

## Spectral Line Variations in the Ap Star HD 42536

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**Abstract.** The Sr-Cr type chemically peculiar star HD 42536 (= HR 2195) was observed with the 2.34 meter Vainu Bappu Telescope, Kavalur during the period of November 1998 to April 1999. A total of 46 spectrograms were obtained in the wavelength region of 3900 Å to 4300 Å at a linear dispersion of 0.65 Å per pixel. The equivalent widths of Sr (4077) and Cr (4172) have been found to be varying with a period of  $0.58 \pm 0.02$  day, the amplitudes being about 100 mÅ and 60 mÅ respectively. This period is a resonance value of the period given by Manfroid and Mathys (1985).

*Keywords :* Ap star, Spectral lines, Variations

### 1. Introduction

Some of the peculiar A type stars (or chemically peculiar stars) have been found to be displaying variations in certain spectral line features. This indicates a variation in the abundances of the respective elements as seen on the surface of the particular star. Considering the concept of heterogeneous surface of these stars with concentration of different elements in various patches, the study of spectral line feature variations can give a better understanding of the surface details.

With this in view, the Ap star HD 42536, which has been catalogued as a variable star, is chosen and spectroscopic observations were obtained. In this paper, the results of our observations are presented.

### 2. Observations

The chemically peculiar A0p star HD 42536 (= HR 2195) of Sr Cr type was spectroscopically observed on 8 nights using the OMR spectrograph, mounted at the Cassegrain focus of the 2.34

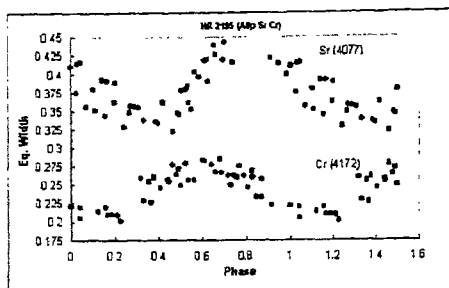


Fig. 1: Variations in the spectral lines of Sr (4077) and Cr(4172) in the Ap star HD 42536 (= HR 2195). The phase is based on the period of 0.58 day and the scale for the equivalent width (in Angstroms) is arbitrary.

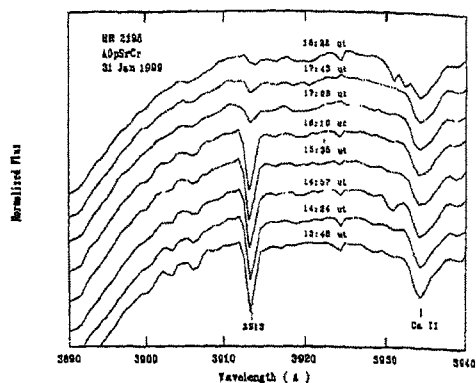


Fig 2: The sequential spectrograms of HD 42536 taken on 31 January 1999 showing the absorption line at 3913 Å.

meter Vainu Bappu Telescope at Kavalur during the period November 1998 to April 1999. A grating of 1200 lines per mm was used and the observations were taken in the second order. A total of 46 spectrograms were obtained covering a usable wavelength region of 3900 Å to 4300 Å on a 1k CCD with a linear dispersion of 0.65 Å per pixel. The data was analysed with the IRAF packages and the respective equivalent widths were obtained.

### 3. Discussion

The equivalent widths of Sr (4077) and Cr (4172) lines, thus obtained, were subjected to the FFT based period determination algorithm (Raveendran, 2002) and it was found that they were varying with a period of  $0.58 \pm 0.02$  day, the amplitudes being about 100 mÅ and 60 mÅ respectively. This is displayed in Fig.1. The initial epoch of JD 2443845.00 as quoted by Renson and Manfroid (1981), was used in the period determination algorithm. They had derived a period of  $3.65 \pm 0.10$  days for this star and also indicated it as an uncertain value.

Later, Manfroid and Mathys (1985) found a shorter period of 1.36 days (see Catalano et al., 1991) and categorically ruled out the possibility of the longer period. While mentioning that this short period also is an uncertain value, they however added that it is probably an alias of the earlier quoted longer period. At this juncture, it is interesting to note that the period of 0.58 day, obtained by us, is a resonance value  $P/(1+P)$  of the above mentioned shorter period.

### 4. Variation of the Feature at 3913Å

In addition, the sequential spectrograms of HD 42536 taken on 31 January 1999 showed an intriguing absorption line at 3913 Å. To our surprise, this feature did not appear on any other spectrograms taken by us on other dates.

This line was indeed strong enough to be noticed in the spectrogram taken at the beginning of that night. But it gradually became weaker in the subsequent spectrograms of the same night as shown in Fig.2. It almost disappeared in a matter of about  $4\frac{1}{2}$  hours. While we have not been able to attribute this feature to any reasonably identifiable element, the appearance and the subsequent weakening of this spectral feature, might be due to some short lived phenomenon on the surface of the star, involving some element that is capable of giving rise to this absorption line. Actual identification of this feature is presently beyond the scope of this paper.

### **References**

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