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# The B[e] Star MWC 84 (CI Cam)

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## 1. Introduction

The star MWC 84 (CI Cam) was first discovered to be an emission line object classified Bep (Merrill & Burwell, 1933), then classified as a symbiotic star and finally identified as the possible optical counterpart of the X-ray transient XTE J0421+560 (Wagner & Starrfield, 1998)

## 2. Spectral characteristics

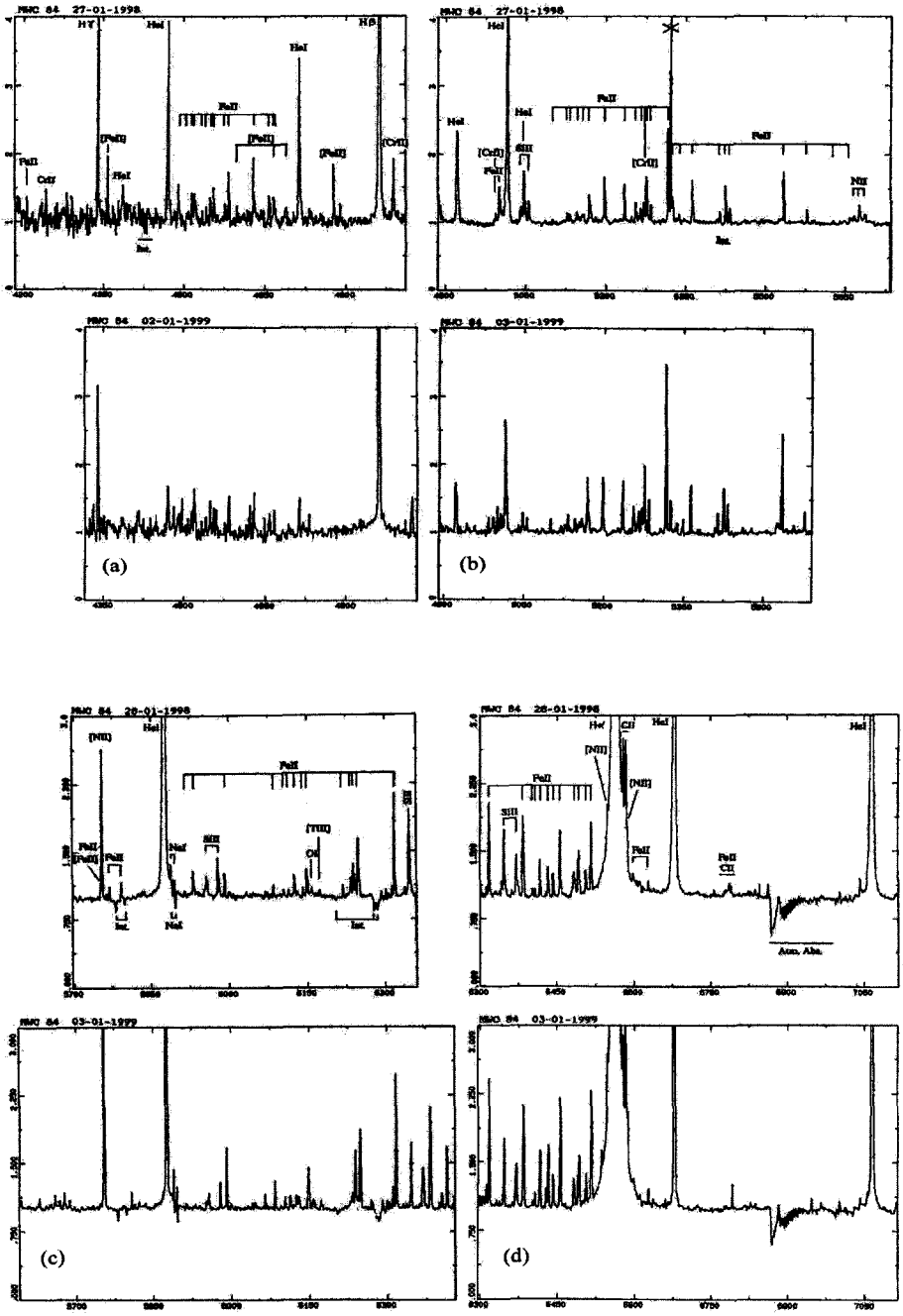
We have observed MWC 84 at the Haute Provence Observatory (CNRS) with a resolution of about 1.3 Å in 1992 (wavelength regions H$\alpha$ and near infrared), 1998 and 1999 (from 4080 to 8880 Å).

The spectrum exhibits more than 450 emission lines (H I, He I, O I, N I, Fe II, Si II, Mg II, [O I], [N II], [Fe II] ...). The strongest lines are due to H I, He I, O I (8446 Å) and the most numerous of them to Fe II (Fig. 1a...1f)). We observe:

- the Balmer lines H$\alpha$, H$\beta$, H$\gamma$, H$\delta$, which show a very steep Balmer decrement. With regard to the Paschen lines, they are visible from P12 to P32,
- the neutral helium lines of the series $^4$D, $^3$D, $^1$S, $^3$S, $^1$P$^o$, $^3$P$^o$ were observed. The first term of each series is very strongly in emission, whereas the second diminishes to a tenth of the equivalent width of the first. The only series where three terms are observable is the $^3$D series. The fourth term is not observable,
- the neutral oxygen line O I (8446 Å) is abnormally strong but this can be explained by a well known fluorescence effect induced by Lyman $\beta$,
- ionized iron is very well represented: 55% of all emissions have been identified totally or partially with Fe II.

The emission lines of the envelope correspond approximately to a spectrum of a B2 type star, with very intense He I lines.

With respect to the photospheric absorption lines, with our resolution, it is difficult to clearly distinguish them because the continuum is often masked by the numerous lines. Only eight interstellar absorption lines are easily visible.

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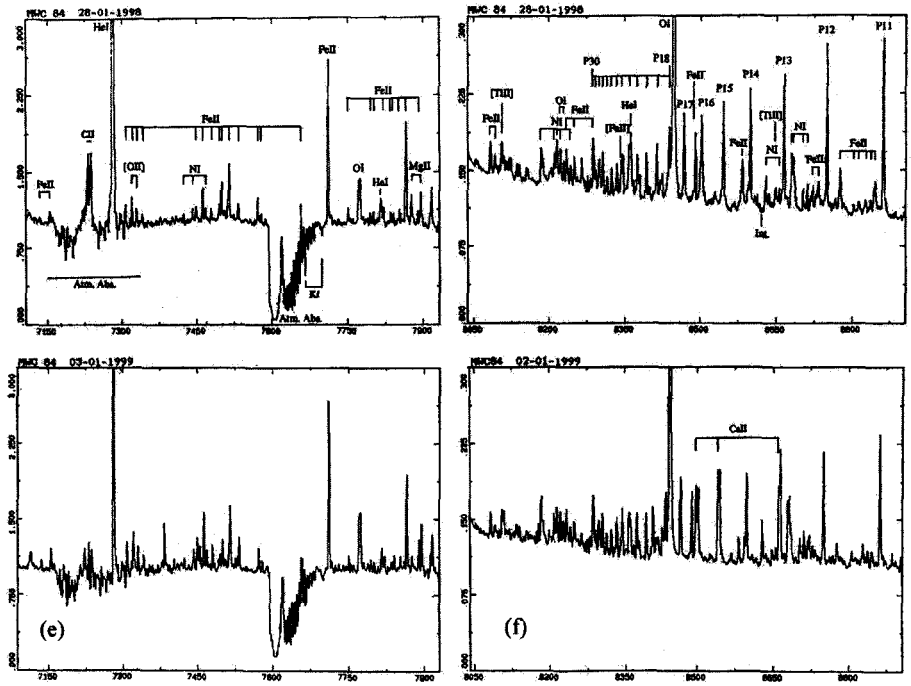


Figure 1. (a)...(f). Spectra of MWC 84 before (top panels) and after the outburst (bottom panels). Abscissae: wavelength in Å, ordinates: intensities. The continuum level is set to unity.

## 3. Variations

We have observed MWC 84 in 1992, 1998 and 1999.

The star presents variations in the equivalent widths of the lines. It is probably the optical counterpart of the X-ray transient XTE J0421+560,/8 for which an outburst has been detected approximately during the first days of April 1998 (Hjellming & Mioduszewsky 1998a, 1998b, 1998c).

Our spectra correspond to the system in a quiescent phase. Those obtained in 1992 and 1998 exhibit very few differences, while those taken in 1998 (two months before the outburst) and in 1999 (nine months after the outburst) show great changes (see Fig. 1):

- hydrogen lines are weaker in 1999 than in 1998 (by a factor of about 0.8),
- He I lines are weaker in 1999 than in 1998 (by a factor of about 0.5),
- Fe II lines are stronger, on the average, in 1999 than in 1998 (by a factor of about 1.2). We notice that the number of [Fe II] lines has diminished in 1999 and, in general, forbidden lines are less numerous than in 1999,

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- the infrared triplet of Ca II is very well visible in 1992 and 1999, but absent in 1998,
- the [N II] line is stronger in 1999 than in 1998 (by about a factor of 2).

## 4. Conclusion

Our spectra taken after the outburst episode exhibit changes with respect to the spectra taken before, the differences being mostly noticeable in the equivalent width of the He I lines and to a lesser degree in the Paschen lines. Also the identification has changed for almost one third of the lines.

It is important to note that we do not observe the He II emission lines (4686 Åand 5411 Å) observed by Wagner and Starrfield (1998) and Garcia et al. (1998).

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