

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 932

Konkoly Observatory
Budapest
1974 October 14

PHOTOELECTRIC MONITORING OF THE FLARE STAR AD Leo

The results of photoelectric observations of the flare star AD Leo, made through a standard B filter, are presented. Two flares were detected during photoelectric monitoring of the star over a total of 32^h35^m, spread over 14 nights during period 20 Nov 1973-26 April 1974. The records of effective coverage are given in Table I. The details of the characteristics of the flare events are given in Table II. The flare characteristics of AD Leo were computed using the same techniques and procedure as those employed earlier by Kapoor, Sanwal, Sinhal (1973, I.B.V.S. No.810). For energy calculations the quiescent state luminosity of the star was taken to be 8.2×10^{29} ergs sec⁻¹ 100A⁻¹ in the B filter with reference to Oke and Schild's (1970, *Astrophys.J.* 161, 1015) calibration of α Lyr.

The light curves of the flares are shown in Figs 1 and 2. Both light curves are combinations of spike and slow flares as characterized by Moffett (1974, *Sky and Telescope*, 48, 94). One can see that before a flare starts, the brightness of the star undergoes dimming, as it often happens in most of the flares, of UV Ceti type. The declining branch of the flare in Fig. 1 could not be covered up to pre-flare brightness of the star. The flares correspond nearly to type II flares (Oskanyan, 1969, *Non-Periodic Phenomena in Variable Stars* Ed. L. Detre, Academic Press, Budapest, p.131).

The author is thankful to Dr.S.D. Sinhal for suggestions and guidance. Part of this work was carried out with financial assistance with PL 480 funds under Smithsonian Institution. Project No SFG-O-6425.

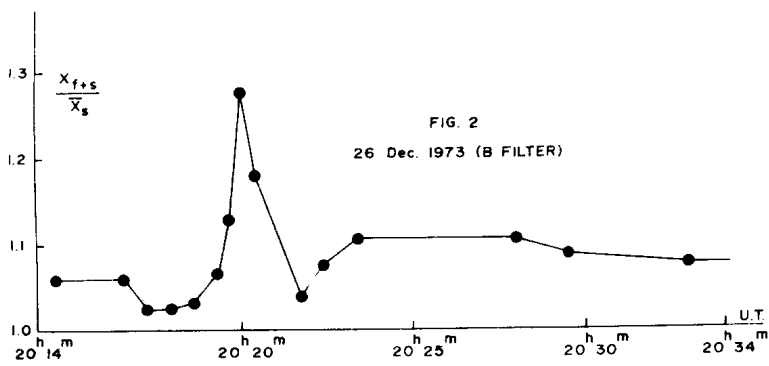
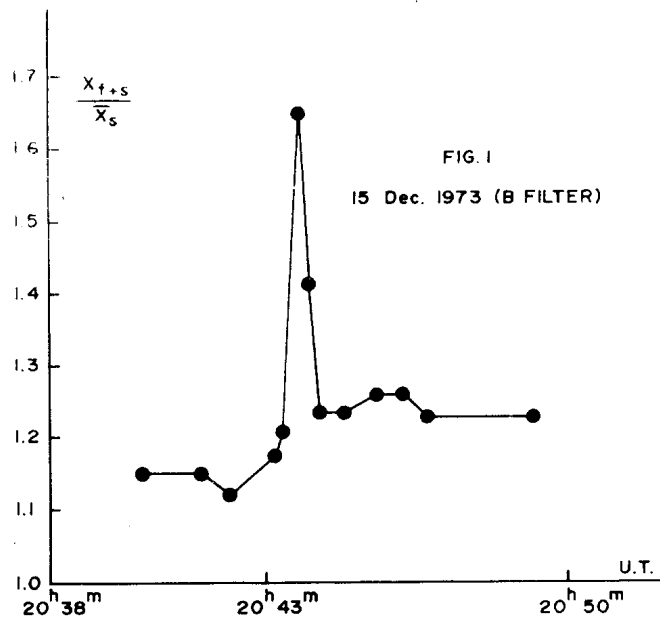


Table I
Coverage of AD Leo

Date 1973	Telescope	(Times rounded off to nearest minute of UT)				
20 Nov.	52 cm	19 ^h 58 ^m -20 ^h 00 ^m	20 ^h 04 ^m - 08 ^m	20 ^h 09 ^m - 11 ^m		
		20 12 - 18	20 20 - 32	20 33 - 46		
		20 48 - 21 00	21 01 - 11	21 12 - 15		
		21 19 - 21	21 23 - 25	21 27 - 29		
		21 30 - 33	21 35 - 40	21 44 - 50		
		21 57 - 22 01	22 02 - 04	22 06 - 09		
		22 10 - 12	22 13 - 17	22 20 - 22		
		13 Dec.	56 cm	19 15 - 32	19 34 - 41	19 45 - 55
		19 57 - 20 00	20 01 - 02	20 03 - 11		
		20 12 - 15	20 16 - 19	20 20 - 27		
21 09 - 17	21 18 - 34					
14 Dec.	56 cm	18 34 - 39	18 41 - 47	18 48 - 52		
		18 53 - 19 01	19 04 - 24	19 25 - 32		
		19 53 - 20 00	20 01 - 04	20 05 - 12		
		20 12 - 32	20 54 - 21 17	-		
15 Dec.	56 cm	18 04 - 09	18 12 - 14	18 15 - 20		
		18 21 - 25	18 30 - 36	18 41 - 54		
		18 55 - 57	19 02 - 08	19 09 - 22		
		19 24 - 30	19 45 - 20 06	20 15 - 39		
		20 40 - 42	20 43 - 48	20 49 - 52		
		21 00 - 04	-	-		
25 Dec.	56 cm	18 05 - 10	18 11 - 15	18 16 - 19		
		18 21 - 30	18 33 - 45	19 25 - 52		
		19 53 - 20 01	20 02 - 15	20 16 - 29		
		17 05 - 09	17 11 - 22	17 24 - 33		
26 Dec.	56 cm	17 34 - 41	17 42 - 45	17 53 - 57		
		17 58 - 18 10	18 12 - 25	18 27 - 42		
		18 43 - 45	18 46 - 51	18 52 - 57		
		19 00 - 11	19 12 - 17	19 20 - 45		
		19 46 - 51	19 52 - 55	19 56 - 20 00		
		20 01 - 10	20 11 - 22	20 23 - 38		
		20 40 - 50	20 51 - 21 03	21 04 - 22		
		16 50 - 54	16 55 - 57	17 02 - 03		
		17 04 - 08	17 09 - 15	17 16 - 22		
		17 23 - 30	17 32 - 18 03	18 04 - 08		
27 Dec.	56 cm	18 20 - 41	18 42 - 46	18 47 - 59		
		19 06 - 17	19 22 - 42	19 43 - 50		
		19 50 - 20 06	20 07 - 09	20 21 - 31		
		20 33 - 40	20 41 - 43	20 45 - 49		
		20 49 - 21 02				
		19 12 - 21	19 32 - 44	20 19 - 23		
		15 32 - 40	15 47 - 16 09	16 21 - 39		
		16 59 - 17 14	17 15 - 18	17 23 - 33		
		17 34 - 41	17 42 - 18 20	18 24 - 41		
		18 46 - 58				
31 Jan.	52 cm	15 31 - 37	15 48 - 16 00	16 01 - 09		
		16 10 - 12	16 13 - 15	16 16 - 29		
		16 30 - 45	16 46 - 52	16 54 - 17 42		
		17 50 - 59	18 47 - 19 13	19 14 - 33		
		19 34 - 39	19 41 - 20 07	20 08 - 30		
		20 31 - 35				
		20 49 - 21 02				

Table I (continued)

Date 1974	Telescope	(Times rounded off to nearest minute of U^m)		
10 Apr.	56 cm	<u>16^h18^m - 20^m</u>	<u>16^h22^m - 28^m</u>	<u>16^h29^m - 40^m</u>
		16 42 - 46	16 47 - 53	18 02 - 20
		18 22 - 46	18 47 - 19 07	19 08 - 26
		19 27 - 30	19 31 - 44	19 45 - 50
		19 51 - 58	19 59 - 20 26	
11 Apr.	56 cm	16 01 - 08	16 09 - 22	16 26 - 56
		16 57 - 17 12	17 13 - 18	
12 Apr.	56 cm	15 37 - 58	15 59 - 16 19	16 21 - 55
		16 57 - 17 15	17 18 - 25	17 33 - 18 14
		18 15 - 43	18 44 - 52	18 59 - 19 14
		19 15 - 33	19 38 - 50	19 55 - 20 18
		20 19 - 31		
26 Apr.	56 cm	17 13 - 30	17 31 - 44	17 45 - 18 02
		18 03 - 13	18 15 - 18	18 29 - 42
		18 44 - 58	18 59 - 19 14	19 15 - 23
		19 24 - 35	19 37 - 44	

- Note: 1. The flare intervals have been underlined.
 2. Total coverage: 32^h35^m spread over 14 nights.
 3. Photomultiplier used: 1P21, unrefrigerated.

Table II
 Characteristics of the Flares on AD Leo
 (dM4e : V=9^m43; U-V=2^m61)

Date	UT	Flare duration		X_{fm+s}	Δm	$\frac{c}{X_s}$	P	$R(z)$	Energy released at flare max (10 ²⁹ ergs/s)	Total emiss- ion during the flare up (10 ³⁰ ergs/s)
1973	max	before max tb	after max ta	X_s			(min)			
15 Dec.20	h ²⁰ m ⁰³ s ⁵	2.2	3	1.651	.544	.031	0.32	1.254	7.58	8.82
26 Dec.20	43 44	3.4	13	1.276	.265	.079	0.54	1.190	5.86	14.88

Note : For notation see Oskanyan (1970, I.B.V.S. No. 488).

Uttar Pradesh State Observatory
 Manora Peak Naini Tal 263129,
 India.