AN UNUSUAL FLARE ON EV LAC

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I. INTRODUCTION.

It has long been noted that the characteristics of the intensity variations during a flare on UV Ceti stars depend on the observed spectral region. The intensity increase being larger in the shorter wavelength region. Typical values for the ratioes between the relative intensity increases on EV Lac in the Johnson UBV-bands are $\Delta U/\Delta B \approx 6$ and $\Delta B/\Delta V \approx 3$. (Moffet 1974).

The relative intensity increase decreases further towards the infrared (Bruevich et al. 1979, Pettersen 1982). The differences in sharpness of the intensity peaks has been attributed to different contribution from line and continuum emission. It has been observed that the line emission has a later maximum and slower decline than the continuum emission (Bopp and Moffet 1973, Mochnacki and Zirin 1980, Pettersen 1981). The rare preflare dips are more often observed in the red and near infrared spectral regions than the blue (Flesch and Oliver 1974, Bruevich et al. 1979). However, a very prominent preflare dip was observed in the blue spectral band (Giampapa et al. 1982). The same authors have speculated if the dip is caused by a general increase in the H^- opacity, or by an off limp "disparition brusque", or by a general increase in the Doppler widths caused by MHD waves assosiated with the oncoming flare.

II. OBSERVATIONS.

During a period in October 1979 the flare star EV Lac was observed photoelectrically with a two-channel photometer mounted on the 30 cm reflector at the Oslo Solar Observatory. The observations were carried out simultainously using a 115Å FWHM centered at Hα and a Schott BG12 filter. The latter approximates a sum of the standard U and B bands. A detailed description of the apparatus is found in Pettersen (1978).

The most interesting of the four flares observed is shown in Figure 1.

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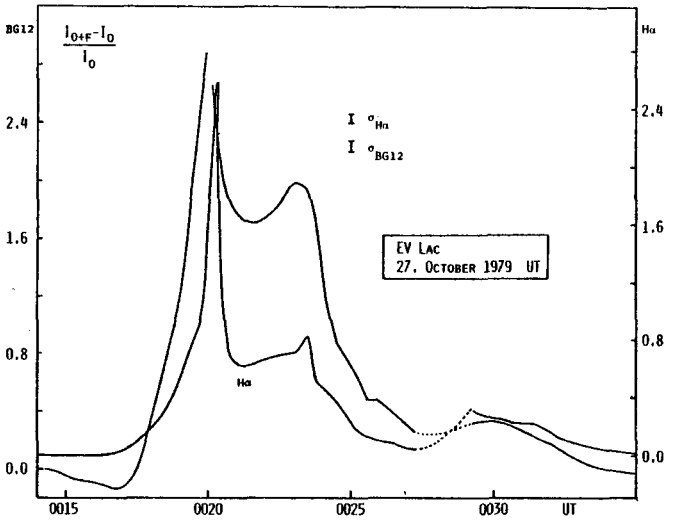

Figure 1. Flare on EV Lac observed in Hα and BG12 filters.

We see a clear preflare dip of 12% in the blue channel while no preflare activity is visible in Hα. The accurate peak intensity in BG12 was not observed as the recorder went off scale. The value in Table 1 is estimated from the intensity gradients.

Table 1. Flare Parameters 27/10-1979.

Filter	t_{max}	$(I_{o+f}-I_o)/I_o$	P(min)
Hα	$00^h20^m20^s$	2.6	5.2
BG12	$00^h20^m12^s$	3.0	13.1

We note that both the primary and secondary maxima occur ≈10 s later in Hα than in BG12. We also note that the maximum increase in intensity is comparable in the two channels and that the same spiked maximum is shown in both channels.

III. DISCUSSION.

The most anomalous feature with this flare is the very large and sharply peaked amplitude observed in the Hα filter. Similar observations

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(Pettersen 1982, Schneeberger et al. 1982) indicate that our observation in Hα compared to the BG12 filter is an order of magnitude larger than previously observed. Even if the delayed maximum could indicate a significant contribution from the Hα line the sharp peak demonstrates that the emission is continuum dominated. This is in accordance with the wide band Hα measurements by Pettersen (1982). In terms of absolute energy per wavelength unit the emission in theHα filter is ≈ 9 times that in BG12. This is larger than the results indicated by Bruevich et al. (1979).

We could speculate in that the excess radiation in the red has to be seen in connection with the preflare dip in blue. All three mechanisms proposed by Giampapa et al. (1982) for the preflare dip could cause an abnormal increase in intensity at longer wavelengths. As no quantitative theoretical results is available it is not possible to determine if any of the proposed mechanisms provide enough energy to explain our observed phenomena.

REFERENCES:

Bopp B.W., and Moffet T.J., 1973, Astrophys.J. 185, 239.
Bruevich V.V., Burnashev V.I., Grinin V.P., Kilyachkov N.N., Kotyshev V.V., Shakovskaya N.I., and Shevchenko V.S., 1979, Izv. Krymsk. Astr. Obs. 61, 90.
Flesch T.R., and Oliver J.P., 1974, Astrophys.J. 189, L127.
Giampapa M.S., Africano J.L., Klimke A., Parks J., Quingley R.J., Robinson R.D., and Worden S.P., 1982, Astrophys.J. 252, L39
Mochnacki S.W., and Zirin H., 1980, Astrophys.J. 239, L27.
Moffet T.J., 1974, Astrophys.J. Supp.Ser. 29, 1.
Pettersen B.R., 1978, Thesis, University of Oslo.
Pettersen B.R., 1982, Reports from Lund Observatory 18, 114.
Schneeberger T.J., Linsky J.L., McClintock W., and Worden S.P., 1979, Astrophys.J. 231, 148.

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