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PHOTOELECTRIC OBSERVATIONS OF AD LEONIS

Continuous photoelectric monitoring of the flare star AD Leo was carried out at the Stephanion Observatory and the National Astronomical Observatory at Rozhen during 1980-1984 within the framework of the Program for Scientific and Technical Co-operation between the Department of Geodetic Astronomy, University of Thessaloniki, Greece and the Department of Astronomy and National Astronomical Observatory, Bulgarian Academy of Sciences, Bulgaria.

Observations were made with the 30 inch Cassegrain reflector at the Stephanion Observatory equipped with a Johnson dual channel photoelectric photometer, in the B colour and with the 60 cm Cassegrain reflector at Rozhen equipped with an EF-1 one channel photoelectric photometer, in the U colour of the international UBV system. The telescopes and the photometers used have been described elsewhere (Mavridis et al., 1982; Panov et al., 1982). The transformations of our instrumental ubv systems to the international UBV system for the period of 1980-1984 is given by the following equations:

$$\begin{aligned} V &= v_o - 0.011(b-v)_o + 3.191 \\ B-V &= 0.569 + 1.022(b-v)_o && (1980, \text{Stephanion}) \\ U-B &= -1.858 + 0.962(u-b)_o \\ \Delta V &= \Delta v - 0.12 (b-v) \\ \Delta(B-V) &= 1.14\Delta(b-v) && (1982-1984, \text{Rozhen}) \\ \Delta(U-B) &= 1.08\Delta(u-b) \end{aligned}$$

The monitoring intervals in U.T., as well as the total monitoring time for each night are given in Table I. The standard deviation of random noise fluctuation ( $\sigma_{\text{mag}} = 2.5 \log(I_o + \sigma)/I_o$ ) for different times (U.T.) of the corresponding monitoring intervals is given in the fourth column of Table I.

During the 5.9 hours of monitoring time one flare was observed, the characteristics of which are given in Table II. The following characteristics (Andrews et al., 1969) for the flare are given:

- a. the date and universal time of the maximum;
- b. the duration before and after the maximum ( $t_b$  and  $t_a$ , respectively),

Table I  
Monitoring intervals in 1980-1984

Date	Monitoring intervals (U.T.) (at Stephanion)	Total Mon.Time	$\sigma$ (U.T.)
1980 March 20/21	20 <sup>h</sup> 34 <sup>m</sup> -20 <sup>h</sup> 58 <sup>m</sup> , 21 <sup>h</sup> 04 <sup>m</sup> -21 <sup>h</sup> 49 <sup>m</sup> , 21 58 -22 15, 22 16 -22 56 22 57 -00 31.	3 <sup>h</sup> 40 <sup>m</sup>	0.03 (20 <sup>h</sup> 42 <sup>m</sup> ), 0.03 (21 <sup>h</sup> 40 <sup>m</sup> ), 0.03 (22 05), 0.03 (22 29), 0.03 (00 00).
	(at Rozhen)		
1982 Feb.21/22	23 <sup>h</sup> 47 <sup>m</sup> 14 <sup>s</sup> -00 <sup>h</sup> 07 <sup>m</sup> 38 <sup>s</sup>	20 <sup>m</sup> 24 <sup>s</sup>	0.04 (23 <sup>h</sup> 55 <sup>m</sup> ).
Oct. 27	01 57 18 -02 03 27, 02 06 33 -02 19 19, 02 23 46 -02 27 37, 02 33 22 -02 52 18, 02 56 21 -03 05 33, 03 06 42 -03 09 10, 03 10 12 -03 12 52, 03 13 42 -03 16 03, 03 16 43 -03 20 57.	60 <sup>m</sup> 37 <sup>s</sup>	0.04 (02 00), 0.03 (02 13), 0.04 (02 25), 0.03 (02 41), 0.04 (02 59), 0.03 (03 07), 0.04 (03 11), 0.03 (03 14), 0.03 (03 18).
1984 March 28	21 18 37 -21 32 55, 21 41 26 -21 48 09, 21 53 43 -22 11 29, 22 16 01 -22 26 29, 22 29 38 -22 32 25.	52 <sup>m</sup> 02 <sup>s</sup>	0.05 (21 25), 0.05 (21 44), 0.04 (22 05), 0.04 (22 20), 0.04 (22 30).
		Total = 5 <sup>h</sup> 53 <sup>m</sup> 03 <sup>s</sup>	

Table II  
Characteristics of the observed flare

Date	U.T. max.	$t_b$ min	$t_a$ min	dura- tion min.	$\frac{I_f - I_o}{I_o}$	P min	$\Delta m$ mag	$\sigma$ mag	Air mass
Mar. 28	22 <sup>h</sup> 21 <sup>m</sup> .4	0.9	4.0	4.9	0.274	0.330	0.26	0.04	1.217

as well as the total duration of the flare;

c. the value of the ratio  $(I_f - I_o)/I_o$  corresponding to the flare maximum, where  $I_o$  is the intensity deflection of the quiet star lessened with sky background and  $I_f$  is the total intensity deflection of the star plus flare lessened with sky background;

d. the integrated intensity of the flare over its total duration, including pre-flares, if present:  $P = \int (I_f - I_o)/I_o dt$ ;

e. the increase of the apparent magnitude of the star at flare maximum  $\Delta m(u) = 2.5 \log (I_f/I_o)$ , where  $u$  is the ultraviolet magnitude of the star in the instrumental system;

f. the standard deviation of random noise fluctuation  $\sigma_{mag} = 2.5 \log (I_o + \sigma)/I_o$ ,

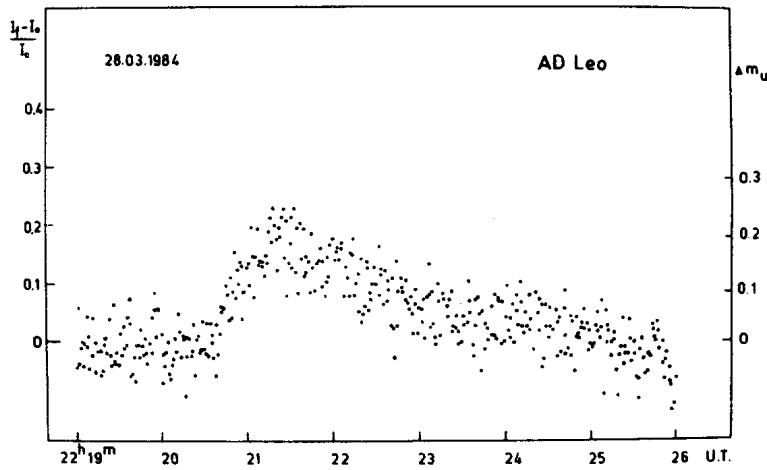


Figure 1

during the quiet-state phase immediately preceding the beginning of the flare;

g. the air mass at the flare maximum.

The light curve of the observed flare in the u-colour is shown in Figure 1.

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