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FLARE MONITORING OF AD Leo

One flare was recorded during 7.61 hours of ultraviolet monitoring within the scheduled April 1971 period for cooperative X-ray and optical observations (IBVS 516). A night in March was spent tracing possible instrumental causes for the fact that three of the six AD Leo "flares" reported in IBVS 499 occurred at the same telescope position. No instrumental causes were confirmed, and, in fact, the reality of one of the flares in question has been supported by the independent observations of Cristaldi and Rodono, IBVS 498. They were not observing at the times of the other flares.

Table I shows the actual monitoring times rounded to the nearest minute of UT. In all cases, an EMI 6256S photomultiplier with d.c. amplification (Keithley 416) and direct strip-chart recording (Speedomax W) was used with the 61-cm diameter Cassegrain at Mt. Cuba Observatory. On April 15 and 16 a standard U filter (Corning 7-54) was used with the f/16 secondary mirror. On March 25, in order to duplicate the 1970 observing conditions, the calcium K-line filter was used with the f/32 secondary.

Although all lighting and physical settings on March 25 were made to agree as closely as possible with the 1970 conditions, there was no sign of a brightened signal occurring between hour angles - 1:56 and - 1:36 (or at any other time during that night). Of the suspected flares reported in IBVS 499, flare No. 3 was the most dubious. This, however, is the only one for which I know of simultaneous monitoring having been done elsewhere. It has the same time of maximum (1970 March 8, 2<sup>h</sup> 27<sup>m</sup>.3 UT) as the second of the four flares reported by Cristaldi and Rodono in IBVS 498. They also noted it to be uncertain and gave the blue-light brightness and duration as several times smaller than my estimate at the K line. This is a reasonable degree of dissimilarity for the difference between the filters used. That there remain two unconfirmed flares at nearly the same hour angle is no longer a basis for regarding them as probably spurious.

Table I. Coverage of AD Leo during 1971.

Date	UT Coverage
March 25	1 <sup>h</sup> 09 <sup>m</sup> - 13 <sup>m</sup> , 1:17-37, 1:43-58, 2:01-19, 2:23-43, 2:47-3:03, 3:06-36, 4:23-57, 5:02-16.
April 15	2:30-42, 2:44-53, 2:57-3:18, 3:19-23, 3:25-35, 3:37-43, 3:46-4:03, 4:07-21, 4:23-40, 4:42-59, 5:03-25, 5:29-47, 5:49-6:21.
April 16	2:12-31, 2:43-3:06, 3:10-11, 3:16-29, 3:38-54, 3:56-4:12.

Table II. Photometry of AD Leo during quiescence.

1971 Date	Filter	UT	$m_c - m_o$	$\frac{I_o}{\sigma}$	$m_{lim} - m_o$
March 25	Ca-K	1:11	1.31	6.8	1.77
		2:33	1.32	6.7	1.75
		4:46	1.26	6.2	1.66
April 15	U	3:08	1.09	8.6	2.01
		3:40	0.99	8.7	2.03
		5:18	1.10	6.8	1.76
April 16	U	2:51	1.25	5.9	1.61
		4:01	1.23	5.5	1.52

INTENSITY

$m_o - m_{o,f} = 1.61$   
 $m_c - m_{o,f} = 2.68$   
 $I_o / \sigma = 8.24$   
 $m_{lim} - m_o = 1.97$   
 $(m_f - m_o)_{max} = -1.33$

AD Leo

15 April 1971

Peak at 3<sup>h</sup> 11<sup>m</sup> 35 UT

$t_b = 0^m 55$ ,  $t_a = 9^m 8$

$P = 3.50$  min

Air Mass = 1.12

COMP. STAR →

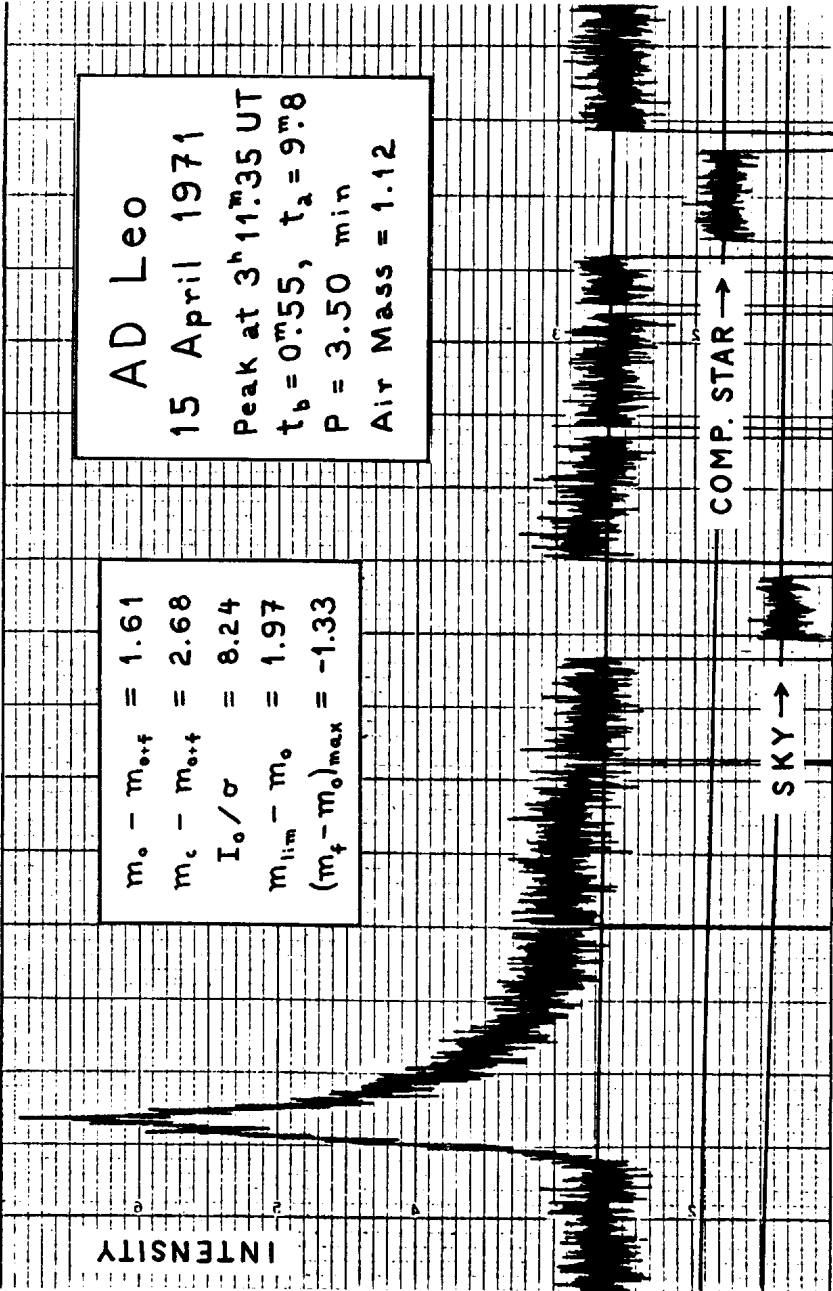
SKY →

3:10

3:15

3:20

3:25 UT



Quantities descriptive of the single flare observed this year are given in the figure, along with an unsmoothed reproduction of the raw data from the photometer chart. All of these quantities are as defined in IBVS 499, although the optical filter is different. Signal to noise is estimated both for the instrumental time constant ( $I_0/\sigma$ ) and for a five-times-longer time constant (appropriate to the mental smoothing that is done in looking for flares) to approximate the minimum detectable flare magnitude ( $m_{lim} - m_0$ ).

Table II provides a sample of the variability (with respect to the comparison star identified in IBVS 449) of AD Leo at times devoid of identified flares.

Mt. Cuba Observatory  
1971 November 23

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#### REFERENCES

- A. D. Andrews, P. F. Chugainov, V. S. Oskanian, and E. M. Kellogg,  
IBVS No. 516, 1971.  
S. Cristaldi and M. Rodono, IBVS No. 498, 1970.  
R. B. Herr, IBVS No. 499, 1970.