

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

Number 2508

Konkoly Observatory
Budapest
25 April 1984
HU ISSN 0374-0676

VARIABLE LINE STRENGTHS OF STAR HD 50896

Wolf-Rayet stars form a distinct class of stellar objects and have spectra in which emission lines of either nitrogen and helium predominate (WN) or else emission lines of helium, carbon and oxygen predominate (WC). Furthermore, these stars suffer mass loss through strong stellar winds. Their evolutionary status is also of significant interest since these objects are suspected to be supernovae precursors. Also, in case of 'Of' and W-R stars, the mechanisms responsible for mass loss are not completely understood. It is also not clear whether these objects are pre-or post-main sequence stars (cf., Kitchin, 1982).

In some W-R stars it has been found that the emission line strengths show temporal variations. Attempts have been made to explain such variability on the basis of binary hypothesis which attributes the emission line strength variations to fluctuations in gas streams in and around the members of a close binary system. Alternatively, the pulsation hypothesis has been used which ascribes these variations in line strengths to the presence of pulsational instability of massive carbon burning cores of evolved objects.

HD 50896 is one amongst the brightest Wolf-Rayet stars ($V = 6.9^m$). Its spectral type is WN 5 (Smith, 1968, 1973) and the star appears to be the central object of the faint ring nebula S308 having a diameter of 35 arc minutes. Previous investigators drew attention to the variation in the emission lines of this star but did not find any periodicity.

Brucato (1971) published sets of photographic survey of line strengths in nine 'Of' stars and reported the evidence of variability in most of the selected stars. Recently, some evidence has also been advanced indicating that the emission line strengths in these objects may show short period fluctuations (Weller and Jeffers 1979). Bhang (1975) published photoelectric line profiles of W-R stars and reported the variations in the profiles of emission lines. Weller and Jeffers (1979) reported similar short term variability in strengths of emission lines for some W-R stars including that of HD 50896. Fermani et al. (1979, 1980) derived a period of 3.763^d from

spectral and photometric variations observed for this star. The period was later confirmed by McLean (1980) and by Cherepashchuk (1981). Here we report our findings of marked variations in the emission line strengths of HD 50896.

The star HD 50896 was observed with a view to monitor the variability of different emission lines in the visible region. We secured 11 spectrophotometric scans of the star on 13th February, 1984 over a time span of nearly 1.5 hours. The star was observed with a Hilger and Watts monochromator at the Cassegrain focus of the 104-cm telescope at Uttar Pradesh State Observatory, Naini Tal. The dispersion at the exit slit of the monochromator was $70 \text{ \AA}/\text{mm}$. The scans were obtained with an exit slit of 0.7 mm admitting 50 \AA of the spectrum.

Figure 1 shows the time variations of the observed strengths of different emission lines for HD 50896. The emission lines chosen are $\lambda 4097(\text{NIII})$ - $\lambda 4103(\text{HeII})$, $\lambda 4339(\text{HeII})$, $\lambda 4859(\text{HeII})$, $\lambda 5411(\text{HeII})$, $\lambda 6560(\text{HeII})$ and $\lambda 7065(\text{HeI})$.

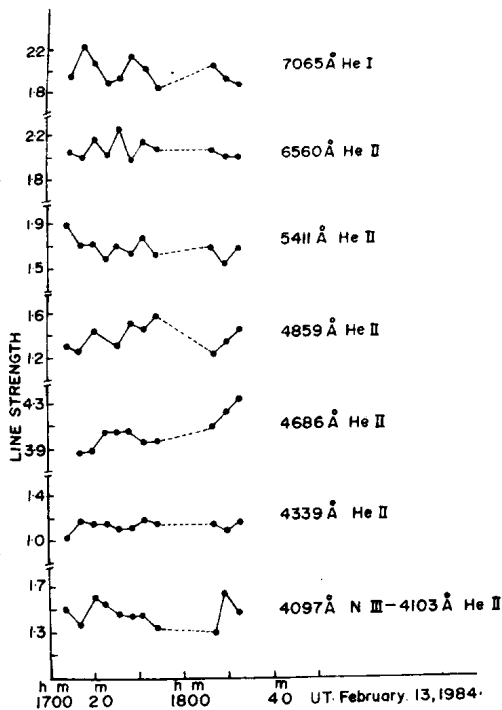


Figure 1

Observed variation in line strengths of star HD 50896

For each line, the line strength has been defined as (Intensity of line)/ (Intensity of continuum). It is clear that there are large variations in line strengths of the chosen emission lines. The variability is of the order of 0.2 for $\lambda 4686$ (HeII) line which is the strongest one. For a few emission lines the characteristic duration of variability (max-min-max) ranges between 20 to 25 minutes. However, this pattern does not repeat itself for all the emission lines. To confirm it, a few more observations are necessary.

These emission line strength variations may favour the presence of pulsational instability possible if the star is evolved and has a massive carbon burning core. Alternatively, one may surmise that the star may be a binary system. The large variations of line to continuum ratio (line strength) and the absence of absorption lines favour a low mass companion. The large height above the galactic plane and the low mass of the companion supports the idea that the star HD 50896 may be a companion star in a binary system.

The author is thankful to Dr. M.C. Pande for suggesting the problem and fruitful discussions.

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