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RECENT ONSET OF AN OUTBURST IN μ CENTAURI

μ Cen (HR 5193, HD 120324, MWC 229, B 2 IV-Ve, v sin i= 155 km/s) a member of the Sco-Cen association, is known as a pole-on Be star. The spectrum cyclically displays strong Balmer line emission. First Balmer emission in μ Cen was observed by Fleming (1890). Afterwards strong emissions, mainly in H_α, were observed by different observers in 1904, 1929 - 1931, 1940, 1953, 1962, 1967 and 1973 (Peters, 1979 and references therein). H_α emission was reduced to a central reversal in photospheric feature by June 1976 (Peters, 1979). In 1977 it became almost an absorption line and some flickering in the H_α emission, was observed by Dachs et al. (1981) which in November 1978 even increased to a flare like phenomenon. Again in June 1983 H_α was perfectly symmetric and virtually undisturbed and emission strength of this line had returned to a moderate level from almost zero in 1977/1978. From moderate emission it again came back to pure absorption till 25 March 1985 and on 27 March 1985 a centrally reversed emission (V < R, R < Icont) was observed by Peters (1986). Along with this emission phase a rapid variability (10-20 minutes) in the profile of photospheric He I 6678 A was also observed by her. After this episode μ Cen was in quiescence phase till 01 February 1987 and it started changing from absorption to emission from 02 February 1987. This reached to a maximum emission strength on 07 February 1987 (Baade, 1987). This type of onsets of emission phases alternating between periods of activity and quiescence, will throw important information for studying the ejection mechanisms of matter from the inner part of the star to the circumstellar envelope.

In this paper we present the results of recent outbursts in μ Cen. Spectroscopic observations of μCen in the H_α region (6400 - 6800 A) were obtained on several nights between March 1987 and April 1987 with Bhavanagar spectrograph using a grating of 1800 grooves/mm at the cassegrain focus of the 0.75 m reflector of Vainu Bappu Observatory, Kavalur, India. The reciprocal dispersion at H_α is 16 A/mm on 098 02 emulsion.

The spectrograms were digitized using PDS-1010M microdensitometer with a sampling interval of 5 μm. The laboratory comparison spectrum (Fe + Ar or Fe + Ne hollow cathode source) which were taken on both sides of the stellar spectrum, was used for wavelength conversion. All data reductions were done on a VAX - 11/780 computer using RESPECT software package (Prabhu et al., 1987). Obtained H_α profiles are shown in Fig. 1. In Fig. 1 the wavelength scale has been shown in an opposite way i.e. the wavelength decreases towards the arrow mark.

From Fig. 1. it is clearly seen that on 26 March 1987 the H_α profile has developed a weak central reversal emission. This central reversal has become very strong on 30 March 1987 according to our observation. Due to the clouds we were not able to take observations on 28, 29, 31 March and 01 April 1987. It may be possible that the strength of H_α central reversal emission was stronger on 29 or 31 March 1987. However this emission again came back to absorption on 02 April 1987. These types of outbursts look like non-periodic (from the available literature survey). But the fact may be that most of the mass loss occured outside of our line of sight to the star for which we are not able to get the correct picture. Peters (1986) has suggested that the outbursts maybe interpreted as an evidence for an abrupt large-scale ejection of matter and there may be a possible link between non-radial pulsations and mass loss in Be stars. Again Ando (1986) suggests that the quasi-periodic oscillation of the rotation profile by the wave-rotation interaction may be the most possible mechanism for episodic mass loss in Be stars. The episodic outbursts in μ Cen which is known as a non-radial pulsator (two retrograde sectoral modes of l= 2, 10, Baade, 1984), may be due to the interactions between high and low order sectoral modes (Vogt and Penrod, 1983, Smith and Penrod 1984). To explore the possible reason for episodic outbursts, it is necessary to observe the photospheric and envelope lines simultaneously. Preliminary results of our observations on H_α and He I 6678 A lines, have been presented in Table I.

From our results we find that the velocities of the ejected material are not uniform during the episodic phase. Also we find that the ejected materials are moving both away and towards the observer's line of sight to the star. Maximum velocity of the ejected material towards the observer is 77.6 km/s and that away from the observer is 39.4 km/s . During this outburst we find a a variable weak emission in the profile of He I 6678 A. Present observation suggests that this may be due to the selective mass loss from different latitudes of the star and this selective mass loss may be due to the interactions of different sectoral modes of non-radial pulsations of the star. More details

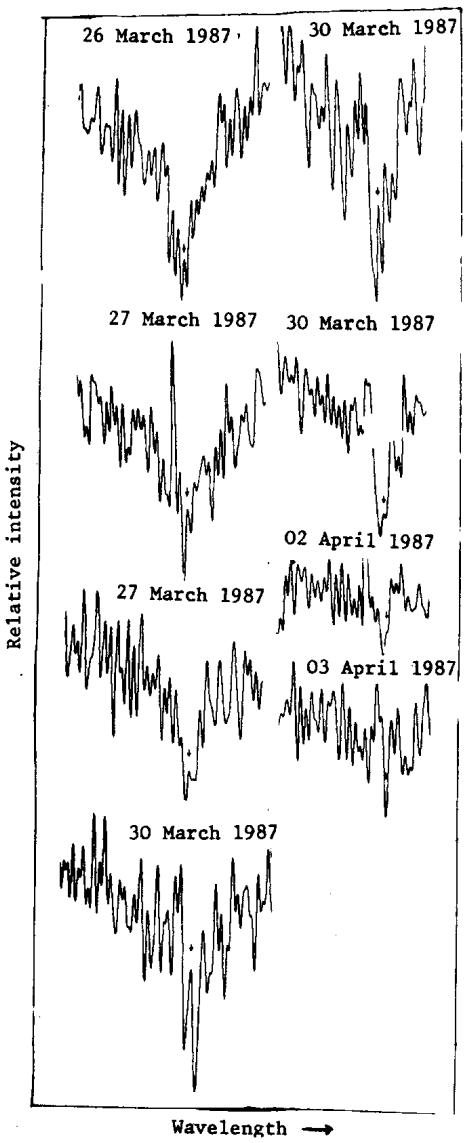

Fig. 1. Spectra of μ Cen in the H_α region. Date of observations have been mentioned along with each spectrum. Wavelength decreases along the right hand side i.e. towards the arrow mark. Vertical arrow marks indicate the peak point of the emission or the absorption minimum. All spectra have been expressed in terms of relative density.

and additional observations will be presented elsewhere. It is noteworthy to mention here that continued observation of μ Cen may provide certain clue to the burning problems of Be stars.

Table I

Date of observation and U T (start and end of exposure)	H_α (6562.817 A)			He I (6678.149 A)	
	Peak/Minimum wavelength (A)	V/R	E/A	Peak/Minimum wavelength (A)	E/A
26 March 1987 20:15 - 20:30	6561.43	< 1	E	6677.74	E
27 March 1987					
20:30 - 20:45	6562.51	< 1	E	6678.79	A
21:00 - 21:45	6563.29	< 1	E	6677.63	E
30 March 1987					
17:22 - 17:40	6562.82	> 1	E	6677.86	E
18:40 - 18:58	6561.35	< 1	E	6679.18	WE
19:07 - 19:22	6561.12	< 1	VWE	6677.40	A
19:30 - 19:45	6562.05	< 1	WE	6678.16	E
02 April 1987					
20:40 - 21:10	6563.68	-	A	6679.79	E
21:25 - 21:55	6562.51	-	A	6677.28	A
03 April 1987	6563.44	-	A	6677.70	E

E - Emission, WE- Weak emission, VWE- Very weak emission, A- Absorption

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