THE OBJECT MWC 137

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ABSTRACT. The main results of the long-term spectral observations of MWC 137 are presented. Variability of the profiles and equivalent widths of Hα, Hβ and HeI, 5876 is shown and discussed.

Key words: Stars: Ae/Be Herbig stars: individual: MWC 137

1. Introduction

MWC 137 is the central star of the extended HII region Sh2-266. An active study of MWC 137 began at the end of 80th years, and it has been included in the various programs of Be, B[e] and Ae/Be Herbig stars researching. In the Fessenkov Astrophysical Institute the first spectrograms of Sh2-266 and MWC 137 have been received in 1971. Some low-excitation emission lines: HI, [NII], [OI] and [SII] have been revealed in the spectrum of the nebula. The spectrum of the central star showed the faint emissions of FeII, HeI and the broad emission lines of HI: FWHM(Hα)=5.6$\pm$ 0.3$\AA$ (Kondratyeva, 1975). Here we present the main spectral results, obtained in 1971–2007.

2. Observations

Observations were carried out with the slit spectrograph mounted at the 70 cm telescope AZT-8. A three-cascade image tube was used as a detector until 1998, and ST-8 CCD since 1999. Spectrograms with a dispersion 70–150 Åmm^{-1} (or 0.5–1.0 Å pixel^{-1}) covered a spectral range about 1000–2000Å. In addition spectrograms with a dispersion 0.18Å pixel^{-1} were received for study of emission line profiles.All spectrograms were reduced following the standard procedure consisting of bias subtraction and flat-field normalization and then all counts were corrected from atmospheric extinction and calibrated from instrumental chromatic response through observations of standard stars from the Catalogue of Kharitonov et al. (1988). Wavelength calibration was done using a laboratory source of HeI, NeI and ArI emission lines.

3. Results

Our values of equivalent widths EW(Hα) and EW(Hβ) are compiled in the Table 1 together with the results of the other authors. As a rule, values EW were determined by measure of 2 or 3 spectrograms. We estimate the errors to be about 10%, the less precision (20–30%) arose because of overexposed Hα images (when the image-tube was used) or if a level of measured continuum was too low (with CCD matrix). Observable variations of EW (Hα) (from 130 up to 550 Å) considerably exceed a range of possible errors and probably reflect the real changes of ionized mass in the circumstellar envelope.The emission profile of Hα, presented in Fig. 1, consists of a red shifted single peak. The values of FWHM(Hα) and V_r – heliocentric radial velocities are listed in the Table 2.

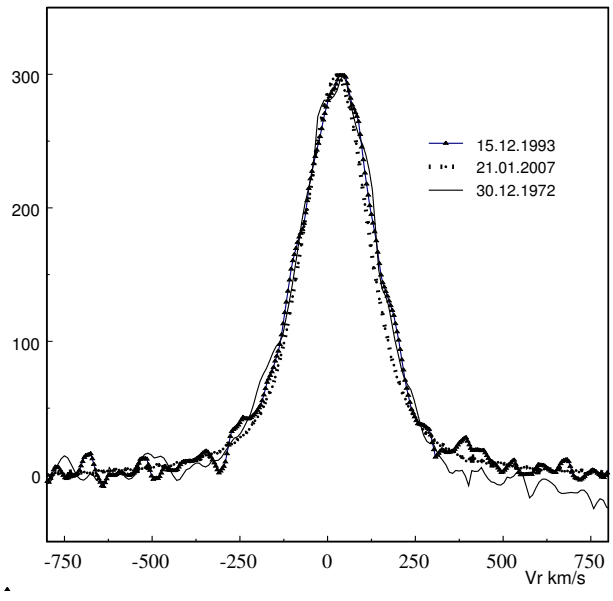

Figure 1: The profile of Hα line for different dates. The Y axes is expressed in the relative intensities.

Our earlier measurements of V_r are in agreement with the data from the other sources (Table 2), However in 2007 V_r (Hα) has considerably decreased,

Table 1: Equivalent widths of the hydrogen lines in the spectrum of MWC 137

Date	EW(Hβ)(Å)	EW(Hα)(Å)
21.02.1971		362±35
10.02.1972		288±48
29.12.1972		180±40
21.02.1974	44.6±4.2	205±15
02.03.1978	32.4±3.2	
31.03.1978	34.5±6.0	
03.04.1978		210±11
04.04.1978		203±29
06.04.1978	49.6±2.4	
07.03.1981		316±23
09.1981		133 (Finkenzeller, 1984)
09.1987		395 (Zickgraf, 2006)
15.02.1988	53.5	
07.11.1988	44±18	
10.11.1988	45±8	
30.01.1989	37±7	
14.01.1991		330±40
27.02.1993	48.1	318±11
15.12.1993		360±40
10.1994		254±17(Esteban, 1998)
31.12.1996		550 (Oudmaijer, 1999)
26.02.1998		213±16
20.12.1999		404 (Vink, 2002)
01.2000	54.4	394(Hernandez, 2004)
02.2002		464 (Zickgraf, 2006)
21.01.2007		530±70

and became closer to V_r (5876) = +29.7±8.0 km s^{-1} and V_r(6678)= +27 ±9.0 km s^{-1} for the same date. By the way, almost the same value V_r (5876) = 32 km s^{-1}, has been received in 2002 (Zickgraf, 2006). It is appreciably, that profiles of Hα, presented in Fig. 1, are not absolutely similar, the most "smooth" and narrow profile was received in 2007. Emission lines HeI,5876, 6678 and 7065 $\mathring{A}$ are presented on all our spectrograms of MWC 137. In the paper of Zickgraf, (2006) the author mentioned, that in September, 1987 the line HeI, 5876 was observed in absorption. Probably, this phenomenon was short-term as on our spectrograms, received in February 1988, this line was again in emission. A modern profile of this line is given in Fig. 2. Its form is asymmetric, probably, a "blue" wing is disturbed by a weak absorption. The value of FWHM (5876) = 234±15 km s^{-1} is more than FWHM (Hα)= 222±12km s^{-1}. In other words the widths of lines increase with potential of ionization and decrease with the distance from the star. Thus we confirm a conclusion of Zickgraf, (2006), that the main mechanism of line broadening is rotation. From the other hand, decreasing of FWHM (Hα) and an asymmetry of HeI profile observed in 2007, testify probably, that outflow mechanism is being activated.

Table 2: Characteristics of Hα profile

Date	FWHM(Hα) km sec^{-1}	Vr (Hα) km sec^{-1}
29.12.1972	255±18	+43.7±9.0
21.02.1974		+47.4±10
15.12.1993	258±18	+42.3±9.0
21.01.2007	222±12	+28.6±8.0
09.1987(Zickgraf, 2006)	197	+42
10.1994(Esteban, 1998)	210	
02.2002(Zickgraf, 2006)	196	+43

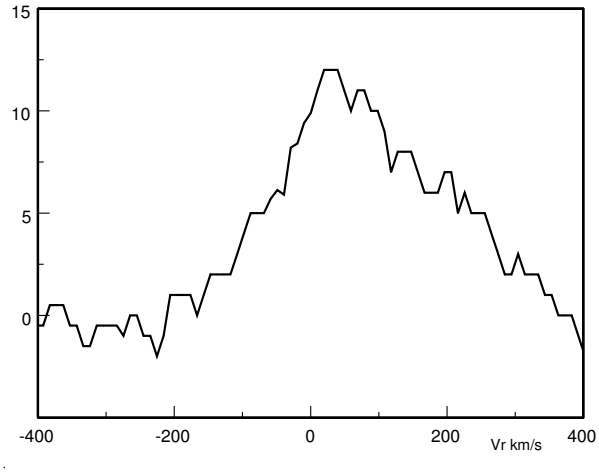

Figure 2: The profile of HeI,5876 line, obtained on January,21 2007. The Y axes is expressed in the relative intensities.

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