the data obtained by Liu Zong-li in spring of 1991 as a new set of data, and the period analysis was made for it using the same methods. The 5 frequencies were: 11.90803, 16.8017, 10.5011, 2.0484 and 22.0833 cycles per day.

## 2. Results

Comparing with the result obtained by Liu Zong-li (1992) the amplitude and period of the first frequency increased. And the amplitude and period of the second frequency decreased. Two new frequencies (10.5011 and 2.0484 cycles per day) were found. They are very obvious in the power spectra of HD93044 (see Figure 1). The frequency (2.0484 cycles per day) might be an interaction term from which resonances can occur and then lead to amplitude and period variations. The resonance hypothesis as an explanation for long-term amplitude and period variations is supported.

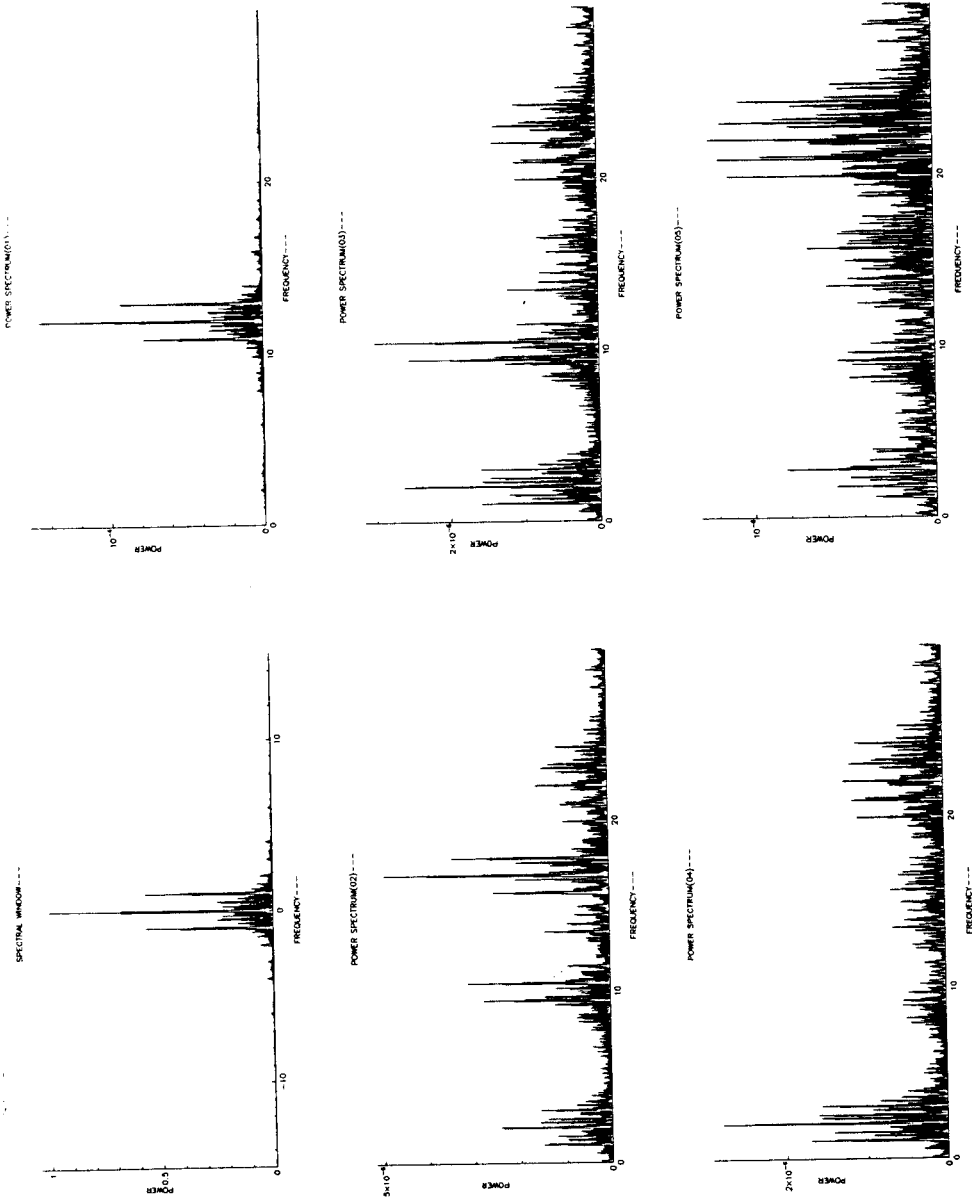


Figure 1. The power spectra of five frequency solution of HD93044

**References:**

- Breger, M. 1990, *Comm. Asteroseismology* **20**, Vienna: Austrian Acad. Science  
Hao, J.-x. 1991, *Publications of Beijing Astronomical Observatory* No.18  
Liu, Z.-l. 1992, *Astrophys. and Space Science*, in press

**Discussion:**

Tobias Kreidl: I would like to comment that I am very pleased to see how small telescopes can be used to obtain good data on  $\delta$  Sct stars and provide a valuable contribution to the studies of these stars, since the errors are mainly limited by transparency and photon counting statistics.

Li Zhi-ping: Thank you.

Michel Breger: The frequency of 2 c/d is very interesting. Have you eliminated the possibility of observational errors causing the 2 c/d peak? Is the frequency present in different subsets of your extensive data?

Li Zhi-ping: Before doing period analysis all the measurements of every night were averaged to obtain the average brightness of every night. The average brightness was subtracted from the measurements of each night to make the average brightness of each night zero to improve the zero-point drifts between the different nights. Therefore, the possibility of observational errors causing the 2 c/d peak was eliminated. The frequency was present in different subsets of our extensive data.

Jaymie Matthews: Does your frequency solution include the cross-coupling terms among the principal frequencies you identify?

Li Zhi-ping: No. you can see that the spectral window is very sharp, and the principal frequencies we identify are independent each other.