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IS THE MK STANDARD η UMA AN INCIPIENT Be STAR?

η UMa (HR 5191, HD 120315) is a well-studied B3 V star with measured v sin i of 226 km s^{-1} (Bernacca and Perinotto 1971). The star is suspected to be a low amplitude photometric variable, and is listed as number 6450 in the New Catalog of Suspected Variable Stars. η UMa is frequently used as a standard star for spectral classification. Morgan and Keenan (1973) establish η UMa as an "MK dagger type", a star whose spectrum has been carefully examined and is used to define the MK system.

Over the past four years we have obtained a number of observations of the Hα region of η UMa using the echelle spectrograph and Reticon or CCD detectors at Ritter Observatory and Kitt Peak National Observatory. These spectral observations had resolving power of 20,000 or 10,000, and the signal to noise ratio was generally 50-100:1. A log of these observations is given in Table 1.

Our initial observations of η UMa were obtained to test our detector and acquire a series of observations of MK standards, and the first observations from April and May of 1986 showed the expected symmetric, rotationally broadened profile (Figure 1). However, observations the following year showed an Hα profile that appeared to be slightly distorted and asymmetric (Figure 2). Though some of these observations were complicated by the presence

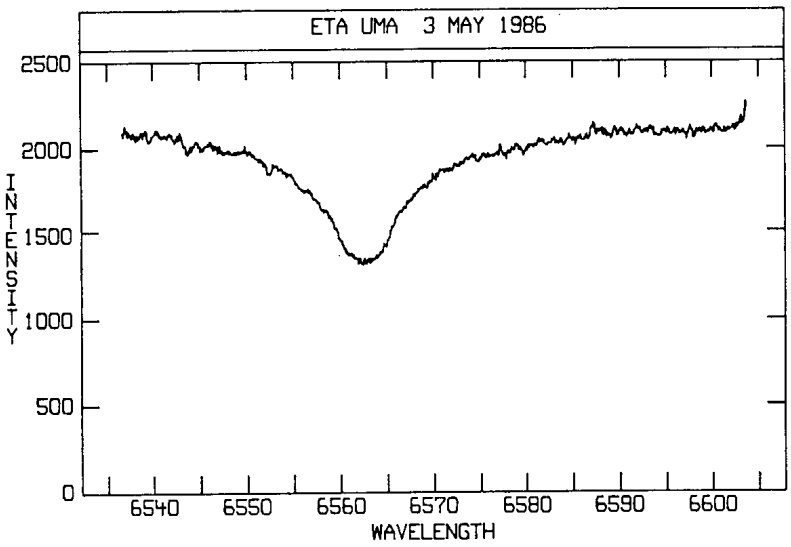

Figure 1: The Hα profile of η UMa in May 1986, obtained with an intensified Reticon detector at Ritter Observatory.

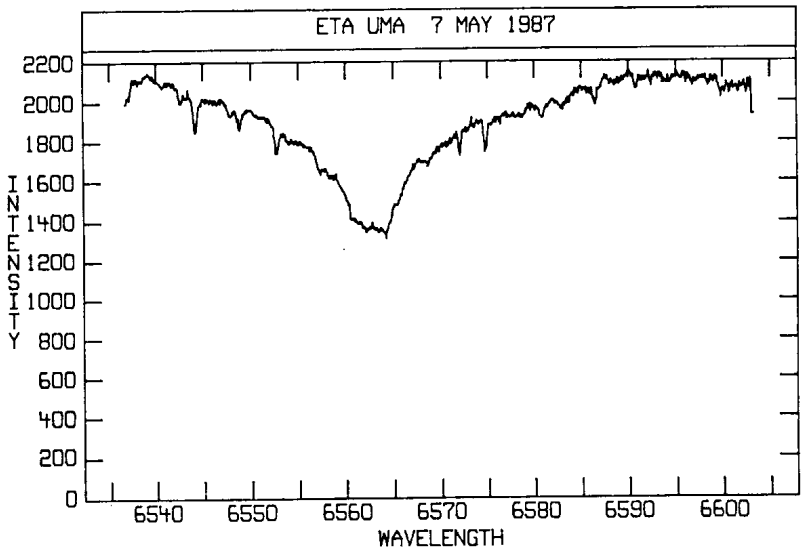

Figure 2: The Hα profile of η UMa in May 1987, showing a distorted and shallower line as compared with a year earlier.

of occasionally strong telluric water vapor lines, the asymmetry was present in scans from both Ritter and KPNO, bolstering our confidence that the effect was real. Additionally, the central

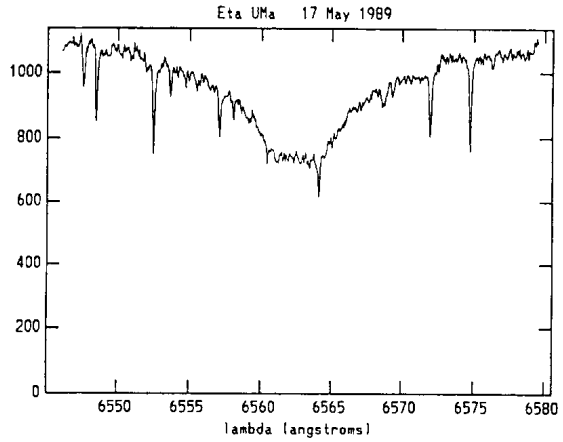

Figure 3: The Hα profile in May 1989, obtained with a CCD detector at Ritter Observatory. The line shows a shallow, flat-bottom profile and is presumably partly filled by emission.

Table 1 **Hα Observations of η UMa**

Date UT	Observatory/Detector	R(Hα)[1]
27 April 1986	Ritter/Reticon	0.628
3 May 1986	"	0.638
4 May 1986	"	0.640
3 June 1986	"	0.643
7 May 1987	"	0.663
23 May 1987	"	0.666
28 May 1987	KPNO/CCD	0.650
26 May 1988	Ritter/Reticon	0.646
8 June 1988	"	0.652
17 May 1989	Ritter/CCD	0.703

[1]Defined as the ratio of the central intensity of Hα to the continuum.

residual intensity of the Hα line, R(Hα), (Table 1) showed a slight increase from 1986 to 1987, as if the line were becoming slightly filled in by emission. This asymmetric profile persisted throughout 1988. Our most recent observation from May 1989 was obtained with our new CCD detector system at Ritter (Bopp et al. 1989) and showed an Hα line with a flat bottom (Figure 3), quite unlike the profile seen two years before. The residual intensity has increased again, suggesting a greater filling of the line by emission.

The profile variations that we have observed in the Hα line of η UMa are not unexpected if the star has weak and/or transient Be characteristics. Certainly the temperature and $v \sin i$ of η UMa make it a credible candidate for such activity. The behavior of η UMa may be reminiscent of that of Zeta Oph, an "ordinary" O9.5 star until 1973, when strong Hα emission unexpectedly appeared. Perhaps η UMa will surprise observers as well, and perhaps some small caution is appropriate before using it as a standard star.

B. W. BOPP
J. R. CAPLINGER
N. A. CROSBY
D. F. MAHONEY
S. P. O'BRIEN
R. C. DEMPSEY

Ritter Observatory and
Dept. of Physics and Astronomy
University of Toledo
Toledo, OH 43606, USA

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